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THE OFFICE OF ENVIRONMENTAL MANAGEMENT TECHNICAL REPORTS

A Bibliography
July 1997

Prepared for
The Office of Science
and Technology

Prepared by
Office of Scientific and
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DISCLAIMER

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ABOUT THIS BIBLIOGRAPHY

The Office of Environmental Management's (EM) technical reports bibliography is an annual publication that contains information on scientific and technical reports sponsored by the Office of Environmental Management added to the Energy Science and Technology Database from July 1, 1995 – Sept. 30, 1996. This information is divided into the following categories: **Focus Areas and Crosscutting Programs**. Support Programs, Technology Integration and International Technology Exchange, are now included in the General category. EM's Office of Science and Technology sponsors this bibliography. Questions regarding the content of the publication should be addressed to Diana Krop, Communications Program Manager, at 301-903-7918 or **Diana.Krop@em.doe.gov**

PROGRAM ACTIVITIES

The Office of Environmental Management within the Department of Energy (DOE) is responsible for environmental restoration, waste management, technology development and facility transition and management. This Office was created in 1989 to consolidate responsibility within DOE for environmental management activities. EM develops DOE policies and plans related to environmental restoration and waste management and is working to foster open communication with the public.

The Office of Science and Technology (OST) was established to conduct an aggressive, national program of applied research, development, demonstration, testing, and evaluation for environmental cleanup solutions that are safe and more time- and cost-effective than those currently available. OST brings together experts from academia, the Federal government, and private industry to conduct a wide range of research and development. Through these unique partnerships, OST leverages resources to develop equipment and methods to render waste management technologies less expensive, safe, and commercially applicable around the globe. In doing so, OST seeks to achieve the twin goals of sustaining our environment and creating economic prosperity.

AVAILABILITY

A searchable EM Technical Reports database is now available from OST's home page via the World Wide Web. The database contains information on scientific and technical reports included in this publication and is searchable by title, focus area, author, performing organization, DOE report number, publication date, and abstract. The Internet address is: **http://em-50.em.doe.gov** (under publications listed as EM Technical Reports Database).

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How To Read A Citation

The principal data elements included in these citations are:

1. **Abstract number** within volume.
2. **Report number** identification for report-type literature.
3. **Title and subtitle** (non-English title may appear in parentheses, if applicable).
4. **Author(s).** First 10 names in the data record are printed, then "et al." is listed.
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15. **Conference title, location, and date,** if applicable.
16. **Order number.** The "DE" order number may be used for ordering from NTIS or OSTI, as appropriate. The "TI" prefix is valid only at OSTI.
17. **Sources of availability** from which a copy of the document may be obtained; usually appear as abbreviations. (See information on following page.)
18. **Drop note** or explanatory statement.
19. **Abstract.**
20. **Subject descriptors.** Listed only if no abstract or only a brief statement is included.

Sample Citations

Report

18494 (DOE/ER/40438–T1) **[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report.** Haeberli, W. Phys. VI collaboration. Wisconsin Univ., Madison (USA). Dept. of Physics. [1989]. 12p. Sponsored by DOE Energy Research. DOE Contract FG02-88ER40438. Order Number DE89007246. Available from NTIS, PC A03/MF A01 - OSTI; GPO Dep.

This paper briefly discusses the Wisconsin test facility for storage cells; results of target tests; the new UHV...

Report Analytic

18500 (INIS-SU—69, pp. 30-32) **Transition energies in Ne-like ions. Correlation effects.** Vainshtejn, L.A. AN SSSR, Moscow. Fizicheskij Inst. 1988. (In Russian). In *Experimental and theoretical physics. Collection.* Order Number DE89780060. Available from NTIS (US Sales Only), PC A03/MF A01; INIS.

Kratkie Soobshcheniya po Fizike.; no. 6.

SILVER IONS/energy-level transitions; XENON IONS/energy-level transitions; CORRELATIONS; D STATES; E STATES;...

54 (DOE/ER/60888-1-Vol.1, pp. 115-117) **Investigation of air pollution in house due to use of various fuels.** Luo, Dayu (Chengdu Sanitation (China)). Canada Mortgage and Housing Corp., Ottawa, ON (Canada). 1990. (CONF-900724-Vol.1: Indoor Air '90: 5th international conference on indoor air quality and climate, Toronto (Canada), 29 Jul - 3 aug 1990). In Indoor air '90: The fifth international conference on indoor air quality and climate. Volume 1: Final report. 786p. Order Number DE90017786. Source: NTIS.

Air pollution in houses caused by combustion of coal is more serious than that by combustion of natural gas and methane (primarily by SO_2 and NO_2). The gas concentration after cooking is higher than that before cooking, and it is higher in kitchen than in bedroom and outdoor. There were mutations in the extract from TSP in 30m^2 air in the bedroom, kitchen and outdoor, where coal and natural gas were used. The supernatant saliva activity of children whose family uses coal is significantly lower than that of pumping streams.

How To Use the Indexes

Five indexes are provided for approaching the content of *The Office of Environmental Management Technical Reports.* Descriptions of entries in these indexes follow.

Corporate Author Index

The corporation, organization, or institution responsible for the issuance of the document is listed in this index. The entries are arranged alphabetically and provide the title and citation number of the reference. For example, the listing for the "Report" sample citation would appear as shown at right.

Wisconsin Univ., Madison (USA). Dept. of Physics
[Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)
Wisconsin Univ., Madison (USA). Lab. of Genetics
Organization of the R chromosome region in maize: Final progress report, June 1, 1983–May 31, 1986, 15:18255 (R;US)

Personal Author Index

Each author's name listed on a document cited in this issue is indexed. An index entry provides title and citation number; for secondary and other names, a cross-reference is given to the primary author name where the full index entry is located.

Hadley, D.L., *See* Lee, A.D., 15:17651
Haeberli, W., [Development of a hydrogen and deuterium polarized gas target for application in storage rings]: Progress report, 15:18494 (R;US)

Subject Index

This index lists the main subject descriptors assigned to each record by indexing professionals. A secondary or qualifier term is used where necessary to describe materials, objects, and processes. Document titles may be enhanced with additional informative phrases where necessary. An excerpt from this index appears at right.

HYDROGEN ISOTOPES
See also DEUTERIUM
HYDROGEN 4
TRITIUM
Neutron-Rich Isotopes
Study on the strong neutron-rich nuclei of lightest elements, 15:18686 (RA;SU;In Russian)

Contract Number Index

DOE technical reports are listed by contract number. Each entry also provides the primary corporation or organization cited for that contract number. A typical entry is shown.

FG02-88ER40438 **Wisconsin Univ., Madison (USA). Dept. of Physics**
15:18494 DOE/ER/40438–T1
FG02-88ER60664 **Rogers and Associates Engineering Corp., Salt Lake City, UT (USA)**

Report Number Index

Technical report literature is indexed by the alphanumerical identifier of the report. Patent documents and conferences are included for convenience. Each entry lists the citation number, the source of availability of the document, an indicator of presence at a GPO depository library, order number, and distribution category. A typical entry is shown.

DOE/ER/40438– T1 15:18494 NTIS, OSTI
E 1.99: DE89007246 MF-411

Environmental Management Technical Reports

GENERAL

Refer also to citation(s) 635, 636, 637, 796, 1013, 1014, 1081, 1543, 2099

1 (ANL–95/46) **Minimum Additive Waste Stabilization (MAWS), Phase I: Soil washing final report.** Argonne National Lab., IL (United States). Aug 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96012963. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the U.S. Department of Energy's environmental restoration and technology development activities, GTS Duratek, Inc., and its subcontractors have demonstrated an integrated thermal waste treatment system at Fernald, OH, as part the Minimum Additive Waste Stabilization (MAWS) Program. Specifically, MAWS integrates soil washing, vitrification of mixed waste streams, and ion exchange to recycle and remediate process water to achieve, through a synergistic effect, a reduction in waste volume, increased waste loading, and production of a durable, leach-resistant, stable waste form suitable for disposal. This report summarizes the results of the demonstration/testing of the soil washing component of the MAWS system installed at Fernald (Plant 9). The soil washing system was designed to (1) process contaminated soil at a rate of 0.25 cubic yards per hour; (2) reduce overall waste volume and provide consistent-quality silica sand and contaminant concentrates as raw material for vitrification; and (3) release clean soil with uranium levels below 35 pCi/g. Volume reductions expected ranged from 50-80 percent; the actual volume reduction achieved during the demonstration reached 66.5 percent. The activity level of clean soil was reduced to as low as 6 pCi/g from an initial average soil activity level of 17.6 pCi/g (the highest initial level of soil provided for testing was 41 pCi/g). Although the throughput of the soil washing system was inconsistent throughout the testing period, the system was online for sufficient periods to conclude that a rate equivalent to 0.25 cubic yards per hour was achieved.

2 (ANL/CMT-ACL/CP–84790) **Laboratory performance evaluation reports for management.** Lindahl, P.C. (Argonne National Lab., IL (United States)); Hensley, J.E.; Bass, D.A.; Johnson, P.L.; Marr, J.J.; Streets, W.E.; Warren, S.W.; Newberry, R.W. Argonne National Lab., IL (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950498–1: 6. international environmental quality and waste management conference: managing for quality - meeting environmental challenges, Denver, CO (United States), 18-20 Apr 1995). Order Number DE95011794. Source: OSTI; NTIS; INIS; GPO Dep.

In support of the US DOE's environmental restoration efforts, the Integrated Performance Evaluation Program (IPEP) was developed to produce laboratory performance evaluation reports for management. These reports will provide information necessary to allow DOE headquarters and field offices to determine whether or not contracted analytical laboratories have the capability to produce environmental data of the quality necessary for the remediation program. This document describes the management report.

3 (ANL/CMT-ACL/CP–85835) **Development of the Integrated Performance Evaluation Program (IPEP) for the Department of Energy's Office of Environmental Management.** Lindahl, P. (Argonne National Lab., IL (United States)); Streets, E.; Bass, D.; Hensley, J.; Newberry, R.; Carter, M. Argonne National Lab., IL (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950495–2: 7. national technology information exchange workshop, Cincinnati, OH (United States), 18-20 Apr 1995). Order Number DE95012929. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory (ANL) and DOE's Radiological and Environmental Sciences Laboratory (RESL), Environmental Measurements Laboratory (EML), and Grand Junction Project office (GJPO) are collaborating with DOE's Office of Environmental Management (EM), Analytical Services Division (ASD, EM-263) and the Environmental Protection Agency (EPA) to develop an Integrated Performance Evaluation Program (IPEP). The purpose of the IPEP is to integrate information from existing PE programs with expanded QA activities to develop information about the quality of radiological, mixed waste, and hazardous environmental sample analyses provided by all laboratories supporting EM programs. The IPEP plans to utilize existing PE programs when available and appropriate for use by DOE; new PE programs will be developed only when no existing program meets DOEs needs. Interagency Agreements have been developed between EPA and DOE to allow DOE to use major existing PE programs developed by EPA. In addition, the DOE radiological Quality Assessment Program (QAP) administered by EML is being expanded for use in EM work. RESL and GJPO are also developing the Mixed Waste Performance Evaluation Program (MAPEP) to provide radiological, inorganic, and organic analytes of interest to EM programs. The use of information from multiple PE programs will allow a more global assessment of an individual laboratory's performance, as well as providing a means of more fairly comparing laboratories' performances in a given analytical area. The EPEP will interact with other aspects of the ASD such as audit and methods development activities to provide an integrated system for assessment and improvement of data quality.

4 (ANL/CMT-ACL/CP–86061) **IPEP: The integrated performance evaluation program for the Department of Energy's Office of Environmental Management.** Lindahl, P.C. (and others); Streets, W.E.; Bass, D.A. Argonne National Lab., IL (United States). 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–6: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95015649. Source: OSTI; NTIS; INIS; GPO Dep.

The quality of the analytical data being provided to DOE's Office of Environmental Management (EM) for environmental restoration activities and the extent to which these data meet the data quality objectives are critical in the decision-making process. One of several quality metrics that can be used in evaluating a laboratory is its performance in performance evaluation (PE) programs. In support of DOE's environmental restoration and waste management efforts, EM has been charged with developing and implementing a program to assess the performance of participating laboratories. Argonne National Laboratory (ANL) and DOE's Environmental Measurements Laboratory (EML) and Radiological and Environmental Sciences Laboratory (RESL) have been collaborating on the development and implementation of a comprehensive Integrated Performance Evaluation Program (IPEP) for DOE-wide implementation. The IPEP will use results from existing inorganic, organic, and radiological PE programs when these are available and appropriate for the analytes and matrices being determined for DOE's EM activities. Existing programs include the U.S. Environmental Protection Agency's (EPA's) Contract Laboratory Program (CLP), the Water Supply (WS) and Water Pollution (WP) PE studies for inorganic and organic analytes, and DOE's Quality Assessment Program (QAP) for radiological analytes. In addition, DOE has begun the development of the Mixed Analyte Performance Evaluation Program (MAPEP) to address the needs of the DOE Complex. These PE programs provide a spectrum of matrices and analytes covering the various inorganic, organic, and low-level radiologic categories found in routine environmental and waste samples. These PE programs already provide some assessment of laboratory performance; IPEP will expand these assessments by evaluating historical performance, as well as results from multiple PE programs, thereby providing an enhanced usage of the PE program information.

5 (ANL/CMT-ACL/CP–86080) **IPEP: Laboratory performance evaluation reports for management of DOE EM programs.** Hensley, J.E. (and others); Lindahl, P.C.; Streets, W.E. Argonne National Lab., IL (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–7: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95015650. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental restoration program/project managers at DOE's Office of Environmental Management (EM) are making important decisions based on analytical data generated by contracted laboratories. The Analytical Services Division, EM-263, is developing the Integrated Performance Evaluation Program (IPEP) to assess the performance of those laboratories, based on results from Performance Evaluation (PE) programs. The IPEP reports will be used by the laboratories to foster self-assessment and improvement. In addition, IPEP will produce PE reports for three levels of EM management (Operations/Project Offices, Area Program Offices, and Deputy Assistant Secretary Office). These reports will be used to assess whether contracted analytical laboratories have the capability to produce environmental data of the quality necessary for making environmental restoration and waste management decisions.

6 (ANL/CMT-ACL/VU–83596) **Development of the Integrated Performance Evaluation Program (IPEP) for the Department of Energy's Office of Environmental Management.** Argonne National Lab., IL (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9410147–5-Vugraphs: 35. ORNL/DOE analytical chemistry in energy technology conference, Gatlinburg, TN (United States), 6-8 Oct 1994). Order Number DE95013496. Source: OSTI; NTIS; GPO Dep.

ASD's Quality Assurance Program assures production of credible environmental data. The Analytical Services Division (EM-263) is responsible for developing and implementing a comprehensive Integrated Performance Evaluation Program (IPEP) for laboratories providing analytical data in support of Environmental Management Programs. The Performance Evaluation Program describes a laboratory's ability to perform environmental analyses of radiochemical, hazardous chemical and mixed waste.

7 (ANL/CMT-ACL/VU–86798) **DOE's Integrated Performance Evaluation Program (IPEP) Laboratory Performance Reports for Sample Management Offices.** Lindahl, P.C. Argonne National Lab., IL (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9505263–VUGRAPHS: Sample and data management workshop, Richland, WA (United States), 23-24 May 1995). Order Number DE95014095. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a program by the Analytical Services Division (EM-263) to develope and implement a comprehensive integrated performance evaluation program for laboratories providing analytical data in support of EM programs.

8 (ANL/CMT/CP–85474) **Thermal oxidation vitrification flue gas elimination system.** Kephart, W. (Foster-Wheeler Environmental Corp., Oak Ridge, TN (United States)); Angelo, F.; Clemens, M. Argonne National Lab., IL (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950542–2: 14. international symposium on thermal treatment technologies: incineration conference, Seattle, WA (United States), 8-12 May 1995). Order Number DE95013407. Source: OSTI; NTIS; INIS; GPO Dep.

With minor modifications to a Best Demonstrated Available Technology hazardous waste incinerator, it is possible to obtain combustion without potentially toxic emissions by using technology currently employed in similar applications throughout industry. Further, these same modifications will reduce waste handling over an extended operating envelope while minimizing energy consumption. Three by-products are produced: industrial grade carbon dioxide, nitrogen, and a final waste form that will exceed Toxicity Characteristics Leaching Procedures requirements and satisfy nuclear waste product consistency tests. The proposed system utilizes oxygen rather than air as an oxidant to reduce the quantities of total emissions, improve the efficiency of the oxidation reactions, and minimize the generation of toxic NO_x emissions. Not only will less potentially hazardous constituents be generated; all toxic substances can be contained and the primary emission, carbon dioxide – the leading "greenhouse gas" contributing to global warming – will be converted to an industrial by-product needed to enhance the extraction of energy feedstocks from maturing wells. Clearly, the proposed configuration conforms to the provisions for Most Achievable Control Technology as defined and mandated for the private sector by the Clear Air Act Amendments of 1990 to be implemented in 1997 and still lacking definition.

9 (ANL/DIS/CP-84269) **Development and use of consolidated criteria for evaluation of emergency preparedness plans for DOE facilities.** Lerner, K.; Kier, P.H.; Baldwin, T.E. Argonne National Lab., IL (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950430-9: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95013684. Source: OSTI; NTIS; INIS; GPO Dep.

Emergency preparedness at US Department of Energy (DOE) facilities is promoted by development and quality control of response plans. To promote quality control efforts, DOE has developed a review document that consolidates requirements and guidance pertaining to emergency response planning from various DOE and regulatory sources. The Criteria for Evaluation of Operational Emergency Plans (herein referred to as the Criteria document) has been constructed and arranged to maximize ease of use in reviewing DOE response plans. Although developed as a review instrument, the document also serves as a de facto guide for plan development, and could potentially be useful outside the scope of its original intended DOE clientele. As regulatory and DOE requirements are revised and added in the future, the document will be updated to stay current.

10 (ANL/EA/CP-84161) **Assessment of risks to individuals from the transportation of radioactive materials.** Biwer, B.M.; Monette, F.A.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950216-148: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95013392. Source: OSTI; NTIS; INIS; GPO Dep.

The radiological impacts to individuals from the transportation of radioactive materials must be assessed when evaluating alternatives for major federal actions as required by the National Environmental Policy Act. Public comments on past environmental impact statements indicate that the public is concerned about the risks of radiation exposure to individuals along a transport route from radioactive materials shipments. Individuals may be exposed during routine, incident-free, transport of radioactive materials or, potentially, as a result of transportation accidents. This paper discusses the computer model RISKIND, which was developed at Argonne National Laboratory to estimate the potential radiological risks to individuals and population subgroups from the transportation of radioactive materials. The code was designed to use site-specific data to provide a detailed analysis for each receptor location. This type of analysis complements the traditional collective population transportation risk analyses conducted for radiological transportation risk assessments.

11 (ANL/EA/CP-84766) **Facility accident considerations in the US Department of Energy Waste Management Program.** Mueller, C. Argonne National Lab., IL (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-941102-45: Winter meeting of the American Nuclear Society (ANS), Washington, DC (United States), 13-18 Nov 1994). Order Number DE95011818. Source: OSTI; NTIS; INIS; GPO Dep.

A principal consideration in developing waste management strategies is the relative importance of Potential radiological and hazardous releases to the environment during postulated facility accidents with respect to protection of human health and the environment. The Office of Environmental Management (EM) within the US Department of Energy (DOE) is currently formulating an integrated national program to manage the treatment, storage, and disposal of existing and future wastes at DOE sites. As part of this process, a Programmatic Environmental impact Statement (PEIS) is being prepared to evaluate different waste management alternatives. This paper reviews analyses that have been Performed to characterize, screen, and develop source terms for accidents that may occur in facilities used to store and treat the waste streams considered in these alternatives. Preliminary results of these analyses are discussed with respect to the comparative potential for significant releases due to accidents affecting various treatment processes and facility configurations. Key assumptions and sensitivities are described.

12 (ANL/EA/CP-85519) **Calculation of projected waste loads for transuranic waste management alternatives.** Hong, K.; Kotek, T.; Koebnick, B.; Wang, Y.; Kaicher, C. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950216-145: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012938. Source: OSTI; NTIS; INIS; GPO Dep.

The level of treatment and the treatment and interim storage site configurations (decentralized, regional, or centralized) impact transuranic (TRU) waste loads at and en route to sites in the US Department of Energy (DOE) complex. Other elements that impact waste loads are the volume and characteristics of the waste and the unit operation parameters of the technologies used to treat it. Projected annual complexwide TRU waste loads under various TRU waste management alternatives were calculated using the WASTE_MGMT computational model. WASTE_MGMT accepts as input three types of data: (1) the waste stream inventory volume, mass, and contaminant characteristics by generating site and waste stream category; (2) unit operation parameters of treatment technologies; and (3) waste management alternative definitions. Results indicate that the designed capacity of the Waste Isolation Pilot Plant, identified under all waste management alternatives as the permanent disposal facility for DOE-generated TRU waste, is sufficient for the projected complexwide TRU waste load under any of the alternatives.

13 (ANL/EA/CP-85661) **Determining training needs from supervisors' assessment of staff proficiency in tasks and skills.** Young, C. (Argonne National Lab., IL (United States)); Hensley, J.; Lehr, J. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950216-144: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012934. Source: OSTI; NTIS; GPO Dep.

To provide the basis for establishing training opportunities, this project investigated supervisors' views of three components of staff activities. The project established the tasks that staff perform, identified staffs level of effectiveness in performing these tasks, and investigated staffs level of proficiency in performing the skills underlying these tasks. Training opportunities were then determined in those areas where knowledge and skins could be improved for staff to perform their tasks more effectively. Staff currently perform their tasks sufficiently well. Furthermore, supervisors indicated that for the most part staff do perform the tasks they should perform. In carrying out these tasks, staff use primarily critical thinking, problem solving, and communication skills rather than discipline-specific skills. Although staff generally have working knowledge of most of these skills, additional training in critical thinking and problem solving, program and project management techniques, and communications is appropriate to further improve the organizations effectiveness.

14 (ANL/EA/CP--88164) **Facilitating relative comparisons of health impacts from postulated accidents in environmental impact statements.** Mueller, C.J. Argonne National Lab., IL (United States). [1996]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960648--5: 21. annual conference of the National Association of Environmental Professionals: practical environmental directions - a changing agenda, Houston, TX (United States), 2-6 Jun 1996). Order Number DE96010794. Source: OSTI; NTIS; INIS; GPO Dep.

Current US Department of Energy (DOE) guidance on the performance of accident analyses supported an environmental impact statement (EIS) stresses a graded approach that emphasizes the most important risks, calls for the evaluation of frequencies as well as consequences for severe accident scenarios, and discourages the use of bounding analyses that confound risk comparisons among EIS alternatives. This paper discusses methods in probabilistic risk analysis that were developed and applied in defining accidents and generating radiological source terms for the DOE Draft Waste Management Programmatic Environmental Impact Statement (WM PEIS); publication of the Final WM PEIS is due in late summer 1996. The strengths and shortcomings of the cited probabilistic risk analysis methods used to evaluate facility accidents are addressed, both as they relate to the WM PEIS and as they relate to more general EIS applications. Key guidance is discussed that was developed by DOE and used in shaping the techniques cited herein for application in an EIS. Related perceptions on accidents observed from the public comment process for the WM PEIS are cited. Finally, recommendations are made on the basis of needs as well as lessons learned in implementing the accident analysis for the WM PEIS.

15 (ANL/EA/CP--88442) **RISKIND: An enhanced computer code for National Environmental Policy Act transportation consequence analysis.** Biwer, B.M.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960212--39: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006896. Source: OSTI; INIS; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); GPO Dep.

The RISKIND computer program was developed for the analysis of radiological consequences and health risks to individuals and the collective population from exposures associated with the transportation of spent nuclear fuel (SNF) or other radioactive materials. The code is intended to provide scenario-specific analyses when evaluating alternatives for environmental assessment activities, including those for major federal actions involving radioactive material transport as required by the National Environmental Policy Act (NEPA). As such, rigorous procedures have been implemented to enhance the code's credibility and strenuous efforts have been made to enhance ease of use of the code. To increase the code's reliability and credibility, a new version of RISKIND was produced under a quality assurance plan that covered code development and testing, and a peer review process was conducted. During development of the new version, the flexibility and ease of use of RISKIND were enhanced through several major changes: (1) a Windows™ point-and-click interface replaced the old DOS menu system, (2) the remaining model input parameters were added to the interface, (3) databases were updated, (4) the program output was revised, and (5) on-line help has been added. RISKIND has been well received by users and has been established as a key component in radiological transportation risk assessments through its acceptance by the U.S. Department of Energy community in recent environmental impact statements (EISs) and its continued use in the current preparation of several EISs.

16 (ANL/EA/CP--88945) **A comparative review of accident studies from recent environmental impact statements.** Mueller, C.; Folga, S.; Nabelssi, B. Argonne National Lab., IL (United States). 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9606114--7: 6. annual Energy Facility Contractors Group (EFCOG) safety analysis workshop on doing the right thing, Knoxville, TN (United States), 5-7 Jun 1996). Order Number DE96009413. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has recently prepared or is in the process of preparing a number of programmatic and site-specific environmental impact statements (EISs). This study was conducted for the purpose of reviewing the self-consistency of programmatic alternatives, associated relative impacts, and supporting data, methods, and assumptions in EISs prepared for related activities. The following EISs, which deal with waste management issues, are reviewed in this paper (the parenthetical acronyms are referred to in Table 1): (1) Final Environmental Impact Statement, Savannah River Site Waste Management, DOE/EIS-0217, Vol. II, July 1995. (SRS WM-EIS), (2) Draft Waste Management Programmatic Environmental Impact Statement for Managing Treatment, Storage, and Disposal of Radioactive and Hazardous Waste, DOE/EIS-0200-D, Vol. IV, Aug. 1995. (WM PEIS), (3) Final Environmental Impact Statement, Interim Management of Nuclear Materials at the Savannah River Site. DOE/EIS-0220, Oct. 1995. (IMNM EIS), (4) Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement, DOE/EIS-0203-F, April 1995. (INEL Site-Wide-EIS), (5) Draft Environmental Impact Statement, Disposition of Surplus Highly Enriched Uranium, DOE/EIS-0240-D, Oct. 1995. (HEU Disposition EIS), (6) Final Environmental Impact Statement, Safe Interim Storage of Hanford Tank Wastes, Hanford Site, Richland, Washington, DOE/EIS-0212, Oct. 1995. (SIS EIS). This study compares the facility accident analysis approaches used in these EISs vis-a-vis the National Environmental Policy Act (NEPA) guidance developed by DOE (Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, Office of NEPA Oversight). The purpose of the comparative review of these approaches with NEPA guidance is to identify potential preferred paths for future EISs.

17 (ANL/EAD/TM–18-Draft) **Risk assessment for the on-site transportation of radioactive wastes for the U.S. Department of Energy Waste Management programmatic environmental impact statement.** Biwer, B.M.; Monette, F.A.; Chen, S.Y. Argonne National Lab., IL (United States). Apr 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017833. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the risk assessment performed for the on-site transportation of radioactive wastes in the U.S. Department of Energy (DOE) Waste Management (WM) Programmatic Environmental Impact Statement (PEIS). Risks for the routine shipment of wastes and the impacts from potential accidental releases are analyzed for operations at the Hanford Site (Hanford) near Richland, Washington. Like other large DOE sites, Hanford conducts waste management operations for all wastes types; consequently, the impacts calculated for Hanford are expected to be greater than those for smaller sites. The risk assessment conducted for on-site transportation is intended to provide an estimate of the magnitude of the potential risk for comparison with off-site transportation risks assessed for the WM PEIS.

18 (ANL/EAD/TM–21-Draft) **Risk assessment for the off-site transportation of high-level waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Monette, F.A. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Biwer, B.M.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). Apr 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017827. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the human health risk assessment conducted for the transportation of high-level waste (HLW) in support of the US Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS). The assessment considers risks to collective populations and individuals under both routine and accident transportation conditions for truck and rail shipment modes. The report discusses the scope of the HLW transportation assessment, describes the analytical methods used for the assessment, defines the alternatives considered in the WM PEIS, and details important assessment assumptions. Results are reported for four alternatives. In addition, to aid in the understanding and interpretation of the results, specific areas of uncertainty are described, with an emphasis on how the uncertainties may affect comparisons of the alternatives. The number and scope of the WM PEIS HLW alternatives were revised after the preparation of this report. An addendum has been added to make this HLW transportation risk assessment consistent with that presented in the WM PEIS.

19 (ANL/EAD/TM–27-Draft) **Supplemental information related to risk assessment for the off-site transportation of transuranic waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Monette, F.A.; Biwer, B.M.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). Apr 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017828. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents supplemental information to support the human health risk assessment conducted for the transportation of transuranic waste (TRUW) in support of the US Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS). Detailed descriptions of the transportation health risk assessment method and results of the assessment are presented in Appendix E of the WM PEIS and are not repeated in this report. This report presents additional information that is not presented in Appendix E but is necessary to conduct the transportation risk assessment for Waste Management (WM) contact- and remote-handed (CH and RH) TRUW. Included are definitions of the TRUW alternatives considered in the WM PEIS, data related to the inventory and to the physical and radiological characteristics of CH and RH TRUW, and detailed results of the assessment for each WM TRUW case considered. After preparation of this report, the WM PEIS TRUW alternatives were revised as combinations of the cases presented herein. An addendum has been added to explain the revision and consolidate the impacts for each alternative for the WM PEIS TRUW transportation risk assessment.

20 (ANL/EAD/TM–28-Draft) **Risk assessment for the transportation of hazardous waste and hazardous waste components of low-level mixed waste and transuranic waste for the U.S. Department of Energy waste management programmatic environmental impact statement.** Lazaro, M.A. (and others); Policastro, A.J.; Hartmann, H.M. Argonne National Lab., IL (United States). Apr 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017829. Source: OSTI; NTIS; INIS; GPO Dep.

This report, a supplement to Appendix E (Transportation Risk) of the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS), provides additional information supporting the accident data for chemical risk assessment and health risk methodology described in that appendix (Part II), as well as providing the uncertainty analysis and on-site risk calculations. This report focuses on hazardous material truck accident rates, release probabilities, and release quantities; provides the toxicological values derived for each hazardous chemical assessed in the WM PEIS and further details on the derivation of health criteria; describes the method used in the transportation risk assessments to address potential additivity of health effects from simultaneous exposure to several chemicals and the method used to address transportation risks for maximally exposed individuals; presents an expanded discussion of the uncertainty associated with transportation risk calculations; and includes the results of the on-site transportation risk analysis. In addition, two addenda are provided to detail the risk assessments conducted for the hazardous components of low-level mixed waste (Addendum I) and transuranic waste (Addendum II).

21 (ANL/EAD/TM–35-Draft) **Supplemental information related to risk assessment for the off-site transportation of low-level mixed waste for the U.S. Department of Energy Waste Management programmatic environmental impact statement.** Monette, F.A. (and others); Biwer, B.M.; LePoire, D.J. Argonne National Lab., IL (United States). Apr 1995. 382p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017801. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides supplemental information to support the human health risk assessment conducted for the transportation of low-level mixed waste (LLMW) in support of the US Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS). The assessment considers both the radioactive and chemical hazards associated with LLMW transportation. Detailed descriptions of the transportation health risk assessment methods and results of the assessment are presented in Appendix E of the WM PEIS. This report presents additional information that is not included in Appendix E but is necessary to conduct the transportation risk assessment for Waste Management (WM) LLMW. Included are definitions of the LLMW alternatives considered in the WM PEIS; data related to the inventory and to the physical, chemical, and radiological characteristics of WM LLMW; an overview of the risk assessment methods; and detailed results of the assessment for each WM LLMW case considered.

22 (ANL/ER/CP–85412) **Performance specifications for technology development.** Erickson, M.D. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950209–9: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE95012467. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of any instrument, technique, or method development project is to deliver needed and usable technologies to customers. To help the US Department of Energy's Office of Environmental Management and its investigators meet that goal, technology performance specifications are being developed for implementation in research and development and in documentation, testing, and evaluation projects. Technology performance specifications will be used to establish milestones, evaluate the status of ongoing projects, and determine the success of completed projects. Preliminary performance specifications will be required in proposals and will be highly weighted in the technical evaluation. The general performance specification approach is to document what currently exists or is nearing completion and compare that baseline to the customers' needs to identify the unmet requirements. These unmet requirements then form the basis for the technology development needs that OTD investigators must address. The process needs to be quantitative, where appropriate, to focus project goals away from vague generalities like "better" toward specifics "reduce detection limit from 50 μg/L to 100 ng/L", or from "cheaper" to "reduction of labor costs for step A from 4 hours to 0.5 hour."

23 (ANL/ET/CP–88519) **Development of value-added products from alumina industry mineral wastes using low-temperature-setting phosphate ceramics.** Wagh, A.S.; Jeong, Seung-Young; Singh, D. Argonne National Lab., IL (United States). Energy Technology Div. Jan 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9606172–1: 4. international alumina quality workshop, Darwin (Australia), 2-7 Jun 1996). Order Number DE96010812. Source: OSTI; NTIS; GPO Dep.

A room-temperature process for stabilizing mineral waste streams has been developed, based on acid-base reaction between MgO and H3PO4 or acid phosphate solution. The resulting waste form sets into a hard ceramic in a few hours. In this way, various alumina industry wastes, such as red mud and treated potliner waste, can be solidified into ceramics which can be used as structural materials in waste management and construction industry. Red mud ceramics made by this process were low-porosity materials ($\approx$2 vol%) with a compression strength equal to portland cement concrete (4944 psi). Bonding mechanism appears to be result of reactions of boehmite, goethite, and bayerite with the acid solution, and also encapsulation of red mud particles in Mg phosphate matrix. Possible applications include liners for ponds and thickned tailings disposal, dikes for waste ponds, and grouts. Compatability problems arising at the interface of the liner and the waste are avoided.

24 (BHI–00066-Rev.2) **Hanford surplus facilities hazards identification document. Revision 2.** Egge, R.G. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005927. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides general safety information needed by personnel who enter and work in surplus facilities managed by Bechtel Hanford, Inc. (BHI). The purpose of the document is to enhance access control of surplus facilities, educate personnel on the potential hazards associated with these facilities prior to entry, and ensure that safety precautions are taken while in the facility. Questions concerning the currency of this information should be directed to the building administrator (as listed in BHI-FS-01, Field Support Administration, Section 1.1, "Access Control for ERC Surplus Facilities").

25 (BHI–00099) **Environmental Restoration Contractor Waste Minimization and Pollution Prevention Plan.** Lewis, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005058. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this plan is to establish the Environmental Restoration Contractor (ERC) Waste Minimization and Pollution Prevention (WMin/P2) Program and outline the activities and schedules that will be employed to reduce the quantity and toxicity of wastes generated as a result of restoration and remediation activities. It is intended to satisfy the US Department of Energy (DOE) and other legal requirements. As such, the Pollution Prevention Awareness program required by DOE Order 5400.1 is included with the Pollution Prevention Program. This plan is also intended to aid projects in meeting and documenting compliance with the various requirements for WMin/P2, and contains the policy, objectives, strategy, and support activities of the WMin/P2 program. The basic elements of the plan are pollution prevention goals, waste assessments of major waste streams, implementation of feasible waste minimization opportunities, and a process for reporting achievements. Various pollution prevention techniques will be implemented with the support of employee training and awareness programs to reduce waste and still meet applicable requirements. Information about the Hanford Site is in the Hanford Site Waste Minimization and Pollution Prevention Awareness Program Plan.

26 (BHI–00099-Rev.1) **Environmental Restoration Contractor Waste Minimization and Pollution Prevention Plan. Revision 1.** Lewis, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009064. Source: OSTI; NTIS; INIS; GPO Dep.

This plan contains the Environmental Restoration Contractor (ERC) Waste Minimization and Pollution Prevention (WMin/P2) Program. The plan outlines the activities and schedules developed by the ERC to reduce the quantity and toxicity of waste dispositioned as a result of restoration and remediation activities. This plan satisfies US Department of Energy (DOE) requirements including the Pollution Prevention Awareness program required by DOE Order 5400.1 (DOE 1988). This plan is consistent with Executive Order 12856 and Secretary O'Leary's pollution prevention Policy Statement of December 27, 1994, which set US and DOE pollution prevention policies, respectively. It is also consistent with the DOE Pollution Prevention Crosscut Plan, 1994, which provides guidance in meeting the DOE goals in pollution prevention. The purpose of this plan is to aid ERC projects in meeting and documenting compliance with requirements for WMin/P2. This plan contains the objectives, strategy, and support activities of the ERC Team WMin/P2 program. The basic elements of the plan are pollution prevention goals, waste assessments of major waste streams, implementation of feasible waste minimization opportunities, and a process for reporting achievements. Wherever appropriate, the ERC will integrate the pollution prevention activities in this plan into regular program activities rather than establishing separate WMin/P2 activities. Moreover, wherever possible, existing documents, procedures, and activities will be used to meet WMin/P2 requirements.

27 (BHI–00116-Rev.2) **216-B-3 Main Pond supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012111. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-B-3 Main Pond and is intended to be used as a supplement to DOE/RL-93-75, 'Hanford Facility Contingency Plan.' This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code, Chapter 173-303 for certain Resource, Conservation and Recovery Act of 1976 waste management units. The 216-B-3 Main Pond is a surface impoundment that received dangerous waste from the Plutonium/Uranium Extraction Plant and other 200 Area operations from 1945 to 1952. The 216-B-3 Main Pond has been stabilized, backfilled, and permanently isolated from all liquid effluent sources. Dangerous waste management activities are no longer required at the 216-B-3 Main Pond. The 216-B-3 Main Pond does not present a significant hazard to adjacent units, personnel, or the environment. It is unlikely that any incidents presenting hazards to the public or the environment would occur at the 216-B-3 Main Pond.

28 (BHI–00118-Rev.2) **216-A-29 Ditch supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012109. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-A-29 Ditch and is intended to be used as a supplement to DOE/RL-93-75, Hanford Facility Contingency Plan (DOE-RL 1993). This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code, Chapter 173-303 for certain Resource Conservation and Recovery Act of 1976 waste management units. The 216-A-29 Ditch is a surface impoundment that received nonregulated process and cooling water and other dangerous wastes primarily from operations of the Plutonium/Uranium Extraction Plant. Active between 1955 and 1991, the ditch has been physically isolated and will be closed. Because it is no longer receiving discharges, waste management activities are no longer required at the unit. The ditch does not present a significant hazard to adjacent units, personnel, or the environment. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the 216-A-29 Ditch.

29 (BHI–00119-Rev.2) **216-A-10 Crib supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012112. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-A-10 Crib. The Crib is a landfill that received process condensate from the 202-A building Plutonium/Uranium Extraction Plant from 1956 to 1987. The crib has not received waste since March 1987 and will be closed under final facility standards. Waste management activities are no longer required at the crib, and it does not present significant hazard to adjacent units, personnel or the environment. It is unlikely that any incidents presenting hazards to the public health or the environment would occur at the 216-A-10 Crib.

30 (BHI–00120-Rev.2) **216-A-37-1 Crib supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012113. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-A-37-1- Crib and is intended to be used as a supplement to DOE/RL-93-75, 'Hanford Facility Contingency Plan'. This plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code. The 216-A-37-1 Crib is a landfill used for percolation of the 242-A Evaporator process condensate from 1977 to 1989. Discharge to the 216-A-37-1 Crib was discontinued in April 1989, and it has been physically isolated and backfilled. The crib will be closed under final facility standards. Because the crib no longer receives discharge, waste management activities are no longer required. The crib does not present a significant hazard to public health or the environment.

31 (BHI–00121-Rev.2) **216-A-36B Crib supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012114. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-A-36B Crib and is intended to be used as a supplement to DOE/RL-93-75, Hanford Facility Contingency Plan (DOE-RL 1993). This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code, Chapter 173-303 for certain Resource Conservation and Recovery Act of 1976 waste management units. The 216-A-36B Crib is a landfill that received ammonia scrubber waste from the 202-A Building (Plutonium/Uranium Extraction Plant) between 1966 and 1972. In 1982, the unit was reactivated to receive additional waste from Plutonium/Uranium Extraction operations. Discharges ceased in 1987, and the crib will be closed under final facility standards. Because the crib is not receiving discharges, waste management activities are no longer required. The crib does not present a significant hazard to adjacent units, personnel, or the environment. There is little likelihood that any incidents presenting hazards to public health or the environment would occur at the 216-A-36B Crib.

32 (BHI–00122-Rev.2) **216-S-10 Pond and Ditch supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012115. Source: OSTI; NTIS; INIS; GPO Dep.

The 216-S-10 Pond and Ditch were used as disposal sites for the Chemical Engineering Laboratory between 1980 and 1983. The 216-S-10 Ditch last received a discharge October 1991. Both the pond and the ditch have been physically isolated, and the pond has been backfilled and decommissioned; both will be closed under final facility standards. Waste management activities are no longer required at the unit. The unit does not present and significant hazard to adjacent units, personnel, or the environment. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the 215-S-10 Pond and Ditch.

33 (BHI–00123-Rev.2) **216-U-12 Crib supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012116. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 216-U-12 Crib and is intended to be used as a supplement to DOE/RL-93-75, Hanford Facility Contingency Plan (DOE-RL 1993). This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code, Chapter 173- 303 for certain Resource Conservation and Recovery Act of 1976 waste management units. The 216-U-12 Crib is a landfill that received waste from the 291-U-1 Stack, 244-WR Vault, 244-U via tank C-5, and the UO_3Plant. The crib pipeline was cut and permanently capped in 1988, and the crib has been backfilled. The unit will be closed under final facility standards. Waste management activities are no longer required at the unit. The crib does not present a significant hazard to adjacent units, personnel, or the environment. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the 216-U-12 Crib.

34 (BHI–00175) **Z plant aggregate area management study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005835. Source: OSTI; NTIS; INIS; GPO Dep.

This document was prepared in support of the development of a Aggregate Area Management Study of Z Plant, 200 West Area, at the US Department of Energy (DOE) Hanford Site near Richland, Washington. It provides a technical description and operational history of the aggregate area and results from an environmental investigation undertaken by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Company (WHC) which is currently the Waste Site and Facility Research Office, Natural Resources, Bechtel Hanford, Inc. (BHI). It is based upon review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. No intrusive field investigations or sampling were conducted in support of this report.

35 (BHI–00217-Rev.1) **Environmental Restoration Contractor Resource Conservation and Recovery Act Permit Implementation Plan.** Lewis, R.A. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013576. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the revised Environmental Restoration Contractor (ERC) Implementation Plan for compliance with the Dangerous Waste and Hazardous and Solid Waste Amendment portions of the Resource Conservation and Recovery Act (RCRA) Permit for the Treatment, Storage, and Disposal of Dangerous Waste (hereafter referred to as the "Permit"). The Permit became effective on September 28, 1994. The ERC has developed the Permit Implementation Plan to ensure that the Permit is properly implemented within the ERC project and functions. The plan contains a list of applicable permit conditions, descriptions, responsible organizations, and the status of compliance. The ERC's responsibilities for Permit implementation are identified within both project and functional organizations. Project Managers are responsible for complying with conditions specific to a particular treatment, storage, or disposal (TSD) unit. TSD-specific compliance in include items such as closure plan deliverables, reporting and record keeping requirements, or compliance with non-unit-specific tasks such as spill reporting and emergency response. Functional organizations are responsible for sitewide activities, such as coordinating Permit modifications and developing personnel training programs.

36 (BHI–00288-Rev.1) **Unit-specific contingency plan for the 183-H solar evaporation basins. Revision 1.** Zoric, J.P. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009919. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a supplement to the Hanford Facility Contingency Plan. It provides the unit-specific information needed to fully comply with the Washington Administrative Code, Chapter 173-303, "Dangerous Waste Regulations," for contingency plans. General emergency and response information is contained in the Hanford Facility Contingency Plan and is not repeated in this supplement. The 183-H solar evaporation basins are four concrete internal surfaces which contained radiologically- and hazardous-contaminated waste. The 183-H basins are currently empty, inactive and designated as a Resource Conservation and Recovery Act interim-status treatment, storage, and disposal unit undergoing closure. There is no dangerous waste management actively occurring. There is very little likelihood of any incidents that would present hazards to public health or the environment occurring at the 183-H basins.

37 (BHI–00412-Rev.1) **300 Area Process Trenches supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75). Revision 1.** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012140. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 300 Area Process Trenches and is intended to be used as a supplement to DOE/RL- 93-75, "Hanford Facility Contingency Plan." This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of WAC 173-303 for certain Resource, Conservation and Recovery Act of 1976 waste management units. The 300 Area Process Trenches are surface impoundments used to receive routine discharges of nonregulated process cooling water from operations in the 300 Area, and dangerous waste from several research and development laboratories and the 300 Area Fuels Fabrication process. Discharges to the trenches ceased in 1994, and the trenches were physically isolated in 1995. These trenches will be closed under interim status. There are no waste management activities required at the 300 Area Process Trenches. The unit does not present any significant hazards to adjacent units, personnel, or the environment. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the 300 Area Process Trenches.

38 (BHI–00627) **The Hanford Site N Reactor buildings task identification and evaluation of historic properties.** Stapp, D.C.; Marceau, T.E. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005870. Source: OSTI; NTIS; INIS; GPO Dep.

The New Production Reactor complex at Hanford (hereafter referred to as N Reactor) is proposed to be deactivated, decommissioned, and demolished in the coming years. Recognizing that the Hanford Site has been important to the nation, state, and local community, a task was funded to examine the effects that these activities may have on the historic properties of N Reactor. The objectives of the N Reactor buildings task were to identify potential historic properties at N Reactor, to complete Historic Property Inventory forms for all structures considered eligible and ineligible for listing in the National Register of Historic Places, and to prepare a Memorandum of Agreement that identifies the measures required to mitigate any adverse effects.

39 (BHI–00628) **Revegetation plan for the 116-C-1 site.** Weiss, S.G. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009903. Source: OSTI; NTIS; INIS; GPO Dep.

This is a demonstration revegetation project. Work should reflect what would be potentially feasible on a large-scale basis. That is, the methodology should be suitable for eventual use in restoring entire operable units–not just individual waste sites–to some level of habitat. The information gained from this demonstration project will be used to help determine the level of habitat restoration that is reasonably achievable in those areas. As such, labor-intensive or extremely expensive methods, for the most part, will not be used. The one exception to this is topsoil. A suitable amount of topsoil (a depth of 1 m [3 ft]) to restore all the waste sites in the entire 100 Areas may be not only extremely expensive but also cause unacceptable ecological damage to the borrow site(s). The 116-C-1 revegetation work in this plan will help demonstrate the results for a range of topsoil depths so that sound decisions can be made for the amount of topsoil that should be imported to achieve acceptable revegetation results.

40 (BHI–00635) **Environmental Analytical Laboratory quality assurance plan.** Stacey, C. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013568. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Analytical Laboratory (EAL) management's policy provides analytical data that meets the requirements of each client. The EAL management provides precise, accurate, and complete documentation that ensures concise understanding of the client's objectives. Management will ensure that facilities, staff, instruments, and documentation are used and maintained to maximize laboratory use and data integrity. This document outlines the organization and Quality Assurance (QA) function, describes and depicts lines of authority, and lists the duties within the organization. It also provides guidance for preparing standard operating procedures that outline the detailed methods of operations and analyses.

41 (BHI–00645-Rev.1) **BHI Purchase Card System user's guide.** Mehden, P. von der. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012138. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the purchase card system (P-Card System) is to apply enhanced acquisition tools for increased return on ERC internal resources, and to reduce the cost of off-the-shelf commercial items through the use of credit cards by authorized personnel. The P-Card may be used to make transactions either over the counter, by mail, or via telephone. For Project employees, the P-Card provides and easier, direct method of acquisition that requires less process time than requisitioning. The P-C eliminates the involvement of the procurement organization in low value-added acquisitions and low-risk transactions. Controller reduces the expenditure of resources in the support of low dollar value products and services acquisition. The P- Card System has been initiated in agreement with American Express Travel Related Services, Inc.; the credit card is and American Express Corporate Purchasing Card. The integrated network application for cardholder reconciliation and reallocation of costs was originally government furnished software developed by the U.S. DOE. Currently, the software application (version 3.0 and beyond) is copyrighted by a Bechtel Hanford, Inc. subcontractor.

42 (BHI–00714-Rev.1) **BHI purchase card system manager's guide. Revision 1.** Mehden, P. von der. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009063. Source: OSTI; NTIS; GPO Dep.

The purpose of the Purchase Card System (P-Card System) is to apply enhanced acquisition tools for increased return on ERC internal resources and to reduce the cost of standard off-the-shelf commercial items through the use of credit cards by authorized personnel. The P-Card may be used to make transactions either over the counter, by mail, or via telephone. The benefits of the System will be realized by: project employees–provides an easier, direct method of acquisition that requires less process time than requisitioning; procurement–eliminates the involvement of the Procurement organization in low value added acquisitions and low risk transactions; controller–reduces the expenditure of resources in the support of low dollar value products and services acquisition. This describes the P-Card system for procurements.

43 (BHI–00792) **Remedial action and waste disposal project - ERDF Readiness Evaluation Plan.** Casbon, M.A. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012129. Source: OSTI; NTIS; INIS; GPO Dep.

This Readiness Evaluation Plan presents the methodology used to assess the readiness of the Environmental Restoration and Disposal Facility. The scope of this plan includes and assessment of the facilities, organizations, procedures, and regulatory approvals necessary for the safe startup of the waste transportation to and disposal in the Environmental Restoration and Disposal Facility.

44 (BHI–00814-01) **Environmental restoration contract radiological controls performance indicator report for 1st Quarter '96.** Shea, K.R. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012132. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents Environmental Restoration Disposal Team performances as measured by selected performance indicators. This report addresses the first quarter of fiscal year 1996, and includes for comparison data from the second, third, and fourth quarters of fiscal year 1995.

45 (BHI–00816) **1996 N-reactor fuel storage basin administrative control level extension justification.** Nellesen, A.L.; Shockley, V.E. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013573. Source: OSTI; NTIS; INIS; GPO Dep.

As provided for in Hanford Site Radiological Control Manual, Article 211 and BIR-SH-02, Vol. 1, Procedure 1.17, this document provides justification for extending the Administrative Control Level (ACL) of 500 mrem per year Total Effective Dose Equivalent (TEDE) to 1,500 mrem per year TEDE for workers involved with N-Reactor Basin Deactivation.

46 (BNL–63201) **Qualitative risk evaluation of environmental restoration programs at Brookhaven National Laboratory.** Morris, S.C. Brookhaven National Lab., Upton, NY (United States). May 1996. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96012423. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the evaluation of risks associated with environmental restoration activities at Brookhaven National Laboratory using two tools supplied by DOE to provide a consistent set of risk estimates across the DOE complex: Risk Data Sheets (RDS) and Relative Risk Ranking. The tools are described, the process taken characterized, results provided and discussed. The two approaches are compared and recommendations provided for continuing improvement of the process.

47 (CONF-940815–119) **Development of an expert system for transportation of hazardous and radioactive materials.** Ferrada, J.J.; Michelhaugh, R.D.; Rawl, R.R. Oak Ridge National Lab., TN (United States). 20 May 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE96010033. Source: OSTI; NTIS; INIS; GPO Dep.

Under the sponsorship of the US Department of Energy's (DOE's) Transportation Management Division (EM-261), the Transportation Technologies Group at Oak Ridge National Laboratory (ORNL) has designed and developed an expert system prototype application of the hazardous materials transportation regulations. The objective of this task was to provide a proof-of-concept for developing a computerized expert system that will ensure straightforward, consistent, and error-free application of the hazardous materials transportation regulations. The expert system prototype entailed the analysis of what an expert in hazardous materials shipping information could/should do. From the analysis of the different features required for the expert system prototype, it was concluded that the developmental efforts should be directed to a Windows™ 3.1 hypermedia environment. Hypermedia technology usually works as an interactive software system that gives personal computer users the ability to organize, manage, and present information in a number of formats–text, graphics, sound, and full-motion video.

48 (CONF-9409325–) **Climate change in the four corners and adjacent regions: Implications for environmental restoration and land-use planning.** Waugh, W.J. (ed.). Rust Geotech, Inc., Grand Junction, CO (United States). Sep 1995. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL96907. From Workshop on climate change in the four corners and adjacent regions: implications for environmental restoration and land-use planning; Grand Junction, CO (United States); 12-14 Sep 1994. Order Number DE96003275. Source: OSTI; NTIS; GPO Dep.

This document contains the workshop proceedings on Climate Change in the Four Corners and Adjacent Regions: Implications for Environmental Restoration and Land-Use Planning which took place September 12-14, 1994 in Grand Junction, Colorado. The workshop addressed three ways we can use paleoenvironmental data to gain a better understanding of climate change and its effects. (1) To serve as a retrospective baseline for interpreting past and projecting future climate-induced environmental change, (2) To differentiate the influences of climate and humans on past environmental change, and (3) To improve ecosystem management and restoration practices in the future. The papers presented at this workshop contained information on the following subjects: Paleoclimatic data from the Pleistocene and Holocene epochs, climate change and past cultures, and ecological resources and environmental restoration. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

49 (CONF-9409423–1) **An implementation of SAS® in an environmental information system.** James,

T. (Univ. of Tennessee, Knoxville, TN (United States)); Zygmunt, B.C. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Southeastern SAS User Group conference; Charleston, SC (United States); 18-20 Sep 1994. Order Number DE96009586. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes a software environmental database information system that uses SAS to process data and ORACLE® as the relational database management system (RDBMS). The hardware includes a network of UNIX-based servers and workstations. The relational database consists of large tables containing envionmental measurement data, as well as other smaller tables with reference, metadata and internal administrative information. The data come in a variety of formats and must be converted to conform to the system's standards. SAS/ACCESS® and PROC SQL are used extensively in the data processing.

50 (CONF-9504179–8) **The tracking of high level waste shipments-TRANSCOM system.** Johnson, P.E.; Joy, D.S.; Pope, R.B. Oak Ridge National Lab., TN (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. annual international conference on high level radioactive waste management; Las Vegas, NV (United States); 30 Apr - 5 May 1995. Order Number DE96009996. Source: OSTI; NTIS; INIS; GPO Dep.

The TRANSCOM (transportation tracking and communication) system is the U.S. Department of Energy's (DOE's) real-time system for tracking shipments of spent fuel, high-level wastes, and other high-visibility shipments of radioactive material. The TRANSCOM system has been operational since 1988. The system was used during FY1993 to track almost 100 shipments within the US.DOE complex, and it is accessed weekly by 10 to 20 users.

51 (CONF-9506115–9) **From public participation to stakeholder involvement: The rocky road to more inclusiveness.** Peelle, E. Oak Ridge National Lab., TN (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 20. National Association of Environmental Professionals annual conference and exposition: environmental challenges - the next twenty years; Washington, DC (United States); 10-13 Jun 1995. Order Number DE95014275. Source: OSTI; NTIS; GPO Dep.

Surviving always at the edge of extinction, public participation in environmental decision making has an uncertain and problematic history. From its emergence from the urban planning and delivery system efforts of the 1960s to many siting and non-siting uses today, it remains a battleground, with few successes and many failures. While some compelling structural, organizational and cultural explanations for this state of affairs exist, the author offers a further one—a too-limited definition and vision of public participation. One then can argue for a more inclusive process such as stakeholder involvement (SI) to enable a more viable approach to decision making. One can argue that the narrow conceptualization offered in the term public participation (PP) is partly responsible for the meager results of decades of efforts by earnest practitioners. Because of the limited, unique, and self-selected publics that respond to the major PP mechanisms such as public hearings, PP has become largely the province of organized activist groups and is largely accepted as such by most parties, including PP professionals. The author reviews the roles of Congress, federal agencies/proponents, local governments, activist groups and PP professionals in creating the current limited PP processes. She discusses trends and prospects for moving to broader based, more inclusive SI approaches. The emerging SI approach presents major methodological and organizational challenges, but offers the promise of outcomes more likely to be legitimated and potentially more lasting.

52 (CONF-9506199–Summ.) **Proceedings of pollution prevention and waste minimization tools workshop.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Pollution prevention and waste minimization tools workshop; Salt Lake City, UT (United States); 20-21 Jun 1995. Order Number DE96002402. Source: OSTI; NTIS; INIS; GPO Dep.

Pollution Prevention (P2) has evolved into one of DOE's sprime strategies to meet environmental, fiscal, and worker safety obligations. P2 program planning, opportunity identification, and implementation tools were developed under the direction of the Waste Minimization Division (EM-334). Forty experts from EM, DP, ER and DOE subcontractors attended this 2-day workshop to formulate the incentives to drive utilization of these tools. Plenary and small working group sessions were held both days. Working Group 1 identified incentives to overcoming barriers in the area of P2 program planning and resource allocation. Working Group 2 identified mechanisms to drive the completion of P2 assessments and generation of opportunities. Working Group 3 compiled and documented a broad range of potential P2 incentives that address fundamental barriers to implementation of cost effective opportunities.

53 (CONF-9507150–2) **On-site laboratory support of Oak Ridge National Laboratory environmental restoration field activities.** Burn, J.L.E. (Bechtel Environmental, Inc., Oak Ridge, Tennessee (United States)). Oak Ridge National Lab., TN (United States). Jul 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 11. annual waste testing and quality assurance symposium; Washington, DC (United States); 23-28 Jul 1995. Order Number DE95016346. Source: OSTI; NTIS; INIS; GPO Dep.

A remedial investigation/feasibility study has been undertaken at Oak Ridge National Laboratory (ORNL). Bechtel National, Inc. and partners CH2M Hill, Ogden Environmental and Energy Services, and PEER Consultants are contracted to Lockheed Martin Energy Systems, performing this work for ORNL's Environmental Restoration (ER) Program. An on-site Close Support Laboratory (CSL) established at the ER Field Operations Facility has evolved into a laboratory where quality analytical screening results can be provided rapidly (e.g., within 24 hours of sampling). CSL capabilities include three basic areas: radiochemistry, chromatography, and wet chemistry. Radiochemical analyses include gamma spectroscopy, tritium and carbon-14 screens using liquid scintillation analysis, and gross alpha and beta counting. Cerenkov counting and crown-ether-based separation are the two rapid methods used for radiostrontium determination in water samples. By extending count times where appropriate, method detection limits can match those achieved by off-site contract laboratories. Volatile organic compounds are detected by means of gas chromatography using either headspace or purge and trap sample introduction (based on EPA 601/602). Ionic content of water samples is determined using ion chromatography and alkalinity measurement. Ion chromatography is used to quantify both anions (based on

EPA 300) and cations. Wet chemistry procedures performed at the CSL include alkalinity, pH (water and soil), soil resistivity, and dissolved/suspended solids. Besides environmental samples, the CSL routinely screens health and safety and waste management samples. The cost savings of the CSL are both direct and indirect.

54 (CONF-950868–34) **A consolidated and standardized relational database for ER data.** Zygmunt, B.C. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From ER '95: environmental remediation conference: committed to results; Denver, CO (United States); 13-18 Aug 1995. Order Number DE96003041. Source: OSTI; NTIS; INIS; GPO Dep.

The three US Department of Energy (DOE) installations on the Oak Ridge Reservation (ORR) (Oak Ridge National Laboratory, Y-12, and K-25) were established during World War II as part of the Manhattan Project that "built the bomb." That research, and work in more recent years, has resulted in the generation of radioactive materials and other toxic wastes. Lockheed Martin Energy Systems manages the three Oak Ridge installations (as well as the Environmental Restoration (ER) programs at the DOE plants in Portsmouth, Ohio, and Paducah, Kentucky). DOE Oak Ridge Operations has been mandated by federal and state agreements to provide a consolidated repository of environmental data and is tasked to support environmental data management activities at all five installations. The Oak Ridge Environmental Information System (OREIS) was initiated to fulfill these requirements. The primary use of OREIS data is to provide access to project results by regulators. A secondary use is to serve as background data for other projects. This paper discusses the benefits of a consolidated and standardized database; reasons for resistance to the consolidation of data; implementing a consolidated database, including attempts at standardization, deciding what to include in the consolidated database, establishing lists of valid values, and addressing quality control (QC) issues; and the evolution of a consolidated database, which includes developing and training a user community, dealing with configuration control issues, and incorporating historical data. OREIS is used to illustrate these topics.

55 (CONF-9508197–1) **Natural physical and biological processes compromise the long-term performance of compacted soil caps.** Smith, E.D. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From NAS workshop on barriers for long term isolation; Denver, CO (United States); 13 Aug 1995. Order Number DE96003027. Source: OSTI; NTIS; INIS; GPO Dep.

Compacted soil barriers are components of essentially all caps placed on closed waste disposal sites. The intended functions of soil barriers in waste facility caps include restricting infiltration of water and release of gases and vapors, either independently or in combination with synthetic membrane barriers, and protecting other manmade or natural barrier components. Review of the performance of installed soil barriers and of natural processes affecting their performance indicates that compacted soil caps may function effectively for relatively short periods (years to decades), but natural physical and biological processes can be expected to cause them to fail in the long term (decades to centuries). This paper addresses natural physical and biological processes that compromise the performance of compacted soil caps and suggests measures that may reduce the adverse consequences of these natural failure mechanisms.

56 (CONF-9510321–1) **Electronic document management meets environmental restoration recordkeeping requirements: A case study.** Burnham, S.L. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 40. international ARMA annual conference; Nashville, TN (United States); 22-25 Oct 1995. Order Number DE96005493. Source: OSTI; NTIS; INIS; GPO Dep.

Efforts at migrating records management at five Department of Energy sites operated under management by Lockheed Martin Energy Systems, Inc. for Environmental Restoration (ER) business activities are described. The corporate environment, project definition, records keeping requirements are described first. Then an evaluation of electronic document management technologies and of internal and commercially available systems are provided. Finally adopted incremental implementation strategy and lessons learned are discussed.

57 (CONF-951203–30) **Computer calculations of wire-rope tiedown designs for radioactive materials packages.** Shappert, L.B. (Oak Ridge National Lab., TN (United States)); Ratledge, J.E.; Moore, R.S.; Dorsey, E.A. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995. Order Number DE96004940. Source: OSTI; NTIS; INIS; GPO Dep.

This Regulatory Compliance Guide (RCG) provides guidance on the use and selection of appropriate wire rope type package tiedowns. It provides an effective way to encourage and to ensure uniform implementation of regulatory requirements applicable to tiedowns. It provides general guidelines for securing packages weighing 5,000 pounds or greater that contain radioactive materials onto legal weight trucks (exclusive of packagings having their own trailer with trunnion type tiedown). This RCG includes a computerized Tiedown Stress Calculation Program (TSCP) which calculates the stresses in the wire-rope tiedowns and specifies appropriate sizes of wire rope and associated hardware parameters (such as turnback length, number of cable clips, etc.).

58 (CONF-951203–31) **Shimpent mobility accountability collection (SMAC).** Best, R.E. (Science Applications, Inc., Oak Ridge, TN (United States)); Hamberger, C.R.; Moerchen, M.F.; Maddigan, R.J.; Lester, P.B.; Shappert, L.B. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995. Order Number DE96004939. Source: OSTI; NTIS; INIS; GPO Dep.

SMAC[4] is the US Department of Energy's (DOE) information system that collects, stores, and analyzes information on all unclassified shipments to and from DOE facilities. SMAC is operated for and under the direction of DOE's Office of Environmental Management (EM) Transportation Management Division (TMD). Currently, SMAC serves DOE Headquarters, Operations offices, Field Offices, and 64 field locations. The system provides data and analysis services to DOE and its contractors, transportation managers, and specialists. It is used to collect data from the sources of transportation activities, screen the data to ensure their quality, train personnel who collect and report the data, analyze data elements, help users conduct their own analyses, and develop and present reports on DOE's transportation activities to DOE and contractor management.

59 (CONF-951203–32) **Offsite Shipment Campaign Readiness Assessment (OSCRA): A tool for offsite shipment campaigns.** Michelhaugh, R.D. (Oak Ridge National Lab., TN (United States)); Pope, R.B.; Bisaria, A. Oak Ridge National Lab., TN (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995. Order Number DE96004938. Source: OSTI; NTIS; INIS; GPO Dep.

The Offsite Shipment Campaign Readiness Assessment (OSCRA) tool is designed to assist program managers in identifying, implementing, and verifying applicable transportation and disposal regulatory requirements for specific shipment campaigns. OSCRA addresses these issues and provides the program manager with a tool to support planning for safe and compliant transportation of waste and other regulated materials. Waste transportation and disposal requirements must be identified and addressed in the planning phase of a waste management project. In the past, in some cases, transportation and disposal requirements have not been included in overall project plans. These planning deficiencies have led to substantial delays and cost impacts. Additionally, some transportation regulatory requirements have not been properly implemented, resulting in substantial fines and public embarrassment for the U.S. Department of Energy (DOE). If a material has been processed and packaged for onsite storage (prior to offsite disposal) in a package that does not meet transportation requirements, it must be repackaged in U.S. Department of Transportation (DOT)-compliant packaging for transport. This repackaging can result in additional cost, time, and personnel radiation exposure. The original OSCRA concept was developed during the Pond Waste Project at the K-25 Site in Oak Ridge, Tennessee. The continued development of OSCRA as a user-friendly tool was funded in 1995 by the DOE Office of Environmental Management, Transportation Management Division (TMD). OSCRA is designed to support waste management managers, site remediation managers, and transportation personnel in defining applicable regulatory transportation and disposal requirements for offsite shipment of hazardous waste and other regulated materials. The need for this tool stems from increasing demands imposed on DOE and the need to demonstrate and document safe and compliant packaging and shipment of wastes from various DOE sites.

60 (CONF-951203–44) **Hazardous Materials Transportation Expert System (HaMTES).** Michelhaugh, R.D.; Pope, R.B.; Ferrada, J.J.; Rawl, R.R. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995. Order Number DE96005662. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Materials Transportation Expert System (HaMTES) was developed to provide straightforward and error-free application of hazardous materials transportation regulations. The interactive system is designed to give users access to knowledge and skills that previously could be obtained only from a highly trained and experienced expert in the hazardous materials shipping regulations. The HaMTES, Version 1.0, was based on the 1995 regulations. HaMTES, Version 2.0, includes the US regulatory changes recently enacted to align the US regulations with 1985 International Atomic Energy Agency (IAEA) Safety Series (SS) 6. Version 2.0 also includes several other enhancements suggested during the beta testing of Version 1.0. As DOE funding allows, it is anticipated that HaMTES will be the core of the hazardous materials module of the Automated Transportation Management System (ATMS), which was developed to provide field offices and site contractors with the automated tools necessary for transacting the increasingly complex transportation management tasks. This paper describes the development of HaMTES, its operating environment and architecture, enhancements to HaMTES, and the use of HaMTES.

61 (CONF-951203–72) **A needs assessment for DOE's packaging and transportation activities - a look into the twenty-first century.** Pope, R. (Oak Ridge National Lab., TN (United States)); Turi, G.; Brancato, R.; Blalock, L.; Merrill, O. Oak Ridge National Lab., TN (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995. Order Number DE96010730. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has performed a department-wide scoping of its packaging and transportation needs and has arrived at a projection of these needs for well into the twenty-first century. The assessment, known as the Transportation Needs Assessment (TNA) was initiated during August 1994 and completed in December 1994. The TNA will allow DOE to better prepare for changes in its transportation requirements in the future. The TNA focused on projected, quantified shipping needs based on forecasts of inventories of materials which will ultimately require transport by the DOE for storage, treatment and/or disposal. In addition, experts provided input on the growing needs throughout DOE resulting from changes in regulations, in DOE's mission, and in the sociopolitical structure of the United States. Through the assessment, DOE's transportation needs have been identified for a time period extending from the present through the first three decades of the twenty-first century. The needs assessment was accomplished in three phases: (1) defining current packaging, shipping, resource utilization, and methods of managing packaging and transportation activities; (2) establishing the inventory of materials which DOE will need to transport on into the next century and scenarios which project when, from where, and to where these materials will need to be transported; and (3) developing requirements and projected changes for DOE to accomplish the necessary transport safely and economically.

62 (CONF-960265–1) **Integration of biotechnology in remediation and pollution prevention activities.** Strong-Gunderson, J.M. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.). Oak Ridge National Lab., TN (United States). [1996]. 5p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Environmental quality, innovative technologies and sustainable economic development: a NAFTA perspective; Mexico City (Mexico); 7-10 Feb 1996. Order Number DE96005439. Source: OSTI; NTIS; INIS; GPO Dep.

The North American Free Trade Agreement/North American Agreement on Environmental Cooperation provides a mechanism for an international collaboration between the US, Canada, and Mexico to jointly develop, modify, or refine technologies that remediate or protect the environment. These countries have a vested interest in this type of collaboration because contaminants do not respect the boundaries of a manufacturing site, region, city, state, or country. The Environmental Sciences Division (ESD) at Oak Ridge National Laboratory (ORNL) consists of a diverse group of individuals who address a variety of environmental issues. ESD is involved in basic and applied research on the fate, transport, and remediation of contaminants; environmental assessment; environmental engineering; and demonstrations of advanced remediation technologies. The remediation and protection of the environment includes water, air, and soils for organic, inorganic, and radioactive contaminants. In addition to remediating contaminated sites, research also focuses on life-cycle analyses of industrial processes and the production of green technologies. The author focuses this discussion on subsurface remediation and pollution prevention; however, the research activities encompass water, soil and air and many of the technologies are applicable to all environments. The discussion focuses on the integration of biotechnology with remediation activities and subsequently linking these biological processes to other remediation technologies.

63 (CONF-9603148–1) **The ORNL Basemapping and Imagery Project: Data collection, processing and dissemination.** Tuttle, M.; Pace, P. Oak Ridge National Lab., TN (United States). 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From Geographic Information System (GIS) enviromental management conference; Reno, NV (United States); 13 Mar 1996. Order Number DE96008802. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past three years, the GIS and Computer Modeling (GCM) Group at Oak Ridge National Laboratory (ORNL), has been engaged in creating a very comprehensive geospatial data base for Department of Energy (DOE) installations managed by the DOE Oak Ridge Operations Office (DOE-ORO). This effort encompasses topographic, planimetric, land use/land cover, flood plain, digital elevation, and digital imagery data for the Oak Ridge Reservation (ORR) and surrounding areas. The ORR covers approximately 34,800 acres and includes ORNL, the K-25 Site and the Y-12 Plant. The geographic extent of the Base Mapping and Imagery Project covers the ORR and surrounding area and two other DOE plants (Portsmouth, Ohio and Paducah, Kentucky) for a total of 166,000 acres. The resulting data represent a major improvement in the spatial accuracy and currency of data which are used as a foundation for environmental restoration, facility studies, and other GIS data applications. A GIS data server was also created in order to store and disseminate the new basemapping data. This paper describes the history of the Base Mapping and Imagery Project with emphasis on the logistical aspects of data quality assessment. data tracking, and data product work flow for a large comprehensive spatial data base. The paper then describes the evolution of the GIS data server including its design from an FTP server to a NetScape-based World Wide Web interface. This combination of data and data access provides the ORR environmental community with a carefully configured and managed GIS dataset.

64 (CONF-960477–7) **A new approach to interpretation of airborne magnetic and electromagnetic data.** Traynin, P. (Utah Univ., Salt Lake City, UT (United States). Dept. of Geology and Geophysics); Zhdanov, M.; Nyquist, J.; Beard, L.; Doll, W. Oak Ridge National Lab., TN (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 9. annual symposium on the application of geophysics to engineering and environmental problems; Denver, CO (United States); 15 Apr - 1 May 1996. Order Number DE96010641. Source: OSTI; NTIS; INIS; GPO Dep.

The airborne geophysical survey carried out at the Oak Ridge Reservation has shown that AEM can be used in evaluating details of waste areas. However, detection of small objects requires a flight altitude of 10-15 m which is impossible due to natural obstacles present in the Oak Ridge area. In these types of cases, data processing in the downward continuation allows to improve the survey resolution and a normalized gradient provides an additional information about the depth of buried objects.

65 (CONF-960648–1) **Measuring the success of public participation efforts associated with the U.S. Department of energy's environmental management activities.** Schweitzer, M.; Carnes, S.A.; Peelle, E.B.; Wolfe, A.K.; Munro, J.F. Oak Ridge National Lab., TN (United States). 2 Jun 1996. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 21. annual conference of the National Association of Environmental Professionals: practical environmental directions - a changing agenda; Houston, TX (United States); 2-6 Jun 1996. Order Number DE96009890. Source: OSTI; NTIS; INIS; GPO Dep.

For the last several years, US DOE's Office of Environmental Restoration and Waste Management (EM) has actively pursued a policy of involving local stakeholders in the planning and implementation of environmental management activities at contaminated sites throughout the DOE complex. An ongoing ORNL study is focusing on how to measure the success of the public participation efforts. Five DOE facilities were selected for intensive site visits; 4 or 5 additional sites were covered by telephone interviews. Key stakeholder groups were interviewed. Based on the data collection and preliminary analysis, 17 definitions of success were developed for public participation programs. Objective and subjective indicators of the success of the public participation efforts are discussed.

66 (CONF-960648–3) **Factors favorable to public participation success.** Peelle, E.; Schweitzer, M.; Munro, J.; Carnes, S.; Wolfe, A. Oak Ridge National Lab., TN (United States). [1996]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 21. annual conference of the National Association of Environmental Professionals: practical environmental directions - a changing agenda; Houston, TX (United States); 2-6 Jun 1996. Order Number DE96009635. Source: OSTI; NTIS; INIS; GPO Dep.

Categories of factors linked to successful public participation (PP) program outcomes include PP process, organizational context, sociopolitical context, strategic considerations and unique (special circumstances) factors. We re-order the long list factors according to how essential, important, and unique they are and discuss their significance and interrelationships. It is argued that bureacratic structure and operational modes are basically in conflict with features of successful PP programs (openness, two-way education, communication with nonexpert outsiders). If this is so, then it is not surprising that the factors essential for PP success in bureacracies involve extraordinary management efforts by agencies to bypass, compensate for, or overcome structural constraints. We conclude by speculating about the long-term viability of PP practices in the agency setting as well as the consequences for agencies that attempt the problematic task of introducing PP into their complex, mission-oriented organizations.

67 (CONF-960706-9) **Operations of the LR56 radioactive liquid cask transport system at U.S. Department of Energy sites.** Davidson, J.S. (Lockheed Martin Energy Systems, Oak Ridge, TN (United States)); Hornstra, D.J.; Sazawal, V.K.; Clement, G. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From American Society of Mechanical Engineers (ASME) pressure vessels and piping conference; Montreal (Canada); 21-26 Jul 1996. Order Number DE96009102. Source: OSTI; NTIS; INIS; GPO Dep.

The LR56 cask system is licensed for use in France under Certificate of Compliance F/309/B(U)F for transport of 4,000-liter volumes of radioactive liquids. Three LR56 cask systems (with modifications for use at Department of Energy (DOE) sites) have been purchased for delivery at the Hanford Site, Oak Ridge National Laboratory (ORNL), and Savannah River Site (SRS). The LR56 cask systems will be used for on-site transfers of Type B quantities of radioactive liquid waste. The ORNL unit will also be used as a Type A packaging for transfers of radioactive liquids between DOE sites. This paper discusses LR56 operating features and the use of the cask system at the three DOE sites.

68 (CONF-9607107-2) **Streamlined environmental remediation characterization using remote sensing techniques: Case studies for the US Department of Energy, Oak Ridge Operations.** Carden, D.M. (Department of Energy (DOE), TN (United States). Oak Ridge Operations); Smyre, J.L.; Evers, T.K.; King, A.L. Oak Ridge National Lab., TN (United States). 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 18. international Society for Photogrammetry and Remote Sensing's congress; Vienna (Austria); 9-19 Jul 1996. Order Number DE96012146. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides an overview of the DOE Oak Ridge Operations Remote Sensing Program and discusses how data from this program have assisted the environmental restoration program in streamlining site-characterization activities. Three case studies are described where remote sensing imagery has provided a more focused understanding of site problems with a resultant reduction in the need for costly and time-consuming, ground-based sampling approaches.

69 (CONF-960804-11) **Recent experience in planning, packaging and preparing non-commercial spent fuel for shipment within the United States.** Johnson, P.E. (Oak Ridge National Lab., TN (United States)); Shappert, L.B.; Turner, D.W. Oak Ridge National Lab., TN (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009395. Source: OSTI; NTIS; INIS; GPO Dep.

US DOE orders dictate that the aluminium clad fuels now stored at ORNL will be shipped to the Savannah River Site. A number of activities had to be carried out in order to ready the fuel for shipping, including choosing a cask capable of transporting the fuel, repackaging the fuel, developing a transportation plan, identifying the appropriate routes, and carrying out a readiness self assessment. These tasks have been successfully completed and are discussed herein.

70 (CONF-960804-12) **Potential benefits and impacts on the CRWMS transportation system of filling spent fuel shipping casks with depleted uranium silicate glass.** Pope, R.B.; Forsberg, C.W.; DeHart, M.D.; Childs, K.W.; Tang, J.S. Oak Ridge National Lab., TN (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009394. Source: OSTI; NTIS; INIS; GPO Dep.

A new technology, the Depleted Uranium Silicate COntainer Fill System (DUSCOFS), is proposed to improve the performance and reduce the uncertainties of geological disposal of spent nuclear fuel (SNF), thus reducing both radionuclide release rates from the waste package and the potential for repository nuclear criticality events. DUSCOFS may also provide benefits for SNF storage and transport if it is loaded into the container early in the waste management cycle. Assessments have been made of the benefits to be derived by placing depleted uranium silicate (DUS) glass into SNF containers for enhancing repository performance assessment and controlling criticality over geologic times in the repository. Also, the performance, benefits, and impacts which can be derived if the SNF is loaded into a multipurpose canister with DUS glass at a reactor site have been assessed. The DUSCOFS concept and the benefits to the waste management cycle of implementing DUSCOFS early in the cycle are discussed in this paper.

71 (DOE/EIS-0218D-Summ.) **Proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel. Summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 62p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012336. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy and United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce highly-enriched uranium from civilian commerce. This is a summary of the Draft Environmental Impact Statement. Environmental effects and policy considerations of three Management Alternative approaches for implementation of the proposed policy are assessed. The three Management Alternatives analyzed are: (1) acceptance and management of the spent nuclear fuel by the Department of Energy in the United States, (2) management of the spent nuclear fuel at one or more foreign facilities (under conditions that satisfy United States nuclear weapons nonproliferation policy objectives), and (3) a combination of components of Management Alternatives 1 and 2 (Hybrid Alternative). A No Action Alternative is also analyzed. For each Management Alternative, there are a number of alternatives for its implementation. For Management Alternative 1, this document addresses the environmental effects of various implementation alternatives such as varied policy durations, management of various quantities of spent nuclear fuel, and differing financing arrangements. Environmental impacts at various potential ports of entry, along truck and rail transportation routes, at candidate management sites, and for alternate storage technologies are also examined. For Management Alternative 2, this document addresses two subalternatives: (1) assisting foreign nations with storage; and (2) assisting foreign nations with reprocessing of the spent nuclear fuel.

72 (DOE/EIS–0218D-Vol.1) **Draft Environmental Impact Statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel. Volume 1.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 444p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012337. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy and United States Department of State are jointly proposing to adopt a policy to manage spent nuclear fuel from foreign research reactors. Only spent nuclear fuel containing uranium enriched in the United States would be covered by the proposed policy. The purpose of the proposed policy is to promote U.S. nuclear weapons nonproliferation policy objectives, specifically by seeking to reduce highly-enriched uranium from civilian commerce. Environmental effects and policy considerations of three Management Alternative approaches for implementation of the proposed policy are assessed. The three Management Alternatives analyzed are: (1) acceptance and management of the spent nuclear fuel by the Department of Energy in the United States, (2) management of the spent nuclear fuel at one or more foreign facilities (under conditions that satisfy United States nuclear weapons nonproliferation policy objectives), and (3) a combination of components of Management Alternatives 1 and 2 (Hybrid Alternative). A No Action Alternative is also analyzed. For each Management Alternative, there are a number of alternatives for its implementation. For Management Alternative 1, this document addresses the environmental effects of various implementation alternatives such as varied policy durations, management of various quantities of spent nuclear fuel, and differing financing arrangements. Environmental impacts at various potential ports of entry, along truck and rail transportation routes, at candidate management sites, and for alternate storage technologies are also examined. For Management Alternative 2, this document addresses two subalternatives: (1) assisting foreign nations with storage; and (2) assisting foreign nations with reprocessing of the spent nuclear fuel. Management Alternative 3 analyzes a hybrid alternative. This document is Vol. 1 of 2 plus summary volume.

73 (DOE/EIS–0218D-Vol.2-App.A) **Proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Appendix A, environmental justice analysis. Volume 2.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012338. Source: OSTI; NTIS; INIS; GPO Dep.

This is Appendix A to a draft Environmental Impact Statement on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. This appendix addresses environmental justice for the acceptance of foreign research reactor spent nuclear fuel containing uranium enriched in the United States. Analyses of environmental justice concerns are provided in three areas: (1) potential ports of entry, (2) potential transportation routes from candidate ports of entry to interim management sites, and (3) areas surrounding potential interim management sites. These analyses lead to the conclusion that the alternatives analyzed in this Environmental Impact Statement (EIS) would result in no disproportionate adverse effects on minority populations or low-income communities surrounding the candidate ports, transport routes, or interim management sites.

74 (DOE/EIS–0218D-Vol.2-App.B) **Proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Appendix B, foreign research reactor spent nuclear fuel characteristics and transportation casks. Volume 2.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 61p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012339. Source: OSTI; NTIS; INIS; GPO Dep.

This is Appendix B of a draft Environmental Impact Statement (EIS) on a Proposed Nuclear Weapons Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. It discusses relevant characterization and other information of foreign research reactor spent nuclear fuel that could be managed under the proposed action. It also discusses regulations for the transport of radioactive materials and the design of spent fuel casks.

75 (DOE/EIS–0218D-Vol.2-App.C) **Proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Appendix C, marine transport and associated environmental impacts. Volume 2.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 43p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012340. Source: OSTI; NTIS; INIS; GPO Dep.

This is Appendix C to a Draft Environmental Statement on a Proposed Nuclear Weapon Nonproliferation Policy Concerning Foreign Research Reactor Spent Nuclear Fuel. Shipment of any material via ocean transport entails risks to both the ship's crew and the environment. The risks result directly from transportation-related accidents and, in the case of radioactive or other hazardous materials, also include exposure to the effects of the material itself. This appendix provides a description of the approach used to assess the risks associated with the transport of foreign research reactor spent nuclear fuel from a foreign port to a U.S. port(s) of entry. This appendix also includes a discussion of the shipping configuration of the foreign research reactor spent nuclear fuel, the possible types of vessels that could be used to make the shipments, the risk assessment methodology (addressing both incident-free and accident risks), and the results of the analyses. Analysis of activities in the port(s) is described in Appendix D. The incident-free and accident risk assessment results are presented in terms of the per shipment risk and total risks associated with the basic implementation of Management Alternative 1and other implementation alternatives. In addition, annual risks from incident-free transport are developed.

76 (DOE/EIS–0218D-Vol.2-App.D) **Proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Appendix D, selection and evaluation of potential ports of entry. Volume 2.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 303p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012341. Source: OSTI; NTIS; INIS; GPO Dep.

This is an appendix to a draft Environmental Impact Statement (EIS) on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel. This appendix describes the process used by the Department of Energy in selecting the potential ports of entry analyzed in this EIS. In addition the appendix provides the basic information required to evaluate ports and port activities, and the potential environmental impacts (incident-free and accidents) associated with the receipt and handling of foreign research reactor spent nuclear fuel from vessels to intermodal transport in ports.

77 (DOE/EIS–0218D-Vol.2-App.E) **Draft environmental impact statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Volume 2, Appendix E, Evaluation of human health effects of overland transportation.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 228p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012342. Source: OSTI; NTIS; INIS; GPO Dep.

This Appendix provides an overview of the approach used to assess the human health risks that may result from the overland transportation of foreign research reactor spent nuclear fuel. The Appendix includes discussion of the scope of the assessment, analytical methods used for the risk assessment (i.e., computer models), important assessment assumptions, determination of potential transportation routes, and presents the results of the assessment. In addition, to aid in the understanding and interpretation of the results, specific arm of uncertainty are described, with an emphasis an how the uncertainties may affect comparisons of the alternatives. he approach used in this Appendix is modeled after that used in the Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Draft Environmental Impact Statement (SNF&INEL Draft EIS) (DOE, 1994b). The SNF&INEL Draft EIS did not perform as detailed an analysis on the specific actions taken for foreign research reactor spent nuclear fuel because of the breadth necessary to analyze the entire spent fuel management program. However, the fundamental assumptions used in this analysis are consistent with those used in the SNF & INEL Draft EIS (DOE, 1994b), and the same computer codes and generic release and accident data are used. The risk assessment results are presented in this Appendix in terms of "Per-shipment" risk factors, as well as for the total risks associated with each alternative. Per-shipment risk factors provide an estimate of the risk from a single spent nuclear fuel shipment between a specific origin and destination. They are calculated for all possible origin and destination pairs for each spent nuclear fuel type. The total risks for a given alternative are found by multiplying the expected number of shipments by the appropriate per-shipment risk factors. This approach provides maximum flexibility for determining the risks for a large number of potential alternatives.

78 (DOE/EIS–0218D-Vol.2-App.F) **Draft environmental impact statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Volume 2, Appendix F, Description and impacts of storage technology alternatives.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 326p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012343. Source: OSTI; NTIS; INIS; GPO Dep.

This appendix presents a description and evaluation of currently available spent nuclear fuel storage technologies, and their applicability to foreign research reactor spent nuclear fuel. These technologies represent the range of alternatives dW would be available to implement the proposed action. Some of these technologies are currently in use at US Department of Energy (DOE) facilities. Several dry storage cask and/or building designs have been licensed by the US Nuclear Regulatory Commission (NRC) and are operational with commercial nuclear power plant spent fuel at several locations. This appendix also discusses potential storage sites and impacts of foreign research reactor spent nuclear fuel storage at these locations.

79 (DOE/EIS–0218D-Vol.2-App.G) **Draft environmental impact statement on a proposed nuclear weapons nonproliferation policy concerning foreign research reactor spent nuclear fuel: Volume 2, Appendix G, Background documents.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Mar 1995. 21p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012344. Source: OSTI; NTIS; INIS; GPO Dep.

This appendix contains background documents, including a fact sheet, memoranda, and a policy proposal.

80 (DOE/EM–0235) **Technology catalogue. Second edition.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Apr 1995. 315p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011541. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's (DOE's) Office of Environmental Management (EM) is responsible for remediating DOE contaminated sites and managing the DOE waste inventory in a safe and efficient manner. EM's Office of Technology Development (OTD) supports applied research and demonstration efforts to develop and transfer innovative, cost-effective technologies to its site clean-up and waste-management programs within EM. The purpose of the Technology Catalogue is to: (a) provide performance data on OTD-developed technologies to scientists and engineers responsible for preparing Remedial Investigation/Feasibility Studies (RI/FSs) and other compliance documents for the DOE's clean-up and waste-management programs; and (b) identify partnering and commercialization opportunities with industry, other federal and state agencies, and the academic community.

81 (DOE/EM–0239) **Cost quality management assessment for the Savannah River Site. Final report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering

and Cost Management. Jun 1995. 130p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95014141. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Engineering and Cost Management (EM-24) conducted the Round I Cost Quality Management Assessment at the Savannah River Operations Office on February 3–14, 1992. Since the Round I CQMA, the mission of DOE-SR changed from production of nuclear materials (T_2, Pu) to environmental restoration. Transition of DOE-SR from defense programs to environmental management started in January 1995. The Round II CQMA at the Savannah River Site, conducted April 23–May 5, 1995, reviewed DOE-SR's cost and cost-related management practices against performance objectives and criteria. SRS has made progress in cost-management practices since Round I and is adopting a more cost-conscious culture.

82 (DOE/EM–0240) **Cost Quality Management Assessment for the Idaho Operations Office. Final report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Jun 1995. 151p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95014140. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Engineering and Cost Management (EM-24) conducted a Cost Quality Management Assessment of EM-30 and EM-40 activities at the Idaho National Engineering Laboratory on Feb. 3–19, 1992 (Round I). The CQMA team assessed the cost and cost-related management activities at INEL. The Round II CQMA, conducted at INEL Sept. 19–29, 1994, reviewed EM-30, EM-40, EM-50, and EM-60 cost and cost-related management practices against performance objectives and criteria. Round II did not address indirect cost analysis. INEL has made measurable progress since Round I.

83 (DOE/EM–0245) **Cost quality management assessment for the Rocky Flats Field Office. Final report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Compliance and Program Coordination. Jul 1995. 132p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95014895. Source: OSTI; NTIS; GPO Dep.

Office of Engineering and Cost Management conducted Round I Cost Quality Management Assessment (CQMA) of the Rocky Flats Field Office (RFFO) on March 16-26, 1992. Since then, the mission of RFFO has changed from production of nuclear weapons to environmental restoration, and at the time of Round II, RFFO was transitioning from a Management & Operating Contractor to a Performance Based Integrating Contractor. This will necessitate a re-evaluation of the way RFFO conducts business. The Round II CQMA, conducted March 6-17, 1995, reviewed RFFO's cost and management practices against performance objectives and criteria (POCs). RFFO has made progress since Round I. Of the 48 relevant POCs assessed in Round I, 4 were met, 33 were partially met, and 11 were not met; in Round II, RFFO meets 42 and partially meets 6. RFFO has a cost/productivity improvement program that has saved $100M in FYs 1993 and 1994. Planned savings are expected from accelerated cleanup projects, re-engineering the waste management process, and sealing materials within pipe segments. RFFO's relationship with regulators and other stakeholders has been improved. Cost- and schedule-estimating procedures have also been improved. Regulations, DOE orders, and other directives are being implemented in an overly conservative manner at Rocky Flats Environmental Technology Site.

84 (DOE/EM–0256) **Fiscal Year 1994 progress in implementing Section 120 of the Comprehensive Environmental Rresponse, Compensation, and Liability Act. Eighth annual report to Congress.** USDOE Assistant Secretary for Environmental Restoration and Waste Management, Washington, DC (United States). Jul 1995. 120p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017758. Source: OSTI; NTIS; INIS; GPO Dep.

Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) (Public Law 96-510), commonly known as Superfund, in 1980. The Superfund Amendments and Reauthorization Act (SARA) (Public Law 99-499), which amended CERCLA in 1986, added Section 120 regarding the cleanup of contaminated sites at Federal facilities. Under Section 120(e)(5) of CERCLA, each department, agency, or instrumentality of the Federal government responsible for compliance with Section 120 must submit an annual report to Congress concerning its progress in implementing the requirements of Section 120. The report must include information on the progress in reaching Interagency Agreements (IAGs), conducting Remedial Investigation and Feasibility Studies (RI/FSs), and performing remedial actions. Federal agencies that own or operate facilities on the National Priorities List (NPL) are required to begin an RI/FS for these facilities within 6 months after being placed on the NPL. Remediation of these facilities is addressed in an IAG between the Federal agency, the U.S. Environmental Protection Agency (EPA), and in some instances the state within which the facility is located. This report, prepared by the U.S. Department of Energy's (DOE's) Office of Environmental Management, is being submitted to Congress in accordance with Section 120(e)(5) of CERCLA. It is DOE's Eighth Annual Report to Congress and provides information on DOE's progress in implementing CERCLA Section 120 in Fiscal Year 1994 (FY 94), i.e., from October 1, 1993, to September 30, 1994. In this report the words "site" and "facility" are used interchangeably.

85 (DOE/EM–0257) **Environmental Restoration Strategic Plan. Remediating the nuclear weapons complex.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Aug 1995. 19p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016164. Source: OSTI; NTIS; INIS; GPO Dep.

With the end of the cold war, the US has a reduced need for nuclear weapons production. In response, the Department of Energy has redirected resources from weapons production to weapons dismantlement and environmental remediation. To this end, in November 1989, the US Department of Energy (DOE) established the Office of Environmental Restoration and Waste Management (renamed the Office of Environmental Management in 1994). It was created to bring under a central authority the management of radioactive and hazardous wastes at DOE sites and inactive or shut down facilities. The Environmental Restoration Program, a major component of DOE's Environmental Management Program, is responsible for the remediation and management of contaminated environmental media (e.g., soil, groundwater, sediments) and the decommissioning of facilities and structures at 130 sites in over 30 states and territories.

86 (DOE/EM–0258) **The transportation external coordination working group.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). 1995. 2p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96000262. Source: OSTI; NTIS; GPO Dep.

In an effort to improve coordinated interactions between the United States Department of Energy (DOE) and external groups interested in transportation activities, DOE established the Transportation External Coordination Working Group (TEC/WG). Membership includes representatives from State, Tribal and local governments, industry, and professional organizations. All DOE programs with significant transportation programs participate.

87 (DOE/EM–0263) **US - Former Soviet Union environmental management activities.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Sep 1995. 33p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96002785. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Environmental Management (EM) has been delegated the responsibility for US DOE's cleanup of nuclear weapons complex. The nature and the magnitude of the waste management and environmental remediation problem requires the identification of technologies and scientific expertise from domestic and foreign sources. This booklet makes comparisons and describes coordinated projects and workshops between the USA and the former Soviet Union.

88 (DOE/EM–0266) **Closing the circle on the splitting of the atom: The environmental legacy of nuclear weapons production in the United States and what the Department of Energy is doing about it.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Jan 1996. 106p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009985. Source: OSTI; NTIS; INIS; GPO Dep.

In the grand scheme of things we are a little more than halfway through the cycle of splitting the atom for weapons purposes. If we visualize this historic cycle as the full sweep of a clockface, at zero hour we would find the first nuclear chain reaction by Enrico Fermi, followed immediately by the Manhattan Project and the explosion of the first atomic bombs. From two o'clock until five, the United States built and ran a massive industrial complex that produced tens of thousands of nuclear weapons. At half past, the Cold War ended, and the United States shut down most of its nuclear weapons factories. The second half of this cycle involves dealing with the waste and contamination from nuclear weapons production - a task that had, for the most part, been postponed into the indefinite future. That future is now upon us. Dealing with the environmental legacy of the Cold War is in many ways as big a challenge for us today as the building of the atomic bomb was for the Manhattan Project pioneers in the 1940s. Our challenges are political and social as well as technical, and we are meeting those challenges. We are reducing risks, treating wastes, developing new technologies, and building democratic institutions for a constructive debate on our future course.

89 (DOE/EM–0274) **Cost management improvement in the Office of Environmental Management 1991-1995. Progress report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Dec 1995. 39p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003786. Source: OSTI; NTIS; GPO Dep.

The Department of Energy's (DOE's) Office of Environmental Management (EM) has been proactive in meeting the cost management challenges of environmental management activities. EM recognized the need for defining and establishing good cost management practices and has, during the first half of the 1990s, initiated more than a dozen major cost-management-related activities that have resulted in: Measureable improvement in cost-and cost-related management practices; Improved communication between field and Headquarters and among field sites; Development of cost management tools; Hiring of cost professionals; Involving regulators and stakeholders early in the planning process. The purposes of this progress report are to summarize EM's cost management initiatives, report on the results of its proactive approach to cleaning up the environment at reasonable cost, and identify future cost management needs.

90 (DOE-EM-STD–5505-96) **DOE limited standard: Operations assessments.** USDOE, Washington, DC (United States). May 1996. 195p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009462. Source: OSTI; NTIS; GPO Dep.

Purpose of this standard is to provide DOE Field Element assessors with a guide for conducting operations assessments, and provide DOE Field Element managers with the criteria of the EM Operations Assessment Program. Sections 6.1 to 6.21 provide examples of how to assess specific areas; the general techniques of operations assessments (Section 5) may be applied to other areas of health and safety (e.g. fire protection, criticality safety, quality assurance, occupational safety, etc.).

91 (DOE/EW/50625–T22) **Environmental Hazards Assessment Program quarterly report, January–March 1995.** Medical Univ. of South Carolina, Charleston, SC (United States). 30 Apr 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE95012199. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of the Environmental Hazards Assessment Program (EHAP) stated in the proposal to DOE are to: develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health oriented aspects of environmental restoration and waste management. This report describes activities and reports on progress for the third quarter (January–March) of the third year of the grant. It reports progress against these grant objectives and the Program Implementation Plan published at the end of the first year of the grant. Questions, comments, or requests for further information concerning the activities under this grant can be forwarded to Jack Davis in the EHAP office of the Medical University of South Carolina at (803) 727-6450.

92 (DOE/EW/50625–T23) **Environmental hazards assessment program. Annual report, July 1, 1994–June 30, 1995.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Jul 1995. 106p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE95016210. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes activities and reports on progress for the third year of the DOE grant to support the Environmental Hazards Assessment Program (EHAP). It reports progress against grant objectives and the Program Implementation Plan published at the end of the first year of the grant. As the program has evolved, more projects have been funded and many existing projects have become more complex. Thus, to accomplish better the objectives over the years and retain a solid focus on the total mission, we have reorganized the grant effort from three to five majoe elements: Public and professional outreach; Clinical programs; Science programs; Information systems; and, Program management.

93 (DOE/EW/50625–T24) **Environmental Hazards Assessment Program. Quarterly report, April–June 1995.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Jul 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE95016211. Source: OSTI; NTIS; GPO Dep.

The objectives of this report are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards, both chemical and radiation, on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health oriented aspects of environmental restoration and waste management. This report describes the progress made this quarter in the following areas: public and professional outreach; science programs; clinical programs; and information support and access systems.

94 (DOE/EW/50625–T25) **Summer Undergraduate Research Program: Environmental studies.** McMillan, J. (ed.). Medical Univ. of South Carolina, Charleston, SC (United States). 1994. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE95016555. Source: OSTI; NTIS; GPO Dep.

The purpose of the summer undergraduate internship program for research in environmental studies is to provide an opportunity for well-qualified students to undertake an original research project as an apprentice to an active research scientist in basic environmental research. The students are offered research topics at the Medical University in the scientific areas of pharmacology and toxicology, epidemiology and risk assessment, environmental microbiology, and marine sciences. Students are also afforded the opportunity to work with faculty at the University of Charleston, SC, on projects with an environmental theme. Ten well-qualified students from colleges and universities throughout the eastern United States were accepted into the program.

95 (DOE/EW/50625–T27) **Environmental Hazards Assessment Program. Quarterly report, July–September 1995.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Oct 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE96001996. Source: OSTI; NTIS; GPO Dep.

This report describes activities and reports on progress for the first quarter (July–September) of the fourth year of the grant to support the Environmental Hazards Assessment Program (EHAP) at the Medical University of South Carolina. It reports progress against the grant objectives and the Program Implementation Plan published at the end of the first year of the grant. The objectives of EHAP stated in the proposal to DOE are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management.

96 (DOE/EW/50625–T29) **Environmental hazards assessment program. Quarterly report, October–December 1995.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Jan 1996. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE96006068. Source: OSTI; NTIS; GPO Dep.

This document is a quarterly report on the Environmental Hazards Assessment Program (EHAP). The highlights discussed include the following: work on immunogenic epidemiology of scleroderma; symposium on the environmental Risk Assessment: does it work for the community based family physician?; project report on low-dose rate radiation health effects; meeting to review case study presentations for an international Risk Assessment/Risk Mangement Forum; and an updated core curriculum computer program models for occupational and environmental medicine.

97 (DOE/EW/50625–T30) **Environmental Hazards Assessment Program quarterly report: January–March 1996.** Medical Univ. of South Carolina, Charleston, SC (United States). 30 Apr 1996. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE96010198. Source: OSTI; NTIS; GPO Dep.

The objectives of the Environmental Hazards Assessment Program are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management. This report describes activities and reports on progress for the third quarter (January–March) of the fourth year of the grant.

98 (DOE/EW/50625–T31) **Environmental Hazards Assessment Program: Quarterly report, April–June, 1996.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Jul 1996. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE96013626. Source: OSTI; NTIS; GPO Dep.

The objectives of the Environmental Hazards Assessment Program (EHAP) are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management. This report describes activities and reports for the fourth quarter (April–June) of the fourth year of the grant. It reports progress against these grant objectives and the Program Implementation Plan.

99 (DOE/EW/50625–T32) **Environmental Hazards Assessment Program: Annual report, July 1, 1995–June 30, 1996.** Medical Univ. of South Carolina, Charleston, SC (United States). 31 Jul 1996. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-92EW50625. Order Number DE96013627. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of the Environmental Hazards Assessment Program (EHAP) are to: (1) develop a holistic, national basis for risk assessment, risk management, and risk communication that recognizes the direct impact of environmental hazards on the health and well-being of all; (2) develop a pool of talented scientists and experts in cleanup activities, especially in human health aspects; and (3) identify needs and develop programs addressing the critical shortage of well-educated, highly-skilled technical and scientific personnel to address the health-oriented aspects of environmental restoration and waste management. This report describes activities and reports on progress for the fourth year of the grant. It reports progress against these grant objectives and the Program Implementation Plan.

100 (DOE/EW/53023–T11) **Tulane/Xavier University hazardous materials in aquatic environments of the Mississippi River Basin. Quarterly progress report, April 1, 1995–June 30, 1995.** Tulane Univ., New Orleans, LA (United States). [1995]. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE95016068. Source: OSTI; NTIS; GPO Dep.

Brief summaries of individual investigators participating in the Tulane/Xavier University Hazardous Materials in Aquatic Ecosystems are provided.

101 (DOE/EW/53023–T13) **Tulane/Xavier Universities hazardous materials in aquatic environments of the Mississippi River Basin. Quarterly progress report, October 1, 1995–December 31, 1995.** Tulane Univ., New Orleans, LA (United States). [1995]. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE96005713. Source: OSTI; NTIS; INIS; GPO Dep.

This quarterly report briefly describes research projects ongoing in this program.

102 (DOE/EW/53023–T14) **Tulane/Xavier University hazardous materials in aquatic environments of the Mississippi River Basin. Annual technical report, January 1–December 31, 1995.** Tulane Univ., New Orleans, LA (United States). Center for Bioenvironmental Research. 2 May 1996. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-93EW53023. Order Number DE96010145. Source: OSTI; NTIS; GPO Dep.

Tulane and Xavier Universities have singled out the environment as a major strategic focus for research and training for now and beyond the year 2000. In 1989, the Tulane/Xavier Center for Bioenvironmental Research (CBR) was established as the umbrella organization which coordinates environmental research at both universities. In December, 1992, the Tulane/Xavier CBR was awarded a five year grant to study pollution in the Mississippi River system. The Hazardous Materials in Aquatic Environments of the Mississippi River Basin project is a broad research and education program aimed at elucidating the nature and magnitude of toxic materials that contaminate aquatic environments of the Mississippi River Basin. Studies include defining the complex interactions that occur during the transport of contaminants, the actual and potential impact on ecological systems and health, and the mechanisms through which these impacts might be remediated. The Mississippi River Basin represents a model system for analyzing and solving contamination problems that are found in aquatic systems world-wide. Summaries which describe objectives, goals, and accomplishments are included on ten collaborative cluster projects, two education projects, and six initiation projects. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

103 (DOE/EW/53023–T15) **Tulane/Xavier University hazardous materials in aquatic environments of the Mississippi River basin. Quarterly progress report, January 1–March 31, 1996.** Tulane Univ., New Orleans, LA (United States). Center for Bioenvironmental Research. 17 May 1996. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-93EW53023. Order Number DE96010294. Source: OSTI; NTIS; GPO Dep.

The objectives of this report are to provide the necessary administrative support to assure that the scientific and educational goals of the project are obtained and to assure that all Department of Energy reporting requirements and requests are fulfilled. The grant reporting is divided into three aspects: Collaborative Cluster projects, Initiation projects and Education projects. A cluster project is one or more closely related collaborative, multidisciplinary research projects in which a group of investigators employs a synergistic approach to the solution of problems in the same general area of research. The accomplishments this quarter of eleven cluster projects are presented. An initial project typically involves a single investigator. The purpose of the project is to undertake pilot work, lasting no more than one year, which will lead to the successful submission of an externally-funded proposal or the development of a collaborative cluster project. The accomplishments this quarter of eleven initiation projects are presented. The education projects are designed to develop courses with emphasis on environmental studies and/or to train students in areas of environmental research.

104 (DOE/EW/53023–T16) **Hazardous materials in aquatic environments of the Mississippi River Basin Project management. Technical quarterly progress report, April 1, 1996–June 30, 1996.** McLachlan, J.; Ide, C.F.; O'Connor, S. Tulane Univ., New Orleans, LA (United States). 1996. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG21-93EW53023. Order Number DE96013670. Source: OSTI; NTIS; GPO Dep.

This quarterly report summarizes accomplishments for the Project examining hazardous materials in aquatic environments of the Mississippi River Basin. Among the many research areas summarized are the following: assessment of mechanisms of metal-induced reproductive toxicity in aquatic species as a biomarker of exposure; hazardous wastes in aquatic environment;ecological sentinels of aquatic contamination in the lower Mississippi River System; remediation of selected contaminants; rapid on-site immunassay for heavy metal contamination; molecular mechanisms of developmental toxicity induced by retinoids and retinoid-like molecules; resuseable synthetic membranes for the removal of aromatic and halogenated organic pollutants from waste water; Effects of steroid receptor activation in neurendocrine cell of the mammalian hypothalamus; modeling and assessment of environmental quality of louisiana bayous and swamps; enhancement of environmental education. The report also contains a summary of publications resulting from this project and an appendix with analytical core protocals and target compounds and metals.

105 (DOE/EW/54069-T1) **A review of the Department of Energy classification policy and procedure.** National Academy of Sciences - National Research Council, Washington, DC (United States). [1995]. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC01-94EW54069. Source: National Academy Press, 2101 Constitution Avenue, N.W., Box 285, Washington, D.C. 20055.

This book presents a discussion on the context for the Department of Energy classification system, current operations, principles behind regulatory changes, information policy, and methods to improve the classification systems.

106 (DOE/ID-10474-Rev.2) **Idaho National Engineering Laboratory (INEL) Environmental Restoration (ER) Program Baseline Safety Analysis File (BSAF).** EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002356. Source: OSTI; NTIS; INIS; GPO Dep.

The Baseline Safety Analysis File (BSAF) is a facility safety reference document for the Idaho National Engineering Laboratory (INEL) environmental restoration activities. The BSAF contains information and guidance for safety analysis documentation required by the U.S. Department of Energy (DOE) for environmental restoration (ER) activities, including: Characterization of potentially contaminated sites. Remedial investigations to identify and remedial actions to clean up existing and potential releases from inactive waste sites Decontamination and dismantlement of surplus facilities. The information is INEL-specific and is in the format required by DOE-EM-STD-3009-94, Preparation Guide for U.S. Department of Energy Nonreactor Nuclear Facility Safety Analysis Reports. An author of safety analysis documentation need only write information concerning that activity and refer to BSAF for further information or copy applicable chapters and sections. The information and guidance provided are suitable for: • Nuclear facilities (DOE Order 5480-23, Nuclear Safety Analysis Reports) with hazards that meet the Category 3 threshold (DOE-STD-1027-92, Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports) • Radiological facilities (DOE-EM-STD-5502-94, Hazard Baseline Documentation) Nonnuclear facilities (DOE-EM-STD-5502-94) that are classified as "low" hazard facilities (DOE Order 5481.1B, Safety Analysis and Review System). Additionally, the BSAF could be used as an information source for Health and Safety Plans and for Safety Analysis Reports (SARs) for nuclear facilities with hazards equal to or greater than the Category 2 thresholds, or for nonnuclear facilities with "moderate" or "high" hazard classifications.

107 (DOE/ID-10511) **Validation of the transportation computer codes HIGHWAY, INTERLINE, RADTRAN 4, and RISKIND.** Maheras, S.J.; Pippen, H.K. Science Applications International Corp., Idaho Falls, ID (United States). May 1995. 370p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-92ID13208. Order Number DE96001332. Source: OSTI; NTIS; INIS; GPO Dep.

The computer codes HIGHWAY, INTERLINE, RADTRAN 4, and RISKIND were used to estimate radiation doses from the transportation of radioactive material in the Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Environmental Impact Statement. HIGHWAY and INTERLINE were used to estimate transportation routes for truck and rail shipments, respectively. RADTRAN 4 was used to estimate collective doses from incident-free transportation and the risk (probability × consequence) from transportation accidents. RISKIND was used to estimate incident-free radiation doses for maximally exposed individuals and the consequences from reasonably foreseeable transportation accidents. The purpose of this analysis is to validate the estimates made by these computer codes; critiques of the conceptual models used in RADTRAN 4 are also discussed. Validation is defined as "the test and evaluation of the completed software to ensure compliance with software requirements." In this analysis, validation means that the differences between the estimates generated by these codes and independent observations are small (i.e., within the acceptance criterion established for the validation analysis). In some cases, the independent observations used in the validation were measurements; in other cases, the independent observations used in the validation analysis were generated using hand calculations. The results of the validation analyses performed for HIGHWAY, INTERLINE, RADTRAN 4, and RISKIND show that the differences between the estimates generated using the computer codes and independent observations were small. Based on the acceptance criterion established for the validation analyses, the codes yielded acceptable results; in all cases the estimates met the requirements for successful validation.

108 (DOE/ID/12584-230) **Commercial Environmental Cleanup - The products and services directory. Treatment, characterization and extraction/delivery/materials handling technologies.** Rust Geotech, Inc., Grand Junction, CO (United States); USDOE Grand Junction Projects Office, CO (United States). Nov 1995. 1200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-120). Order Number DE96004909. Source: OSTI; NTIS; INIS; GPO Dep.

This directory is patterned after the telephone Yellow Pages and is designed as a reference tool to those who may seek commercial remedies for their environmental cleanup problems. It offers the user the opportunity to survey 325 environmental cleanup businesses that currently market their products and services through 1,134 applications of commercially available technologies. Like the Yellow Pages, the Directory furnishes the user with points-of-contact to investigate the capabilities of the listed companies to perform within acceptable standards, practices, and costs and to meet a user's specific needs. The three major sections of the Directory are organized under the broad headings of Treatment, Characterization, and Extraction/Delivery/Materials Handling. Within each section, information is grouped according to the applicable contaminant medium and companies are listed alphabetically under each medium heading. Not all vendors in the environmental cleanup business are included in this first edition of the Directory. Future editions will more completely reflect the status of the industry. The database of the commercial cleanup products and services Directory will be offered on the Internet in the future and will be available on the Homepage www.doe.gjpo.com.

109 (DOE/ID/12735–T35) **Projects at the Western Environmental Technology Office. Quarterly technical progress report, January 1–March 31, 1995.** MSE, Inc., Butte, MT (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE95013077. Source: OSTI; NTIS; GPO Dep.

This quarterly report briefly describes recent progress in eight projects. The projects are entitled Biomass Remediation Project; Heavy Metal-Contaminated Soil Project; MHD Shutdown; Mine Waste Technology Program; Plasma Projects; Resource Recovery Project; Spray Casting Project; and Watervliet Arsenal Project.

110 (DOE/ID/13167–T22) **Integration/coordination contractor support to Environmental Restoration Program and Program Support Office. Contract status report, September 1, 1995–September 30, 1995.** Jason Associates Corp., Idaho Falls, ID (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AM07-92ID13167. Order Number DE96001019. Source: OSTI; NTIS; GPO Dep.

This status report updates activities on the following tasks: Environmental restoration task planning; Waste management task planning; Waste management project support; CPP stakeholder involvement; EM site specific advisory board - Idaho National Engineering Laboratory; and, Hypermedia document. A summary status assessment and forecast of all tasks is provided and A cost management report is included.

111 (DOE/ID/13220–T5) **Magnetically controlled deposition of metals using gas plasma. Quarterly progress report, July 1995–September 1995.** Idaho Univ., Moscow, ID (United States). Dept. of Mechanical Engineering. 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-93ID13220. Order Number DE96002992. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to develop a method of spraying materials on a substrate in a controlled manner to eliminate waste inherent in present plating processes. The process will utilize a standard spray gun with the addition of magnetic fields to focus and control the plasma.

112 (DOE/MC/27346–5098) **Economic evaluation and market analysis for natural gas utilization. Topical report.** Hackworth, J.H.; Koch, R.W.; Rezaiyan, A.J. K and M Engineering and Consulting Corp., Washington, DC (United States). Apr 1995. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27346. Order Number DE96000631. Source: OSTI; NTIS; INIS; GPO Dep.

During the past decade, the U.S. has experienced a surplus gas supply. Future prospects are brightening because of increased estimates of the potential size of undiscovered gas reserves. At the same time, U.S. oil reserves and production have steadily declined, while oil imports have steadily increased. Reducing volume growth of crude oil imports was a key objective of the Energy Policy Act of 1992. Natural gas could be an important alternative energy source to liquid products derived from crude oil to help meet market demand. The purpose of this study was to (1) analyze three energy markets to determine whether greater use could be made of natural gas or its derivatives and (2) determine whether those products could be provided on an economically competitive basis. The following three markets were targeted for possible increases in gas use: transportation fuels, power generation, and chemical feedstock. Gas-derived products that could potentially compete in these three markets were identified, and the economics of the processes for producing those products were evaluated. The processes considered covered the range from commercial to those in early stages of process development. The analysis also evaluated the use of both high-quality natural gas and lower-quality gases containing CO_2 and N_2 levels above normal pipeline quality standards.

113 (DOE/MC/29109–5173) **Road transportable analytical laboratory (RTAL) system. Quarterly report, August–October 1995.** Engineering Computer Optecnomics, Inc., Annapolis, MD (United States). Nov 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE96004435. Source: OSTI; NTIS; GPO Dep.

Goal is the development and demonstration of a system to meet DOE needs for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soil, groundwater, and surface waters. The system consists of a set of individual laboratory modules. This report documents progress on Phase II, which is a transition to Maturity Level 5, Full-Scale Demonstration.

114 (DOE/MC/31179–96/CO618) **The GETE approach to facilitating the commercialization and use of DOE-developed environmental technologies.** Harvey, T.N. Global Environment and Technology Foundation, Annandale, VA (United States). 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC31179. (CONF-9510108–36: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003668. Source: OSTI; NTIS; INIS; GPO Dep.

The Global Environmental Technology Enterprise (GETE) was conceived to develop and implement strategies to facilitate the commercialization of innovative, cost-effective Department of Energy (DOE)-developed environmental technologies. These strategies are needed to aid DOE's clean-up mission; to break down barriers to commercialization; and to build partnerships between the federal government and private industry in order to facilitate the development and use of innovative environmental technologies.

115 (DOE/MC/31388–96/CO624) **Environmental management technology demonstration and commercialization.** Daly, D.J. (and others); Erickson, T.A.; Groenewold, G.H. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC31388. (CONF-9510108–29: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003683. Source: OSTI; NTIS; INIS; GPO Dep.

The Energy & Environmental Research Center (EERC), a contract-supported organization focused on technology research, development, demonstration, and commercialization (RDD&C), is entering its second year of a Cooperative

Agreement with the U.S. Department of Energy (DOE) Morgantown Energy Technology Center (METC) to facilitate the development, demonstration, and commercialization of innovative environmental management (EM) technologies in support of the activities of DOE's Office of Environmental Science and Technology (EM-50) under DOE's EM Program. This paper reviews the concept and approach of the program under the METC-EERC EM Cooperative Agreement and profiles the role the program is playing in the commercialization of five EM technologies.

116 (DOE/MC/32112–96/CO632) **Electrodialysis-ion exchange for the separation of dissolved salts.** Baroch, C.J.; Grant, P.J. Wastren, Inc., Idaho Falls, ID (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32112. (CONF-9510108–31: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003688. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy generates and stores a significant quantity of low level, high level, and mixed wastes. As some of the DOE facilities are decontaminated and decommissioned, additional and possibly different forms of wastes will be generated. A significant portion of these wastes are aqueous streams containing acids, bases, and salts, or are wet solids containing inorganic salts. Some of these wastes are quite dilute solutions, whereas others contain large quantities of nitrates either in the form of dissolved salts or acids. Many of the wastes are also contaminated with heavy metals, radioactive products, or organics. Some of these wastes are in storage because a satisfactory treatment and disposal processes have not been developed. This report describes the process of electrodialysis-ion exchange (EDIX) for treating aqueous wastes streams consisting of nitrates, sodium, organics, heavy metals, and radioactive species.

117 (DOE/OR–01-1347/V4) **Oak Ridge Reservation Federal Facility Agreement. Quarterly report for the Environmental Restoration Program. Volume 4, July 1995–September 1995.** Oak Ridge National Lab., TN (United States). Oct 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96001774. Source: OSTI; NTIS; INIS; GPO Dep.

This quarterly progress report satisfies requirements for the Environmental Restoration (ER) Program that are specified in the Oak Ridge Reservation Federal Facility Agreement (FFA) established between the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Tennessee Department of Environment and Conservation (TDEC). The reporting period covered herein is July through September 1995 (fourth quarter of FY 1995). Sections 1.1 and 1.2 provide respectively the milestones scheduled for completion during the reporting period and a list of documents that have been proposed for transmittal during the following quarter but have not been approved as FY 1995 commitments.

118 (DOE/OR–01-1393/V3&D1) **Remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit. Volume 3. Appendix E.** Oak Ridge National Lab., TN (United States). Sep 1995. 437p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–315/V3&D1). Order Number DE96010203. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Appendix E: Toxicity Information and Uncertainty Analysis, description of methods, from the combined Remedial Investigation/Feasibility Study Report for the Clinch River/Poplar Crack (CR/PC) Operable Unit (OU). The CR/PC OU is located in Anderson and Roane Counties, Tennessee and consists of the Clinch River and several of its embayments in Melton Hill and Watts Bar Reservoirs. These waters have received hazardous substances released over a period of 50 years from the US Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act. A remedial investigation has been conducted to determine the current nature and extent of any contamination and to assess the resulting risk to human health and the environment. The feasibility study evaluates remedial action alternatives to identify any that are feasible for implementation and that would effectively reduce risk. Historical studies had indicated that current problems would likely include ^{137}Cs in sediment of the Clinch River, mercury in sediment and fish of Poplar Creek and PCBs and pesticides in fish from throughout the OU. Peak releases of mercury and ^{137}Cs occurred over 35 years ago, and current releases are low. Past releases of PCBs from the ORR are poorly quantified, and current releases are difficult to quantify because levels are so low. The site characterization focused on contaminants in surface water, sediment, and biota. Contaminants in surface water were all found to be below Ambient Water Quality Criteria. Other findings included the following: elevated metals including cesium 137 and mercury in McCoy Branch sediments; PCBs and chlordane elevated in several fish species, presenting the only major human health risk, significant ecological risks in Poplar Creek but not in the Clinch River.

119 (DOE/OR–01-1407-D1) **Preliminary assessment of the ecological risks to wide-ranging wildlife species on the Oak Ridge Reservation.** Sample, B.E.; Baron, L.A.; Jackson, B.L. Oak Ridge National Lab., TN (United States). Aug 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017552. Source: OSTI; NTIS; INIS; GPO Dep.

Historically, ecological risk assessment at CERCLA sites [such as the Oak Ridge Reservation (ORR)], has focused on species that may be definitively associated with a contaminated area or source operable unit. Consequently the species that are generally considered are those with home ranges small enough such that multiple individuals or a distinct population can be expected to reside within the boundaries of the contaminated site. This approach is adequate for sites with single, discrete areas of contamination that only provide habitat for species with limited requirements. This approach is not adequate however for large sites with multiple, spatially separated contaminated areas that provide habitat for wide-ranging wildlife species. Because wide-ranging wildlife species may travel between and use multiple contaminated sites they may be exposed to and be at risk from contaminants from multiple locations. Use of a particular contaminated site by wide-ranging species will be dependent upon the amount of suitable habitat available at that site. Therefore to adequately evaluate risks to wide-ranging species at the ORR-wide scale, the use of multiple contaminated sites must be weighted by the amount of suitable habitat on OUs. This reservation-wide ecological risk assessment is intended to identify which endpoints are significantly at risk; which contaminants are responsible for this risk; and which OUs significantly contribute to risk.

120 (DOE/OR–01-1441/V2) **Oak Ridge Reservation Federal Facility Agreement: Quarterly report for the Environmental Restoration Program. Volume 2, January–March 1996.** Department of Energy, Oak Ridge, TN (United States). Oak Ridge Operations Office. Apr 1996. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96009976. Source: OSTI; NTIS; GPO Dep.

This report provides information about ER Program activities conducted on the Oak Ridge Reservation under the Federal Facility Agreement (FFA). Specifically, it includes information on milestones scheduled for completion during the reporting period as well as scheduled for completion during the next reporting period (quarter), accomplishments of the ER Program, concerns related to program work, and scheduled activities for the next quarter. It also provides a listing of the identity and assigned tasks of contractors performing ER Program work under the FFA.

121 (DOE/OR–01-1445-D1) **US Department of Energy Oak Ridge Operations Environmental Management Public Involvement Plan for the Oak Ridge Reservation.** Oak Ridge National Lab., TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Mar 1996. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96008331. Source: OSTI; NTIS; INIS; GPO Dep.

This document was prepared in accordance with CERCLA requirements for writing community relations plans. It includes information on how the DOE Oak Ridge Operations Office prepares and executes Environmental Management Community relations activities. It is divided into three sections: the public involvement plan, public involvement in Oak Ridge, and public involvement in 1995. Four appendices are also included: environmental management in Oak Ridge; community and regional overview; key laws, agreements, and policy; and principal contacts.

122 (DOE/OSTI–3411/1) **The Office of Environmental Management technical reports: A bibliography.** USDOE Office of Scientific and Technical Information (OSTI), Oak Ridge, TN (United States). Jan 1996. 1044p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96001666. Source: OSTI; NTIS; INIS; GPO Dep.

The Office of Environmental Management's (EM) technical reports bibliography is an annual publication that contains information on scientific and technical reports sponsored by the Office of Environmental Management added to the Energy Science and Technology Database from July 1, 1994 through June 30, 1995. This information is divided into the following categories: Focus Areas, Cross-Cutting Programs, and Support Programs. In addition, a category for general information is included. EM's Office of Science and Technology sponsors this bibliography.

123 (DOE/RL–91-45-Rev.3) **Hanford Site Risk Assessment Methodology. Revision 3.** Bechtel National, Inc., Richland, WA (United States). May 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017531. Source: OSTI; NTIS; INIS; GPO Dep.

This methodology has been developed to prepare human health and ecological evaluations of risk as part of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial investigations (RI) and the Resource conservation and Recovery Act of 1976 (RCRA) facility investigations (FI) performed at the Hanford Site pursuant to the hanford Federal Facility Agreement and Consent Order (Ecology et al. 1994), referred to as the Tri-Party Agreement. Development of the methodology has been undertaken so that Hanford Site risk assessments are consistent with current regulations and guidance, while providing direction on flexible, ambiguous, or undefined aspects of the guidance. The methodology identifies site-specific risk assessment considerations and integrates them with approaches for evaluating human and ecological risk that can be factored into the risk assessment program supporting the Hanford Site cleanup mission. Consequently, the methodology will enhance the preparation and review of individual risk assessments at the Hanford Site.

124 (DOE/RL–93-33) **Focused feasibility study of engineered barriers for waste management units in the 200 areas.** Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 245p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013560. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) at the Hanford Site in Washington State is organized into numerically designated operational areas consisting of the 100, 200, 300, 400, 600, and 1100 Areas. In November 1989, the U.S. Environmental Protection Agency (EPA) included the 200 Areas (as well as the 100, 300, and 1,100 Areas) of the Hanford Site on the National Priorities List (NPL) under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Inclusion on the NPL initiates the remedial investigation (RI) and feasibility study (FS) process to characterize the nature and extent of contamination, assess risks to human health and the environment, and select remedial actions. The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) was developed and signed by representatives from the EPA, Washington State Department of Ecology (Ecology), and DOE in May 1989 to provide a framework to implement and integrate cleanup activities. The scope of the agreement covers CERCLA past-practice, Resource Conservation and Recovery Act of 1976 (RCRA) past-practice, and RCRA treatment, storage, and disposal (TSD) activities on the Hanford Site. The 1991 revision to the Tri-Party Agreement required that an aggregate area approach be implemented in the 200 Areas based on the Hanford Site Past-Practice Strategy (HPPS) and established a milestone (M-27-00) to complete 10 Aggregate Area Management Study (AAMS) Reports in 1992.

125 (DOE/RL–93-66) **Hanford Remedial Action Environmental Impact Statement, Richland, Washington. Implementation Plan.** USDOE Richland Operations Office, WA (United States). Jun 1995. 167p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95014919. Source: OSTI; NTIS; INIS; GPO Dep.

This implementation plan was prepared in compliance in compliance with 10 CFR 1021. It includes the following sections: introduction; purpose and need for departmental action; scope, content, and alternatives for the HRA EIS; public participation process; schedule for preparation of the HRA EIS; anticipated environmental reviews and consultations; and contractor disclosure statement. The following appendices are also included: notice of intent, federal register notice for extension of public scoping period, proposed annotated outline for the draft HRA EIS, summary of final report for the Hanford Future Site Uses Working Group, and summary of comments and responses from the public scoping process.

126 (DOE/RL–93-69-Rev.2) **Tri-party agreement databases, access mechanism and procedures. Revision 2.** Brulotte, P.J. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005134. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the information required for the Washington State Department of Ecology (Ecology) and the U.S. Environmental Protection Agency (EPA) to access databases related to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). It identifies the procedure required to obtain access to the Hanford Site computer networks and the Tri-Party Agreement related databases. It addresses security requirements, access methods, database availability dates, database access procedures, and the minimum computer hardware and software configurations required to operate within the Hanford Site networks. This document supersedes any previous agreements including the Administrative Agreement to Provide Computer Access to U.S. Environmental Protection Agency (EPA) and the Administrative Agreement to Provide Computer Access to Washington State Department of Ecology (Ecology), agreements that were signed by the U.S. Department of Energy (DOE), Richland Operations Office (RL) in June 1990, Access approval to EPA and Ecology is extended by RL to include all Tri-Party Agreement relevant databases named in this document via the documented access method and date. Access to databases and systems not listed in this document will be granted as determined necessary and negotiated among Ecology, EPA, and RL through the Tri-Party Agreement Project Managers. The Tri-Party Agreement Project Managers are the primary points of contact for all activities to be carried out under the Tri-Party Agreement. Action Plan. Access to the Tri-Party Agreement related databases and systems does not provide or imply any ownership on behalf of Ecology or EPA whether public or private of either the database or the system. Access to identified systems and databases does not include access to network/system administrative control information, network maps, etc.

127 (DOE/RL–94-61-Vol.1) **100 Area source operable unit focused feasibility study. Volume 1.** USDOE Richland Operations Office, WA (United States). Jun 1995. 896p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95014150. Source: OSTI; NTIS; INIS; GPO Dep.

The 100 Area is one of four Hanford areas placed on the National Priority List of waste sites in 1989 under CERCLA authority. Purpose of this focused feasibility study (FFS) is to provide decision makers sufficient information to select interim remedial alternatives for IRM (interim remedial measures) candidate waste sites within the 100 Areas. Scope covers high-priority source waste sites (sites at which there was direct disposal of wastes or a direct release of hazardous substances). This FFS contains three major components; the first major component, Sections 1.0-7.0 and Appendices A, B, and C, is the Process Document, which describes the Remedial Alternatives developed for remediation of the 100 Area source waste sites, evaluates these alternatives against CERCLA and other environmental criteria, and compares the alternatives against each other. The Process Document addresses 10 logical groupings of individual waste sites. It evaluates remedial alternatives for each waste site group assuming their groundwater should be protected as a potential drinking water source and the remediated areas will be used for recreational or other occasional use. A second major component of this report, the Sensitivity Analysis (Appendix D), evaluates how the analysis might change for different exposure scenarios. The third major component comprises the operableunit specific FFSs prepared for the 100-HR-1, 100-BC-1, and 100-DR-1 Operable Units (Appendices E, F, and G).

128 (DOE/RL–94-69) **Strategic plan for Hanford site information management.** USDOE Richland Operations Office, WA (United States). Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006358. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site missions are to clean up the Site, to provide scientific knowledge and technology to meet global needs, and to partner in the economic diversification of the region. To achieve these long-term missions and increase confidence in the quality of the Site's decision making process, a dramatically different information management culture is required, consistent with US Department of Energy (DOE) mandates on increased safety, productivity, and openness at its sites. This plan presents a vision and six strategies that will move the Site toward an information management culture that will support the Site missions and address the mandates of DOE.

129 (DOE/RL–94-96-Rev.1) **Hanford Site Pollution Prevention Plan progress report, 1994. Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001068. Source: OSTI; NTIS; INIS; GPO Dep.

This report tracks progress made during 1994 against the goals stated in DOE/RL-92-62, Executive Summary, Hanford Site Pollution Prevention Plan. The Executive Summary of the plan was submitted to the Washington State Department of Ecology (Ecology) in September 1992. The plan, Executive Summary, and the progress reports are elements of a pollution prevention planning program that is required by WAC 173-307, "Plans," for all hazardous substance users and/or all hazardous waste generators regulated by Ecology. These regulations implement RCW 70.95C, "Waste Reduction," an act relating to hazardous waste reduction. The act encourages voluntary efforts to redesign industrial processes to help reduce or eliminate hazardous substances and hazardous waste byproducts, and to maximize the in-process reuse or reclamation of valuable spent material. The Hanford Site is voluntarily complying with this state regulatory-mandated program. All treatment, storage, or disposal (TSD) facilities are exempt from participating; the Hanford Site is classified as a TSD.

130 (DOE/RL–94-140) **Close-out report Fitzner-Eberhardt Arid Lands Ecology Reserve remedial action, Hanford, Washington.** Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 16p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013574. Source: OSTI; NTIS; INIS; GPO Dep.

The Fitzner-Eberhardt Arid Lands Ecology (ALE) Reserve consists of 312 km^2 (120 mi^2) of shrub-steppe land on the western edge of the Hanford Site. It is located south of Highway 240 and east of the point where the Yakima River borders the site. The land was set aside as a natural research area in 1967 by the Atomic Energy Commission. Historically tribal land, the area was homesteaded by pioneers before it was taken by the federal government in 1943 as a security buffer to protect the Hanford Site defense production facilities. One antiaircraft artillery battery (latter converted to a Nike missile site) was located on this land; plutonium production plants or storage facilities were never built there. A more complete account can be found in the Preliminary Assessment Screening (PAS) Report for the Arid Lands Ecology Reserve, Hanford. With the recent change in mission at the Hanford Site from plutonium production to environmental cleanup, much attention has been given to releasing clean tracts of land for other uses. The ALE Reserve is one such tract of land. The existing areas of contamination in the ALE Reserve were considered to be small. In March 1993, the U.S. Department of Energy (DOE), the Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) signed and Agreement in Principle in which they agreed to expedite cleanup of the ALE Reserve. Cleanup activities and a draft close-out report were to be completed by October 1994. Additionally, DOE proposed to mitigate hazards that may pose a physical threat to wildlife or humans.

131 (DOE/RL--95-17-Vol.1-Pt.1) **Hanford Site annual dangerous waste report: Volume 1, Part 1, Generator dangerous waste report, dangerous waste.** USDOE Richland Operations Office, WA (United States). 1994. 457p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012346. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information on hazardous wastes at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, waste number, weight, and waste designation.

132 (DOE/RL--95-17-Vol.1-Pt.2) **Hanford Site annual dangerous waste report: Volume 1, Part 2, Generator dangerous waste report, dangerous waste.** USDOE Richland Operations Office, WA (United States). 1994. 495p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012347. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information on hazardous materials at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, waste number, weight, and waste designation.

133 (DOE/RL--95-24-Rev.1) **Mitigation action plan for the environmental restoration disposal facility.** Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008047. Source: OSTI; NTIS; INIS; GPO Dep.

This Mitigation Action Plan describes the mitigation actions for the Environmental Restoration Disposal Facility (ERDF). "Mitigation" is defined in the Council on Environmental Quality (CEQ) regulations implementing the National Environmental Policy Act (NEPA) in the Code of Federal Regulations (CFR) Section 1508.20, Part 40, as including one or more of the following actions: (1) Avoiding the impact by not taking a certain action or parts of an action, (2) Minimizing impacts by limiting the degree or magnitude of the action and its implementation, (3) Rectifying the impact by repairing, rehabilitating, or restoring the affected environment, (4) Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action, and (5) Compensating for the impact by replacing or providing substitute resources or environments. This Mitigation Action Plan addresses potential impacts to human health and safety and the environment, as identified in the ERDF Record of Decision (ROD), and includes potential impacts to worker safety, air and water quality, noise, and biological and cultural resources because of the construction and operation of the ERDF. Mitigation measures will be planned and executed throughout the operational life of the ERDF. Certain mitigation measures can only be determined as operations are initiated, because there are still uncertainties regarding how the facility will be administered and operated. The evaluation of potential mitigation options affecting natural resources will be coordinated with the natural resources Trustees. This Mitigation Action Plan discusses the bounding requirements with which the facility must comply, regardless of operational circumstances.

134 (DOE/RL--95-43) **Needs assessment activity report: April 1995.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Apr 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96000683. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a US Department of Energy Headquarters task (DOE-HQ), the Packaging Operations and Development Group within Westinghouse Hanford Company (WHC) has assessed the packaging needs of many DOE sites. These assessments have involved site visits and meetings with personnel involved with transportation and packaging of hazardous materials. By March 1995, 20 DOE facilities had been visited. As a result, these sites been informed of some of the packaging activities that DOE has sponsored and is sponsoring, have been apprised of the affects of upcoming changes to transportation regulations, have discussed their short-term packaging needs, and have shared unique packaging they have developed which may be of use to other DOE facilities. Program successes include discovery of a need for a reusable Type A liquid sample packaging and its development within another DOE task, establishing communications pathways between DOE sites that have similar transportation and packaging needs, and starting to establish a centralized packaging clearinghouse that will coordinate DOE Complex needs and improve the cost-effectiveness of transportation and packaging activities.

135 (DOE/RL--95-49) **Radionuclide air emissions report for the Hanford site, Calendar year 1994.** Gleckler, B.P. (Westinghouse Hanford Co., Richland, WA (United States)); Diediker, L.P.; Jette, S.J.; Rhoads, K.; Soldat, S.K. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016483. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents radionuclide air emissions from the Hanford Site in 1994, and the resulting effective dose equivalent to the maximally exposed member of the public, referred to as the "MEI." The report has been prepared and will be submitted in accordance with reporting requirements in the Code of Federal Regulations, title 40, Protection of the Environment, Part 61, "National Emissions Standards for Hazardous Air Pollutants," Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities."

136 (DOE/RL–95-53) **Nonradioactive air emissions notice of construction for the Environmental Analytical Laboratory.** Bechtel National, Inc., Richland, WA (United States). May 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017511. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents emissions from the Environmental Analytical Laboratory (EAL). The facility was originally designed and built by Westinghouse Hanford Company to perform radiological and nonradiological screening and soils analysis on a quick turnaround basis in support of the Comprehensive Environmental Response, Compensation, and Liability, Act of 1980 (CERCLA) operable units. The facility would like to broaden its analytical capabilities by providing both radiological and nonradiological screening and sample analysis for Resource Conservation and Recovery Act of 19 76 (RCRA) inactive treatment storage, and disposal (TSD) units contained within the CERCLA operable units. The EAL will be conducting both soil and water analysis. Air emissions will be generated from the laboratory standards (analytes and reagents) used for calibration. The EAL will be considered a toxic air pollution emission unit. The air emissions from the EAL are based on the chemical quantities processed annually. Quantities of standards and reagents used during analysis were obtained from the laboratory inventory list. The EAL inventory is listed in Table 1 of this document. Each sample will be prepared, screened, labeled, and controlled in the field prior to acceptance into the EAL. The samples are then transferred to MO-425 and MO-426 (trailers) that are designated for that particular type of analysis.

137 (DOE/RL–95-56-Rev.2) **100-BC-1 Excavation Demonstration Project Plan. Revision 2.** Bechtel National, Inc., Richland, WA (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017499. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) have requested that the US Department of Energy (DOE), through the Environmental Restoration Contractor (ERC), perform removal actions at waste sites within the 100-BC-1 Operable Unit (OU) at the Hanford Site. To accelerate removal actions, the EPA (lead regulatory agency), Ecology (support regulatory agency), and DOE (responsible agency) have chosen an expedited response action (ERA) pathway for these removal actions. These removal actions will be non-time critical, and will follow the applicable sections of 40 CFR 300 Subpart E, and the Comprehensive Environmental Response, Compensation, and Recovery Act of 1980 (CERCLA). The Resource Conservation and Recovery Act of 1976 and the Washington State Model Toxics Control Act Cleanup Regulations (MTCA) are key sources of applicable or relevant and appropriate requirements (ARAR) for the removal actions. Section 7.0 of this plan details the ARARS. This document provides information and guidance on the strategy planned to carry out the removal actions and meet all the project objectives. This document provides the objectives, site selection, subsystems, and phasing (Sections 2.0 through 5.0) of the project. Section 6.0 ties together the previous sections and details the strategy and data needs required to meet the project objectives while performing the removal actions. This strategy is applicable to all sites that will be addressed by this removal action project.

138 (DOE/RL–95-75) **Pollution Prevention Successes Database (P2SDb) user guide.** Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Jul 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001822. Source: OSTI; NTIS; INIS; GPO Dep.

When Pollution Prevention Opportunity Assessments (P2OAs) were launched at the Hanford Site during the summer of 1994, the first comment received from those using them expressed the desire for a method to report assessments electronically. As a temporary measure, macros were developed for use on word processing systems, but a more formal database was obviously needed. Additionally, increased DOE and Washington state reporting requirements for pollution prevention suggested that a database system would streamline the reporting process. The Pollution Prevention Group of Westinghouse Hanford Company (WHC) contracted with the Data Automation Engineering Department from ICF Kaiser Hanford Company (ICFKH) to develop the system. The scope was to develop a database that will track P2OAs conducted by the facilities and contractors at the Hanford Site. It will also track pollution prevention accomplishments that are not the result of P2OAs and document a portion of the Process Waste Assessments conducted in the past. To accommodate the above criteria, yet complete the system in a timely manner, the Pollution Prevention Successes Database (P2SDb) is being implemented in three phases. The first phase will automate the worksheets to provide both input and output of the data associated with the worksheets. The second phase will automate standard summary reports and ad hoc reports. The third phase will provide automated searching of the database to facilitate the sharing of pollution prevention experiences among various users. This User's Guide addresses only the Phase 1 system.

139 (DOE/RL–95-82) **Inventory of miscellaneous streams.** Lueck, K.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001634. Source: OSTI; NTIS; INIS; GPO Dep.

On December 23, 1991, the US Department of Energy, Richland Operations Office (RL) and the Washington State Department of Ecology (Ecology) agreed to adhere to the provisions of the Department of Ecology Consent Order. The Consent Order lists the regulatory milestones for liquid effluent streams at the Hanford Site to comply with the permitting requirements of Washington Administrative Code. The RL provided the US Congress a Plan and Schedule to discontinue disposal of contaminated liquid effluent into the soil column on the Hanford Site. The plan and schedule document contained a strategy for the implementation of alternative treatment and disposal systems. This strategy included prioritizing the streams into two phases. The Phase 1 streams were considered to be higher priority than the Phase 2 streams. The actions recommended for the Phase 1 and 2 streams in the two reports were incorporated in the Hanford Federal Facility Agreement and Consent Order. Miscellaneous Streams are those liquid effluents streams identified within the Consent Order that are discharged to the ground but are not categorized as Phase 1 or Phase 2 Streams. This document consists of an inventory of the liquid effluent streams being discharged into the Hanford soil column.

140 (DOE/RL–95-84) **1994 Annual report on waste generation and waste minimization progress as required by DOE Order 5400.1, Hanford Site.** USDOE Richland Operations Office, WA (United States). Sep 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001813. Source: OSTI; NTIS; INIS; GPO Dep.

Many Waste Minimization/Pollution Prevention successes at the Hanford Site occur every day without formal recognition. A few of the successful projects are: T-Plant helps facilities reuse equipment by offering decontamination services for items such as gas cylinders, trucks, and railcars, thus saving disposal and equipment replacement costs. Custodial Services reviewed its use of 168 hazardous cleaning products, and, through a variety of measures, replaced them with 38 safer substitutes, one for each task. Scrap steel contaminated with low level radioactivity from the interim stabilization of 107-K and 107-C was decontaminated and sold to a vendor for recycling. Site-wide programs include the following: the Pollution Prevention Opportunity Assessment (P2OA) program at the Hanford site was launched during 1994, including a training class, a guidance document, technical assistance, and goals; control over hazardous materials purchased was achieved by reviewing all purchase requisitions of a chemical nature; the Office Supply Reuse Program was established to redeploy unused or unwanted office supply items. In 1994, pollution prevention activities reduced approximately 274,000 kilograms of hazardous waste, 2,100 cubic meters of radioactive and mixed waste, 14,500,000 kilograms of sanitary waste, and 215,000 cubic meters off liquid waste and waste water. Pollution Prevention activities also saved almost \$4.2 million in disposal, product, and labor costs. Overall waste generation increased in 1994 due to increased work and activity typical for a site with an environmental restoration mission. However, without any Waste Minimization/Pollution Prevention activities, solid radioactive waste generation at Hanford would have been 25% higher, solid hazardous waste generation would have been 30% higher, and solid sanitary waste generation would have been 60% higher.

141 (DOE/RL–95-94) **Needs assessment activity report: Fiscal year 1995.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001633. Source: OSTI; NTIS; INIS; GPO Dep.

The Needs Assessment program has assessed the packaging requirements of many U.S. Department of Energy (DOE) sites. These assessments have involved site visits and meetings with personnel involved with transportation and packaging of hazardous materials. By September 1995, 24 DOE facilities had been visited, with 14 site visits occurring in fiscal year 1995. As a result, these sites have been informed of some of the packaging activities that DOE has sponsored and is sponsoring, have been apprised of the affects of upcoming changes to transportation regulations, have discussed their near-term packaging needs, and have shared unique packaging they have developed, which may be of use to other DOE facilities. Program successes include discovery of a need for a reusable Type A liquid sample packaging and its development within another DOE task and establishing communications pathways between DOE sites that have similar transportation and packaging needs. This report recommends that the Needs Assessment activity continue to pursue the strategy of visiting DOE sites to meet with their transportation and packaging personnel. These visits will ensure that DOE needs are met, communications pathways between DOE sites are established and cultivated, and redundant packaging development is identified. The site visits should be expanded to include meetings with the long-range and strategic planners at each site, and at the DOE-Headquarters level, to ensure that all future transportation and packaging needs are identified early enough to allow adequate transportation assessment and packaging development. This activity could become a permanent conduit for information and will ensure that all future DOE transportation and packaging needs are satisfied in a cost-effective, timely, and efficient manner.

142 (DOE/RL–95-103) **Hanford site guide for preparing and maintaining generator group pollution prevention program documentation.** Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005133. Source: OSTI; NTIS; INIS; GPO Dep.

This manual provides the necessary guidance to contractor generator groups for developing and maintaining documentation of their pollution prevention (P2) program activities. Preparation of program documentation will demonstrate compliance with contractor and U.S. Department of Energy (DOE) requirements, as well as state and federal regulations. Contractor waste generator groups are no longer required to prepare and update facility waste minimization plans. Developing and maintaining program documentation replace this requirement.

143 (DOE/RL–96-09-Rev.1) **Richland Environmental Restoration Project management action process document.** USDOE Richland Operations Office, WA (United States). Apr 1996. 200p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013567. Source: OSTI; NTIS; INIS; GPO Dep.

A critical mission of the U.S. Department of Energy (DOE) is the planning, implementation, and completion of environmental restoration programs at DOE facilities. An integral part of this mission involves the safe and cost-effective environmental restoration of the Hanford Site. For over 40 years the Hanford Site supported United States national defense programs, largely through the production of nuclear materials. One legacy of historical Hanford Site operations is a significant waste inventory of radioactive and/or regulated chemical materials. Releases of these materials have, in some cases, contaminated the Hanford Site environment. The DOE Richland Operations Office (RL) is responsible for protecting human health and the environment from potential Hanford Site environmental hazards by identifying, assessing, and mitigating risks posed by contaminated sites.

144 (DOE/RL–96-16-c-Vol.1) **Data for the screening assessment. Volume 1: Text, Columbia River Comprehensive Impact Assessment.** Miley, T.B.; O'Neil, T.K.; Gilbert, R.O.; Klevgard, L.A.; Walters, T.B. Pacific Northwest National Lab., Richland, WA (United States). Jun 1996. 60p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States);Washington State Government, Olympia, WA (United States). DOE Contract AC06-76RL01830.

(PNNL–11208-Vol.1). Order Number DE96012244. Source: OSTI; NTIS; INIS; GPO Dep.

The Columbia River is a critical resource for residents of the Pacific Northwest. This resource drew the Manhattan Project's planners to the site now called Hanford to produce nuclear weapon materials. Production of those materials has left behind a legacy of chemical and radioactive contamination and materials that have, are, and will continue to pose a threat to the Columbia river for the foreseeable future. To evaluate the impact to the river from this Hanford-derived contamination, the US Department of Energy, US Environmental Protection Agency, and State of Washington Department of Ecology (the Tri-Party agencies) initiated a study referred to as the Columbia River Comprehensive Impact Assessment (CRCIA). To address concerns about the scope and direction of CRCIA as well as enhance regulator, stakeholder, tribal, and public involvement, the CRCIA Management Team was formed in August 1995. A major CRCIA Team decision was to organize CRCIA into phases, with additional phases to be identified as warranted after completion of the initial phase. The initial phase is comprised of two parts: (1) a screening assessment to evaluate the current impact to the river resulting from Hanford-derived contamination and (2) identification of requirements considered necessary by the CRCIA Management Team for a comprehensive assessment of impact to the river. The purpose of the screening assessment is to support cleanup decisions. The scope of the screening assessment is to evaluate the current risk to humans and the environment resulting from Hanford-derived contaminants. The screening assessment has the primary components of: identifying contaminants to be assessed; identifying a variety of exposure scenarios to evaluate human contaminant exposure; identifying a variety of other species to evaluate ecological contaminant exposure; and assessing risks posed by exposure of humans and other species to the contaminants.

145 (DOE/RL–96-16-c-Vol.2) **Data for the screening assessment. Volume 2: Appendices, Columbia River Comprehensive Impact Assessment.** Miley, T.B.; O'Neil, T.K.; Gilbert, R.O.; Klevgard, L.A.; Walters, T.B. Pacific Northwest National Lab., Richland, WA (United States). Jun 1996. 462p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States);Washington State Government, Olympia, WA (United States). DOE Contract AC06-76RL01830. (PNNL–11208-Vol.2). Order Number DE96012239. Source: OSTI; NTIS; INIS; GPO Dep.

Contains computer diskettes.

The Columbia River is a critical resource for residents of the Pacific Northwest. This resource drew the Manhattan Project's planners to the site now called Hanford to produce nuclear weapon materials. Production of those materials has left behind a legacy of chemical and radioactive contamination and materials that have, are, and will continue to pose a threat to the Columbia river for the foreseeable future. To evaluate the impact to the river from this Hanford-derived contamination, the US Department of Energy, US Environmental Protection Agency, and State of Washington Department of Ecology (the Tri-Party agencies) initiated a study referred to as the Columbia River Comprehensive Impact Assessment (CRCIA). To address concerns about the scope and direction of CRCIA as well as enhance regulator, stakeholder, tribal, and public involvement, the CRCIA Management Team was formed in August 1995. A major CRCIA Team decision was to organize CRCIA into phases, with additional phases to be identified as warranted after completion of the initial phase. The initial phase is comprised of two parts: (1) a screening assessment to evaluate the current impact to the river resulting from Hanford-derived contamination and (2) identification of requirements considered necessary by the CRCIA Management Team for a comprehensive assessment of impact to the river. The purpose of the screening assessment is to support cleanup decisions. The scope of the screening assessment is to evaluate the current risk to humans and the environment resulting from Hanford-derived contaminants. The screening assessment has the primary components of: identifying contaminants to be assessed; identifying a variety of exposure scenarios to evaluate human contaminant exposure; identifying a variety of other species to evaluate ecological contaminant exposure; and assessing risks posed by exposure of humans and other species to the contaminants. This volume compiles the data from this study.

146 (DOE/RL–107) **Fiscal year 1996 U.S. Department of Energy, Richland Operations Office Site summary baseline.** Johndro-Collins, A. USDOE Richland Operations Office, WA (United States). Oct 1995. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006852. Source: OSTI; NTIS; INIS; GPO Dep.

The technical baseline is a hierarchical description of the Hanford Site cleanup mission. This technical baseline does not address the science, technology, or economic transition missions. It begins with a definition of the existing conditions at the Hanford Site, provides a description of the end product or mission accomplishments at completion, presents a statement of the major requirements and constraints that must be observed during the performance of the mission, and provides a statement of the top-level strategic approach to accomplish the mission. Mission-level interfaces are also described. This information is further defined hierarchically in increasing levels of detail. This definition is composed of the following major elements: functions that are key task descriptions; requirements that are the measurable standards to which the functions must be performed; architectures which are specific engineering solutions or systems that perform the functions described earlier; and verification ensuring the system satisfies the requirements and fulfills the functions. The above information is supplemented with the following: interface data; risk analyses and watch lists; assumptions; and required analyses.

147 (DOE/SR/18233–4) **South Carolina Department of Health and Environmental Control federal facility agreement. Annual progress report, fiscal year 1995.** Hucks, R.L. South Carolina Dept. of Health and Environmental Control, Columbia, SC (United States). 30 Jan 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-91SR18233. Order Number DE96009662. Source: OSTI; NTIS; GPO Dep.

South Carolina Department of Health and Environmental Control (SCDHEC) reviewed 105 primary documents during fiscal year 1995 (October 1, 1994 through September 30, 1995). The primary documents reviewed consisted of 27 RCRA Facility Investigation/Remedial Investigation (RFI/RI) workplans, 13 RFI/RI Reports, 12 Baseline Risk Assessments (BRA's), 27 Site Evaluation (SE) Reports, 8 Proposed Plans, 5 Record of Decisions (ROD's), 6 Remedial Design Workplans, 6 Remedial Action Workplans and 10 miscellaneous primary documents. Numerous other administrative duties were conducted during the reporting period that are not accounted for above. These included, but were not limited to, extension requests, monitoring well approvals, and Treatability Studies. The list of outgoing correspondence from SCDHEC to the Department of Energy (DOE) and Westinghouse Savannah River Company (WSRC) is attached.

148 (DOE/SR/18233–T1) **Oversight and implementation of Federal Facility Agreement. Annual progress report, FY 1993.** Hucks, R.L. South Carolina Dept. of Health and Environmental Control, Columbia, SC (United States). 27 Jul 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG09-91SR18233. Order Number DE95016156. Source: OSTI; NTIS; GPO Dep.

South Carolina Department of Health and Environmental Control (SCDHEC) reviewed 57 primary documents during fiscal year 1993 (October 1, 1992 through September 30, 1993). The primary documents reviewed consisted of 24 RCRA Facility Investigation/Remedial Investigation (RFI/RI) workplans, 26 Site Evaluation (SE) reports, 3 Proposed Plans, 1 Record of Decision (ROD), and 3 miscellaneous primary documents. Numerous other administrative duties were conducted during the reporting period that are not accounted for above. These included, but are not limited to, extension requests, monitoring well approvals, treatability studies, and site visit reports.

149 (EML–581) **Semi-annual report of the Department of Energy, Office of Environmental Management, Quality Assessment Program.** Sanderson, C.G.; Greenlaw, P. USDOE Environmental Measurements Lab., New York, NY (United States). Environmental Studies Div. 1 Jul 1996. 315p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96012328. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results from the analysis of the 44th set of environmental quality assessment samples (QAP XLIV) that were received on or before June 3, 1996. The QAP is designed to test the quality of environmental measurements being reported to the Department of Energy by it's contractors. Since 1976, samples have been prepared and analyzed by the Environmental measurements Laboratory.

150 (EML–582) **Report of the Department of Energy, Office of Environmental Management, Quality Assessment Program, inorganic intercomparison study.** Greenlaw, P.D. USDOE Environmental Measurements Lab., New York, NY (United States). Environmental Studies Div. 1 Jul 1996. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96012329. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents results from the soil inorganic analysis of the 44th set of environmental quality assessment samples, of the quality assessment program, that were received on or before June 3, 1996. The samples were analyzed for RCRA metals.

151 (ES/ER/TM–33/R2) **Approach and strategy for performing ecological risk assessments for the US Department of Energy's Oak Ridge Reservation: 1995 revision.** Suter, G.W. II; Sample, B.E.; Jones, D.S.; Ashwood, T.L.; Loar, J.M. Oak Ridge National Lab., TN (United States). Sep 1995. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96007746. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide guidance for planning and performing ecological risk assessments (ERAs) on the Oak Ridge Reservation (ORR). It is the third such document prepared for this purpose. The first ecorisk strategy document described the ERA process and presented a tiered approach to ERAs appropriate to complex sites. The first revision was necessitated by the considerable progress that has been made by the parties to the Federal Facilities Agreement (FFA) for the ORR in resolving specific issues relating to ERA as a result of a series of data quality objectives (DQOs) meetings. The tiered approach to ERAs as recommended in the first document was implemented, generic conceptual models were developed, and a general approach for developing ecological assessment endpoints and measurement endpoints was agreed upon. This revision is necessitated by comments from the US Environmental Protection Agency's Region IV and the Tennessee Department of Environment and Conservation (TDEC) which clarified and modified the positions taken during the DQO process. In particular, support for the collection of data that would support ERAs for all OUs on the ORR have been withdrawn. Therefore, the work plan developed to fill the reservation-wide data needs identified in the DQO process has also been withdrawn, and portions that are still relevant have been incorporated into this document. The reader should be aware that this guidance is complex and lengthy because it attempts to cover all the reasonable contingencies that were considered to be potentially important to the FFA parties.

152 (ES/ER/TM–106) **Preliminary remediation goals for use at the U.S. Department of Energy Oak Ridge Operations Office.** Oak Ridge National Lab., TN (United States). Jun 1995. 610p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95013998. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents Preliminary Remediation Goals (PRGs) for use in human health risk assessment efforts under the United States Department of Energy, Oak Ridge Operations Office Environmental Restoration (ER) Division. Chemical-specific PRGs are concentration goals for individual chemicals for specific medium and land use combinations. The PRGs are referred to as risk-based because they have been calculated using risk assessment procedures. Risk-based calculations set concentration limits using both carcinogenic or noncarcinogenic toxicity values under specific exposure pathways. The PRG is a concentration that is derived from a specified excess cancer risk level or hazard quotient. This report provides the ER Division with standardized PRGs which are integral to the Remedial Investigation/Feasibility Study process. By managing the assumptions and systems used in PRG derivation, the Environmental Restoration Risk Assessment Program will be able to control the level of quality assurance associated with these risk-based guideline values.

153 (ES/ER/TM–112/R2) **Environmental restoration risk-based prioritization work package planning and risk ranking methodology. Revision 2.** Dail, J.L.; Nanstad, L.D.; White, R.K. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). Jun 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95015374. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

This document presents the risk-based prioritization methodology developed to evaluate and rank Environmental Restoration (ER) work packages at the five US Department of Energy, Oak Ridge Field Office (DOE-ORO) sites [i.e., Oak Ridge K-25 Site (K-25), Portsmouth Gaseous Diffusion Plant (PORTS), Paducah Gaseous Diffusion Plant (PGDP), Oak Ridge National Laboratory (ORNL), and the Oak Ridge Y-12 Plant (Y-12)], the ER Off-site Program, and Central ER. This prioritization methodology was developed to support the increased rigor and formality of work planning in the overall conduct of operations within the DOE-ORO ER Program. Prioritization is conducted as an integral component of the fiscal ER funding cycle to establish program budget priorities. The purpose of the ER risk-based prioritization methodology is to provide ER management with the tools and processes needed to evaluate, compare, prioritize, and justify fiscal budget decisions for a diverse set of remedial action, decontamination and decommissioning, and waste management activities. The methodology provides the ER Program with a framework for (1) organizing information about identified DOE-ORO environmental problems, (2) generating qualitative assessments of the long- and short-term risks posed by DOE-ORO environmental problems, and (3) evaluating the benefits associated with candidate work packages designed to reduce those risks. Prioritization is conducted to rank ER work packages on the basis of the overall value (e.g., risk reduction, stakeholder confidence) each package provides to the ER Program. Application of the methodology yields individual work package "scores" and rankings that are used to develop fiscal budget requests. This document presents the technical basis for the decision support tools and process.

154 (ES/ER/TM–137) **Results of the user survey of functional requirements for the Oak Ridge Environmental Information System.** Oak Ridge National Lab., TN (United States). Mar 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95013299. Source: OSTI; NTIS; GPO Dep.

Environmental Restoration Program.

The Oak Ridge Environmental Information System (OREIS) user survey of functional requirements was conducted in the spring and summer of 1994 to allow representatives of the OREIS user community to review and confirm the functionality of the OREIS system and to provide a method to document user acceptance of the system. The results of the survey confirm that the OREIS system meets data and functional requirements of the users. It further emphasizes that the user community is quite diverse, with many different needs for and perspectives about OREIS, and with varying needs for access and use of software tools. To meet the needs of a diverse and potentially changing user community, OREIS staff will survey the user community periodically to obtain input on changes to user requirements for future versions of the system.

155 (ES/ER/TM–145) **Technical specification for transferring ambient air monitoring data to the Oak Ridge Environmental Information System (OREIS).** Oak Ridge Environmental Information System (OREIS) Program, TN (United States). Jun 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014026. Source: OSTI; NTIS; GPO Dep.

In September 1994, a team was formed to develop, document, and implement technical specifications for transmitting ambient air environmental compliance and monitoring data to the Oak Ridge Environmental Information System (OREIS). The approach used to transmit this data is documented in the "Plan for Integrating Environmental Compliance and Monitoring Data into OREIS." This plan addresses the consolidated data requirements defined by the Federal Facility Agreement (FFA) and the Tennessee Oversight Agreement (TOA) as they pertain to environmental compliance and monitoring data maintained by Energy Systems' Oak Ridge Environmental Management organizations. Ibis document describes. the requirements, responsibilities, criteria, and format for transmitting ambient air compliance and monitoring data to OREIS.

156 (ES/ER/TM–152) **Terrestrial mapping of the Oak Ridge Reservation: Phase 1. Environmental Restoration Program.** Washington-Allen, R.A. (Oak Ridge National Lab., TN (United States)); Ashwood, T.L.; Christensen, S.W.; Offerman, H.; Scarbrough-Luther, P. Oak Ridge National Lab., TN (United States). Jun 1995. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012979. Source: OSTI; NTIS; GPO Dep.

This report presents the results of the first phase in development of a habitat map of the terrestrial ecosystem on the Oak Ridge Reservation (ORR). During this phase, a satellite image of the ORR was classified into land use/land cover types, the classified image was incorporated into a geographic information system map of the ORR, and the accuracy of the map was assessed. A habitat map is a critical foundation for evaluation of the potential impact of historical (or ongoing) contamination on terrestrial biota of the ORR. The abundance and distribution of wildlife species and plant communities of concern are intrinsically linked to the abundance and distribution of habitat on which those species and communities rely. Thus, the impact of spatially discrete patches of contamination on those biota is directly proportional to the degree of overlap between habitat and contamination. Landsat 5 Thematic Mapper satellite imagery was used to create the land use/land cover map. A Thematic Mapper image consists of seven images of the same point on the earth produced by seven separate sensors, each of which detects a unique part of the electromagnetic spectrum. Separately and in various combinations, these spectral images can be correlated with vegetation type or other land cover type. The image selected for this map was from April 13, 1994, and covers 189,000 ha.

157 (ES/ER/TM–189) **Technical specification for transferring tank construction data to the Oak Ridge Environmental Information System (OREIS).** Oak Ridge Environmental Information System (OREIS) Program, TN (United States). Jun 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96011655. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goal of this technical specification is to meet the consolidated environmental data requirements defined by the Federal Facility Agreement (FFA) and the Tennessee Oversight Agreement as they pertain to tank construction data maintained in Oak Ridge, Tennessee, by the US Department of Energy's Maintenance and Operations contractor Lockheed Martin Energy Systems, Inc., and prime contractors to the Department of Energy. This technical specification describes the organizational responsibilities for loading tank construction data into OREIS, describes the logical and physical data transfer files, addresses business rules and submission rules, addresses configuration control of this technical specification, and addresses required changes to the current OREIS data base structure based on site requirements. This technical specification addresses the tank construction data maintained by the Y-12, K-25, and ORNL sites that will be sent to OREIS. The initial submission of data will include only inactive Environmental Restoration tanks as specified by the FFA.

158 (ES/WM-30) **Oak Ridge Reservation Waste Management Plan.** Turner, J.W. (ed.). Oak Ridge National Lab., TN (United States). Feb 1995. 247p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M-4090). Order Number DE95012970. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the waste management plan for the Oak Ridge Reservation facilities. The primary purpose is to convey what facilities are being used to manage wastes, what forces are acting to change current waste management systems, and what plans are in store for the coming fiscal year.

159 (ES/WM-49) **Waste treatment at the La Hague and Marcoule sites.** Oak Ridge National Lab., TN (United States); Societe Generale pour les Techniques Nouvelles (SGN), 78 - Saint-Quentin-en-Yvelines (France); CEA Agence Nationale pour la Gestion des Dechets Radioactifes (ANDRA), 92 - Fontenay-aux-Roses (France); Numatec, Inc., Bethesda, MD (United States). Apr 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. 1AK-EGJ68V. (ORNL/M-4616). Order Number DE95015372. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Management Program.

In this report, an overview of waste treatment and solidification facilities located at the La Hague and Marcoule sites, which are owned and/or operated by Cogema, provided. The La Hague facilities described in this report include the following: The STE3 liquid effluent treatment facility (in operation); the AD2 solid waste processing facility (also in operation); and the UCD alpha waste treatment facility (under construction). The Marcoule facilities described in this report, both of which are in operation, include the following: The STEL-EVA liquid effluent treatment facilities for the entire site; and the alpha waste incinerator of the UPI plant. This report is organized into four sections: this introduction, low-level waste treatment at La Hague, low-level waste treatment at Marcoule, and new process development. including the solvent pyrolysis process currently in the development stage for Cogema's plants.

160 (ES/WM-81) **Function analysis for waste information systems.** Sexton, J.L.; Neal, C.T.; Heath, T.C.; Starling, C.D. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). Apr 1996. 246p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011533. Source: OSTI; NTIS; INIS; GPO Dep.

This study has a two-fold purpose. It seeks to identify the functional requirements of a waste tracking information system and to find feasible alternatives for meeting those requirements on the Oak Ridge Reservation (ORR) and the Portsmouth (PORTS) and Paducah (PGDP) facilities; identify options that offer potential cost savings to the US government and also show opportunities for improved efficiency and effectiveness in managing waste information; and, finally, to recommend a practical course of action that can be immediately initiated. In addition to identifying relevant requirements, it also identifies any existing requirements that are currently not being completely met. Another aim of this study is to carry out preliminary benchmarking by contacting representative companies about their strategic directions in waste information. The information obtained from representatives of these organizations is contained in an appendix to the document; a full benchmarking effort, however, is beyond the intended scope of this study.

161 (FEMP-2363B) **Effective management of regulator RI/FS comments.** Wolinsky, S.M.; Lojek, D.; George, R.D.; Houser, S.M.; Strimbu, M.J. Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950868-36: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96004701. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes a successful strategy that facilitates regulatory approval of CERCLA documents required by compliance agreement and CERCLA, based on the experience of Operable Unit 1, Waste Storage Area, of the Fernald Environmental Management Project (FEMP). This strategy, which has become the site standard at the FEMP, was instrumental in obtaining regulator approval of the OU1 RI and FS, and early approval of the Record of Decision during a very tight compliance agreement-driven schedule. This strategy can be applied at any DOE Superfund site, especially where there is need to recover lost schedule, an incentive to meet milestones early, a need to improve the relationship between the DOE and the regulators, or where the regulatory agencies have historically provided a large volume of comments on CERCLA documents. The strategy focuses on early identification and resolution of issues relating to draft RI/FS documents, as raised in regulatory agency review comments. This pro-active strategy has the potential for schedule and cost savings, as well as for improved communication between DOE and the regulators. The strategy includes preparation of a separate comment response document, integration of comment responses with RI/FS documents, development of a database of agency comments and their resolution, and sharing lessons learned with preparers of subsequent RI/FS documents. The paper provides background on the FEMP and describes the FEMP comment response strategy; DOE and regulator interface; the Sitewide Comment Database; networked electronic file management; the process for classifying, analyzing, and responding to comments; integration with base RI/FS documents; and a conclusion.

162 (FEMP-2425) **The Fernald wet records recovery project: A case history.** Sterling, H.J. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Devir, B.R.; Hawley, R.A.; Freesmeyer, M.T. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). 22 Jun 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950669-1: DOE records management conference: Camino Real to the year 2000, Albuquerque, NM (United States), 27-30 Jun 1995). Order Number DE95013795. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses a project performed to recover wet records discovered in January 1995 at the Fernald Environmental Management Project (FEMP). This paper discusses the emergency and record recovery phases of the project, the technical options considered for records recovery, and special measures which were required due to radiological contamination of the records. Also, the root causes and lessons learned from the incident, and path forward for future records management operations at Fernald, are discussed.

163 (FEMP–2441) **1994 Site environmental report.** Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States). Jul 1995. 221p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. Order Number DE96004201. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald site is a Department of Energy (DOE)-owned facility that produced high-quality uranium metals for military defense for nearly 40 years. DOE suspended production at the site in 1989 and formally ended production in 1991. Although production activities have ceased, the site continues to examine the air and liquid pathways as possible routes through which pollutants from past operations and current remedial activities may leave the site. The Site Environmental Report (SER) is prepared annually in accordance with DOE Order 5400.1, General Environmental Protection Program. This 1994 SER provides the general public as well as scientists and engineers with the results from the site's ongoing Environmental Monitoring Program. Also included in this report is information concerning the site's progress toward achieving full compliance with requirements set forth by DOE, U.S. Environmental Protection Agency (USEPA), and Ohio EPA (OEPA). For some readers, the highlights provided in this Executive Summary may provide sufficient information. Many readers, however, may wish to read more detailed descriptions of the information than those which are presented here. All information presented in this summary is discussed more fully in the main body of this report.

164 (FEMP–2516) **Remediation activities at the Fernald Environmental Management Project (FEMP).** Walsh, T.J. (FERMCO, Cincinnati, OH (United States)); Danner, R. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-9606125–10: Air and Waste Management (AWM) annual meeting, Nashville, TN (United States), 23-28 Jun 1996). Order Number DE96012142. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP) is a United States Department of Energy (DOE) facility located in southwestern Ohio. The facility began manufacturing uranium products in the early 1950's and continued processing uranium ore concentrates until 1989. The facility used a variety of chemical and metallurgical processes to produce uranium metals for use at other DOE sites across the country. Since the facility manufactured uranium metals for over thirty years, various amounts of radiological contamination exists at the site. Because of the chemical and metallurgical processes employed at the site, some hazardous wastes as defined by the Resource Conservation and Recovery Act (RCRA) were also generated at the site. In 1989. the FEMP was placed on the National Priorities List (NPL) requiring cleanup of the facility's radioactive and chemical contamination under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This paper discusses the proposed remediation activities at the five Operable Units (OUs) designated at the FEMP. In addition, the paper also examines the ongoing CERCLA response actions and RCRA closure activities at the facility.

165 (INEL–94/0115-Rev.2) **Waste management facilities cost information: System cost model product description. Revision 2.** Lundeen, A.S.; Hsu, K.M.; Shropshire, D.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1996. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009568. Source: OSTI; NTIS; INIS; GPO Dep.

Formerly EGG-WM–11352.

In May of 1994, Lockheed Idaho Technologies Company (LITCO) in Idaho Falls, Idaho and subcontractors developed the System Cost Model (SCM) application. The SCM estimates life-cycle costs of the entire US Department of Energy (DOE) complex for designing; constructing; operating; and decommissioning treatment, storage, and disposal (TSD) facilities for mixed low-level, low-level, transuranic, and mixed transuranic waste. The SCM uses parametric cost functions to estimate life-cycle costs for various treatment, storage, and disposal modules which reflect planned and existing facilities at DOE installations. In addition, SCM can model new facilities based on capacity needs over the program life cycle. The SCM also provides transportation costs for DOE wastes. Transportation costs are provided for truck and rail and include transport of contact-handled, remote-handled, and alpha (transuranic) wastes. The user can provide input data (default data is included in the SCM) including the volume and nature of waste to be managed, the time period over which the waste is to be managed, and the configuration of the waste management complex (i.e., where each installation's generated waste will be treated, stored, and disposed). Then the SCM uses parametric cost equations to estimate the costs of pre-operations (designing), construction costs, operation management, and decommissioning these waste management facilities.

166 (INEL–95/00057) **ICPP radiological and toxicological sabotage analysis.** Kubiak, V.R.; Mortensen, F.G. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950787–87: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE96001618. Source: OSTI; NTIS; INIS; GPO Dep.

In June of 1993, the Department of Energy (DOE) issued Notice 5630.3A, "Protection of Departmental Facilities Against Radiological and Toxicological Sabotage," which states that all significant radiological and toxicological hazards at Department facilities must be examined for potential sabotage. This analysis has been completed at the Idaho Chemical Processing Plant (ICPP). The ICPP radiological and toxicological hazards include spent government and commercial fuels, Special Nuclear Materials (SNM), high-level liquid wastes, high-level solid wastes, and process and decontamination chemicals. The analysis effort included identification and assessment of quantities of hazardous materials present at the facility; identification and ranking of hazardous material targets; development of worst case scenarios detailing possible sabotage actions and hazard releases; performance of vulnerability assessments using table top and computer methodologies on credible threat targets; evaluation of potential risks to the public, workers, and the environment; evaluation of sabotage risk reduction options; and selection of cost effective prevention and mitigation options.

167 (INEL–95/0166) **Comparative economics for DUCRETE spent fuel storage cask handling, transportation, and capital requirements.** Powell, F.P. (Sierra Nuclear Corp., Roswell, GA (United States)). Idaho National Engineering Lab., Idaho Falls, ID (United States). Apr 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014147. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes economic differences between a DUCRETE spent nuclear fuel storage cask and a conventional concrete storage cask in the areas of handling, transportation, and capital requirements. The DUCRETE cask is under evaluation as a new technology that could substantially reduce the overall costs of spent fuel and depleted U disposal. DUCRETE incorporates depleted U in a Portland cement mixture and functions as the cask's primary radiation barrier. The cask system design includes insertion of the US DOE Multi-Purpose Canister inside the DUCRETE cask. The economic comparison is from the time a cask is loaded in a spent fuel pool until it is placed in the repository and includes the utility and overall US system perspectives.

168 (INEL–95/0167) **Conceptual design report for a transportable DUCRETE spent fuel storage cask system.** Hopf, J.E. (Sierra Nuclear Corp., Scotts Valley, CA (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95017516. Source: OSTI; NTIS; INIS; GPO Dep.

A conceptual design has been developed for a spent fuel dry storage cask that employs depleted uranium concrete (DUCRETE) in place of ordinary concrete. DUCRETE, which uses depleted uranium oxide rocks rather than gravel as the concrete's heavy aggregate, is a more efficient overall radiation shield (gamma and neutron) than either steel or ordinary concrete. Thus, it allows the cask weight and size to be substantially reduced. Also, using DUCRETE as shielding avoids, or at least defers, disposal of the depleted uranium as waste. This report focuses on DUCRETE cask transportation issues. The approach studied involves placing the storage cask into a simple steel transportation overpack. Preliminary analyses were performed to demonstrate the transportation system's ability to meet the structural, thermal, and shielding transportation criteria. Conservative manual calculations were performed to demonstrate the adequacy of the DUCRETE transportation overpack with respect to structural requirements. Two-dimensional thermal analyses were performed on the system (the DUCRETE storage cask inside the steel overpack) using the ANSYS thermal analysis code. Two-dimensional shielding analyses were performed on the system with the MCNP code. Effects of the fuel axial burnup profile and solar radiation are considered. The analyses show that the proposed system can meet the transportation structural criteria and can easily meet the transportation shielding criteria. The thermal criteria are not as easy to meet because when the storage cask is placed horizontally in the transportation overpack, the DUCRETE storage cask's ventilation duct becomes an insulating dead air space. The maximum allowable temperature for the DUCRETE, which is not yet known, will be the limiting factor.

169 (INEL–95/00175) **Hazardous solvent substitution.** Twitchell, K.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9507191–1: Electric Power Research Institute radwaste workshop, Orlando, FL (United States), 14 Jul 1995). Order Number DE96002050. Source: OSTI; NTIS; INIS; GPO Dep.

Eliminating hazardous solvents is good for the environment, worker safety, and the bottom line. However, even though we are motivated to find replacements, the big question is 'What can we use as replacements for hazardous solvents?'You, too, can find replacements for your hazardous solvents. All you have to do is search for them. Search through the vendor literature of hundreds of companies with thousands of products. Ponder the associated material safety data sheets, assuming of course that you can obtain them and, having obtained them, that you can read them. You will want to search the trade magazines and other sources for product reviews. You will want to talk to users about how well the product actually works. You may also want to check US Environmental Protection Agency (EPA) and other government reports for toxicity and other safety information. And, of course, you will want to compare the product's constituent chemicals with the many hazardous constituency lists to ensure the safe and legal use of the product in your workplace.

170 (INEL–95/0185) **Idaho National Engineering Laboratory radiological control performance indicator report. Fourth quarterly calendar year 1994.** Aitken, S.B. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001340. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a report and analysis of the Radiological Control Program through the fourth quarter of calendar year 1994 (CY-1994) at the Idaho National Engineering Laboratory (INEL) under the direction of Lockheed Idaho Technologies Company (LITCO). The Radiological Performance Indicator Report is provided in accordance with Article 133 of the INEL Radiological Control Manual.

171 (INEL–95/00193) **Material monitoring.** Kotter, W.; Zirker, L.; Hancock, J.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9504207–3: Hazardous waste and materials conference, Pocatello, ID (United States), 17-19 Apr 1995). Order Number DE96004001. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Reduction Operations Complex (WROC) facilities are located at the Idaho National Engineering Laboratory (INEL). The overall goal for the Pollution Prevention/Waste Minimization Unit is to identify and establish the correct amount of waste generated so that it can be reduced. Quarterly, the INEL Pollution Prevention (P2) Unit compares the projected amount of waste generated per process with the actual amount generated. Examples of waste streams that would be addresses for our facility would include be are not limited to: Maintenance, Upgrades, Office and Scrap Metal. There are three potential sources of this variance: inaccurate identification of those who generate the waste; inaccurate identification of the process that generates the waste; and inaccurate measurement of the actual amount generated. The Materials Monitoring Program was proposed to identify the sources of variance and reduce the variance to an acceptable level. Prior to the implementation of the Material Monitoring Program, all information that was gathered and recorded was done so through an informal estimation of waste generated by various personnel concerned with each processes. Due to the inaccuracy of the prior information gathering system, the Material Monitoring Program was established. The heart of this program consists of two main parts. In the first part potential waste generators provide information on projected waste generation process. In the second part, Maintenance, Office, Scrap Metal and Facility Upgrade wastes from given processes is disposed within the appropriate bin dedicated to that process. The Material Monitoring Program allows for the more accurate gathering of information on the various waste types that are being generated quarterly.

172 (INEL–95/00228) **A general theory to explain the relatively high cost of environmental restoration at DOE facilities.** Sullivan, W.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–22: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96001925. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration costs for Department of Energy (DOE) facilities have been the subject of much scrutiny and concern for several years. General opinion is that DOE clean-up costs are as much as three times higher than costs for similar clean-up projects in the private sector. Consequently, DOE Environmental Restoration professionals are continually under pressure to do more with less, which, ironically, can lead to additional inefficiencies in the system. This paper proposes a general theory as to why DOE costs are higher, explains the reasons why current conditions will make it difficult to realize any pervasive or significant decreases in clean-up costs, and presents some general changes that need to take place in the DOE system in order to bring about conditions that will allow more efficient clean-up to occur. The theory is based on a simple economic model that describes the balance between the resources spent for risk avoidance and the corresponding changes in overall productivity as a function of risk. The elementary concepts illustrated with the economic model, when refined and specifically applied, have the potential to become the catalyst for significant change-change that is absolutely necessary if we truly intend to conduct environmental clean-up with the same efficiencies as private industry.

173 (INEL–95/00234) **Development of a cumulative risk assessment for the Idaho National Engineering Laboratory's waste area group 2.** Burns, D.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–26: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96001933. Source: OSTI; NTIS; INIS; GPO Dep.

In 1989, the Idaho National Engineering Laboratory (INEL) was added to the Environmental Protection Agency's (EPA) National Priorities List of Superfund sites. A Federal Facility Agreement and Consent Order (FFA/CO) for the INEL was signed by the Department of Energy, Idaho Operations Office (DOE-ID), EPA, and the State of Idaho in December 1991. The goal of this agreement is to ensure that potential or actual INEL releases of hazardous substances to the environment are thoroughly investigated in accordance with the National Contingency Plan (NCP) and that appropriate response actions are taken as necessary to protect human health and the environment. The Test Reactor Area (TRA) is included as Waste Area Group (WAG) 2 of ten INEL WAGs identified in the FFA/CO. WAG 2 consists of 13 operable units (OUs) which include pits, tanks, rubble piles, ponds, cooling towers, wells, french drains, perched water and spill areas. OU 2-13 is the Comprehensive Remedial Investigation/Feasibility Study (RI/FS) for WAG 2. The study presented here is a preliminary evaluation of the comprehensive risk for WAG-2. This investigation will be used as the basis of the WAG-2 comprehensive baseline risk assessment (BRA), and it will serve as a model for other INEL comprehensive risk assessments. The WAG-2 preliminary risk evaluation consisted of two broad phases. These phases were (1) a site and contaminant screening that was intended to support the identification of COPCs and risk assessment data gaps, and (2) an exposure pathway analysis that evaluated the comprehensive human health risks associated with WAG-2. The primary purposes of the investigation were to screen WAG-2 release sites and contaminants, and to identify risk assessment data gaps, so the investigation will be referred to as the WAG-2 Screening and Data Gap Analysis (SDGA) for the remainder of this report.

174 (INEL–95/0255(94)) **1994 Environmental monitoring drinking water and nonradiological effluent programs annual report.** Andersen, B.D.; Brock, T.A.; Meachum, T.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1995. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003484. Source: OSTI; NTIS; INIS; GPO Dep.

EG&G Idaho, Inc., initiated monitoring programs for drinking water in 1988 and for nonradiological parameters and pollutants in liquid effluents in 1985. These programs were initiated for the facilities operated by EG&G Idaho for the US Department of Energy at the Idaho National Engineering Laboratory. On October 1, 1994, Lockheed Idaho Technologies Company (LITCO) replaced EG&G Idaho as the prime contractor at the INEL and assumed responsibility for these programs. Section I discusses the general site characteristics, the analytical laboratories, and sampling methodology general to both programs. Section 2, the Drinking Water Program, tracks the bacteriological, chemical, and radiological parameters required by State and Federal regulations. This section describes the drinking water monitoring activities conducted at 17 LITCO-operated production wells and 11 distribution systems. It also contains all of the drinking water parameters detected and the regulatory limits exceeded during calendar year 1994. In addition, groundwater quality is discussed as it relates to contaminants identified at the wellhead for LITCO production wells. Section 3 discusses the nonradiological liquid effluent monitoring results for 27 liquid effluent streams. These streams are presented with emphasis on calendar year 1994 activities. All parameter measurements and concentrations were below the Resource Conservation and Recovery Act toxic characteristics limits.

175 (INEL–95/0273) **System cost model user's manual, version 1.2.** Shropshire, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1995. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001354. Source: OSTI; NTIS; INIS; GPO Dep.

The System Cost Model (SCM) was developed by Lockheed Martin Idaho Technologies in Idaho Falls, Idaho and

MK-Environmental Services in San Francisco, California to support the Baseline Environmental Management Report sensitivity analysis for the U.S. Department of Energy (DOE). The SCM serves the needs of the entire DOE complex for treatment, storage, and disposal (TSD) of mixed low-level, low-level, and transuranic waste. The model can be used to evaluate total complex costs based on various configuration options or to evaluate site-specific options. The site-specific cost estimates are based on generic assumptions such as waste loads and densities, treatment processing schemes, existing facilities capacities and functions, storage and disposal requirements, schedules, and cost factors. The SCM allows customization of the data for detailed site-specific estimates. There are approximately forty TSD module designs that have been further customized to account for design differences for nonalpha, alpha, remote-handled, and transuranic wastes. The SCM generates cost profiles based on the model default parameters or customized user-defined input and also generates costs for transporting waste from generators to TSD sites.

176 (INEL–95/0274(1stQTR)) **Idaho National Engineering Laboratory Radiological Control performance indicator report: First quarter, calendar year 1995.** Aitken, S.B. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001580. Source: OSTI; NTIS; INIS; GPO Dep.

The INEL Radiological Control Performance Indicator Report is provided quarterly, inaccordance with Article 133 of the INEL Radiological Control Manual. Indicators are used as a measure of performance of the Radiological Control Program and as a motivation for improvement, not as a goal in themselves. These indicators should be used by management to assist in focusing priorities and attention and adherence to As-Low-As-Reasonably-Achievable (ALARA) practices. The ALARA Committees establish ALARA goals for the INEL based on forecasts and goals provided by each facility organizational manager or supervisor.Performance goals are realistic and measurable. Stringent goals are set at least annually to reflect expected workloads and improvement of radiological performance. Goals higher than previous goals may occasionally be set due to changes in work scope or mission. The INEL Radiological Control Performance Indicators consist of: Collective dose in person-rem; average worker dose, maximum dose to a worker, and maximum neutron dose to a worker;the number of skin and clothing contaminations, including the number of contaminated wounds and facial contaminations; the number of radioactive material intakes; the area of Contamination, High Contamination, and Airborne Radioactivity Areas in square feet; and airborne radioactivity events and spills.

177 (INEL–95/0274(3rdQTR)) **Idaho National Engineering Laboratory Radiological Control Performance Indicator Report. Third quarter, calendar year 1995.** Reavis, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004528. Source: OSTI; NTIS; GPO Dep.

The INEL Radiological Control Performance Indicator Report is provided quarterly, in accordance with Article 133 of the INEL Radiological Control Manual. Indicators are used as a measure of performance of the Radiological Control Program and as a motivation for improvement, not as a goal in themselves. These indicators should be used by management to assist in focusing priorities and attention and adherence to As-Low-As-Reasonably-Achievable (ALARA) practices. The INEL Radiological Control Performance Indicators consist of: collective dose in person-rem; average work dose, maximum dose to a worker, and maximum neutron dose to a worker; the number of skin and clothing contaminations, including the number of contaminated wounds and facial contaminations; the number of radioactive material intakes resulting in a dose assessment of 10 mrem or more; the area of contamination, high contamination, and airborne radioactivity areas in square feet; and airborne radioactivity events and spills.

178 (INEL–95/0300-Rev.1) **Waste management facilities cost information for transportation of radioactive and hazardous materials.** Feizollahi, F.; Shropshire, D.; Burton, D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (DOE/ID/12701–1-EX.SUMM.). Order Number DE96002295. Source: OSTI; NTIS; INIS; GPO Dep.

Formerly EGG-WM-10877.

This report contains cost information on the U.S. Department of Energy (DOE) Complex waste streams that will be addressed by DOE in the programmatic environmental impact statement (PEIS) project. It describes the results of the task commissioned by DOE to develop cost information for transportation of radioactive and hazardous waste. It contains transportation costs for most types of DOE waste streams: low-level waste (LLW), mixed low-level waste (MLLW), alpha LLW and alpha MLLW, Greater-Than-Class C (GTCC) LLW and DOE equivalent waste, transuranic (TRU) waste, spent nuclear fuel (SNF), and hazardous waste. Unit rates for transportation of contact-handled (<200 mrem/hr contact dose) and remote-handled (>200 mrem/hr contact dose) radioactive waste are estimated. Land transportation of radioactive and hazardous waste is subject to regulations promulgated by DOE, the U.S. Department of Transportation (DOT), the U.S. Nuclear Regulatory Commission (NRC), and state and local agencies. The cost estimates in this report assume compliance with applicable regulations.

179 (INEL–95/00303) **Experimental validation of lead cross sections for scale and MCNP.** Henrikson, D.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9509100–131: 5. international conference on nuclear criticality safety, Albuquerque, NM (United States), 17-22 Sep 1995). Order Number DE96002522. Source: OSTI; NTIS; INIS; GPO Dep.

Moving spent nuclear fuel between facilities often requires the use of lead-shielded casks. Criticality safety that is based upon calculations requires experimental validation of the fuel matrix and lead cross section libraries. A series of critical experiments using a high-enriched uranium-aluminum fuel element with a variety of reflectors, including lead, has been identified. Twenty-one configurations were evaluated in this study. The fuel element was modelled for KENO V.a and MCNP 4a using various cross section sets. The experiments addressed in this report can be used to validate lead-reflected calculations. Factors influencing calculated k_{eff} which require further study include diameters of styrofoam inserts and homogenization.

180 (INEL–95/0312) **ICPP environmental monitoring report CY-1994.** Lockheed Idaho Technologies Co.,

Idaho Falls, ID (United States). May 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001550. Source: OSTI; NTIS; INIS; GPO Dep.

Summarized in this report are the data collected through Environmental Monitoring programs conducted at the Idaho Chemical Processing Plant (ICPP) by the Environmental Protection Department. The ICPP is responsible for complying with all applicable Federal, State, Local and DOE Rules, Regulations and Orders. Radiological effluent and emissions are regulated by the DOE in accordance with the Derived Concentration Guides (DCGs) as presented in DOE Order 5400.5. The State of Idaho regulates nonradiological waste resulting from the ICPP operations including airborne, liquid, and solid waste. The Environmental Department updated the Quality Assurance (QA) Project Plan for Environmental Monitoring activities during the third quarter of 1992. QA activities have resulted in the ICPP's implementation of the Environmental Protection Agency (EPA) rules and guidelines pertaining to the collection, analyses, and reporting of environmentally related samples. Where no EPA methods for analyses existed for radionuclides, LITCO methods were used.

181 (INEL–95/00347) **Activities of the INEL Sample Management Office: Resulting in efficiency at the INEL.** Watkins, C.S.; Hoiland, S.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9509266–2-Ext.Abst.: Industrial and environmental chemistry special symposium, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96003503. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. IDAHO NATIONAL ENGINEERING LABORATORY/program management; LABORATORIES/monitoring; LABORATORIES; MONITORING; QUALITY ASSURANCE; CONTRACTORS; PERFORMANCE

182 (INEL–95/0422) **Idaho Chemical Processing Plant failure rate database.** Alber, T.G.; Hunt, C.R.; Fogarty, S.P.; Wilson, J.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001367. Source: OSTI; NTIS; INIS; GPO Dep.

This report represents the first major upgrade to the Idaho Chemical Processing Plant (ICPP) Failure Rate Database. This upgrade incorporates additional site-specific and generic data while improving on the previous data reduction techniques. In addition, due to a change in mission at the ICPP, the status of certain equipment items has changed from operating to standby or off-line. A discussion of how this mission change influenced the relevance of failure data also has been included. This report contains two data sources: the ICPP Failure Rate Database and a generic failure rate database. A discussion is presented on the approaches and assumptions used to develop the data in the ICPP Failure Rate Database. The generic database is included along with a short discussion of its application. A brief discussion of future projects recommended to strengthen and lend credibility to the ICPP Failure Rate Database also is included.

183 (INEL–95/00426) **Consensus standard requirements and guidance.** Putman, V.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951006–24: Winter meeting of the American Nuclear Society (ANS), San Francisco, CA (United States), 29 Oct - 1 Nov 1995). Order Number DE96002533. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents information from the ANS Criticality Alarm System Workshop relating to the consensus standard requirements and guidance. Topics presented include: definition; nomenclature; requirements and recommendations; purpose of criticality alarms; design criteria; signal characteristics; reliability, dependability and durability; tests; and emergency preparedness and planning.

184 (INEL–95/0455) **User's and reference guide to the INEL RML/analytical radiochemistry sample tracking database version 1.00.** Femec, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002186. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the sample tracking database in use at the Idaho National Engineering Laboratory (INEL) by the Radiation Measurements Laboratory (RML) and Analytical Radiochemistry. The database was designed in-house to meet the specific needs of the RML and Analytical Radiochemistry. The report consists of two parts, a user's guide and a reference guide. The user's guide presents some of the fundamentals needed by anyone who will be using the database via its user interface. The reference guide describes the design of both the database and the user interface. Briefly mentioned in the reference guide are the code-generating tools, CREATE-SCHEMA and BUILD-SCREEN, written to automatically generate code for the database and its user interface. The appendices contain the input files used by the these tools to create code for the sample tracking database. The output files generated by these tools are also included in the appendices.

185 (INEL–95/00480) **Proposed criteria for the stability in earthquakes of nuclear-material shipping casks.** Morrow, W.M.; Uldrich, E.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9511128–9: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96002510. Source: OSTI; NTIS; INIS; GPO Dep.

A criterion based on the ratio of potential energy required to tip over the cask to the kinetic energy that a cask would obtain in an earthquake is proposed. The kinetic energy is estimated from the equation of motion for an inverted pendulum, the design basis ground velocities, and design basis spectral velocities. The previously known scaling effect which shows that larger structures that larger structures are more stable than smaller ones of the same geometry is demonstrated.

186 (INEL–95/00486) **The INEL approach: Environmental Restoration Program management and implementation methodology.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–31: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007282. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objectives of the INEL Environmental Restoration (ER) Program management approach are to facilitate meeting mission needs through the successful implementation of a sound, and effective project management philosophy. This paper outlines the steps taken to develop the ER program, and explains further the implementing tools and processes used to achieve what can be viewed as fundamental to a successful program. The various examples provided will demonstrate how the strategies for implementing these operating philosophies are actually present and at work throughout the program, in spite of budget drills and organizational changes within DOE and the implementing contractor. A few of the challenges and successes of the INEL Environmental Restoration Program have included: a) completion of all enforceable milestones to date, b) acceleration of enforceable milestones, c) managing funds to reduce uncosted obligations at year end by utilizing greater than 99% of FY-95 budget, d) an exemplary safety record, e) developing a strategy for partial Delisting of the INEL by the year 2000, f) actively dealing with Natural Resource Damages Assessment issues, g) the achievement of significant project cost reductions, h) and implementation of a partnering charter and application of front end quality principles.

187 (INEL–95/00558) **Using the baseline environmental management report (BEMR) to examine alternate program scenarios.** Kristofferson, K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951209–6: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96003115. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Office of Environmental Management (EM) released the first Baseline Environmental Management Report (BEMR) in March, 1995. The Congressionally-mandated report provides life-cycle cost estimates, tentative schedules, and projected activities necessary to complete DOE's Environmental Management Program. This "base case" estimate is based on current program assumptions and the most likely set of activities. However, since the future course of the Environmental Management Program depends upon a number of fundamental technical and policy choices, alternate program scenarios were developed. These alternate cases show the potential cost impacts of changing assumptions in four key areas: future land use, program funding and scheduling, technology development, and waste management configurations. Several cost and program evaluation tools were developed to support the analysis of these alternate cases. The objective of this paper is to describe the analytical tool kit developed to support the development of the 1995 Baseline Report and to discuss the application of these tools to evaluate alternate program scenarios.

188 (INEL–95/0576) **Idaho National Engineering Laboratory materials in inventory natural and enriched uranium management and storage costs.** Nebeker, R.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004135. Source: OSTI; NTIS; INIS; GPO Dep.

On July 13, 1994, the Office of Environmental Management (EM) was requested to develop a planning process that would result in management policies for dealing with nuclear materials in inventory. In response to this request, EM launched the Materials In Inventory (MIN) Initiative. A Headquarters Working Group was established to develop the broad policy framework for developing MIN management policies. MIN activities cover essentially all nuclear materials within the DOE complex, including such items as spent nuclear fuel, depleted uranium, plutonium, natural and enriched uranium, and other materials. In August 1995, a report discussing the natural and enriched uranium portion of the Initiative for the Idaho National Engineering Laboratory (INEL) was published. That report, 'Idaho National Engineering Laboratory Materials-in-Inventory, Natural and Enriched Uranium'.' identified MIN under the control of Lockheed Idaho Technologies Company at the INEL. Later, additional information related to the costs associated with the storage of MIN materials was requested to supplement this report. This report provides the cost information for storing, disposing, or consolidating the natural and enriched uranium portion of the MIN materials at the INEL. The information consists of eight specific tables which detail present management costs and estimated costs of future activities.

189 (INEL–95/00602) **Estimating and understanding DOE waste management costs'.** Kang, J.S. (USDOE, Washington, DC (United States)); Sherick, M.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951209–7: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96003510. Source: OSTI; NTIS; INIS; GPO Dep.

This paper examines costs associated with cleaning up the US Department of Energy's (DOE's) nuclear facilities, with particular emphasis on the waste management program. Life-cycle waste management costs have been compiled and reported in the DOE Baseline Environmental Management Report (BEMR). Waste management costs are a critical issue for DOE because of the current budget constraints. The DOE sites are struggling to accomplish their environmental management objectives given funding scenarios that are well below anticipated waste management costs. Through the BEMR process, DOE has compiled complex-wide cleanup cost estimates and has begun analysis of these costs with respect to alternative waste management scenarios and policy strategies. From this analysis, DOE is attempting to identify the major cost drivers and prioritize environmental management activities to achieve maximum utilization of existing funding. This paper provides an overview of the methodology DOE has used to estimate and analyze some waste management costs, including the key data requirements and uncertainties.

190 (INEL–95/0619) **Evaluation of retrieval activities and equipment for removal of containers from the transuranic storage area retrieval enclosure.** Bannister, R. (BNFL, Inc., Englewood, CO (United States)); Rhoden, G.; Davies, G.B. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); BNFL, Inc., Englewood, CO (United States). Sep 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003994. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1970, the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory has accepted over 55,000 cubic meters of Transuranic contaminated hazardous waste for interim storage. The waste has been neatly stored in "cell" configurations on adjoining, above ground asphalt pads at the Transuranic Storage Area (TSA). A number of reports have been supplied for review and comment describing the methodology and equipment proposed for retrieval of drums and boxes from a storage facility at the INEL site. The contract for this review requires two main issues to be addressed. First, the adequacy of equipment and methodology for the retrieval of containers which have been breached, lost structural integrity, or are otherwise damaged, Second, to review the strategies and equipment for retrieval of intact waste containers. These issues are presented in the following report along with additional detail in the methodology to complete the description of the operations required for retrieval under most operational scenarios. The documentation reviewed is considered to be at an interim stage and is therefore expected to be subject to the development of the methodology from the existing level of detail with input from the facility operators. This review aims to anticipate some of this development by providing suggested detailed methods of retrieval and equipment for both normal and abnormal operations.

191 (INEL–96/00005) **Measurement of ^{222}Rn flux, ^{222}Rn emanation and ^{226}Ra concentration from injection well pipe scale.** Rood, A.S. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Kendrick, D.T. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States);American Petroleum Inst., Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960110–2: 29. midyear topical meeting of the Health Physics Society: naturally occuring and accelerator produced radioactive material - regulation and risk assessment, Scottsdale, AZ (United States), 7-10 Jan 1996). Order Number DE96007275. Source: OSTI; NTIS; INIS; GPO Dep.

The presence of Naturally Occurring Radioactive Material (NORM) has been recognized since the early 1930s in petroleum reservoirs and in oil and gas production and processing facilities. NORM was typically observed in barite scale that accumulated on the interior of oil production tubing and in storage tank and heater-treater separation sludge. Recent concern has been expressed over the health impacts from the uncontrolled release of NORM to the public. There are several potential exposure pathways to humans from oil-field NORM. Among these is inhalation of radon gas and its daughter products. For this exposure pathway to be of any significance, radon must first be released from the NORM matrix and diffuse in free air. The radon emanation fraction refers to the fraction of radon atoms produced by the decay of radium, that migrate from the bulk material as free gaseous atoms. The purpose of this investigation was to characterize the radon release rates from NORM-scale contaminated production tubing being stored above ground, characterize the radon emanation fraction of the bulk scale material when removed from the tubing, and characterize the radium concentrations of the scale. Accurate characterization of ^{222}Rn emanation fractions from pipe scale may dictate the type of disposal options available for this waste. Characterization of radon release from stored pipes will assist in determining if controls are needed for workers or members of the public downwind from the source. Due to the sensitive nature of this data, the location of this facility is not disclosed.

192 (INEL–96/0012) **Analysis of ICPP fuel storage rack inner tie and corner tie substructures.** Nitzel, M.E.; Rahl, R.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1996. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007523. Source: OSTI; NTIS; INIS; GPO Dep.

Finite element models were developed and analyses performed for the tie plate, inner tie block assembly, and corner tie block assembly of a 25 port fuel rack assembly designed for installation in Pool 1 of Building 666 at the Idaho Chemical Processing Plant. These models were specifically developed to investigate the adequacy of certain welds joining components of the fuel storage rack assembly. The work scope for the task was limited to an investigation of the stress levels in the subject subassemblies when subjected to seismic loads. Structural acceptance criteria used for the elastic calculations performed were as found in the overall rack design report as issued by the rack's designer, Holtec International. Structural acceptance criteria used for the plastic calculations performed as part of this effort were as defined in Subsection NF and Appendix F of the ASME Boiler & Pressure Vessel Code. The results of the analyses will also apply to the 30 port fuel storage rack design that is also scheduled for installation in Pool 1 of ICPP 666. The results obtained from the analyses performed for this task indicate that the welds joining the inner tie block and corner tie block to the surrounding rack structure meet the acceptance criteria. Further, the structural members (plates and blocks) were also found to be within the allowable stress limits established by the acceptance criteria. The separate analysis performed on the inner tie plate confirmed the structural adequacy for both the inner tie plate, corner tie plate, and tie block bolts. The analysis results verified that the inner tie and corner tie block should be capable of transferring the expected seismic load without structural failure.

193 (INEL–96/00034) **Development of waste chargeback systems at the Idaho National Engineering Laboratory (INEL).** Piscitella, R.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–15: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007274. Source: OSTI; NTIS; INIS; GPO Dep.

Includes vugraphs.

Chargeback systems have been discussed (and cussed), tried, modified, and in some cases, successfully implemented in the DOE complex over the years. With the current emphasis on "Doing business like a private company," there has been renewed interest at the Idaho National Engineering Laboratory (INEL) in implementing chargeback systems for waste management activities. The most recent activities relating to chargeback at the INEL started the summer of 1995 with direction from waste operations management to develop and pilot test a chargeback system. This paper presents the results of this effort to date.

194 (INEL–96/0053) **Idaho Chemical Processing Plant Process Efficiency improvements.** Griebenow, B. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010359. Source: OSTI; NTIS; INIS; GPO Dep.

In response to decreasing funding levels available to support activities at the Idaho Chemical Processing Plant (ICPP) and a desire to be cost competitive, the Department of Energy Idaho Operations Office (DOE-ID) and Lockheed

Idaho Technologies Company have increased their emphasis on cost-saving measures. The ICPP Effectiveness Improvement Initiative involves many activities to improve cost effectiveness and competitiveness. This report documents the methodology and results of one of those cost cutting measures, the Process Efficiency Improvement Activity. The Process Efficiency Improvement Activity performed a systematic review of major work processes at the ICPP to increase productivity and to identify nonvalue-added requirements. A two-phase approach was selected for the activity to allow for near-term implementation of relatively easy process modifications in the first phase while obtaining long-term continuous improvement in the second phase and beyond. Phase I of the initiative included a concentrated review of processes that had a high potential for cost savings with the intent of realizing savings in Fiscal Year 1996 (FY-96.) Phase II consists of implementing long-term strategies too complex for Phase I implementation and evaluation of processes not targeted for Phase I review. The Phase II effort is targeted for realizing cost savings in FY-97 and beyond.

195 (INEL–96/0054) **Hazard classification of environmental restoration activities at the INEL.** Peatross, R.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013303. Source: OSTI; NTIS; INIS; GPO Dep.

The following documents require that a hazard classification be prepared for all activities for which US Department of Energy (DOE) has assumed environmental, safety, and health responsibility: the DOE Order 5481.1B, Safety Analysis and Review System and DOE Order 5480.23, Nuclear Safety Analysis Reports. A hazard classification defines the level of hazard posed by an operation or activity, assuming an unmitigated release of radioactive and nonradioactive hazardous material. For environmental restoration activities, the release threshold criteria presented in Hazard Baseline Documentation (DOE-EM-STD-5502-94) are used to determine classifications, such as Radiological, Nonnuclear, and Other Industrial facilities. Based upon DOE-EM-STD-5502-94, environmental restoration activities in all but one of the sites addressed by the scope of this classification (see Section 2) can be classified as "Other Industrial Facility". DOE-EM-STD-5502-94 states that a Health and Safety Plan and compliance with the applicable Occupational Safety and Health Administration (OSHA) standards are sufficient safety controls for this classification.

196 (INEL–96/0101) **Environmental management requirements/defensible costs project. Final report.** Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1996. 114p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010362. Source: OSTI; NTIS; INIS; GPO Dep.

Lockheed Idaho Technologies Company (LITCO) used a systems engineering approach to develop the first formal requirements baseline for Idaho National Engineering Laboratory (INEL) Environmental Management (EM) Programs. The recently signed Settlement Agreement with the State of Idaho (Batt Agreement), along with dramatically reduced EM funding targets from Department of Energy (DOE) headquarters, drove the immediacy of this effort. Programs have linked top-level requirements to work scope to cost estimates. All EM work, grouped by decision units, was scrubbed by INEL EM programs and by an independent "Murder Board." Direct participation of upper level management from LITCO and the DOE-Idaho Operations Office ensured best information and decisions. The result is a scrubbed down, defensible budget tied to top-level requirements for use in the upcoming DOE-Headquarters' budget workout, the Internal Review Board, the FY98 Activity Data Sheets submittal, and preparation of the FY97 control accounts and out-year plans. In addition to the remarkable accomplishments during the past eight weeks, major issues were identified and documented and follow-on tasks are underway which will lead to further improvements in INEL EM program management.

197 (INEL–96/0148) **Technical requirements document for the waste flow analysis.** Shropshire, D.E. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014177. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this Technical Requirements Document is to define the top level customer requirements for the Waste Flow Analysis task. These requirements, once agreed upon with DOE, will be used to flow down subsequent development requirements to the model specifications. This document is intended to be a "living document" which will be modified over the course of the execution of this work element. Initial concurrence with the technical functional requirements from Environmental Management (EM)-50 is needed before the work plan can be developed.

198 (INEL–96/0186) **ICPP environmental monitoring report CY-1995.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1996. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013307. Source: OSTI; NTIS; INIS; GPO Dep.

Summarized in this report are the data collected through Environmental Monitoring programs conducted at the Idaho Chemical Processing Plant (ICPP) by the Environmental Protection Department. The ICPP is responsible for complying with all applicable Federal, State, Local and DOE Rules, Regulations and Orders. Radiological effluent and emissions are regulated by the DOE in accordance with the Derived Concentration Guides (DCGs). The State of Idaho regulates nonradiological waste resulting from the ICPP operations including airborne, liquid, and solid waste. The Environmental Department updated the Quality Assurance (QA) Project Plan for Environmental Monitoring activities during the third quarter of 1992. QA activities have resulted in the ICPP's implementation of the Environmental Protection Agency (EPA) rules and guidelines pertaining to the collection, analyses, and reporting of environmentally related samples. Where no EPA methods for analyses existed for radionuclides, Lockheed Idaho Technologies Company (LITCO) methods were used.

199 (KCP–613-5735) **Pollution prevention opportunity assessment approach, training, and technical assistance for DOE contractors. FY 1995 report.** Pemberton, S. Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. Feb 1996. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-76DP00613. Order Number DE96006087. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy and its contractors are faced with environmental concerns and large waste management costs. Federal legislation and DOE Orders require sites to develop waste minimization/pollution prevention programs. In response to these requirements, the Kansas City Plant developed a pollution prevention tool called a pollution prevention opportunity assessment (PPOA). Pilot assessments resulted in the development of a graded approach to reduce the amount of effort required for activities that utilized nonhazardous and/or low-volume waste streams. The project's objectives in FY95 were to validate DOE's PPOA Graded Approach methodology, provide PPOA training and technical assistance to interested DOE personnel and DOE contractors, enhance the methodology with energy analysis and tools for environmental restoration activities, implement a DOE-wide PPOA database, and provide support to DOE EM-334 in the completion of a report which estimates the future potential for pollution prevention and waste minimization in the DOE complex.

200 (K/ER-47/R1) **Site descriptions of environmental restoration units at the Oak Ridge K-25 Site, Oak Ridge, Tennessee.** Goddard, P.L.; Legeay, A.J.; Pesce, D.S.; Stanley, A.M. Oak Ridge K-25 Site, TN (United States). Nov 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003111. Source: OSTI; NTIS; INIS; GPO Dep.

This report, Site Descriptions of Environmental Restoration Units at the Oak Ridge K-25 Site, Oak Ridge, Tennessee, is being prepared to assimilate information on sites included in the Environmental Restoration (ER) Program of the K-25 Site, one of three major installations on the Oak Ridge Reservation (ORR) built during World War III as part of the Manhattan Project. The information included in this report will be used to establish program priorities so that resources allotted to the K-25 ER Program can be best used to decrease any risk to humans or the environment, and to determine the sequence in which any remedial activities should be conducted. This document will be updated periodically in both paper and Internet versions. Units within this report are described in individual data sheets arranged alphanumerically. Each data sheet includes entries on project status, unit location, dimensions and capacity, dates operated, present function, lifecycle operation, waste characteristics, site status, media of concern, comments, and references. Each data sheet is accompanied by a photograph of the unit, and each unit is located on one of 13 area maps. These areas, along with the sub-area, unit, and subunit breakdowns within them, are outlined in Appendix A. Appendix B is a summary of information on remote aerial sensing and its applicability to the ER program.

201 (LA-13028-MS) **Baseline radionuclide concentrations in soils and vegetation around the proposed Weapons Engineering Tritium Facility and the Weapons Subsystems Laboratory at TA-16.** Fresquez, P.R.; Ennis, M. Los Alamos National Lab., NM (United States). Sep 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96000053. Source: OSTI; NTIS; INIS; GPO Dep.

A preoperational environmental survey is required by the Department of Energy (DOE) for all federally funded research facilities that have the potential to cause adverse impacts on the environment. Therefore, in accordance with DOE Order 5400.1, an environmental survey was conducted over the proposed sites of the Weapons Engineering Tritium Facility (WETF) and the Weapons Subsystems Laboratory (WSL) at Los Alamos National Laboratory (LANL) at TA-16. Baseline concentrations of tritium (^{3}H), plutonium (^{238}Pu and ^{239}Pu) and total uranium were measured in soils, vegetation (pine needles and oak leaves) and ground litter. Tritium was also measured from air samples, while cesium (^{137}Cs) was measured in soils. The mean concentration of airborne tritiated water during 1987 was 3.9 pCi/m^{3}. Although the mean annual concentration of ^{3}H in soil moisture at the 0–5 cm (2 in) soil depth was measured at 0.6 pCi/mL, a better background level, based on long-term regional data, was considered to be 2.6 pCi/mL. Mean values for ^{137}Cs, ^{218}Pu, ^{239}Pu, and total uranium in soils collected from the 0–5 cm depth were 1.08 pCi/g, 0.0014 pCi/g, 0.0325 pCi/g, and 4.01 { micro} g/g, respectively. Ponderosa pine (Pinus ponderosa) needles contained higher values of ^{238}Pu, ^{239}Pu, and total uranium than did leaves collected from gambel's oak (Quercus gambelii). In contrast, leaves collected from gambel's oak contained higher levels of ^{137}Cs than what pine needles did.

202 (LA-13133-SR) **94-1 Research and Development Project Lead laboratory support. Status report, October 1–December 31, 1995.** Dinehart, M. (comp.). Los Alamos National Lab., NM (United States). May 1996. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96010651. Source: OSTI; NTIS; INIS; GPO Dep.

This is a quarterly progress report of the 94-1 Research and Development Lead Laboratory Support Technical Program Plan for the first quarter of FY 1996. The report provides details concerning descriptions, DOE-complex-wide material stabilization technology needs, scientific background and approach, progress, benefits to the DOE complex, and collaborations for selected subprojects. An executive summary and report on end-of-quarter spending is included.

203 (LA-13148-MS) **Ecotoxicological screen of Potential Release Site 50-006(d) of Operable Unit 1147 of Mortandad Canyon and relationship to the Radioactive Liquid Waste Treatment Facilities project.** Gonzales, G.J.; Newell, P.G. Los Alamos National Lab., NM (United States). Apr 1996. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96010042. Source: OSTI; NTIS; INIS; GPO Dep.

Potential ecological risk associated with soil contaminants in Potential Release Site (PRS) 50-006(d) of Mortandad Canyon at the Los Alamos National Laboratory was assessed by performing an ecotoxicological risk screen. The PRS surrounds Outfall 051, which discharges treated effluent from the Radioactive Liquid Waste Treatment Facility. Discharge at the outfall is permitted under the Clean Water Act National Pollution Discharge Elimination System. Radionuclide discharge is regulated by US Department of Energy (DOE) Order 5400.5. Ecotoxicological Screening Action Levels (ESALSs) were computed for nonradionuclide constituents in the soil, and human risk SALs for radionuclides were used as ESALs. Within the PRS and beginning at Outfall 051, soil was sampled at three points along each of nine linear transects at 100-ft intervals. Soil samples from 3 depths for each sampling point were analyzed for the concentration of a total of 121 constituents. Only the results of the surface sampling are reported in this report.

204 (LA-SUB-96-48) **Product and market study for Los Alamos National Laboratory. Building resources for technology commercialization: The SciBus Analytical, Inc. paradigm.** Los Alamos National Lab., NM (United States); Calidex Corp., Saratoga, CA (United States). 1 Feb

1996. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96012106. Source: OSTI; NTIS; GPO Dep.

The study project was undertaken to investigate how entrepreneurial small businesses with technology licenses can develop product and market strategies sufficiently persuasive to attract resources and exploit commercialization opportunities. The study attempts to answer two primary questions: (1) What key business development strategies are likely to make technology transfers successful, and (2) How should the plan best be presented in order to attract resources (e.g., personnel, funding, channels of distribution)? In the opinion of the investigator, Calidex Corporation, if the business strategies later prove to be successful, then the plan model has relevance for any technology licensee attempting to accumulate resources and bridge from technology resident in government laboratories to the commercial marketplace. The study utilized SciBus Analytical, Inc. (SciBus), a Los Alamos National Laboratory CRADA participant, as the paradigm small business technology licensee. The investigator concluded that the optimum value of the study lay in the preparation of an actual business development plan for SciBus that might then have, hopefully, broader relevance and merit for other private sector technology transfer licensees working with various Government agencies.

205 (LA-SUB–96-97) **Study of polyelectrolytes for Los Alamos National Laboratory. Final report.** Labonne, N. (Florida State Univ., Tallahassee, FL (United States)). Los Alamos National Lab., NM (United States); Florida State Univ., Tallahassee, FL (United States). Nov 1994. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013704. Source: OSTI; NTIS; INIS; GPO Dep.

To assess the safety of a potential radioactive waste repository, analysis of the fluid solution containing low levels of activity need to be performed. In some cases, the radioactivity would be so weak (3–30 pCi/L) that the solution must be concentrated for measurement. For this purpose, Los Alamos National Laboratory scientists are synthesizing some water soluble polyelectrolytes, which, because they are strong complexing agents for inorganic cations, can concentrate the radioelements in solution. To assist in characterization of these polyelectrolytes, the author has performed experiments to determine physico-chemical constants, such as pKa values and stability constants. The complexation constants between both polyelectrolytes and europium were determined by two methods: solvent extraction and ion exchange. Results are presented.

206 (LA-UR–95-692) **Cost effectiveness studies of environmental technologies: Volume 1.** Silva, E.M.; Booth, S.R. (eds.). Los Alamos National Lab., NM (United States). Feb 1994. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007853. Source: OSTI; NTIS; INIS; GPO Dep.

This paper examines cost effectiveness studies of environmental technologies including the following: (1) In Situ Air Stripping, (2) Surface Towed Ordinance Locator System, (3) Ditch Witch Horizontal Boring Technology, (4) Direct Sampling Ion Trap Mass Spectrometer, (5) In Situ Vitrification, (6) Site Characterization and Analysis Penetrometer System, (7) In Situ Bioremediation, and (8) SEAMIST Membrane System Technology.

207 (LA-UR–95-1703) **Decision support tools for policy and planning.** Jacyk, P.; Schultz, D.; Spangenberg, L. Los Alamos National Lab., NM (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505278–1: Gensym users group meeting, Cambridge, MA (United States), 24 May 1995). Order Number DE95015327. Source: OSTI; NTIS; INIS; GPO Dep.

A decision support system (DSS) is being developed at the Radioactive Liquid Waste Treatment Facility, Los Alamos National Laboratory (LANL). The DSS will be used to evaluate alternatives for improving LANL's existing central radioactive waste water treatment plant and to evaluate new site-wide liquid waste treatment schemes that are required in order to handle the diverse waste streams produced at LANL. The decision support system consists of interacting modules that perform the following tasks: rigorous process simulation, configuration management, performance analysis, cost analysis, risk analysis, environmental impact assessment, transportation modeling, and local, state, and federal regulation compliance checking. Uncertainty handling techniques are used with these modules and also with a decision synthesis module which combines results from the modules listed above. We believe the DSS being developed can be applied to almost any other industrial water treatment facility with little modification because in most situations the waste streams are less complex, fewer regulations apply, and the political environment is simpler. The techniques being developed are also generally applicable to policy and planning decision support systems in the chemical process industry.

208 (LA-UR–95-1880) **Above and beyond basic public participation.** Mathai, L.P.; Lefkoff, M.S.; Kelly, E.J. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9506237–1: International Congress on Hazardous Waste: impact on human and ecological health, Atlanta, GA (United States), 5-8 Jun 1995). Order Number DE95015197. Source: OSTI; NTIS; INIS; GPO Dep.

This paper evolved out of a discussion about public participation as it is currently being brought to the fore-front of clean-up activities at hazardous waste sites. There exists much official and unofficial documentation pertaining to the need for public involvement. The purposes for public involvement efforts in Environmental Restoration are: to enable substantive input to the clean-up process; methods for establishing formal, and now informal, mechanisms for public input and awareness of on-going facility activities; and the opening of better channels for communication and conflict resolution between the public and the facility. This presentation will briefly outline the regulatory approach for public outreach because many of these terms are used with such frequency, their meanings tend to get forgotten or misconstrued. Then, the authors will critique the most common methods for conducting public involvement as attempted through advisory boards and public meetings. For illustrative purposes, they will be referring to the site they are most familiar with, which is Los Alamos National Laboratory (LANL).

209 (LA-UR–95-2267) **The restructuring of the Environmental Restoration Program at Los Alamos National Laboratory.** Jansen, J. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36.

(CONF-950868–8: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95016915. Source: OSTI; NTIS; GPO Dep.

The Los Alamos National Laboratory (Laboratory) has supported this country through 50 years of research and development primarily in the area of nuclear weapons and energy. As a result of the Laboratory's activities, contamination of the environment occurred. The cleanup of contaminated areas and the prevention of further contamination has become an important part of the Laboratory's new mission: the reduction of the nuclear danger. The cleanup of the Laboratory is somewhat unique. It is a very large site. It includes 43 square miles of Laboratory land that will continue to be in industrial use or under institutional control for decades or centuries to come. It also includes about 25 square miles of former Laboratory land that has been converted to residential use, the Los Alamos townsite. The unusual topography and hydrogeology of the site was shaped during the last million years through the eruption of a huge volcano and the ensuing erosion of the tuff-basalt plateau into 19 canyons and associated finger-like mesas. During the early phase of the Environmental Restoration (ER) Program, 2,100 sites were identified as potential release sites. Sites range from a few hundred square feet to a few acres in area. Contamination depths range from a few to 100 feet. Typical contaminants are chemicals, heavy metals, radioactive constituents, and high explosives. Of greatest concern are surface contamination, migration of the contaminants along the surface into creeks and arroyos of the canyons and ultimately into the Rio Grande, and migration through the earth into the drinking water aquifers.

210 (LA-UR–96-170) **Dynamic quality assurance/ quality control (QA/QC) program to maximize the use of on-site measurement.** Kelly, L.A.; Roberts, J.B.; Swanson, A.L.; Canavan, H.E. Los Alamos National Lab., NM (United States). [1996]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960175–3: 4. international on-site analysis meeting, Orlando, FL (United States), 21-24 Jan 1996). Order Number DE96007169. Source: OSTI; NTIS; INIS; GPO Dep.

The use of on-site mobile laboratories at Los Alamos National Laboratory (LANL) has increased within the last year to accommodate the diverse analytical requirements of demands for the Environmental Restoration Project (ERP). The purpose of the mobile laboratory is to provide sample results with the appropriate QC components within a near real time (i.e. < 8 hours) to aid in a real time decision process such as determining the extent of contamination and/or where to focus the sampling efforts. To meet the data quality objectives (DQOS) of ERP, a flexible QA/QC program needs to exist. By developing a QA/QC program containing the capability to measure extraction efficiency and instrument sensitivity and by participating in the DQO process, the appropriate QC can easily be tailored to provide quick and inexpensive analytical data while still meeting the project requirements. An QA/QC program, consisting of both static and dynamic elements, can be tailored to meet the ERP objectives.

211 (LA-UR–96-378) **Chemical Exposure Assessment Program at Los Alamos National Laboratory: A risk based approach.** Stephenson, D.J. Los Alamos National Lab., NM (United States). [1996]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–67: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008124. Source: OSTI; NTIS; INIS; GPO Dep.

The University of California Contract And DOE Order 5480.10 require that Los Alamos National Laboratory (LANL) perform health hazard assessments/inventories of all employee workplaces. In response to this LANL has developed the Chemical Exposure Assessment Program. This program provides a systematic risk-based approach to anticipation, recognition, evaluation and control of chemical workplace exposures. Program implementation focuses resources on exposures with the highest risks for causing adverse health effects. Implementation guidance includes procedures for basic characterization, qualitative risk assessment, quantitative validation, and recommendations and reevaluation. Each component of the program is described. It is shown how a systematic method of assessment improves documentation, retrieval, and use of generated exposure information.

212 (LBL–36825) **A joint Russian-American field test at the Chelyabinsk-65 (Mayak) Site: Test description and preliminary results.** Wollenberg, H. (and others); Tsang, C.F.; Frangos, W. Lawrence Berkeley Lab., CA (United States). May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (RAC–12; CONF-950917–11: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95012351. Source: OSTI; NTIS; INIS; GPO Dep.

In September 1994, a Russian-American team conducted hydrogeological, geochemical, geophysical, and radiometric measurements in the territory of the Mayak Production Association. The primary purpose of these operations was to examine the groundwater plume moving from Lake Karachai toward the river. Activities encompassed isolation of hydrologic intervals in two wells and production of water from these intervals, to compare isolated versus open-well sampling methods; surface and soil-water sampling, accompanying radiometric measurements and subsequent chemical analyses; and electrical resistivity profiling in areas of expected contrasting resistivity. Preliminary results indicate that (1) ^{60}Co and ^{137}Cs are present in small concentrations in water of the Mishelyak River, (2) analyses of water samples collected by a downhole sampler and of water produced from packed-off intervals agree within limits of laboratory accuracy, attesting to the efficacy of the sampling methods presently used by the Russian workers; and (3) strong contrasts occur between the electrical resistivities of soil and bedrock. Further collaborative work is strongly recommended, and should include more detailed isolation of intervals in wells by multi-packer installations, to better determine the geochemical and hydrological characteristics of the Karachai-Mishelyak system; deployment of a broader soil-water and soil sampling array; a more detailed examination of the distribution and concentration of radionuclides by high-resolution field gamma spectrometry; and a detailing of the area's electrical resistivity setting, using a mobile electromagnetic measurement system.

213 (LBL–36928) **Strongly coupled single-phase flow problems: Effects of density variation, hydrodynamic dispersion, and first order decay.** Oldenburg, C.M.; Pruess, K. Lawrence Berkeley Lab., CA (United States). Mar 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9503110–1: TOUGH 95: transport of unsaturated

ground water and heat workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95014777. Source: OSTI; NTIS; GPO Dep.

We have developed TOUGH2 modules for strongly coupled flow and transport that include full hydrodynamic dispersion. T2DM models two-dimensional flow and transport in systems with variable salinity, while T2DMR includes radionuclide transport with firstorder decay of a parent-daughter chain of radionuclide components in variable salinity systems. T2DM has been applied to a variety of coupled flow problems including the pure solutal convection problem of Elder and the mixed free and forced convection salt-dome flow problem. In the Elder and salt-dome flow problems, density changes of up to 20% caused by brine concentration variations lead to strong coupling between the velocity and brine concentration fields. T2DM efficiently calculates flow and transport for these problems. We have applied T2DMR to the dispersive transport and decay of radionuclide tracers in flow fields with permeability heterogeneities and recirculating flows. Coupling in th ese problems occurs by velocity-dependent hydrodynamic dispersion. Our results show that the maximum daughter species concentration may occur fully within a recirculating or low-velocity region. In all of the problems, we observe very efficient handling of the strongly coupled flow and transport processes.

214 (LBL–37333) **Geological aspects of the nuclear waste disposal problem.** Laverov, N.P. (Russian Academy of Sciences (Russian Federation)); Omelianenko, B.L.; Velichkin, V.I. Lawrence Berkeley Lab., CA (United States). Jun 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95015138. Source: OSTI; NTIS; INIS; GPO Dep.

For the successful solution of the high-level waste (HLW) problem in Russia one must take into account such factors as the existence of the great volume of accumulated HLW, the large size and variety of geological conditions in the country, and the difficult economic conditions. The most efficient method of HLW disposal consists in the maximum use of protective capacities of the geological environment and in using inexpensive natural minerals for engineered barrier construction. In this paper, the principal trends of geological investigation directed toward the solution of HLW disposal are considered. One urgent practical aim is the selection of sites in deep wells in regions where the HLW is now held in temporary storage. The aim of long-term investigations into HLW disposal is to evaluate geological prerequisites for regional HLW repositories.

215 (LBL–37337) **Weathering products of basic rocks as sorptive materials of natural radionuclides.** Omelianenko, B.I. (AN SSSR, Moscow (Russian Federation). Inst. Geologii Rudnykh Mestorozhdenij, Petrografii, Mineralogii i Geokhimii); Niconov, B.S.; Ryzhov, B.I.; Shikina, N.D. Lawrence Berkeley Lab., CA (United States). Jun 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95015137. Source: OSTI; NTIS; INIS; GPO Dep.

The principal requirements for employing natural minerals as buffer and backfill material in high-level waste (HLW) repositories are high sorptive properties, low water permeability, relatively high thermal conductivity, and thermostability. The major task of the buffer is to prevent the penetration of radionuclides into groundwater. The authors of this report examined weathered basic rocks from three regions of Russia in consideration as a suitable radioactive waste barrier.

216 (LBL–38151) **Direct and inverse modeling of multiphase flow systems.** Finsterle, S. Lawrence Berkeley Lab., CA (United States). Oct 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9510354–1: 1. GAMM seminar on modelling and computation in environmental sciences, Stuttgart (Germany), 12-13 Oct 1995). Order Number DE96008394. Source: OSTI; NTIS; GPO Dep.

A modeling study is presented which demonstrates how the combination of simulation and optimization techniques can be used to improve the design of a multi-component remediation system. A series of computer codes has been developed at the Lawrence Berkeley National Laboratory to solve forward and inverse problems in groundwater hydrology. Simulations of non-isothermal, three-phase flow of volatile organic compounds in three-dimensional heterogeneous media were performed. Inverse modeling capabilities have been developed which can be used for both automatic model calibration and optimization of remediation schemes. In this study, we discuss a sequence of simulations to demonstrate the potential use of numerical models to design and analyze cleanup of a contaminated aquifer.

217 (ORNL/ER–183/A1) **Addendum to the health and safety plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program.** Clark, C. Jr.; Burman, S.N.; Wilson, K.A. Oak Ridge National Lab., TN (United States). Aug 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017188. Source: OSTI; NTIS; INIS; GPO Dep.

There are three purposes for this addendum to the health and safety plan for Waste Area Grouping 6. The first purpose is to provide record of a corrective action response concerning an occurrence on WAG 6 in October 1994 (ORO-MMES-ENVRES-1994-0016.) This occurrence involved a precautionary evacuation of subcontractor field crews due to malfunctioning monitor alarms for organic vapors. The corrective action is to revise the WAG 6 Site health and safety plan to improve communications during emergency events. The second purpose is to incorporate any outstanding health and safety issues not addressed in the original health and safety plan for WAG 6 document (ORNL/ER-183). The only variance of note is tritium air monitoring in the Tumulus building. The tritium air monitor is added in this addendum as monitoring equipment for WAG 6 with description of action level and calibration. The third purpose of this addendum is to satisfy a condition of approval for the pending Nuclear Criticality Safety Assessment (NCSA) pertaining to KEMA fuel storage at WAG 6. This approval condition requires the following: "The location of the KEMA burial shall be recorded and maintained in a controlled document that identifies the quantity and the general physical conditions at the time of the entombment with an admonishment to obtain nuclear criticality safety guidance before altering the burial condition." In order to satisfy the approval, this document must be controlled. The predecessor to the pending NCSA is NSR No. 0002WM22001.

218 (ORNL/ER–200/R1) **Meteorological monitoring sampling and analysis plan for the environmental monitoring plan at Waste Area Grouping 6, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge

National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Sep 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006788. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses meteorological monitoring activities that wall be conducted in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-burial land disposal facility for low-level radioactive waste at the Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and managed by Lockheed Martin Energy Systems, Inc. Meteorological monitoring of various climatological parameters (e.g., temperature, wind speed, humidity) will be collected by instruments installed at WAG 6. Data will be recorded electronically at frequencies varying from 5-min intervals to 1-h intervals, dependent upon parameter. The data will be downloaded every 2 weeks, evaluated, compressed, and uploaded into a WAG 6 data base for subsequent use. The meteorological data will be used in water balance calculations in support of the WAG 6 hydrogeological model.

219 (ORNL/ER–206/V1) **Final project report on arsenic biogeochemistry in the Clinch River and Watts Bar Reservoir: Volume 1, Main text. Environmental Restoration Program.** Ford, C.J.; Byrd, J.T.; Grebmeier, J.M.; Harris, R.A.; Moore, R.C.; Madix, S.E.; Newman, K.A.; Rash, C.D. Oak Ridge National Lab., TN (United States). Apr 1995. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012537. Source: OSTI; NTIS; GPO Dep.

This document reports on the study of arsenic contamination in the Clinch River/Watts Bar Reservoir (CR/WBR) system, downstream from the US Department of Energy's Oak Ridge Reservation (ORR). Arsenic is of particular interest and concern because it occurs commonly in coal-bearing rock and waste products, such as fly ash associated with the burning of coal; it is classified as a Class A carcinogen by the Environmental Protection Agency; and disposal of fly ash, both on and off the ORR, may have contaminated surface water and sediments in the Clinch River and Watts Bar Reservoir. Four main sites were sampled quarterly over a 3-year period. Sites investigated included lower Watts Bar Reservoir near Watts Bar Dam [Tennessee River kilometer (TRK) 849.6], the Kingston area [Clinch River kilometer (CRK) 1.6], Poplar Creek, and the McCoy Branch Embayment. Additional sites were investigated in the vicinity of these main stations to determine the distribution of contamination and to identify possible alternative or additional sources of arsenic.

220 (ORNL/ER–206/V2) **Final project report on arsenic biogeochemistry in the Clinch River and Watts Bar Reservoir: Volume 2, Quality assurance/quality control summary report for arsenic biogeochemistry in the Clinch River and Watts Bar Reservoir. Environmental Restoration Program.** Newman, K.A.; Ford, C.J.; Byrd, J.T. Oak Ridge National Lab., TN (United States). Apr 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012538. Source: OSTI; NTIS; GPO Dep.

Arsenic contamination was studied in the Clinch River/Watts Bar Reservoir (CR/WBR) system downstream from the US Department of Energy's Oak Ridge Reservation (ORR). Arsenic is of particular interest and concern because (1) it occurs commonly in coal-bearing rock and waste products such as fly ash associated with the burning of coal, (2) it is classified as a Class A carcinogen by the US Environmental Protection Agency, and (3) disposal of fly ash, both on and off the ORR, may have contaminated surface water and sediments in the Clinch River and Watts Bar Reservoir. The present study dffers from previous reports on arsenic concentrations in the CR/WBR system in the use of much more sensitive and precise processing and analytical techniques to measure arsenic species (arsenate, arsenite, and organic arsenic) at levels well below the ecological and human health risk screening criteria. The absolute detection limits using these techniques are approximately 20 to 40 pmol/L or 0.0015 to 0.003 μg/L.

221 (ORNL/ER–307) **Quality Assurance Project Plan for the treatability study of in situ vitrification of Seepage Pit 1 in Waste Area Grouping 7 at Oak Ridge National Laboratory.** Oak Ridge National Lab., TN (United States). Jul 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017047. Source: OSTI; NTIS; INIS; GPO Dep. Environmental Restoration Program.

This Quality Assurance Project Plan (QAPjP) establishes the quality assurance procedures and requirements to be implemented for the control of quality-related activities for Phase 3 of the Treatability Study (TS) of In Situ Vitrification (ISV) of Seepage Pit 1, ORNL Waste Area Grouping 7. This QAPjP supplements the Quality Assurance Plan for Oak Ridge National Laboratory Environmental Restoration Program by providing information specific to the ISV-TS. Phase 3 of the TS involves the actual ISV melt operations and posttest monitoring of Pit 1 and vicinity. Previously, Phase 1 activities were completed, which involved determining the boundaries of Pit 1, using driven rods and pipes and mapping the distribution of radioactivity using logging tools within the pipes. Phase 2 involved sampling the contents, both liquid and solids, in and around seepage Pit 1 to determine their chemical and radionuclide composition and the spatial distribution of these attributes. A separate QAPjP was developed for each phase of the project. A readiness review of the Phase 3 activities presented QAPjP will be conducted prior to initiating field activities, and an Operational Acceptance, Test (OAT) will also be conducted with no contamination involved. After, the OAT is complete, the ISV process will be restarted, and the melt will be allowed to increase with depth and incorporate the radionuclide contamination at the bottom of Pit 1. Upon completion of melt 1, the equipment will be shut down and mobilized to an adjacent location at which melt 2 will commence.

222 (ORNL/ER/Sub–87-99053/2/R1) **Data base management plan for the remedial investigation/feasibility study at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Nov 1993. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96002148. Source: OSTI; NTIS; INIS; GPO Dep.

This Data Base Management (DBM) Plan has been prepared for use by Bechtel National, Inc. (Bechtel) and its subcontractors in the performance of the Oak Ridge National Laboratory (ORNL) Remedial Investigation/Feasibility Study (RI/FS) program activities. The RI/FS program is being performed under subcontract to Martin Marietta Energy Systems, Inc. (Energy Systems), the contractor operating ORNL for the Department of Energy. This DBM Plan defines the procedures and protocol to be followed in developing and maintaining the data base used by Bechtel and its subcontractors for RI/FS activities at ORNL; describes the management controls, policies, and guidelines to be followed; and identifies responsible positions and their Energy Systems functions. The Bechtel RI/FS data base will be compatible with the Oak Ridge Environmental Information System and will include data obtained from field measurements and laboratory and engineering analyses. Personnel health and safety information, document control, and project management data will also be maintained as part of the data base. The computerized data management system is being used to organize the data according to application and is capable of treating data from any given site as a variable entity. The procedures required to implement the DBM Plan are cross-referenced to specific sections of the plan.

223 (ORNL/M–4087) **The Center for Environmental Technology Innovative Technology Screening Process.** Bertrand, C.M. Oak Ridge National Lab., TN (United States). Feb 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008966. Source: OSTI; NTIS; INIS; GPO Dep.

The Center for Environmental Technology's (CET) mission is to provide a fully integrated system for accelerated evaluation, development, commercialization, and public acceptance of creative environmental solutions which match the foremost demands in today's environmentally sensitive world. In short, CET will create a means to provide quick, effective solutions for environmental needs. To meet this mission objective, CET has created a unique and innovative approach to eliminating the usual barriers in developing and testing environmental technologies. The approach paves the way for these emerging, cutting-edge technologies by coordinating environmental restoration and waste management activities of industry, universities, and the government to: efficiently and effectively transfer technology to these users, provide market-driven, cost-effective technology programs to the public and DOE, and aid in developing innovative ideas by initiating efforts between DOE facilities and private industry. The central part to this mission is selecting and evaluating specific innovative technologies for demonstration and application at United States Department of Energy (DOE) installations. The methodology and criteria used for this selection, which is called the CET Innovative Technology Screening Process, is the subject of this paper. The selection criteria used for the screening process were modeled after other DOE technology transfer programs and were further developed by CET's Technology Screening and Evaluation Board (TSEB). The process benefits both CET and the proposing vendors by providing objective selection procedures based on predefined criteria. The selection process ensures a rapid response to proposing vendors, all technologies will have the opportunity to enter the selection process, and all technologies are evaluated on the same scale and with identical criteria.

224 (ORNL/M–4913) **Attitudes and practices regarding disposal of liquid nuclear waste at Clinton Laboratories in the very early years: A historical analysis.** Stow, S.H. Oak Ridge National Lab., TN (United States). Feb 1996. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006821. Source: OSTI; NTIS; INIS; GPO Dep.

Many previously unreferenced documents show that the management and disposal of the liquid nuclear waste generated at Clinton Labs (which became ORNL after 1948) during the 1940s was performed with the highest degree of integrity and professionalism, contradicting today's perceptions. Even before construction of the laboratories in early 1943, professionals were making plans for the "safe" disposal of waste through treatment and dilution at medically prescribed levels into White Oak Creek and the Clinch River; concern for human health permeated all the disposal decisions. Chemical and physical treatment processes were used to remove as much of the activity as possible before release. Environmental and biological monitoring of the surface waters was instituted very early in the disposal history. Information learned at Clinton Labs with regard to waste disposal was transferred to Hanford. By the latter part of the 1940s, the scientists were formulating fairly sophisticated research programs for managing liquid waste and began research on the disposal of low-level solid waste. This historical analysis attempts to place the actions of the 1940s in proper perspective, drawing on the attentiveness and integrity of those who participated 50 years ago. Applying standards of the 1990s to actions in the 1940s must be done skilfully, carefully, and with the realization that those individuals were operating under extremely trying conditions, with minimal knowledge of radionuclide behavior.

225 (ORNL/TM–12380) **User's manual for the radioactive decay and accumulation code RADAC.** Salmon, R.; Loghry, S.L.; Ashline, R.C. Oak Ridge National Lab., TN (United States). Nov 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003110. Source: OSTI; NTIS; INIS; GPO Dep.

The RADAC computer code calculates radioactive decay and accumulation of decayed products using an algorithm based on the direct use of the Bateman equations and referred to here as the yield factor method. This report explains the yield factor method, gives an overview of the various modules in the RADAC code system, and describes the decay and accumulation code in detail. The RADAC code has capacity for two waste types and can accommodate up to 60 years of annual waste inputs. Decay times as high as 1 million years can be calculated. The user supplies the undecayed composition and radioactivity of the waste placed in storage each year. The code calculates the decayed composition, radioactivity, and thermal power of the accumulated waste at the end of each year and gives the results in terms of grams and curies of individual radionuclides. Calculations can be made for up to 19 waste storage sites in a single run. For each site and each waste type, calculations can be made by 1-year steps up to 60 years, by 10-year steps to 160 years, and by 6 discrete steps to 1 million years. Detailed outputs can be printed for each waste site and each time step by individual radionuclides. Summarized outputs are also available. Excluding data-preparation time, RADAC requires about 2 min to run 19 waste sites with two types of transuranic waste at each site, using a 486 DX computer with a clock speed of 33 MHz. Because RADAC uses a preselected set of decay times and does not make in-reactor calculations, it should not be viewed as a substitute for ORIGEN2. RADAC is intended for use in applications in which accumulations at the decay times provided by the code are sufficient for the user's purposes.

226 (PNL–10260-Rev.1) **Financial assistance to states and tribes to support emergency preparedness and response and the safe transportation of hazardous shipments: 1996 Update.** Bradbury, J.A.; Leyson, J.; Lester, M.K. Pacific Northwest Lab., Richland, WA (United

States). Jul 1996. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96014168. Source: OSTI; NTIS; INIS; GPO Dep.

This report revises and updates the 1995 report Financial Assistance to States and Tribes to Support Emergency Preparedness and Response and the Safe Transportation of Hazardous Shipments, PNL-10260 (UC-620). The presentation of data and some of the data reported have been changed; these data supersede those presented in the earlier publication. All data have been updated to fiscal year 1995, with the exception of FEMA data that are updated to fiscal year 1994 only. The report identifies and summarizes existing sources of financial assistance to States and Tribes in preparing and responding to transportation emergencies and ensuring the safe transportation of hazardous shipments through their jurisdictions. It is intended for use as an information resource for the U.S. Department of Energy's Office of Environmental Management (EM), Office of Transportation, Emergency Management, and Analytical Services (EM-76).

227 (PNL–10574) **Hanford Site environmental report for calendar year 1994.** Dirkes, R.L.; Hanf, R.W. (eds.). Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 375p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001346. Source: OSTI; NTIS; INIS; GPO Dep.

This Hanford Site Environmental Report is prepared annually pursuant to DOE Order 5400.1 to summarize environmental data that characterize Hanford Site environmental management performance and demonstrate compliance status. The report also highlights significant environmental programs and efforts. More detailed environmental compliance, monitoring, surveillance, and study reports may be of value; therefore, to the extent practical, these additional reports have been referenced in the text. Individual papers have been indexed separately for the database.

228 (PNL–10575) **Hanford Site environmental data for calendar year 1994: Surface and Columbia River.** Bisping, L.E. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001151. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental monitoring at the Hanford Site, located in southeastern Washington State, is conducted by Battelle Memorial Institute, Pacific Northwest Division, as part of its contract to operate the Pacific Northwest Laboratory (PNL) for the US Department of Energy. The data collected provide a historical record of radionuclide and radiation levels attributable to natural causes, worldwide fallout, and Hanford operations. Data are also collected to monitor several chemicals. Pacific Northwest Laboratory publishes an annual environmental report for the Hanford Site each calendar year. The Hanford Site Environmental Report for Calendar Year 1994 describes the Site mission and activities, general environmental features, radiological and chemical releases from operations, status of compliance with environmental regulations, status of programs to accomplish compliance, and environmental monitoring activities and results. The report includes a summary of offsite and onsite environmental monitoring data collected during 1994 b PNL's Environmental Monitoring Program. Appendix A of that report contains data summaries created from raw surface and river monitoring data. This volume contains the actual raw data used to create the summaries.

229 (PNL–10601) **Toxicology profiles of chemical and radiological contaminants at Hanford.** Harper, B.L.; Strenge, D.L.; Stenner, R.D.; Maughan, A.D.; Jarvis, M.K. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000877. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes toxicology information required under Section 3.3 (Toxicity Assessment) of HSRAM, and can also be used to develop the short toxicology profiles required in site assessments (described in HSRAM, Section 3.3.5). Toxicology information is used in the dose-response step of the risk assessment process. The dose-response assessment describes the quantitative relationship between the amount of exposure to a substance and the extent of toxic injury or disease. Data are derived from animal studies or, less frequently, from studies in exposed human populations. The risks of a substance cannot be ascertained with any degree of confidence unless dose-response relations are quantified. This document summarizes dose-response information available from the US Environmental Protection Agency (EPA). The contaminants selected for inclusion in this document represent most of the contaminants found at Hanford (both radiological and chemical), based on sampling and analysis performed during site investigations, and historical information on waste disposal practices at the Hanford Site.

230 (PNL–10608) **Risk information in support of cost estimates for the Baseline Environmental Management Report (BEMR). Section 1.** Gelston, G.M. (Pacific Northwest Lab., Richland, WA (United States)); Jarvis, M.F.; Warren, B.R.; Von Berg, R. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 302p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015593. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory (PNL)(1) effort on the overall Baseline Environmental Management Report (BEMR) project consists of four installation-specific work components performed in succession. These components include (1) development of source terms, 92) collection of data and preparation of environmental settings reports, (3) calculation of unit risk factors, and (4) utilization of the unit risk factors in Automated Remedial Action Methodology (ARAM) for computation of target concentrations and cost estimates. This report documents work completed for the Nevada Test Site, Nevada, for components 2 and 3. The product of this phase of the BEMR project is the development of unit factors (i.e., unit transport factors, unit exposure factors, and unit risk factors). Thousands of these unit factors are gene rated and fill approximately one megabyte of computer information per installation. The final unit risk factors (URF) are transmitted electronically to BEMR-Cost task personnel as input to a computer program (ARAM). Abstracted files and exhibits of the URF information are included in this report. These visual formats are intended to provide a sample of the final task deliverable (the URF files) which can be easily read without a computer.

231 (PNL–10714) **Nonradiological chemical pathway analysis and identification of chemicals of concern for environmental monitoring at the Hanford Site.** Blanton, M.L.; Cooper, A.T.; Castleton, K.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-76RL01830. Order Number DE96003370. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest's Surface Environmental Surveillance Project (SESP) is an ongoing effort tot design, review, and conducted monitoring on and off the Hanford site. Chemicals of concern that were selected are listed. Using modeled exposure pathways, the offsite cancer incidence and hazard quotient were calculated and a retrospective pathway analysis performed to estimate what onsite concentrations would be required in the soil for each chemical of concern and other detected chemicals that would be required to obtain an estimated offsite human-health risk of 1.0E-06 cancer incidence or 1.0 hazard quotient. This analysis indicates that current nonradiological chemical contamination occurring on the site does not pose a significant offsite human-health risk; the highest cancer incidence to the offsite maximally exposed individual was from arsenic (1.76E-10); the highest hazard quotient was chromium(VI) (1.48E-04). The most sensitive pathways of exposure were surfacewater and aquatic food consumption. Combined total offsite excess cancer incidence was 2.09E-10 and estimated hazard quotient was 2.40E-04. Of the 17 identified chemicals of concern, the SESP does not currently (routinely) monitor arsenic, benzo(a)pyrene, bis(2- ethylhexyl)phthalate (BEHP), and chrysene. Only 3 of the chemicals of concern (arsenic, BEHP, chloroform) could actually occur in onsite soil at concern high enough to cause a 1.0E-06 excess cancer incidence or a 1.0 hazard index for a given offsite exposure pathway. During the retrospective analysis, 20 other chemicals were also evaluated; only vinyl chloride and thallium could reach targeted offsite risk values.

232 (PNL-SA-23600) **TEMPEST: A computer code for three-dimensional analysis of transient fluid dynamics.** Fort, J.A. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015802. Source: OSTI; NTIS; INIS; GPO Dep.

TEMPEST (Transient Energy Momentum and Pressure Equations Solutions in Three dimensions) is a powerful tool for solving engineering problems in nuclear energy, waste processing, chemical processing, and environmental restoration because it analyzes and illustrates 3-D time-dependent computational fluid dynamics and heat transfer analysis. It is a family of codes with two primary versions, a N- Version (available to public) and a T-Version (not currently available to public). This handout discusses its capabilities, applications, numerical algorithms, development status, and availability and assistance.

233 (PNL-SA-25593) **Incorporating pollution into US Department of Energy design projects: Case study results and participant feedback.** Dorsey, J.A. (Pacific Northwest Lab., Richland, WA (United States)); Greitzer, F.L.; Raney, E.A. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950646-30: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95014183. Source: OSTI; NTIS; GPO Dep.

Pollution prevention seeks to eliminate the release of all pollutants (hazardous and non-hazardous) to all media (land, air, and water). Beyond eliminating pollution at the source, pollution prevention includes energy conservation, water conservation, and protection of natural resources. Therefore, pollution prevention addresses not only wastes exiting a process, but materials entering and being consumed by the process as well. Historically, pollution prevention activities within the US Department of Energy (DOE) have focused on existing process waste streams – the Pollution Prevention Opportunity Assessment (P2OA) being the central tool for identifying and implementing pollution prevention opportunities. However, it is estimated that 70% of a product's total lifecycle cost is fixed by design (i.e., before the product, process, or facility ever gets built). By moving pollution prevention upstream into design, new opportunities emerge for minimizing waste not only during operations, but during construction and dismantlement of a facility as well. This is significant because it is estimated that the environmental consequences from construction of a building are comparable to a decade of operating the building, and demolition creates even more waste than construction.

234 (PNL-SA-25713) **Development of an educational partnership for enhancement of a computer risk assessment model.** Topper, K. (Mesa State Coll., Grand Junction, CO (United States). Dept. of Physics and Environmental Sciences); Castleton, K.; Buck, J.; Droppo, J. Jr. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-155: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95014191. Source: OSTI; NTIS; INIS; GPO Dep.

The Multimedia Environmental Pollutant Assessment System (MEPAS) is a computer program which evaluates exposure pathways for chemical and radioactive releases according to their potential human health impacts. MEPAS simulates the exposure pathways through standard source-to-receptor transport principles using, a multimedia approach (air, groundwater, overland flow, soil, surface water) in conjunction with specific chemical exposure considerations. This model was originally developed by Pacific Northwest Laboratory (PNL) to prioritize environmental concerns at potentially contaminated US Department of Energy (DOE) sites. Currently MEPAS is being used to evaluate a range of environmental problems which are not restricted to DOE sites. A partnership was developed between PNL and Mesa State College during 1991. This partnership involves the use of undergraduate students, faculty, and PNL personnel to complete enhancements to MEPAS. This has led to major refinements to the original MEPAS shell for DOE in a very cost-effective manner. PNL was awarded a 1993 Federal Laboratory Consortium Award and Mesa State College was awarded an Environmental Restoration and Waste Management Distinguished Faculty Award from DOE in 1993 as a result of this collaboration. The college has benefited through the use of MEPAS within laboratories and through the applied experience gained by the students. Development of this partnership will be presented with the goal of allowing other DOE facilities to replicate this program. It is specifically recommended that DOE establish funded programs which support this type of a relationship on an ongoing basis. Additionally, specific enhancements to MEPAS will be presented through computer display of the program.

235 (PNL-SA-26080) **Development and implementation of an analytical quality assurance plan at the Hanford site.** Kuhl-Klinger, K.J. (Pacific Northwest Lab., Richland, WA (United States)); Taylor, C.D.; Kawabata, K.K. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 11p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-76RL01830. (CONF-950877–22: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96002716. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Analytical Services Quality Assurance Plan (HASQAP) provides a uniform standard for onsite and offsite laboratories performing analytical work in support of Hanford Site environmental cleanup initiatives. The Hanford Site is a nuclear site that originated during World War 11 and has a legacy of environmental clean up issues. In early 1993, the need for and feasibility of developing a quality assurance plan to direct all analytical activities performed to support environmental cleanup initiatives set forth in the Hanford Federal Facility Agreement and Consent Order were discussed. Several group discussions were held and from them came the HASQAP. This document will become the quality assurance guidance document in a Federal Facility Agreement and Consent Order. This paper presents the mechanics involved in developing a quality assurance plan for this scope of activity, including the approach taken to resolve the variability of quality control requirements driven by numerous regulations. It further describes the consensus building process and how the goal of uniting onsite and offsite laboratories as well as inorganic, organic, and radioanalytic disciplines under a common understanding of basic quality control concepts was achieved.

236 (PNL-SA–26402) **Overview of contamination from US and Russian nuclear complexes.** Bradley, D.J. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9506245–1: NATO meeting on nuclear submarine decommissioning and related problems, Moscow (Russian Federation), 19-22 Jun 1995). Order Number DE95016818. Source: OSTI; NTIS; INIS; GPO Dep.

This paper briefly compares the United States and Russian weapons complexes and provides a perspective on the releases of radioactivity to the environment in both countries. Fortunately, the technologies, data, models, and scientific experience that have been gained over the last 50 years are being shared between the US Department of Energy (DOE) and Ministry of Atomic Energy of the Russian Federation (MINATOM) which constitutes a new environmental partnership between the two countries.

237 (PNL-SA–26460) **Risk-based prioritization at Hanford Nuclear Site.** Hesser, W.A.; Mosely, M.T. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-951135–26: 1995 International mechanical engineering congress and exhibition, San Francisco, CA (United States), 12-17 Nov 1995). Order Number DE96004382. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the method used to incorporate risk-based decision making into the Hanford resource allocation process. This method, the Revised Priority Planning Grid, is used as a tool to calculate benefits and benefit-to-cost ratios for comparison of environmental cleanup activities. The tool is based on Hanford Site objectives. Benefits are determined by estimating the impact on those objectives resulting from funding specific environmental management activities. Impacts are also a function of the weights associated with the objectives. These weights in the Revised Priority Planning Grid reflect US Development of Energy management values, which were obtained through a formal value-elicitation process. With modification to the objectives and weights, the Revised Priority Planning Grid could be used in different situations. By factoring in environmental, safety, and health risk and assigning higher scores to those activities that provide the most benefit, the Revised Priority Planning Grid is a reproducible, scientific way of scoring competing activities or interests.

238 (PNNL–10969) **TWRS privatization bibliography.** Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008336. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this bibliography is to present a select set of documents that may be of interest to the Offeror, covering a variety of subject areas related to the TWRS Privatization Project. The organization of this bibliography is by subject area. Some of the documents overlap subject areas, and may be presented in more than one. Additionally, assignment of a document to one subject area does not necessarily preclude that document from containing information relevant to other subject areas not identified. The subject areas include, in order of presentation:. Waste Characterization; Pre-treatment; High-level Waste Immobilization; Low-level Waste Immobilization; Low-level Waste Melter Test Program; Performance Assessment; and General Safety.

239 (PNNL–10969-Rev.1) **TWRS privatization bibliography.** Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008174. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this bibliography is to present a select set of documents that may be of interest to the Offeror, covering a variety of subject areas related to the TWRS Privatization Project. This bibliography is not, nor is intended to be, exhaustive or complete. It was prepared with the intent of providing a sampling of representative documents potentially helpful to Offerors. The documents referenced herein have been identified as representative of those potentially helpful to Offerors. This list of documents does not represent the full extent of available and potentially helpful information, nor should it be taken as a representation of documents determined to be of greater importance than other documents not referenced herein. There are numerous documents available to the public that are NOT cited in this bibliography; the Offeror is encouraged to perform searches for alternate sources of information.

240 (PNNL–10969-Rev.2) **TWRS privatization bibliography. Revision 2.** Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011470. Source: OSTI; NTIS; GPO Dep.

The purpose of this bibliography is to present a select set of documents that may be of interest to the Offeror, covering a variety of subject areas related to the TWRS Privatization Project. This bibliography is not, nor is it intended to be, exhaustive or complete. It was prepared with the intent of providing a sampling of representative documents potentially helpful to Offerors. This bibliography is organized by subject area. The subjects covered are: waste characterization; pre-treatment; high-level waste immobilization; low-level waste immobilization; low-level waste melter test program; performance assessment; general; and safety.

241 (PNNL–11030) **TWEAT '95: User's documentation update.** Robertus, B.; Lambert, R. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008180. Source: OSTI; NTIS; INIS; GPO Dep.

This report is designed to be a supplement to TWEAT'94 (PVTD-C94-05.01K Rev.1). It is intended to describe the primary features of the Ternary Waste Envelope Assessment Tool software package that have been added in FY'95 and how to use them. It contains only minimal duplication of information found in TWEAT'94 even though all features of TWEAT'94 will still be available. Emphasis on this Update is the binary plotting capability and the OWL Import modifications. Like it's predecessors, this manual does not provide instructions for modifying the program code itself. The user of TWEAT'95 is expected to be familiar with the basic concepts and operation of the TWEAT software as discussed in TWEAT'94. Software and hardware requirements have not changed since TWEAT'94. TWEAT has now been tested using Macintosh System software versions 6.05 through 7.5.

242 (PNNL–11080) **Supplemental mathematical formulations, Atmospheric pathway: The Multimedia Environmental Pollutant Assessment System (MEPAS).** Droppo, J.G.; Buck, J.W. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008330. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

The Multimedia Environmental Pollutant Assessment System (MEPAS) is an integrated software implementation of physics-based fate and transport models for health and environmental risk assessments of both radioactive and hazardous pollutants. This atmospheric component report is one of a series of formulation reports that document the MEPAS mathematical models. MEPAS is a "multimedia" model; pollutant transport is modeled within, through, and between multiple media (air, soil, groundwater, and surface water). The estimated concentrations in the various media are used to compute exposures and impacts to the environment, to maximum individuals, and to populations.

243 (PNNL–11080-Rev.) **The Multimedia Environmental Pollutant Assessment System (MEPAS)®: Atmospheric pathway formulations. Revision.** Droppo, J.G.; Buck, J.W. Pacific Northwest National Lab., Richland, WA (United States). Mar 1996. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010944. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.

Report is unlimited; software package is copyrighted.

The Multimedia Environmental Pollutant Assessment System (MEPAS) is an integrated software implementation of physics-based fate and transport models for health and environmental risk assessments of both radioactive and hazardous pollutants. This atmospheric component report is one of a series of formulation reports that document the MEPAS mathematical models. MEPAS is a multimedia model; pollutant transport is modeled within, through, and between multiple media (air, soil, groundwater, and surface water). The estimated concentrations in the various media are used to compute exposures and impacts to the environment, to maximum individuals, and to populations. The MEPAS atmospheric component for the air media documented in this report includes models for emission from a source to the air, initial plume rise and dispersion, airborne pollutant transport and dispersion, and deposition to soils and crops. The material in this report is documentation for MEPAS Versions 3.0 and 3.1 and the MEPAS version used in the Remedial Action Assessment System (RAAS) Version 1.0.

244 (PNNL–11106) **CY 1995 radiation dose reconciliation report and resulting CY 1996 dose estimate for the 324 nuclear facility.** Landsman, S.D.; Thornhill, R.E.; Peterson, C.A. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010136. Source: OSTI; NTIS; INIS; GPO Dep.

In this report, the dose estimate for CY 1995 is reconciled by month wih actual doses received. Results of the reconciliation were used to revise estimates of worker dose for CY 1996. Resulting dose estimate for the facility is also included. Support for two major programs (B-Cell Cleanout and Surveillance and Maintenance) accounts for most of the exposure received by workers in the faility. Most of the expousre received by workers comes from work in the Radiochemical Engineering Complex airlock. In spite of schedule and work scope changes during CY 1995, dose estimates were close to actual exposures received. A number of ALARA measures were taken throughout the year; exposure reduction due to those was 20.6 Man-Rem, a 28% reduction from the CY 1995 estimate. Baseline estimates for various tasks in the facility were used to compile the CY 1996 dose estimate of 45.4 Man-Rem; facility goal for CY 1996 is to reduce worker dose by 20%, to 36.3 Man-Rem.

245 (SAND–93-0350) **Dynamic pulse buckling of cylindrical shells under axial impact: A comparison of 2D and 3D finite element calculations with experimental data.** Hoffman, E.L.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95014529. Source: OSTI; NTIS; INIS; GPO Dep.

A series of tests investigating dynamic pulse buckling of a cylindrical shell under axial impact is compared to several 2D and 3D finite element simulations of the event. The purpose of the work is to investigate the performance of various analysis codes and element types on a problem which is applicable to radioactive material transport packages, and ultimately to develop a benchmark problem to qualify finite element analysis codes for the transport package design industry. Four axial impact tests were performed on 4 in-diameter, 8 in-long, 304 L stainless steel cylinders with a 3/16 in wall thickness. The cylinders were struck by a 597 lb mass with an impact velocity ranging from 42.2 to 45.1 ft/sec. During the impact event, a buckle formed at each end of the cylinder, and one of the two buckles became unstable and collapsed. The instability occurred at the top of the cylinder in three tests and at the bottom in one test. Numerical simulations of the test were performed using the following codes and element types: PRONTO2D with axisymmetric four-node quadrilaterals; PRONTO3D with both four-node shells and eight-node hexahedrons; and ABAQUS/Explicit with axisymmetric two-node shells and four-node quadrilaterals, and 3D four-node shells and eight-node hexahedrons. All of the calculations are compared to the tests with respect to deformed shape and impact load history. As in the tests, the location of the instability is not consistent in all of the calculations. However, the calculations show good agreement with impact load measurements with the exception of an initial load spike which is proven to be the dynamic response of the load cell to the impact. Finally, the PRONIT02D calculation is compared to the tests with respect to strain and acceleration histories. Accelerometer data exhibited good qualitative agreement with the calculations. The strain comparisons show that measurements are very sensitive to gage placement.

246 (SAND–94-0932) **The effect of stratigraphic dip on brine inflow and gas migration at the Waste Isolation Pilot Plant.** Webb, S.W. (Sandia National Labs., Albuquerque, NM (United States)); Larson, K.W. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96006448. Source: OSTI; NTIS; INIS; GPO Dep.

The natural dip of the Salado Formation at the Waste Isolation Pilot Plant (WIPP), although regionally only about 111, has the potential to affect brine inflow and gas-migration distances due to buoyancy forces. Current models, including those in WIPP Performance Assessment calculations, assume a perfectly horizontal repository and stratigraphy. With the addition of buoyancy forces due to the dip, brine and gas flow patterns can be affected. Brine inflow may increase due to countercurrent flow, and gas may preferentially migrate up dip. This scoping study has used analytical and numerical modeling to evaluate the impact of the dip on brine inflow and gas-migration distances at the WIPP in one, two, and three dimensions. Sensitivities to interbed permeabilities, two-phase curves, gas-generation rates, and interbed fracturing were studied.

247 (SAND–94-1311) **Air intake shaft performance tests (Shaft 5): In situ data report (May 1988–July 1995). Waste Isolation Pilot Plant (WIPP) Thermal/Structural Interactions Program.** Munson, D.E. (Sandia National Labs., Albuquerque, NM (United States). Repository Isolation Systems Dept.); Hoag, D.L.; Ball, J.R.; Baird, G.T.; Jones, R.L. Sandia National Labs., Albuquerque, NM (United States). Jul 1995. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96006196. Source: OSTI; NTIS; INIS; GPO Dep.

Data are presented from the Air Intake Shaft Test, an in situ test fielded at the Waste Isolation Pilot Plant (WIPP). The construction of this shaft, well after the initial three access shafts, presented an unusual opportunity to obtain valuable detailed data on the mechanical response of a shaft for application to seal design. These data include selected fielding information, test configuration, instrumentation activities, and comprehensive results from a large number of gages. Construction of the test began in December 1987; gage data in this report cover the period from May 1988 through July 1995, with the bulk of the data obtained after obtaining access in November, 1989 and from the heavily instrumented period after remote gage installation between May, 1990, and October, 1991.

248 (SAND–94-1945) **ITEP: A survey of innovative environmental restoration technologies in the Netherlands and France.** Roberds, W.J. (Golder Associates, Inc., Redmond, WA (United States)); Voss, C.F.; Hitchcock, S.A. Sandia National Labs., Albuquerque, NM (United States); Golder Associates, Inc., Redmond, WA (United States). May 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95015057. Source: OSTI; NTIS; INIS; GPO Dep.

The International Technology Exchange Program (ITEP) of the Department of Energy's (DOE's) Office of Environmental Management (EM) is responsible for promoting the import of innovative technologies to better address EM's needs and the export of US services into foreign markets to enhance US competitiveness. Under this program, potentially innovative environmental restoration technologies, either commercially available or under development in the Netherlands and France, were identified, described, and evaluated. It was found that 12 innovative environmental restoration technologies, which are either commercially available or under development in the Netherlands and France, may have some benefit for the DOE EM program and should be considered for transfer to the United States.

249 (SAND–94-1946) **A survey of environmental needs and innovative technologies in Germany.** Voss, C.F. (Golder Associates, Inc., Redmond, WA (United States)); Roberds, W.J. Sandia National Labs., Albuquerque, NM (United States); Golder Associates, Inc., Redmond, WA (United States). May 1995. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95015058. Source: OSTI; NTIS; INIS; GPO Dep.

The International Technology Program (IT?), formerly the international Technology Exchange Program (ITEP), of the Department of Energy's (DOE's) Office of Environmental Restoration and Waste Management (EM) is responsible for promoting: (1) the import of innovative technologies to better address EM's needs; and (2) the export of US services into foreign markets to enhance US competitiveness. Under this program: (1) the environmental restoration market in Germany was evaluated, including the description of the general types of environmental problems, the environmental regulations, and specific selected contaminated sites; and (2) potentially innovative environmental restoration technologies, either commercially available or under development in Germany, were identified, described and evaluated. It was found that: (1) the environmental restoration market in Germany is very large, on the order of several billion US dollars per year, with a significant portion possibly available to US businesses; and (2) a large number (54) of innovative environmental restoration technologies, which are either commercially available or under development in Germany, may have some benefit to the DOE EM program and should be considered for transfer to the US.

250 (SAND–94-1949) **Estimating the hydrogen ion concentration in concentrated NaCl and Na_2SO_4 electrolytes.** Rai, D. (Pacific Northwest Lab., Richland, WA (United States)); Felmy, A.R.; Juracich, S.P.; Rao, F. Sandia National Labs., Albuquerque, NM (United States); Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95016459. Source: OSTI; NTIS; GPO Dep.

Combination glass electrodes were tested for determining H^+ concentrations in concentrated pure and mixed NaCl and Na_2SO_4 solutions, as well as natural brine systems. NaCl, Na_2SO_4, and mixtures of NaCl and Na_2SO_4 solutions were analyzed. Correction factors for estimating $pC_H{}^+$ (negative logarithm of H^+ concentration) were determined from measured/observed pH values. Required Gran-type titrations were done with HCl and/or NaOH. The titration method is described and a step-by-step procedure provided; it has been used previously for determining pC_H^+ values of synthetic chloride-dominated brines. Precautions are required to determine correction factors for electrolytes that react with H^+ or OH^- [sulfate brines for titration with acid; magnesium brines for titration with base because of precipitation of Mg(OH)2]. Correction factors A ($pC_H^+ = pH_{ob} + A$) from HCl titrations were similar to those from NaOH titrations where the concentration of free H^+ was calculated using a thermodynamic model. These values should be applicable to solns with a very large range in measured pH values (2 to 12). Because a large number of solns were titrated with HCl and the A values are similar for HCl and NaOH titrations, the A values for NaCl and Na2SO4 solns were fit as a function of molality to allow extrapolation. For NaCl solns 0 to 6.0 M, A can be obtained by multiplying the molality by 0.159. For Na2SO4 solns 0 to 2.0 M, the values of A can be obtained from ($0.221 - 0.549X + 0.201X^2$), where X is the molality of Na_2SO_4. Orion-Ross electrode evaluations indicated that the A values did not differ significantly for different electrodes. Results suggest that the data in this report can be used to estimate A values for different NaCl and Na_2SO_4 solns even for noncalibrated electrodes.

251 (SAND–95-0081C) **Estimates of fire environments in ship holds containing radioactive material packages.** Koski, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Cole, J.K.; Hohnstreiter, G.F.; Wix, S.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–18: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003643. Source: OSTI; NTIS; INIS; GPO Dep.

Fire environments that occur on cargo ships differ significantly from the fire environments found in land transport. Cargo ships typically carry a large amount of flammable fuel for propulsion and shipboard power, and may transport large quantities of flammable cargo. As a result, sea mode transport accident records contain instances of long lasting and intense fires. Since Irradiated Nuclear Fuel (INF) casks are not carried on tankers with large flammable cargoes, most of these dramatic, long burning fires are not relevant threats, and transport studies must concentrate on those fires that are most likely to occur. By regulation, INF casks must be separated from flammable cargoes by a fire-resistant, liquid-tight partition. This makes a fire in an adjacent ship hold the most likely fire threat. The large size of a cargo ship relative to any spent nuclear fuel casks on board, however, may permit a severe, long lasting fire to occur with little or no thermal impact on the casks. Although some flammable materials such as shipping boxes or container floors may exist in the same hold with the cask, the amount of fuel available may not provide a significant threat to the massive transport casks used for radioactive materials. This shipboard fire situation differs significantly from the regulatory conditions specified in 10 CFR 71 for a fully engulfing pool fire. To learn more about the differences, a series of simple thermal analyses has been completed to estimate cask behavior in likely marine and land thermal accident situations. While the calculations are based on several conservative assumptions, and are only preliminary, they illustrate that casks are likely to heat much more slowly in shipboard hold fires than in an open pool fire. The calculations also reinforce the basic regulatory concept that for radioactive materials, the shipping cask, not the ship, is the primary protection barrier to consider.

252 (SAND–95-0184C) **Impact limiter design for a lightweight tritium hydride vessel transport container.** Harding, D.C.; Longcope, D.B.; Neilsen, M.K. Sandia National Labs., Albuquerque, NM (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–10: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003645. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories (SNL) has designed an impact-limiting system for a small, lightweight radioactive material shipping container. The Westinghouse Savannah River Company (WSRC) is developing this Type B package for the shipment of tritium, replacing the outdated LP-50 shipping container. Regulatory accident resistance requirements for Type B packages, including this new tritium package, are specified in 10 CFR 71 (NRC 1983). The regulatory requirements include a 9-meter free drop onto an unyielding target, a 1-meter drop onto a mild steel punch, and a 30-minute 800° C fire test. Impact limiters are used to protect the package in the free-drop accident condition in any impact orientation without hindering the package's resistance to the thermal accident condition. The overall design of the new package is based on a modular concept using separate thermal shielding and impact mitigating components in an attempt to simplify the design, analysis, test, and certification process. Performance requirements for the tritium package's limiting system are based on preliminary estimates provided by WSRC. The current tritium hydride vessel (THV) to be transported has relatively delicate valving assemblies and should not experience acceleration levels greater than approximately 200 g's. A thermal overpack and outer stainless steel shell, to be designed by WSRC, will form the inner boundary of the impact-limiting system (see Figure 1). The mass of the package, including cargo, inner container, thermal overpack, and outer stainless steel shell (not including impact limiters) should be approximately 68 kg. Consistent with the modular design philosophy, the combined thermal overpack and containment system should be considered essentially rigid, with the impact limiters incurring all deformation.

253 (SAND–95-0185C) **Chemical compatibility screening results of plastic packaging to mixed waste simulants.** Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–3: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003070. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a chemical compatibility program for evaluating transportation packaging components for transporting mixed waste forms. We have performed the first phase of this experimental program to determine the effects of simulant mixed wastes on packaging materials. This effort involved the screening of 10 plastic materials in four liquid mixed waste simulants. The testing protocol involved exposing the respective materials to ~3 kGy of gamma radiation followed by 14 day exposures to the waste simulants of 60 C. The seal materials or rubbers were tested using VTR (vapor transport rate) measurements while the liner materials were tested using specific gravity as a metric. For these tests, a screening criteria of ~1 g/m^2/hr for VTR and a specific gravity change of 10% was used. It was concluded that while all seal materials passed exposure to the aqueous simulant mixed waste, EPDM and SBR had the lowest VTRs. In the chlorinated hydrocarbon simulant mixed waste, only VITON passed the screening tests. In both the simulant scintillation fluid mixed waste and the ketone mixture simulant mixed waste, none of the seal materials met the screening criteria. It is anticipated that those materials with the lowest VTRs will be evaluated in the comprehensive phase of the program. For specific gravity testing of liner materials the data showed that while all materials with the exception of polypropylene passed the screening criteria, Kel-F, HDPE, and XLPE were found to offer the greatest resistance to the combination of radiation and chemicals.

254 (SAND–95-0193C) **The development of a visualization tool for displaying analysis and test results.** Uncapher, W.L. (Sandia National Labs., Albuquerque, NM (United States). Transportation System Development Dept.); Ammerman, D.J.; Ludwigsen, J.S.; Knight, R.D.; Wix, S.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–61: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007665. Source: OSTI; NTIS; INIS; GPO Dep.

The evaluation and certification of packages for transportation of radioactive materials is performed by analysis, testing, or a combination of both. Within the last few years, many transport packages that were certified have used a combination of analysis and testing. The ability to combine and display both kinds of data with interactive graphical tools allows a faster and more complete understanding of the response of the package to these environments. Sandia National Laboratories has developed an initial version of a visualization tool that allows the comparison and display of test and of analytical data as part of a Department of Energy-sponsored program to support advanced analytical techniques and test methodologies. The capability of the tool extends to both mechanical (structural) and thermal data.

255 (SAND–95-0194C) **Integration of finite element analysis and numerical optimization techniques for RAM transport package design.** Harding, D.C.; Eldred, M.S.; Witkowski, W.R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–11: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003655. Source: OSTI; NTIS; INIS; GPO Dep.

Type B radioactive material transport packages must meet strict Nuclear Regulatory Commission (NRC) regulations specified in 10 CFR 71. Type B containers include impact limiters, radiation or thermal shielding layers, and one or more containment vessels. In the past, each component was typically designed separately based on its driving constraint and the expertise of the designer. The components were subsequently assembled and the design modified iteratively until all of the design criteria were met. This approach neglects the fact that components may serve secondary purposes as well as primary ones. For example, an impact limiter's primary purpose is to act as an energy absorber and protect the contents of the package, but can also act as a heat dissipater or insulator. Designing the component to maximize its performance with respect to both objectives can be accomplished using numerical optimization techniques.

256 (SAND–95-0201C) **Testing of the structural evaluation test unit.** Ammerman, D.J.; Bobbe, J.G. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–56: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007686. Source: OSTI; NTIS; INIS; GPO Dep.

In the evaluation of the safety of radioactive material transportation it is important to consider the response of Type B packages to environments more severe than that prescribed by the hypothetical accident sequence in Title 10 Part 71 of the Code of Federal Regulations (NRC 1995). The impact event in this sequence is a 9-meter drop onto an essentially unyielding target, resulting in an impact velocity of 13.4 m/s. The behavior of 9 packages when subjected to impacts more severe than this is not well known. It is the purpose of this program to evaluate the structural response of a test package to these environments. Several types of structural response are considered. Of primary importance is the behavior of the package containment boundary, including the bolted closure and 0-rings. Other areas of concern are loss of shielding capability due to lead slump and the deceleration loading of package contents, that may cause damage to them. This type of information is essential for conducting accurate risk assessments on the transportation of radioactive materials. Currently very conservative estimates of the loss of package protection are used in these assessments. This paper will summarize the results of a regulatory impact test and three extra-regulatory impact tests on a sample package.

257 (SAND–95-0203C) **Crush performance of redwood for developing design procedures for impact limiters.** Cramer, S.M. (Univ. of Wisconsin, Madison, WI (United States)); Hermanson, J.C.; McMurtry, W.M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–17: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003642. Source: OSTI; NTIS; INIS; GPO Dep.

Containers for the transportation of hazardous and radioactive materials incorporate redwood in impact limiters. Redwood is an excellent energy absorber, but only the most simplistic information exists on its crush properties. Tbe stress-strain interrelationship for any wood species subject to three-dimensional stresses is largely unknown for any all stress condition and wood behavior at both high strains and high strain-rates is known only in general terms. Both stress-strain and crush failure theories have been developed based only on uniaxial load tests. The anisotropy of wood adds an additional complexity to measuring wood response and developing suitable theories to describe it. A long history of wood utilization in the building industry has led to design procedures and property information related to simple uniaxial loadings that do not inflict damage to the wood. This lack of knowledge may be surprising for a material that has a long history of engineered use, but the result is difficulty in utilizing wood in more sophisticated designs such as impact limiters. This study provides a step toward filling the information gap on wood material response for high performance applications such as impact limiters.

258 (SAND–95-0204C) **Analytical determination of package response to severe impact.** Ludwigsen, J.S.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–50: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007683. Source: OSTI; NTIS; INIS; GPO Dep.

One important part of radioactive material transport risk assessments is amount of release from packages in accidents more severe than design basis accident (US NRC 10CFR71 1995). In order to remove some of the conservatism from current risk assessments, an effort is ongoing to qualify the finite element method for predicting cask performance by comparing analytical results to test measurements of the Structural Evaluation Test Unit (SETU) cask. Comparisons of deformed shapes, strains, and accelerations were made for impact velocities of 13.4, 20.1, and 26.8 m/s (30, 45, and 60 mph). The 13.4 m/s impact corresponds to the regulatory 9 m (30 ft) free fall, and the others correspond to impacts with 2.25 and 4 times the kinetic energy of the regulatory impact. One other analysis at an impact velocity of 38.0 m/s (85 mph) or 8 times regulatory impact kinetic energy was also done.

259 (SAND–95-0211C) **SeaRAM: an evaluation of the safety of RAM transport by sea.** McConnell, P. (Sandia National Labs., Livermore, CA (United States)); Sorenson, K.B.; Carter, M.H.; Keane, M.P.; Keith, V.F.; Heid, R.J. Sandia National Labs., Livermore, CA (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–47: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007422. Source: OSTI; NTIS; INIS; GPO Dep.

SeaRAM is a multi-year Department of Energy (DOE) project designed to validate the safety of shipping radioactive materials (RAM) by sea. The project has an ultimate goal of developing and demonstrating analytic tools for performing comprehensive analyses to evaluate the risks to humans and the environment due to sea transport of plutonium, vitrified high-level waste (VHLW), and spent fuel associated with reprocessing and research reactors. To achieve this end, evaluations of maritime databases and structural an thermal analyses of particular severe collision and fire accidents have been and will continue to be conducted. Program management for SeaRAM is based at the DOE's Office of Environmental Restoration. Technical activities for the project are being conducted at Sandia National Laboratories (SNL). Several private organizations are also involved in providing technical support, notably Engineering Computer Optecnomics, Inc. (ECO). The technical work performed for SeaRAM also supports DOE participation in an International Atomic Energy Agency (IAEA) Cooperative Research Program (CRP) entitled Accident Severity at Sea During Transport of Radioactive Material. This paper discusses activities performed during the first year of the project.

260 (SAND–95-0227C) **Development on inelastic analysis acceptance criteria for radioactive material transportation packages.** Ammerman, D.J.; Ludwigsen, J.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–55: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007685. Source: OSTI; NTIS; INIS; GPO Dep.

The response of radioactive material transportation packages to mechanical accident loadings can be more accurately characterized by non-linear dynamic analysis than by the "Equivalent dynamic" static elastic analysis typically used in the design of these packages. This more accurate characterization of the response can lead to improved package safety and design efficiency. For non-linear dynamic analysis to become the preferred method of package design analysis, an acceptance criterion must be established that achieves an equivalent level of safety as the currently used criterion defined in NRC Regulatory Guide 7.6 (NRC 1978). Sandia National Laboratories has been conducting a study of possible acceptance criteria to meet this requirement. In this paper non-linear dynamic analysis acceptance criteria based on stress, strain, and strain-energy-density will be discussed. An example package design will be compared for each of the design criteria, including the approach of NRC Regulatory Guide 7.6.

261 (SAND–95-0375C) **Impact limiter tests of four commonly used materials and establishment of an impact limiter data base.** McMurtry, W.M.; Hohnstreiter, G.F. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–19: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003644. Source: OSTI; NTIS; INIS; GPO Dep.

In designing a package for transporting hazardous or radioactive materials, there are a number of components whose design can lead to the success or failure to meet regulatory requirements for Type B packages. One of these components is the impact limiter. The primary purpose of the impact limiter is to protect the package and its contents from sudden deceleration. It can also act as a thermal barrier. The package is protected by the impact limiter's ability to act as an energy absorber. The crush strength of most impact limiting materials is determined by a standard quasistatic (QS) method. However it has been observed that there are a number of factors that affect crush strength. The material being used as an impact limiter may appear incompressible because of one or more of these factors. Factors that determine compressive strength of impact limiter materials are; the material density; the thickness of the impact limiter material. There must be adequate material to absorb the impact and not go into lockup, lockup up occurs when the free volume of the material is eliminated and the crush strength sharply increases; the angle of impact; and the loading rate and operating temperature. All of these are interactive and therefore difficult to model. It is the intent of tests discussed in this paper to determine the dependency of crush strength to loading rate and angle of impact to the basic grain direction of two different densities of four impact limiting materials.

262 (SAND–95-1758) **International technology catalogue: Foreign technologies to support the environmental restoration and waste management needs of the DOE complex.** Matalucci, R.V. (ed.) (Sandia National Labs., Albuquerque, NM (United States). International Programs Dept.); Jimenez, R.D.; Esparza-Baca, C. (ed.). Sandia National Labs., Albuquerque, NM (United States). Jul 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95017835. Source: OSTI; NTIS; INIS; GPO Dep.

This document represents a summary of 27 foreign-based environmental restoration and waste management technologies that have been screened and technically evaluated for application to the cleanup problems of the Department of Energy (DOE) nuclear weapons complex. The evaluation of these technologies was initiated in 1992 and completed in 1995 under the DOE's International Technology Coordination Program of the Office of Technology Development. A methodology was developed for conducting a country-by-country survey of several regions of the world where specific environmental technology capabilities and market potential were investigated. The countries that were selected from a rank-ordering process for the survey included: then West Germany, the Netherlands, France, Japan, Taiwan, the Czech and Slovak Republics, and the Former Soviet Union. The notably innovative foreign technologies included in this document were screened initially from a list of several hundred, and then evaluated based on criteria that examined for level of maturity, suitability to the DOE needs, and for potential cost effective application at a DOE site. Each of the selected foreign technologies that were evaluated in this effort for DOE application were subsequently matched with site-specific environmental problem units across the DOE complex using the Technology Needs Assessment CROSSWALK Report. For ease of tracking these technologies to site problem units, and to facilitate their input into the DOE EnviroTRADE Information System, they were categorized into the following three areas: (1) characterization, monitoring and sensors, (2) waste treatment and separations, and (3) waste containment. Technical data profiles regarding these technologies include title and description, performance information, development status, key regulatory considerations, intellectual property rights, institute and contact personnel, and references.

263 (SAND–95-2639C) **A successful effort to involve stakeholders in the selection of a site for a corrective action management unit.** Conway, R. (Sandia National Labs., Albuquerque, NM (United States)); Merkhofer, M.W.; Oms, E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–1: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96002780. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the effort to clean up hazardous waste sites, Sandia National Laboratories in New Mexico (SNL/NM) adopted a novel approach to involving stakeholders in a key decision associated with its Environmental Restoration (ER) Project. The decision was where to locate a Corrective Action Management Unit (CAMU), an area designed to consolidate, store, and treat wastes generated from cleanup activities. The decision-making approach was a variation of a technique known as multiattribute utility analysis (MUA). Although MUA has rarely been undertaken during normal Project activities, it proved to be a surprisingly effective means for involving stakeholders in the decision process, generating consensus over a selected site, and enhancing public trust and understanding of Project activities. Requirements and criteria for selecting CAMU sites are provided by the Environmental Protection Agency's (EPA's) CAMU Final Rule (EPA 1993). Recognizing the lack of experience with the Rule and the importance of community understanding and support, the ER Project sought an approach that would allow stakeholders to participate in the site-selection process.

264 (SAND–95-2696C) **Study of evacuation times based on general accident history.** Mills, G.S. (Sandia National Labs., Albuquerque, NM (United States)); Neuhauser, K.S.; Smith, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–5: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003099. Source: OSTI; NTIS; INIS; GPO Dep.

The RADTRAN 4 computer code, which calculates estimates of accident dose-risk corresponding to specified transportation scenarios, ascribes doses to potentially exposed members of the public. These persons are modeled as not being evacuated from the affected area for 24 hours following a release of radioactive material. Anecdotal evidence has suggested that this value may be unnecessarily conservative; consequently risk estimates are unnecessarily high. An initial survey of recent trucking accidents, reported in newspapers and other periodicals (1988 through 1994), that involved evacuation of the general population in the affected areas was undertaken to establish the actual time required for such evacuations. Accidents involving hazardous materials other than those which are radioactive (e.g., gasoline, insecticides, other chemicals) but also requiring evacuations of nearby residents were included in the survey. However, the resultant set of sufficiently documented trucking incidents yielded rather sparse data [1]. When the probability density distribution of the truck accident data was compared with that resulting from addition of four other (rail and fixed site) incidents, there was no statistically significant difference between them. Therefore, in order to improve the statistical significance of the data set, i.e., maximize the number of pertinent samples, a search for evacuations resulting from all types of accidents was performed. This resulted in many more references; a set of 48 incidents which could be adequately verified was compiled and merged with the original two data sets for a total of 66 evacuation accounts.

265 (SAND–95-2736C) **Verification of RADTRAN.** Kanipe, F.L.; Neuhauser, K.S. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951204–28: Fall meeting of the American Geophysical Union, San Francisco, CA (United States), 11-15 Dec 1995). Order Number DE96003663. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents details of the verification process of the RADTRAN computer code which was established for the calculation of risk estimates for radioactive materials transportation by highway, rail, air, and waterborne modes.

266 (SAND–95-2842C) **MPATHav: A software prototype for multiobjective routing in transportation risk assessment.** Ganter, J.H.; Smith, J.D. Sandia National

Labs., Albuquerque, NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–25: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003660. Source: OSTI; NTIS; INIS; GPO Dep.

Most routing problems depend on several important variables: transport distance, population exposure, accident rate, mandated roads (e.g., HM-164 regulations), and proximity to emergency response resources are typical. These variables may need to be minimized or maximized, and often are weighted. 'Objectives' to be satisfied by the analysis are thus created. The resulting problems can be approached by combining spatial analysis techniques from geographic information systems (GIS) with multiobjective analysis techniques from the field of operations research (OR); we call this hybrid multiobjective spatial analysis' (MOSA). MOSA can be used to discover, display, and compare a range of solutions that satisfy a set of objectives to varying degrees. For instance, a suite of solutions may include: one solution that provides short transport distances, but at a cost of high exposure; another solution that provides low exposure, but long distances; and a range of solutions between these two extremes.

267 (SAND–95-3018C) **Application of spreadsheets to standardize transportation radiological risk assessments.** McClure, J.D. (Sandia National Labs., Albuquerque, NM (United States)); Neuhauser, K.S.; Smith, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–22: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003639. Source: OSTI; NTIS; INIS; GPO Dep.

Because of the complexity, volume of data and calculations required, one preferred analytical tool to perform transportation risk assessments is the RADTRAN computer code. RADTRAN combines user-determined material, packaging, transportation, demographic and meteorological factors, with health physics data to calculate expected radiological consequences and accident risk from transporting radioactive materials by all commercial modes including truck, rail, ship, air and barge. The computer code consists of two major modules for each transport mode: the incident-free module, in which doses from normal transport are calculated; and the accident module, in which dose consequences and probabilities are evaluated to generate risk estimates. The purpose of this presentation is to describe the development of a standardized procedure to perform transportation radiological risk assessments employing conventional spreadsheet programs to automate generation of RADTRAN input files and post-processing analysis of the resulting output.

268 (SAND–95-3019C) **Determination of buildup factors in titanium and depleted uranium.** Jones, T.H. (Univ. of New Mexico, Albuquerque, NM (United States)); Busch, R.D.; Miller, J.A.; Seager, K.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–15: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003640. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 13% by volume of the US Department of Energy (DOE) current backlog of radioactive waste is characterized as high-level waste. Transportation of these wastes requires that the waste package have adequate shielding against gamma radiation. This project investigates the radiation shielding performance of titanium and depleted uranium, which have been proposed for use as gamma shielding materials in DOE transportation packages, by experimentally determining their buildup factors. Buildup factors are important in shield heating and radiation damage calculations. A point-isotropic-source type of buildup factor is the most useful for application in the point-kernal approach utilized in many simple shielding codes. The point-kernal method provides reasonable results for cases in which the shield is made of one solid material and the source can be approximated as one homogeneous material. The point-kernal method has been incorporated into a large number of shielding codes treating three-dimensional geometry using buildup factor data in some form. Buildup factors vary with a number of parameters such as the distance of penetration through the attenuating medium; the geometric configuration of the attenuating medium, source and detector position; the composition of the medium; the detector response function; and the energy and direction of emission of the source photons, ideally taken to be monoenergetic and isotropic.

269 (SAND–95-3020C) **Thermal effects of an advanced wire mesh packaging material.** Wix, S.D. (Gram, Inc., Albuquerque, NM (United States)); Pierce, J.D. Sandia National Labs., Albuquerque, NM (United States). [1995]. 1p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–29: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003768. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. PACKAGING/destructive testing; RADIOACTIVE WASTES/packaging; WASTE TRANSPORTATION; CONTAINERS; PACKAGING; WIRES; HEAT RESISTANT MATERIALS

270 (SAND–96-0203C) **A successful effort to involve stakeholders in a facility siting decision using LIPS with stakeholder involvement.** Merkhofer, L. (Applied Decision Analysis, Inc., Menlo Park, CA (United States)); Conway, R.; Anderson, B. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9511179–1: State and tribal forum on risk based decision making, St. Louis, MO (United States), 12-15 Nov 1995). Order Number DE96007682. Source: OSTI; NTIS; INIS; GPO Dep.

Local public opposition to federal bureaucratic decisions has resulted in public agencies rethinking the role of stakeholders in decision making. Efforts to include stakeholders directly in the decision-making process are on the increase. Unfortunately, many attempts to involve members of the public in decisions involving complex technical issues have failed. A key problem has been defining a meaningful role for the public in the process of arriving at a technical decision. This paper describes a successful effort by Sandia National Laboratories (SNL) in New Mexico to involve stakeholders in an important technical decision associated with its Environmental Restoration (ER) Project. The decision was where to locate a Corrective Action Management Unit

(CAMU), a facility intended to consolidate and store wastes generated from the cleanup of hazardous waste sites. A formal priority setting process known as the Laboratory Integration Prioritization System (LIPS) was adapted to provide an approach for involving the public. Although rarely applied to stakeholder participation, the LIPS process proved surprisingly effective. It produced a consensus over a selected site and enhanced public trust and understanding of Project activities.

271 (SAND–96-0209C) **A status report on the development and certification of the Beneficial Uses Shipping System (BUSS) cask.** Yoshimura, H.R.; Bronowski, D.R. Sandia National Labs., Albuquerque, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–46: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007663. Source: OSTI; NTIS; INIS; GPO Dep.

In the early 1980s, the US Department of Energy (DOE) implemented a program to encourage beneficial uses of nuclear byproduct materials, such as cesium-137 and strontium-90, created during the production of defense materials. Potential uses of the cesium-137 (^{137}CS) isotope included sterilizing medical products, maintaining the quality of certain food products, and disinfecting municipal sewage sludge. Strontium-90 (^{90}Sr) is a good heat source and has been used in thermoelectric generators and other products that require a constant supply of heat. During that same period, a proposed facility in Albuquerque, New Mexico, was designed to use cesium-137 to sterilize sewage sludge. To support the sewage sludge treatment facility, Sandia National Laboratories was funded by the DOE to develop a Nuclear Regulatory Commission (NRC)-certified Type B shipping container to transport cesium chloride (CsCl) or strontium fluoride (SrF_2) capsules produced by the Hanford Waste Encapsulation and Storage Facility (WESF) in the State of Washington. The primary purpose of the Beneficial Uses Shipping System (BUSS) cask is to provide shielding and confinement, as well as impact, puncture, and thermal protection for certified, special form contents during transport under normal and hypothetical accident conditions. The BUSS cask was designed to meet dimensional and weight constraints of the WESF and user facilities. Attaining as-low-as-reasonably-achievable (ALARA) radiation exposures in the design and operation of the transport system was a major design goal. Another goal was to obtain regulatory approval of the design by preparing a safety analysis report for packaging (SARP) (Yoshimura et al. 1993).

272 (SAND–96-0258C) **An assessment of simplified methods to determine damage from ship-to-ship collisions.** Parks, M.B.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–62: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007667. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories (SNL) is studying the safety of shipping, radioactive materials (RAM) by sea, the SeaRAM project (McConnell, et al. 1995), which is sponsored by the US Department of Energy (DOE). The project is concerned with the potential effects of ship collisions and fires on onboard RAM packages. Existing methodologies are being assessed to determine their adequacy to predict the effect of ship collisions and fires on RAM packages and to estimate whether or not a given accident might lead to a release of radioactivity. The eventual goal is to develop a set of validated methods, which have been checked by comparison with test data and/or detailed finite element analyses, for predicting the consequences of ship collisions and fires. These methods could then be used to provide input for overall risk assessments of RAM sea transport. The emphasis of this paper is on methods for predicting- effects of ship collisions.

273 (SAND–96-0282C) **Analysis of a ship-to-ship collision.** Porter, V.L.; Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–63: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007668. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories is involved in a safety assessment for the shipment of radioactive material by sea. One part of this study is investigation of the consequences of ship-to-ship collisions. This paper describes two sets of finite element analyses performed to assess the structural response of a small freighter and the loading imparted to radioactive material (RAM) packages during several postulated collision scenarios with another ship. The first series of analyses was performed to evaluate the amount of penetration of the freighter hull by a striking ship of various masses and initial velocities. Although these analyses included a representation of a single RAM package, the package was not impacted during the collision so forces on the package could not be computed. Therefore, a second series of analyses incorporating a representation of a row of seven packages was performed to ensure direct package impact by the striking ship. Average forces on a package were evaluated for several initial velocities and masses of the striking ship. In addition to. providing insight to ship and package response during a few postulated ship collisions scenarios, these analyses will be used to benchmark simpler ship collision models used in probabilistic risk assessment analyses.

274 (SAND–96-0323C) **Transportation risks associated with moving special nuclear material from RFETS to Lowry AFB, Denver.** Weiner, R.F. Sandia National Labs., Albuquerque, NM (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–2: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96005900. Source: OSTI; NTIS; INIS; GPO Dep.

Among the alternatives considered for the short-term disposition of special nuclear material now stored at the Rocky Flats Environmental Technology Site (RFETS)was transportation of the material offsite and disposition in an unused missile silo. Such silos may be available at the Lowry Air Force Base on the east side of Denver. Therefore, the risks of transporting the material under consideration were analyzed. The risks were analyzed using RADTRAN 4.0.18 (Neuhauser and Kanipe, 1992). The 40-km route from RFETS to Lowry maximized the use of limited-access divided highways (26 of the 40 km): the routes from RFETS to Denver and through Denver were on limited-access freeway, while the route from Denver to Lowry AFB was on secondary roads and is modeled using the RADTRAN "suburban" designation. Population densities were given in the HIGHWAY routing code available on TRANSNET, and used 1990 census figures. The source term was that given in an available file developed for RADTRAN by Sandia National Laboratories, and the shipment modeled contained 203 Curies of Pu-239 oxide and 47.9 Curies Pu-240 oxide. Radiation exposure at 1 meter from the container surface was 1.5 mrem/hr (transport index = 1.5). RADTRAN 4.0 and HIGHWAY are validated and verified codes; TRANSNET is the user interface.

275 (SAND–96-0341C) **Classification of poison inhalation hazard materials into severity groups.** Griego, N.R.; Weiner, R.F. Sandia National Labs., Albuquerque, NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–48: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007423. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 1.5 billion tons of hazardous materials (hazmat) are transported in the US annually, and most reach their destinations safely. However, there are infrequent transportation accidents in which hazmat is released from its packaging. These accidental releases can potentially affect the health of the exposed population and damage the surrounding environment. Although these events are rare, they cause genuine public concern. Therefore, the US Department of Transportation Research & Special Programs Administration (DOT- RSPA) has sponsored a project to evaluate the protection provided by the current bulk (defined as larger than 118 gallons) packagings used to transport materials that have been classified as Poison Inhalation Hazards (PIH) and recommend performance standards for these PIH packagings. This project was limited to evaluating bulk packagings larger than 2000 gallons. This project involved classifying the PIH into severity categories so that only one set of packaging performance criteria would be needed for each severity category rather than a separate set of performance criteria for each individual PIH. By grouping the PIH into Hazard Zones, Packaging Groups and performance standards for these Hazard Zones can be defined. Each Hazard Zone can correspond to a Packaging Group or, as in 49CFR173 for non-bulk packagings, one Packaging Group may cover more than one Hazard Zone. If the packaging groups are chosen to correspond to the classification categories presented in this report, then the maximum allowable leak rates used to define these categories could be used as the maximum allowable leak rates for the performance oriented packaging standards. The results discussed in this report are intended to provide quantitative guidance for the appropriate authorities to use in making these decisions.

276 (SAND–96-0370C) **Geospatial analyses and system architectures for the next generation of radioactive materials risk assessment and routing.** Ganter, J.H. Sandia National Labs., Albuquerque, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–57: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007427. Source: OSTI; NTIS; INIS; GPO Dep.

This paper suggests that inexorable changes in the society are presenting both challenges and a rich selection of technologies for responding to these challenges. The citizen is more demanding of environmental and personal protection, and of information. Simultaneously, the commercial and government information technologies markets are providing new technologies like commercial off-the-shelf (COTS) software, common datasets, "open" GIS, recordable CD-ROM, and the World Wide Web. Thus one has the raw ingredients for creating new techniques and tools for spatial analysis, and these tools can support participative study and decision-making. By carrying out a strategy of thorough and demonstrably correct science, design, and development, can move forward into a new generation of participative risk assessment and routing for radioactive and hazardous materials.

277 (SAND–96-0714C) **Investigation of RADTRAN Stop Model input parameters for truck stops.** Griego, N.R.; Smith, J.D.; Neuhauser, K.S. Sandia National Labs., Albuquerque, NM (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–44: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006980. Source: OSTI; NTIS; INIS; GPO Dep.

RADTRAN is a computer code for estimating the risks and consequences as transport of radioactive materials (RAM). RADTRAN was developed and is maintained by Sandia National Laboratories for the US Department of Energy (DOE). For incident-free transportation, the dose to persons exposed while the shipment is stopped is frequently a major percentage of the overall dose. This dose is referred to as Stop Dose and is calculated by the Stop Model. Because stop dose is a significant portion of the overall dose associated with RAM transport, the values used as input for the Stop Model are important. Therefore, an investigation of typical values for RADTRAN Stop Parameters for truck stops was performed. The resulting data from these investigations were analyzed to provide mean values, standard deviations, and histograms. Hence, the mean values can be used when an analyst does not have a basis for selecting other input values for the Stop Model. In addition, the histograms and their characteristics can be used to guide statistical sampling techniques to measure sensitivity of the RADTRAN calculated Stop Dose to the uncertainties in the stop model input parameters. This paper discusses the details and presents the results of the investigation of stop model input parameters at truck stops.

278 (SAND–96-0715C) **Expected residence time model.** Smith, J.D.; Neuhauser, K.S.; Kanipe, F.L. Sandia National Labs., Albuquerque, NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–43: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006979. Source: OSTI; NTIS; INIS; GPO Dep.

The Transportation Technology Department of Sandia National Laboratories develops analytical and computational tools for the US Department of Energy to assess the radiological consequences and risks from the transportation of radioactive materials by all modes. When large quantities of materials are to be transported movements may occur over an extended period of time in what is collectively referred as a "shipping campaign". Since the routes over which the shipments occur often remain the same, cumulative exposure to individuals inhabiting the population zones adjacent to the transport links must be estimated. However, individuals do not remain in the same residences throughout their lifetimes and, in fact, move quite often. To appropriately allocate exposures among populations over extended periods of time, perhaps years, requires a model that accounts for three population categories; (1) the original populations residing in the areas adjacent to the transport links, (2) individuals moving out and (3) individuals moving into residences in the designated areas. The model described here accounts for these conditions and will be incorporated as a user option in the RADTRAN computer code for transportation consequence and risk analysis (Reference 1). RADTRAN is a computer code for estimating the consequences and risks associated with the transport of radioactive materials.

279 (SAND–96-0850C) **Multiattribute utility analysis as a framework for public participation siting a hazardous waste facility.** Merkhofer, M.W. (Applied Decision Analysis, Inc., Menlo Park, CA (United States)); Conway, R.; Anderson, R.G. Sandia National Labs., Albuquerque, NM (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9605147–1: 1996 prioritization methodology workshop, Oakland, CA (United States), 14-15 May 1996). Order Number DE96008867. Source: OSTI; NTIS; INIS; GPO Dep.

How can the public play a role in decisions involving complicated scientific arguments? This paper describes a public participation exercise in which stakeholders used multiattribute utility analysis to select a site for a hazardous waste facility. Key to success was the ability to separate and address the two types of judgements inherent in environmental decisions: technical judgements on the likely consequences of alternative choices and value judgements on the importance or seriousness of those consequences. This enabled technical specialists to communicate the essential technical considerations and allowed stakeholders to establish the value judgements for the decision. Although rarely used in public participation, the multiattribute utility approach appears to provide a useful framework for the collaborative resolution of many complex environmental decision problems.

280 (SAND–96-1922C) **Use of inelastic analysis to determine the response of packages to puncture accidents.** Ammerman, D.J.; Ludwigsen, J.S. Sandia National Labs., Albuquerque, NM (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960706–29: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96013238. Source: OSTI; NTIS; INIS; GPO Dep.

The accurate analytical determination of the response of radioactive material transportation packages to the hypothetical puncture accident requires inelastic analysis techniques. Use of this improved analysis method recudes the reliance on empirical and approximate methods to determine the safety for puncture accidents. This paper will discuss how inelastic analysis techniques can be used to determine the stresses, strains and deformations resulting from puncture accidents for thin skin materials with different backing materials. A method will be discussed to assure safety for all of these types of packages.

281 (WHC-EP–0850-1) **Hanford Facility resource conservation and recovery act permit general inspection plan.** Beagles, D.B. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006831. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Facility Resource Conservation and Recovery Act Permit, General Inspection Requirements, includes a requirement that general facility inspections be conducted of the 100, 200 East, 200 West, 300, 400, and 1100 Areas and the banks of the Columbia River. This inspection plan describes the activities that shall be conducted for a general inspection of the Hanford Facility.

282 (WHC-EP–0853-Vol.2) **DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan. Volume 2.** McCormack, R.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 43p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017152. Source: OSTI; NTIS; GPO Dep.

The Hanford Site Integrated Stabilization Management Plan (SISMP) is being developed in support of the US Department of Energy's (DOE) Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 Integrated Program Plan (IPP). Volume 1 of the SISMP identifies the technical scope and costs associated with Hanford Site plans to resolve concerns identified in DNFSB Recommendation 94-1. Volume 2 of the SISMP provides the Resource Loaded Integrated Schedules for Spent Nuclear Fuel Project and Plutonium Finishing Plant activities identified in Volume 1 of the SISMP. Appendix A provides the schedules and progress curves related to spent nuclear fuel management. Appendix B provides the schedules and progress curves related to plutoniumbearing material management. Appendix C provides programmatic logic diagrams that were referenced in Volume 1 of the SISMP.

283 (WHC-EP–0857) **Statement of work for analytical services provided to Westinghouse Hanford Company by the Pacific Northwest Laboratory Analytical Chemistry Laboratory.** Perry, J.K. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012822. Source: OSTI; NTIS; INIS; GPO Dep.

This statement of work establishes the laboratory analytical criteria and requirements for the fiscal year 1995 radioactive airborne emissions measurement program for the Hanford Site.

284 (WHC-EP–0889) **Hanford Isotope Project strategic business analysis Cesium-137 (Cs-137).** Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006823. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this business analysis is to address the beneficial reuse of Cesium 137 (Cs-137) in order to utilize a valuable national asset and possibly save millions of tax dollars. Food irradiation is the front runner application along with other uses. This business analysis supports the objectives of the Department of Energy National Isotope Strategy distributed in August 1994 which describes the DOE plans for the production and distribution of isotope products and services. As part of the Department's mission as stated in that document. "The Department of Energy will also continue to produce and distribute other radioisotopes and enriched stable isotopes for medical diagnostics and therapeutics, industrial, agricultural, and other useful applications on a businesslike basis. This is consistent with the goals and objectives of the National Performance Review. The Department will endeavor to look at opportunities for private sector to co-fund or invest in new ventures. Also, the Department will seek to divest from ventures that can more profitably or reliably be operated by the private sector."

285 (WHC-EP-0890) **Hanford isotope project strategic business analysis yttrium-90 (Y-90).** Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006824. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this analysis is to address the short-term direction for the Hanford yttrium-90 (Y-90) project. Hanford is the sole DOE producer of Y-90, and is the largest repository for its source in this country. The production of Y-90 is part of the DOE Isotope Production and Distribution (IP and D) mission. The Y-90 is "milked" from strontium-90 (Sr-90), a byproduct of the previous Hanford missions. The use of Sr-90 to produce Y-90 could help reduce the amount of waste material processed and the related costs incurred by the clean-up mission, while providing medical and economic benefits. The cost of producing Y-90 is being subsidized by DOE-IP and D due to its use for research, and resultant low production level. It is possible that the sales of Y-90 could produce full cost recovery within two to three years, at two curies per week. Preliminary projections place the demand at between 20,000 and 50,000 curies per year within the next ten years, assuming FDA approval of one or more of the current therapies now in clinical trials. This level of production would incentivize private firms to commercialize the operation, and allow the government to recover some of its sunk costs. There are a number of potential barriers to the success of the Y-90 project, outside the control of the Hanford Site. The key issues include: efficacy, Food and Drug Administration (FDA) approval and medical community acceptance. There are at least three other sources for Y-90 available to the US users, but they appear to have limited resources to produce the isotope. Several companies have communicated interest in entering into agreements with Hanford for the processing and distribution of Y-90, including some of the major pharmaceutical firms in this country.

286 (WHC-SA-2788) **NRF TRIGA packaging.** Clements, M.D. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203-37: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005196. Source: OSTI; NTIS; INIS; GPO Dep.

Training Reactor Isotopes, General Atomics (TRIGA®) Reactors are in use at four US Department of Energy (DOE) complex facilities and at least 23 university, commercial, or government facilities. The development of the Neutron Radiography Facility (NRF) TRIGA packaging system began in October 1993. The Hanford Site NRF is being shut down and requires an operationally user-friendly transportation and storage packaging system for removal of the TRIGA fuel elements. The NRF TRIGA packaging system is designed to remotely remove the fuel from the reactor and transport the fuel to interim storage (up to 50 years) on the Hanford Site. The packaging system consists of a cask and an overpack. The overpack is used only for transport and is not necessary for storage. Based upon the cask's small size and light weight, small TRIGA reactors will find it versatile for numerous refueling and fuel storage needs. The NRF TRIGA packaging design also provides the basis for developing a certifiable and economical packaging system for other TRIGA reactor facilities. The small size of the NRF TRIGA cask also accommodates placing the cask into a larger certified packaging for offsite transport. The Westinghouse Hanford Company NRF TRIGA packaging, as described herein can serve other DOE sites for their onsite use, and the design can be adapted to serve university reactor facilities, handling a variety of fuel payloads.

287 (WHC-SA-2796) **Type A radioactive liquid sample packaging family.** Edwards, W.S. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203-36: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005195. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company (WHC) has developed two packagings that can be used to ship Type A quantities of radioactive liquids. WHC designed these packagings to take advantage of commercially available items where feasible to reduce the overall packaging cost. The Hedgehog packaging can ship up to one liter of Type A radioactive liquid with no shielding and 15 cm of distance between the liquid and the package exterior, or 30 ml of liquid with 3.8 cm of stainless steel shielding and 19 cm of distance between the liquid and the package exterior. The One Liter Shipper can ship up to one liter of Type A radioactive liquid that does not require shielding.

288 (WHC-SA-2831) **Project planning at the Hanford Site for International Atomic Energy Agency (IAEA) safeguards of excess fissile material.** Smith, B.W. (Pacific Northwest Lab., Richland, WA (United States)); McRae, L.P.; Walker, A.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950787-59: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE95015737. Source: OSTI; NTIS; INIS; GPO Dep.

In his September 1993 address to the United Nations General Assembly, President Clinton proposed several initiatives to promote nuclear nonproliferation. One element is of these initiatives was that the United States offered to place excess fissile material under International Atomic Energy Agency @A) safeguards. Three Department of Energy (DOE) facilities were identified as part of a phased approach for initial implementation. This paper describes the planning process used to provide information to assist the DOE in making decisions for the initial offer, outlines tasks to be performed, and develops a budget request. The process consisted of: (1) Characterizing the Hanford Site from the perspective of IAEA safeguards; (2) identify key issues to be resolved; (3) developing budget estimates and schedules; (4) interfacing with other DOE components and the IAEA to clarify expected activities; and (5) initiating additional data collection and preparatory activities to reduce planning uncertainties.

289 (WHC-SA–2835) **Facility preparations for the initial International Atomic Energy Agency Inpsection of Hanford Site excess material.** Johnson, W.C. (USDOE Richland Operations Office, WA (United States)); Scott, D.D.; Bartlett, W.D.; Delegard, C.H.; McRae, L.P.; Six, D.E.; Amacker, O.P. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950923–19: 5. international conference on facility-safeguards interface, Jackson Hole, WY (United States), 24-30 Sep 1995). Order Number DE96002796. Source: OSTI; NTIS; GPO Dep.

In September 1993 President Clinton offered to place excess US nuclear materials under IAEA safeguards. In January 1994, the Hanford Site was identified as the second site in the US to be prepared for placement on the eligibility list for LAEA safeguards selection. Planning and preparation started at Hanford in February 1994. The PFP mission is to provide safe storage of Category 1 and 2 special nuclear material (SNM) and laboratory support to the Hanford Site. The mission includes the stabilizing and packaging of SNM for temporary storage sufficient to support the deactivation and cleanup function of the facility. The storage of Category 1 and 2 SNM at this facility indirectly supports national security interests, and safe storage is accomplished in a manner that ensures the health and safety of the public and employees are not compromised. The PFP is located in the approximate center of the Hanford Site inside the 200 West Area. The PFP is within a designated protected area (PA) and is located approximately 10.5 km from the Columbia River and 34 km northwest of the Richland city limits. The, Hanford Site is located in Southeastern Washington and has been associated with plutonium production since the mid 1940s. Excess plutonium oxide has been placed under IAEA safeguards in a phased approach at the PFP's Plutonium Storage Vault. This paper is an overview and summary of the many tasks required to meet IAEA safeguards requirements.

290 (WHC-SA–2855) **Studies of the chemistry of transuranium elements and technetium at the Institute of Physical Chemistry, Russian Academy of Sciences, supported by the US Department of Energy.** Peretrukhin, V.F. (Russian Academy of Sciences, Moscow (Russian Federation). Inst. of Physical Chemistry); Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950917–10: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95011570. Source: OSTI; NTIS; INIS; GPO Dep.

Studies at Hanford in the 1980s revealed the potential for actinides to form stable soluble complexes in alkaline media, simulating radioactive tank waste. Pu(IV) hydrous oxide and Pu(VI) solubility increased with hydroxide concentration, ionic strength, and aluminate/carbonate concentrations. Subsequent contacts between US and Russian researchers in 1993 led to a technical literature review of the chemistry of TRU and Tc in alkaline media; this review addresses oxidation states, solubility, speciation, redox reactions, electrochemistry, radiation chemistry, and separations in alkaline media. As an outgrowth, a program of fundamental and applied chemistry studies of TRU and Tc is being conducted at IPC/RAS with US DOE support: solubility, redox reagents, coprecipitation, and radiation chemistry. This overview provides information on the Hanford Site tank waste system, US DOE technological needs, and IPC/RAS developments.

291 (WHC-SA–2885) **Assessment for potential radionuclide emissions from stacks and diffuse and fugitive sources on the Hanford Site.** Davis, W.E. (Westinghouse Hanford Co., Richland, WA (United States)); Schmidt, J.W.; Gleckler, B.P.; Rhoads, K. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9507119–1: Summer national meeting of the American Institute of Chemical Engineers, Boston, MA (United States), 30 Jul - 2 Aug 1995). Order Number DE95016338. Source: OSTI; NTIS; INIS; GPO Dep.

By using the six EPA-approved methods, instead of only the original back calculation method for assessing the 84 WHC registered stacks, the number of stacks requiring continuous monitoring was reduced from 32 to 19 stacks. The intercomparison between results showed that no correlation existed between back calculations and release fractions. Also the NDA, upstream air samples, and powder release fraction method results were at least three orders of magnitude lower then the back calculations results. The most surprising results of the assessment came from NDA. NDA was found to be an easy method for assessing potential emissions. For the nine stacks assessed by NDA, all nine of the stacks would have required continuous monitoring when assessed by back calculations. However, when NDA was applied all stacks had potential emissions that would cause an EDE below the $>$ 0.1 mrem/y standard. Apparent DFs for the HEPA filter systems were calculated for eight nondesignated stacks with emissions above the detection limit. These apparent DFs ranged from 0.5 to 250. The EDE dose to the MEI was calculated to be 0.028 mrem/y for diffuse and fugitive emissions from the Hanford Sited. This is well below the $>$ 0.1 mrem/y standard.

292 (WHC-SA–2890) **Comparison of the N Reactor and Ignalina Unit No. 2 Level 1 Probabilistic Safety Assessments.** Coles, G.A.; McKay, S.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950914–2: American Nuclear Society international topical conference on the safety of operating reactors, Seattle, WA (United States), 17-23 Sep 1995). Order Number DE95015811. Source: OSTI; NTIS; INIS; GPO Dep.

A multilateral team recently completed a full-scope Level 1 Probabilistic Safety Assessment (PSA) on the Ignalina Unit No. 2 reactor plant in Lithuania. This allows comparison of results to those of the PSA for the U.S. Department of Energy's (DOE) N Reactor. The N Reactor, although unique as a Western design, has similarities to Eastern European and Soviet graphite block reactors.

293 (WHC-SA–2931-FP) **Information/records management-defensible budgets for the 21st century.** DiLiberto, A.J.; Whittet, L.A. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950876–2: 19. annual symposium of the Nuclear Information Records Management Association, Washington, DC (United States), 27-30 Aug 1995). Order Number DE96001103. Source: OSTI; NTIS; GPO Dep.

This paper provides to the Nuclear Information and Records Management Association (NIRMA) members the skills, knowledge, and information needed to develop performance-based cost estimating. It includes a detailed basis of estimates to represent a work breakdown structure that is technically complete, fully documented, defensible to various external reviews, and validatable.

294 (WHC-SA-2935) **Hanford site Computer Automated Mapping Information System (CAMIS).** Rush, S.F. (ICF Kaiser Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9509349-1: Geographic technology in government, Reston, VA (United States), 6 Sep 1995). Order Number DE96009103. Source: OSTI; NTIS; INIS; GPO Dep.

The Computer Automated Mapping Information System (CAMIS) provides sitewide, networked access to CAD based geographically referenced data. CAMIS allows multiple organizations to maintain and share their data. Information collected and managed according to site-wide standards, enables each organization to focus their limited resources on data issues tied to their own discipline without having to collect or manage reference data outside their respective domains. Sharing information also minimizes redundant data and helps improve the overall quality of the sites' data resources.

295 (WHC-SA-2959) **Interpretation of large-strain geophysical crosshole tests.** Drnevich, V.P. (School of Civil Engineering, West Lafayette, IN (United States)); Salgado, R.; Ashmawy, A.; Grant, W.P.; Vallenas, P. Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Oct 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9511128-14: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96005192. Source: OSTI; NTIS; INIS; GPO Dep.

At sites in earthquake-prone areas, the nonlinear dynamic stress-strain behavior of soil with depth is essential for earthquake response analyses. A seismic crosshole test has been developed where large dynamic forces are applied in a borehole. These forces generate shear strains in the surrounding soil that are well into the nonlinear range. The shear strain amplitudes decrease with distance from the source. Velocity sensors located in three additional holes at various distances from the source hole measure the particle velocity and the travel time of the shear wave from the source. This paper provides an improved, systematic interpretation scheme for the data from these large-strain geophysical crosshole tests. Use is made of both the measured velocities at each sensor and the travel times. The measured velocity at each sensor location is shown to be a good measure of the soil particle velocity at that location. Travel times to specific features on the velocity time history, such as first crossover, are used to generate travel time curves for the waves which are nonlinear. At some distance the amplitudes reduce to where the stress-strain behavior is essentially linear and independent of strain amplitude. This fact is used together with the measurements at the three sensor locations in a rational approach for fitting curves of shear wave velocity versus distance from the source hole that allow the determination of the shear wave velocity and the shear strain amplitude at each of the sensor locations as well as the shear wave velocity associated with small-strain (linear) behavior. The method is automated using off-the-shelf PC-based software. The method is applied to large-strain crosshole tests performed as part of the studies for the design and construction of the proposed Multi-Function Waste Tank Facility planned for Hanford Site.

296 (WHC-SA-2964) **Comparison of RESRAD with hand calculations.** Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951209-4: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96002797. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a continuation of an earlier comparison done with two other computer programs, GENII and PATHRAE. The dose calculations by the two programs were compared with each other and with hand calculations. These band calculations have now been compared with RESRAD Version 5.41 to examine the use of standard models and parameters in this computer program. The hand calculations disclosed a significant computational error in RESRAD. The Pu-241 ingestion doses are five orders of magnitude too small. In addition, the external doses from some nuclides differ greatly from expected values. Both of these deficiencies have been corrected in later versions of RESRAD.

297 (WHC-SA-2975) **An overview of the Radioisotope Thermoelectric Generator Transporation System Program.** McCoy, J.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960109-10: STAIF 96: space technology and applications international forum, Albuquerque, NM (United States), 7-11 Jan 1996). Order Number DE96003113. Source: OSTI; NTIS; INIS; GPO Dep.

Radioisotope Thermoelectric Generators (RTG) convert the heat generated by radioactive decay to electricity using thermocouples. RTGs have a long operating life, are reasonably lightweight, and require little or no maintenance once assembled and tested. These factors make RTGs particularly attractive for use in spacecraft However, because RTGs contain significant quantities of radioactive materials, normally plutonium-238 and its decay products, they must be transported in packages built in accordance with Title 10, Code of Federal Regulations, Part 71. The US Department of Energy assigned the Radioisotope Thermoelectric Generator Transportation System (RTGTS) Program to Westinghouse Hanford Company in 1988 to develop a system meeting the regulatory requirements. The program objective was to develop a transportation system that would fully comply with 10 CFR 71 while protecting RTGs from adverse environmental conditions during normal conditions of transport (e.g., shock and heat). The RTGTS is scheduled for completion in December 1996 and will be available to support the National Aeronautics and Space Administrations Cassini mission to Saturn in October 1997. This paper provides an overview of the RTGTS and discusses the hardware being produced. Additionally, various program management innovations mandated by recent ma or changes in the US Department of Energy structure and resources will be outlined.

298 (WHC-SA-2979) **Radioisotope Thermoelectric Generator Transporation System licensed hardware second certification test series and package shock mount**

system test. Ferrell, P.C.; Moody, D.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960109–11: STAIF 96: space technology and applications international forum, Albuquerque, NM (United States), 7-11 Jan 1996). Order Number DE96003112. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a summary of two separate drop test a e performed in support of the Radioisotope Thermoelectric Generator (RTG) Transportation System (RTGTS). The first portion of this paper presents the second series of drop testing required to demonstrate that the RTG package design meets the requirements of Title 10, Code of Federal Regulations, "Part 71" (10 CFR 71). Results of the first test series, performed in July 1994, demonstrated that some design changes were necessary. The package design was modified to improve test performance and the design changes were incorporated into the Safety Analysis Report for Packaging (SARP). The second full-size certification test article (CTA-2) incorporated the modified design and was tested at the US Department of Energy's (DOE) Hanford Site near Richland, Washington. With the successful completion of the test series, and pending DOE Office of Facility Safety Analysis approval of the SARP, a certificate of compliance will be issued for the RTG package allowing its use. The second portion of this paper presents the design and testing of the RTG Package Mount System. The RTG package mount was designed to protect the RTG from excessive vibration during transport, provide shock protection during on/off loading, and provide a mechanism for moving the RTG package with a forklift. Military Standard (MIL-STD) 810E, Transit Drop Procedure (DOE 1989), was used to verify that the shock limiting system limited accelerations in excess of 15 G's at frequencies below 150 Hz. Results of the package mount drop tests indicate that an impact force of 15 G's was not exceeded in any test from a free drop height of 457 mm (18 in.).

299 (WHC-SA–2980) **A compendium of the radioisotope thermoelectric generator transportation system and recent programmatic changes.** Becker, D.L.; McCoy, J.C. Westinghouse Hanford Co., Richland, WA (United States). Mar 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960706–12: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96009891. Source: OSTI; NTIS; INIS; GPO Dep.

Because RTGs contain significant quantities of radioactive materials, usually plutonium-238 and its decay products, they must be transported in packages built in accordance with 10 CFR 71 (1994). To meet these regulatory requirements, US DOE commissioned Westinghouse Hanford Co. in 1988 to develop a Radioisotope Thermoelectric Generator Transportation System (RTGTS) that would fully comply while protecting RTGs from adverse environmental conditions during normal transport conditions (eg, mainly shock and heat). RTGTS is scheduled for completion Dec. 1996 and will be available to support NASA's Cassini mission to Saturn in Oct. 1997. This paper provides an overview of the RTGTS project, discusses the hardware being produced, and summarizes various programmatic and management innovations required by recent changes at DOE.

300 (WHC-SA–2995-FP) **Air pollution control at a DOE facility.** Curn, B.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951173–2: 18. world energy engineering congress, Atlanta, GA (United States), 8-10 Nov 1995). Order Number DE96003498. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) plutonium production program Produced some of the greatest scientific and engineering accomplishments of all time. It is remarkable to consider the accomplishments of the Manhattan Project. The Reactor on the Hanford Site, the first production reactor in the world, began operation only 13 months after the start of construction. The DOE nuclear production program was also instrumental in pioneering other fields such as health physics an radiation monitoring. The safety record of these installations is remarkable considering that virtually every significant accomplishment was on the technological threshold of the time. One other area that the DOE Facilities pioneered was the control of radioactive particles and gases emitted to the atmosphere. The high efficiency particulate air filter (HEPA) was a development that provided high collection efficiencies of particulates to protect workers and the public. The halogen and noble gases also were of particular concern. Radioactive iodine is captured by adsorption on activated carbon or synthetic zeolites. Besides controlling radioncuclide air pollution, DOE facilities are concerned with other criteria pollutants and hazardous air pollutant emissions. The Hanford Site encompasses all those air pollution challenges.

301 (WHC-SA–3006-FP) **Technical liaison with the Institute of Physical Chemistry (Russian Academy of Science).** Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960158–1: Efficient separations and processing crosscutting program 1996 technical meeting, Gaithersburg, MD (United States), 16-19 Jan 1996). Order Number DE96004831. Source: OSTI; NTIS; INIS; GPO Dep.

The Institute of Physical Chemistry of the Russian Academy of Science (IPC/RAS) is engaged by the DOE to conduct studies of the fundamental and applied chemistry of the transuranium elements (TRU; primarily neptunium, plutonium, and americium; Np, Pu, Am) and technetium $T_c$in alkaline media. This work is being supported by the DOE because the radioactive wastes stored in underground tanks at DOE sites (Hanford, Savannah River, and Oak Ridge) contain TRU and T_c, are alkaline, and the chemistries of TRU and $T_c$are not well developed in this system. Previous studies at the IPC/RAS centered on the fundamental chemistry and on coprecipitation. Work continuing in FY 1996 will focus more on the applied chemistry of the TRU and $T_c$in alkaline media and continue effort on the coprecipitation task.

302 (WHC-SA–3013) **Type B Drum packages.** Edwards, W.S. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203–38: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005190. Source: OSTI; NTIS; INIS; GPO Dep.

The Type B Drum package is a container in which a single drum containing Type B quantities of radioactive material will be packaged for shipment. The Type B Drum containers are being developed to fill a void in the packaging and transportation capabilities of the US Department of Energy (DOE), as no double containment packaging for single drums of Type B radioactive material is currently available. Several multiple-drum containers and shielded casks presently exist. However, the size and weight of these containers present multiple operational challenges for single-drum shipments. The Type B Drum containers will offer one unshielded version and, if needed, two shielded versions, and will provide for the option of either single or double containment. The primary users of the Type B Drum container will be any organization with a need to ship single drums of Type B radioactive material. Those users include laboratories, waste retrieval facilities, emergency response teams, and small facilities.

303 (WHC-SA-3053) **ISOSHLD 4.0.** Greenborg, J.; Schmittroth, F.A.; Rittman, P.D.; Roetman, V.E. Westinghouse Hanford Co., Richland, WA (United States). Mar 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960415–38: American Nuclear Society (ANS) Radiation Protection and Shielding Division topical meeting on advancements and applications in radiation protection and shielding, Falmouth, MA (United States), 21-25 Apr 1996). Order Number DE96009910. Source: OSTI; NTIS; INIS; GPO Dep.

ISOSHLD was developed to carry out routine shielding calculations that would otherwise be very laborious. More sophisticated methods exist, but there is still need for easy-to-use reliable computer codes. The code has been revised several times including PC and mainframe-based versions. These versions generally represent different objectives and differ in code, data, and supported features. The current version includes all features. It has a 30 group energy range from 10 keV and 10 MeV. Bremsstrahlung is included, MODE 1 capability is retained (fission product inventories from decay and transmutation), and the libraries now fully support the actinides. There were several design objectives in this latest revision; modernization, state-of-the-art nuclear data, and full capability including source generation and time dependent calculations.

304 (WHC-SD-CP-DRD–002) **Conceptual baseline document for the nuclear materials safeguards system.** Nelson, R.A. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050000. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the baseline scope, schedule, and cost requirements of the Nuclear Materials Safeguards System (NMSS) replacement for the Plutonium Finishing Plant. The Nuclear Material Safeguards System (NMSS), operating in PFP, comprises data from several site safeguards systems that have been merged since 1987. NMSS was designed and implemented to the state of computer technology for the mid 1970's. Since implementation, the hardware vendor has stopped producing computer systems and the availability of personnel trained and willing to work with the technology has diminished. Maintenance has become expensive and 'reliability is a serious concern. -This effort provides a replacement in kind of the NMSS, using modern, scalable, upgradable hardware and software to the same standards used for the Hanford Local Area Network (HLAN) system. The NMSS Replacement is a Client/Server architecture designed on a Personal Computer based local area network (LAN) platform. The LAN is provided through an ethernet interface running the Transmission Control Protocol/Internet Protocol (TCP/IP). This architecture conforms to the HLAN standard, including the End System Operating Environment (ESOE). The Server runs the Microsoft Windows NT' Server operating system, Microsoft SQL Server2 database management system, and application tools. Clients run Microsoft Windows' and application software provided as part of the system. The interface between the clients and the database is through Microsoft ODBC4.

305 (WHC-SD-CP-LB–036) **Method performance for radioanalytical chemistry.** Catlow, S.A. Westinghouse Hanford Co., Richland, WA (United States). 1 Sep 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050002. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides method qualification data for radioanalytical procedures as required by WHC-SD-CP-QAPP-016. A short description of the Methodology, the original source(s) of the methodology, a MDC example, and precision and accuracy from historic data.

306 (WHC-SD-CP-QAPP–016-Rev.1) **222-S Laboratory Quality Assurance Plan. Revision 1.** Meznarich, H.K. Westinghouse Hanford Co., Richland, WA (United States). 31 Jul 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001067. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Plan provides,quality assurance (QA) guidance, regulatory QA requirements (e.g., 10 CFR 830.120), and quality control (QC) specifications for analytical service. This document follows the U.S Department of Energy (DOE) issued Hanford Analytical Services Quality Assurance Plan (HASQAP). In addition, this document meets the objectives of the Quality Assurance Program provided in the WHC-CM-4-2, Section 2.1. Quality assurance elements required in the Guidelines and Specifications for Preparing Quality Assurance Program Plans (QAMS-004) and Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005) from the US Environmental Protection Agency (EPA) are covered throughout this document. A quality assurance index is provided in the Appendix A. This document also provides and/or identifies the procedural information that governs laboratory operations. The personnel of the 222-S Laboratory and the Standards Laboratory including managers, analysts, QA/QC staff, auditors, and support staff shall use this document as guidance and instructions for their operational and quality assurance activities. Other organizations that conduct activities described in this document for the 222-S Laboratory shall follow this QA/QC document.

307 (WHC-SD-CP-QAPP–017) **Quality Assurance Program Plan for the Waste Sampling and Characterization Facility.** Grabbe, R.R. Westinghouse Hanford Co., Richland, WA (United States). 2 Mar 1995. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008870. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this Quality Assurance Plan is to provide quality assurance (QA) guidance, implementation of regulatory QA requirements, and quality control (QC) specifications for analytical service. This document follows the

Department of Energy (DOE)-issued Hanford Analytical Services Quality Assurance Plan (HASQAP) and additional federal [10 US Code of Federal Regulations (CFR) 830.120] QA requirements that HASQAP does not cover. This document describes how the laboratory implements QA requirements to meet the federal or state requirements, provides what are the default QC specifications, and/or identifies the procedural information that governs how the laboratory operates. In addition, this document meets the objectives of the Quality Assurance Program provided in the WHC-CM-4-2, Section 2.1. This document also covers QA elements that are required in the Guidelines and Specifications for Preparing Quality Assurance Program Plans (QAPPs), (QAMS-004), and Interim Guidelines and Specifications for Preparing Quality Assurance Product Plans (QAMS-005) from the Environmental Protection Agency (EPA). A QA Index is provided in the Appendix A.

308 (WHC-SD-CP-TI–171) **Flowsheet for shear/leach processing of N Reactor fuel at PUREX.** Enghusen, M.B. Westinghouse Hanford Co., Richland, WA (United States). 13 Apr 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011573. Source: OSTI; NTIS; INIS; GPO Dep.

This document was originally prepared to support the restart of the PUREX plant using a new Shear/Leach head end process. However, the PUREX facility was shutdown and processing of the remaining N Reactor fuel is no longer considered an alternative for fuel disposition. This document is being issued for reference only to document the activities which were investigated to incorporate the shear/leach process in the PUREX plant.

309 (WHC-SD-CP-TI–197) **GENII dose calculations for offsite maximum individual and populations from Plutonium Finishing Plant.** Nguyen, L.V. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050003. Source: OSTI; NTIS; INIS; GPO Dep.

Document describes the potential dose consequences to the offsite maximum individual and population for ground and stack level releases at the offsite receptors from the Plutonium Finishing Plant.

310 (WHC-SD-EN-CSUD–002) **ABCASH plotting program users guide.** Troyer, G.L. Westinghouse Hanford Co., Richland, WA (United States). 25 Apr 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011652. Source: OSTI; NTIS; INIS; GPO Dep.

The Automated Bar Coding of Air Samples at Hanford (ABCASH) system provides an integrated data collection, sample tracking, and data reporting system for radioactive particulate air filter samples. The ABCASH plotting program provides a graphical trend report for ABCASH of the performance of air sample results. This document provides an operational guide for using the program. Based on sample location identifier and date range, a trend chart of the available data is generated. The trend chart shows radiological activity versus time. General indications of directional trend of the concentrations in air over time may be discerned. Comparison limit set point values are also shown as derived from the ABCASH data base.

311 (WHC-SD-FF-CSWD–055-Rev.1) **R-1 (C-620-A) and R-2 (C-620-B) air compressor control logic, computer software description. Revision 1.** Walter, K.E. Westinghouse Hanford Co., Richland, WA (United States). 8 Jun 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014314. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an updated computer software description for the software used on the FFTF R-1 (C-620-A) and R-2 (C-620-B) air compressor programmable controllers. Logic software design changes were required to allow automatic starting of a compressor that had not been previously started.

312 (WHC-SD-FF-CSWD–056-Rev.1) **R-189 (C-620) air compressor control logic software documentation. Revision 1.** Walter, K.E. Westinghouse Hanford Co., Richland, WA (United States). 8 Jun 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014313. Source: OSTI; NTIS; INIS; GPO Dep.

This relates to FFTF plant air compressors. Purpose of this document is to provide an updated Computer Software Description for the software to be used on R-189 (C-620-C) air compressor programmable controllers. Logic software design changes were required to allow automatic starting of a compressor that had not been previously started.

313 (WHC-SD-LL-ATP–023) **GENRTC Project No. 2F3E0A, OCB A-382, acceptance test procedure.** Akerson, A.W. Westinghouse Hanford Co., Richland, WA (United States). 10 Apr 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010739. Source: OSTI; NTIS; GPO Dep.

This test procedure provides the steps necessary to verify correct functional operation of controls, annunciators, alarms, protective relays and related systems impacted by CENRTC #2F3E0A, Microwave Transfer Trip Project, modification work performed under work package 6B-93-00040/M (CENRTC 2F3E0A MWTT OCB A-382 PACKAGE).

314 (WHC-SD-MP-SWD–30001-Rev.7) **Certification of MCNP Version 4A for WHC computer platforms. Revision 7.** Carter, L.L. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011546. Source: OSTI; NTIS; INIS; GPO Dep.

MCNP is a general-purpose Monte Carlo code that can be used for neutron, photon, or coupled neutron/photon transport, including the capability to calculate eigenvalues for critical systems. The code treats an arbitrary three-dimensional configuration of materials in geometric cells bounded by first- and second-degree surfaces, and some special fourth-degree surfaces (elliptical tori).

315 (WHC-SD-NR-TSR–001) **Fuel supply shutdown facility interim operational safety requirements.** Besser, R.L.; Brehm, J.R.; Benecke, M.W.; Remaize, J.A. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013341. Source: OSTI; NTIS; INIS; GPO Dep.

These Interim Operational Safety Requirements (IOSR) for the Fuel Supply Shutdown (FSS) facility define acceptable conditions, safe boundaries, bases thereof, and management or administrative controls to ensure safe operation. The IOSRs apply to the fuel material storage buildings in various modes (operation, storage, surveillance).

316 (WHC-SD-PRP-HA-012-Rev.1) **283-E and 283-W Hazards Assessment.** Sutton, L.N. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050020. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning Activites for the 283-E and 283-W Facilities on the Hanford Site. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

317 (WHC-SD-SNF-ATP-010) **Acceptance test procedure for High Pressure Water Jet System.** Crystal, J.B. Westinghouse Hanford Co., Richland, WA (United States). 30 May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015652. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of the acceptance test is to demonstrate a combined system. This includes associated tools and equipment necessary to perform cleaning in the 105 K East Basin (KE) for achieving optimum reduction in the level of contamination/dose rate on canisters prior to removal from the KE Basin and subsequent packaging for disposal. Acceptance tests shall include necessary hardware to achieve acceptance of the cleaning phase of canisters. This acceptance test procedure will define the acceptance testing criteria of the high pressure water jet cleaning fixture. The focus of this procedure will be to provide guidelines and instructions to control, evaluate and document the acceptance testing for cleaning effectiveness and method(s) of removing the contaminated surface layer from the canister presently identified in KE Basin. Additionally, the desired result of the acceptance test will be to deliver to K Basins a thoroughly tested and proven system for underwater decontamination and dose reduction. This report discusses the acceptance test procedure for the High Pressure Water Jet.

318 (WHC-SD-SNF-PLN-008) **Small Water System Management Program: 100 K Area.** Hunacek, G.S. Jr. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Wastren, Inc., Idaho Falls, ID (United States). 29 Jun 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016345. Source: OSTI; NTIS; INIS; GPO Dep.

Purposes of this document are: to provide an overview of the service and potable water system presently in service at the Hanford Site's 100 K Area; to provide future system forecasts based on anticipated DOE activities and programs; to delineate performance, design, and operations criteria; and to describe planned improvements. The objective of the small water system management program is to assure the water system is properly and reliably managed and operated, and continues to exist as a functional and viable entity in accordance with WAC 246-290-410.

319 (WHC-SD-SQA-CSA-20398) **CSER 95-008: Criticality storage category for grouted K Basin cartridge filters at CWC.** Miller, E.M. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013344. Source: OSTI; NTIS; INIS; GPO Dep.

The 13 containers from K Basins hold one cartridge filter each. The filters removed solids from the K Basins water before the water went to air-cooled chillers. The filters are about 75.7 cm (30 inches) in diameter and 86 cm (34 inches) tall (based on an outline on drawing H-1-34709 (Reference 1)). This is a volume of 388 liters. Drawing H-1-34709 (Reference 1) shows the configuration of the concreted 122 cm (48 inch) diameter culvert cut to 124 cm (49 inches) long and shows the imbedded steel. The culvert is 0.35 cm (0.138 inches) thick and has a volume of 1450 liters. There are four 127 cm (50 inch) long 2 inch by 3/4 inch steel bars and reinforcing steel in the container. The culvert and four bars weigh 169.6 kg. The cylindrical culvert is oriented vertically with an 11 gauge bottom plate welded on and then filled to 15 cm (6 inches) with grout. The cartridge filter, bagged in 20 mill plastic (Reference 2), is then placed in the center of the culvert and the culvert is filled with concrete. Four of the 13 culverts were then put vertically into 152 cm (5 foot) diameter culverts about 61 cm (2 feet) high, centered radially, and concreted into the larger base. The two configurations weigh about 3600 and 5400 kgs, respectively.

320 (WHC-SD-TP-CSWD-002-Vol.2) **Radcalc for Windows. Volume 2: Technical manual.** Green, J.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050093. Source: OSTI; NTIS; INIS; GPO Dep.

Radcalc for Windows is a user-friendly menu-driven Windows-compatible software program with applications in the transportation of radioactive materials. It calculates the radiolytic generation of hydrogen gas in the matrix of low-level and high-level radioactive waste using NRC-accepted methodology. It computes the quantity of a radionuclide and its associated products for a given period of time. In addition, the code categorizes shipment quantities as radioactive, Type A or Type B, limited quantity, low specific activity, highway route controlled, and fissile excepted using DOT definitions and methodologies, as outlined in 49 CFR Subchapter C. The code has undergone extensive testing and validation. Volume I is a User's Guide, and Volume II is the Technical Manual for Radcalc for Windows

321 (WHC-SD-TP-RPT-015-Rev.1) **Transportation impact analysis for the shipment of low specific activity nitric acid. Revisison 1.** Green, J.R. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013330. Source: OSTI; NTIS; INIS; GPO Dep.

This is in support of the Plutonium-Uranium Extraction (PUREX) Facility Low Specific Activity (LSA) Nitric Acid Shipment Environmental Assessment. It analyzes potential toxicological and radiological risks associated with transportation of PUREX Facility LSA Nitric Acid from the Hanford Site to Portsmouth VA, Baltimore MD, and Port Elizabeth NJ.

322 (WHC-SD-TP-SEP-034) **Safety evaluation for packaging CPC metal boxes.** Romano, T. Westinghouse Hanford Co., Richland, WA (United States). 15 May 1995. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012577. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides authorization for the use of Container Products Corporation (CPC) metal boxes, as described in this document, for the interarea shipment of radioactive contaminated equipment and debris for storage in the Central Waste Complex (CWC) or T Plant located in the 200 West Area. Authorization is granted until November 30, 1995. The CPC boxes included in this SEP were originally procured as US Department of Transportation (DOT) Specification 7A Type A boxes. A review of the documentation provided by the manufacturer revealed the documentation did not adequately demonstrate compliance to the 4 ft drop test requirement of 49 CFR 173.465(c). Preparation of a SEP is necessary to document the equivalent safety of the onsite shipment in lieu of meeting DOT packaging requirements until adequate documentation is received. The equivalent safety of the shipment is based on the fact that the radioactive contents consist of contaminated equipment and debris which are not dispersible. Each piece is wrapped in two layers of no less than 4 mil plastic prior to being placed in the box which has an additional 10 mil liner. Pointed objects and sharp edges are padded to prevent puncture of the plastic liner and wrapping.

323 (WHC-SD-WM-MAR–007) **Waste Encapsulation and Storage Facility mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013879. Source: OSTI; NTIS; INIS; GPO Dep.

This report defines the mission for the Waste Encapsulation and Storage Facility (WESF). It contains summary information regarding the mission analysis which was performed by holding workshops attended by relevant persons involved in the WESF operations. The scope of the WESF mission is to provide storage of Cesium (Cs) and Strontium (Sr) capsules, previously produced at WESF, until every capsule has been removed from the facility either to another storage location, for disposal or for beneficial use by public or private enterprises. Since the disposition of the capsules has not yet been determined, they may be stored at WESF for many years, even decades. The current condition of the WESF facility must be upgraded and maintained to provide for storage which is safe, cost effective, and fully compliant with DOE direction as well as federal, state, and local laws and regulations. The Cs capsules produced at WESF were originally released to private enterprises for uses such as the sterilization of medical equipment; but because of the leakage of one capsule, all are being returned. The systems, subsystems, and equipment not required for the storage mission will be available for use by other projects or private enterprises. Beyond the storage of the Cs and Sr capsules, no future mission for the WESF has been identified.

324 (WHC-SD-WM-UM–030) **ISO-PC Version 1.98: User's guide.** Rittmann, P.D. Westinghouse Hanford Co., Richland, WA (United States). 2 May 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012788. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes how to use Version 1.98 of the shielding program named ISO-PC. Version 1.98 corrects all known errors in ISOSHLD-II. In addition, a few numeric problems have been eliminated. There are three new namelist variables, 25 additional shielding materials, and 5 more energy groups. The two major differences with the original ISOSHLD-II are the removal of RIBD(radioisotope buildup and decay) source generator, and the removal of the non-uniform source distribution parameter, SSV1. This version of ISO-PC works with photon energies from 10 KeV to 10 MeV using 30 energy groups.

325 (WHC-SP–0098-6) **Routine environmental monitoring schedule, calendar year 1995.** Schmidt, J.W.; Markes, B.M.; McKinney, S.M. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015812. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides Bechtel Hanford, Inc. (BHI) and Westinghouse Hanford Company (WHC) a schedule of monitoring and sampling routines for the Operational Environmental Monitoring (OEM) program during calendar year (CY) 1995. Every attempt will be made to consistently follow this schedule; any deviation from this schedule will be documented by an internal memorandum (DSI) explaining the reason for the deviation. The DSI will be issued by the scheduled performing organization and directed to Near-Field Monitoring. The survey frequencies for particular sites are determined by the technical judgment of Near-Field Monitoring and may depend on the site history, radiological status, use and general conditions. Additional surveys may be requested at irregular frequencies if conditions warrant. All radioactive wastes sites are scheduled to be surveyed at least annually. Any newly discovered wastes sites not documented by this schedule will be included in the revised schedule for CY 1995.

326 (WHC-SP–0564-37) **Westinghouse Hanford Company Health and Safety Performance Report. First quarter calendar year 1995.** Lansing, K.A. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013514. Source: OSTI; NTIS; GPO Dep.

During the first quarter of CY 1995, four of the WHC sitewide ALARA performance goals were completed on or ahead of schedule. One of the completed goals related to reduction of radiological areas at WHC-managed facilities. Due to anticipated resource reductions and increased scope of work, several facilities escalated their reduction schedule. This allowed the ALARA goal to be completed and exceeded ahead of schedule. Industrial Safety and Health initiatives are being pursued in areas such as workplace ergonomics, safety training, and standards development. Positive efforts are ongoing in the areas of management commitment and employee involvement through the WHC Voluntary Protection Program. Successful implementation continues through the President's Accident Prevention Council (PAPC) and division employee Accident Prevention Councils. The Company now has established CY 1995 PAPC goals. Major programmatic accomplishments completed during this reporting period include the Department of Energy-Headquarters (DOE-HQ) formally endorsing the Radiological Control organization's approach toward development of the Radiation Protection Program (RPP) document. The DOE-HQ has recognized the significant contributions and leadership that Radiological Control has provided in planning and implementation of this "model example of an RPP" across the DOE complex and is encouraging other sites to contact WHC for assistance in developing their RPPs.

327 (WHC-SP–0564-39) **Westinghouse Hanford Company health and safety performance report. Third**

quarter calendar year 1995. Lansing, K.A. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005129. Source: OSTI; NTIS; INIS; GPO Dep.

The lost/restricted workday severity rate posted in CY 1994 of 45.50 was a significant improvement over the prior years and, remarkably, this rate has been reduced to 16.40 thus far in CY 1995 (Table 2–2). The indications from this sustained reduction are that employee, management, HEHF, and accident investigator efforts to manage injuries are becoming stronger (page 2–8). Congratulations to the Human Resources Department for working over 835,000 hours without a lost workday away injury/illness! The last lost workday away case occurred on 12/17/92. The Workers Compensation Report shows significant reduction in the amount of money expended for medical treatments and time loss due to industrial injuries. The cost of insurance continues to decrease. Continued savings can be attributed to aggressive claims and safety case management, an enhanced attitude by management creating a positive and proactive safety awareness culture, and a more aggressive return-to-work philosophy.

328 (WHC-SP–0665-17) **Quarterly environmental radiological survey summary: Second Quarter 1995 100, 200, 300, and 600 Areas.** McKinney, S.M. Westinghouse Hanford Co., Richland, WA (United States). 27 Jul 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001070. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the radiological surveys performed in support of the operational environmental monitoring program at the Hanford Site. The Second Quarter 1995 survey results and the status of actions required from current and past reports are summarized.

329 (WHC-SP–0856-Rev.2) **Maintenance implementation plan for T Plant. Revision 2.** Ayers, W.S. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013579. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a Maintenance Implementation Plan (MIP) for the T Plant Facility complex located in the 200 West Area of the Hanford Reservation in Washington state. This plan has been developed to provide a disciplined approach to maintenance functions and to describe how the T Plant facility will implement and comply with the regulations according to US DOE order 4330.4B, entitled Maintenance Management Program, Chapter 2.0 "Nuclear Facilities". Physical structures, systems, processes, as well as all associated equipment specifically assigned to these groups are included in the MIP.

330 (WHC-SP–0969-48) **Site management system executive summary report – March 1995.** Schultz, E.A. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013581. Source: OSTI; NTIS; INIS; GPO Dep.

Performance data for March 1995 reflects a continued unfavorable schedule variance and favorable cost variance. The March fiscal-year-to-date (FYTD) schedule variance is an unfavorable $105.5M. EM-30 (Office of Waste Management) is the biggest contributor ($81.9 million) to the behind-schedule condition. The majority of the EM-30 schedule variance is associated with the Tank Waste Remediation System (TWRS) program. A breakdown of individual program performance is listed on page 6. The TWRS schedule variance totals a negative $63.0 million and is attributed to the delay in receiving key decision 0 (KD-0) for Project W-314, "Tank Farm Restoration and Safe Operations"; the delay in receiving KD-3 for Project W-320, "106-C Sluicing"; late deployment of the rotary and push mode sampling trucks due to equipment and operational issues; late placement of melter contracts; and the Multi-Function Waste Tank Facility (MWTF) workscope still being a part of the baseline. Class I change requests are in process to rebaseline the activities associated with KDs. An aggressive sampling schedule has been developed for the rotary and push mode sampling activity. Thirty-seven enforceable agreement milestones were schedule FYTD. Thirty-six (97 percent) of the thirty-seven were completed on or ahead of schedule and one (3 percent) is delinquent. The Department of Energy, Richland Operations Office entered into dispute resolution on April 7, 1995, for the delinquent milestone. Six (13 percent) of the 39 remaining enforceable agreement milestones scheduled for FY 1995 are forecast to be late. Additional information on these milestones can be found on pages 13 through 15. Performance data reflects a significant favorable $25.7 million (4 percent) cost variance. The majority of the cost variance is attributed to progress towards achievement of productivity commitment goals and is expected to continue for the remainder of this fiscal year.

331 (WHC-SP–0969-52) **Hanford Site performance summary – EM funded programs, July 1995.** Schultz, E.A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001818. Source: OSTI; NTIS; INIS; GPO Dep.

Performance data for July 1995 reflects a 4% unfavorable schedule variance and is an improvement over June 1995. The majority of the behind schedule condition is attributed to EM-30, (Office of Waste Management). The majority of the EM-30 schedule variance is associated with the Tank Waste Remediation System (TWRS) Program. The TWRS schedule variance is attributed to the delay in obtaining key decision 0 (KD-0) for Project W-314, "Tank Farm Restoration and Safe Operations" and the Multi-Function Waste Tank Facility (MWTF) workscope still being a part of the baseline. Baseline Change Requests (BCRs) are in process rebaselining Project W-314 and deleting the MWTF from the TWRS baseline. Once the BCR's are approved and implemented, the overall schedule variance will be reduced to $15.0 million. Seventy-seven enforceable agreement milestones were scheduled FYTD. Seventy-one (92%) of the seventy-seven were completed on or ahead of schedule, two were completed late and four are delinquent. Performance data reflects a continued significant favorable cost variance of $124.3 million (10%). The cost variance is attributed to process improvements/efficiencies, elimination of low-value work, workforce reductions and is expected to continue for the remainder of this fiscal year. A portion of the cost variance is attributed to a delay in billings which should self-correct by fiscal year-end.

332 (WHC-SP–0969-53) **Hanford site performance summary: EM funded programs August 1995.** Schultz, E.A. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003260. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents information about the milestones achieved by the Environmental Management program at the Hanford Site. This information is presented is context of cost of each milestone.

333 (WHC-SP–0969-54) **Hanford Site performance summary: EM funded programs.** Edwards, C. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96004643. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford performance at fiscal year end reflects a three percent unfavorable schedule variance ($46.3 million*) which was an improvement over August 1995 ($46.3 million for September versus $65.9 million for August) and is below established reporting thresholds (greater than 3 percent). The majority of the behind schedule condition (53 percent) is attributed to EM-40 (Office of Environmental Restoration [ER]) and is a result of late receipt of funds, procurement delays, and US Army Corps of Engineers (USACE) work planned but not accomplished. Other primary contributors to the behind schedule condition are associated with tank farm upgrades, high-level waste disposal and work for others (support to the US Department of Energy-Headquarters [DOE-HQ]). The remaining behind schedule condition is distributed throughout the remaining Hanford programs and do not share common causes. A breakdown of individuals listed on page 8.

334 (WHC-SP–1103-Rev.1) **Information management fiscal year 1996 site support program plan, WBS 6.4. Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003351. Source: OSTI; NTIS; GPO Dep.

In the recent past, information resource management (IRM) was a neatly separable component of the overall DOE mission, concerned primarily with procuring and implementing automatic data processing (ADP) systems. As the DOE missions have shifted from producing product to managing processes, those clear lines have blurred. Today, IRM is firmly embedded in all aspects of the DOE mission. BCS Richland, Inc., (BCSR) provides IRM for the Hanford Site. The main focus in executing this mission is to meet customer goals by providing high-quality, timely, and cost-effective electronic communication, computing, and information services. Information resources provide the US Department of Energy, Richland Operations Office (RL) and the Hanford Site contractors the ability to generate, store, access, and communicate information quickly, reliably, and cost effectively. BCSR plans, implements, and operates electronic communication, computing and information management systems that enable effective operation of the Hanford Site. Five strategic initiatives to encompass the vision provide guidance and focus to the information technology (IT) direction for developing the BCSR program plan. These strategic initiatives are the program vision and are as follows: primary focus; fast response; accessible information; world class information management infrastructure; powerful desktop. The business directions that guide the development of the BCSR Program Plan are: (1) emphasize providing cost-effective and value-added communication, computing, and information systems products and services to the Site missions; (2) strengthen the alignment of products and services with Site projects and programs and eliminate duplications Sitewide; (3) focus on the effective resolution of critical Site information management (IM) issues.

335 (WHC-SP–1132) **External communication FY 1995 Site Support Program Plan WBS 6.10.6.** Whiting, W.P. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005137. Source: OSTI; NTIS; INIS; GPO Dep.

External Communications activities provide value to the company, its projects, and DOE by achieving compliance to more than 30 DOE orders, DOE directives, policies, state and federal laws. Through the systematic development of informed consent involving Hanford management, stakeholders, the general public and regulators, Hanford cleanup is better able to proceed in concert with involved parties. External Communications provides further efficiencies as the single point of contact for media interactions which otherwise would be scattered throughout WHC programs. Enhanced efficiency is expected from the realignment of multi-purpose communication teams which are dedicated to five key programmatic areas: TWRS Communications, Transition Facilities Communications, Spent Fuels Communications, Waste, Analytical and Environmental Services Communications, and Program Communications Services.

336 (WHC-SP–1138-Rev.1) **Engineering testing and technology projects FY 1996 Site Support Program Plan, WBS 6.3.3 and 6.3.8. Revision 1.** Brown, L.C. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001631. Source: OSTI; NTIS; INIS; GPO Dep.

The engineering laboratory services for development, assembly, testing, and evaluation to support the resolution of WHC, Hanford, and DOE complex wide engineering issues for 1996 are presented. Primary customers are: TWRS, spent nuclear fuels, transition projects, liquid effluent program, and other Hanford contractors and programs. Products and services provided include: fabrication and assembly facilities for prototype and test equipment, development testing, proof of principle testing, instrumentation testing, nondestructive examination application development and testing, prototype equipment design and assembly, chemical engineering unit operations testing, engineering test system disposal, and safety issue resolution.

337 (WHC-SP–1166) **Liaison activities with the Institute of Physical Chemistry/Russian Academy of Science Fiscal Year 1995.** Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96002793. Source: OSTI; NTIS; INIS; GPO Dep.

Investigations into the chemistry of alkaline Hanford Site tank waste (TTP RL4-3-20-04) were conducted in Fiscal Year 1995 at Westinghouse Hanford Company under the support of the Efficient Separations and Processing Crosscutting Program (EM-53). The investigation had two main subtasks: liaison with the Institute of Physical Chemistry of the Russian Academy of Science and further laboratory testing of the chemistry of thermal reconstitution of Hanford Site tank waste. Progress, which was achieved in the liaison subtask during Fiscal Year 1995, is summarized as follows: (1) A technical dialogue has been established with Institute scientists. (2) Editing was done on a technical literature review on the chemistry of transuranic elements and technetium in alkaline media written by researchers at the Institute. The report was issued in May 1995 as a Westinghouse Hanford Company document. (3) Four tasks from the Institute were selected for support by the U.S. Department of Energy. Work on three tasks commenced on 1 March 1995; the fourth task commenced on 1 April 1995. (4) Technical information describing the composition of Hanford Site tank waste was supplied to the Institute. (5) A program review of the four tasks was conducted at the Institute during a visit 25 August to 1 September, 1995. A lecture on the origin, composition, and proposed treatment of Hanford Site tank wastes was presented during this visit. Eight additional tasks were proposed by Institute scientists for support in Fiscal Year 1996. (6) A paper was presented at the Fifth International Conference on Radioactive Waste Management and Environmental Remediation (ICEM'95) in Berlin, Germany on 3 to 9 September, 1995 on the solubility of actinides in alkaline media.

338 (WHC-SP–1168) **Packaging design criteria for the Type B Drum.** Edwards, W.S.; Smith, R.J.; Wells, A.H. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001632. Source: OSTI; NTIS; INIS; GPO Dep.

The Type B Drum package is a transportation cask capable of shipping a single 55-gal (208 L) drum of transuranic (TRU) waste. The Type B Drum is smaller than existing certified packages, such as the TRUPACT-II cask, but will allow payloads with higher thermal and gas generation rates, thus providing greater operational flexibility. The Type B Drum package has double containment so that plutonium contents and other radioactive material may be transported in Type B quantities. Conceptual designs of unshielded and shielded versions of the Type B Drum were completed in Report on the Conceptual Design of the Unshielded Type B Drum Packaging and Report on the Conceptual Design of the Shielded type B Drum Packaging (WEC 1994a, WEC 1994b), which demonstrated the Type B Drum to be a viable packaging system. A Type B package containment system must withstand the normal conditions of transport and the hypothetical accident conditions, which include a 9-m (30-ft) drop onto an unyielding surface and a 1-m (3-ft) drop onto a 15-cm (6-in.) diameter pin, and a fire and immersion scenarios.

339 (WHC-SP–1169) **Site Support Program Plan Infrastructure Program.** Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005135. Source: OSTI; NTIS; INIS; GPO Dep.

The Fiscal Year 1996 Infrastructure Program Site Support Program Plan addresses the mission objectives, workscope, work breakdown structures (WBS), management approach, and resource requirements for the Infrastructure Program. Attached to the plan are appendices that provide more detailed information associated with scope definition. The Hanford Site's infrastructure has served the Site for nearly 50 years during defense materials production. Now with the challenges of the new environmental cleanup mission, Hanford's infrastructure must meet current and future mission needs in a constrained budget environment, while complying with more stringent environmental, safety, and health regulations. The infrastructure requires upgrading, streamlining, and enhancement in order to successfully support the site mission of cleaning up the Site, research and development, and economic transition.

340 (WINCO–1197) **Using ytterbium-169 for safe and economical industrial radiography.** Dowalo, J.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Jan 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE96003482. Source: OSTI; NTIS; INIS; GPO Dep.

Safety has become an issue of paramount importance for industrial radiography. Many NDE facilities and suppliers are finding the cost of performing radiography Prohibitive due to heightened safety concerns for radiation area protection. The most common sources used in radiography, Iridium-192 and Cobalt-60, result in high radiation fields over a large area. Even when collimators are used large radiation fields can result from multicurie source radiography. Radiographic operations are being forced to find alternative test methods and techniques to the use of the old stand-by sources. These alternate methods are not always as comprehensive a test as full volumetric examination with radiography. Since Iridium and Cobalt are in such wide spread use, they are sometimes called upon to perform test of materials which are not in their optimum sensitivity range.

341 (WSRC-MS–94-0255) **The Savannah River Environmental Technology Field Test Platform: Phase 2.** Rossabi, J.; Riha, B.D.; Eddy-Dilek, C.A.; Pemberton, B.E.; May, C.P.; Jarosch, T.R.; Looney, B.B.; Raymond, R. Westinghouse Savannah River Co., Aiken, SC (United States). 14 Mar 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060138. Source: OSTI; NTIS; INIS; GPO Dep.

The principal goal in the development of new technologies for environmental monitoring and characterization is transferring them to organizations and individuals for use in site assessment and compliance monitoring. The DOE complex has devised several strategies to facilitate this transfer including joint research projects between private industries and government laboratories or universities (CRADAs) and streamlined licensing procedures. One strategy that has been under-utilized is a planned sequence gradually moving from laboratory development and field demonstration to long term evaluation and onsite use. Industrial partnership and commercial production can be initiated at any step based on the performance, market, user needs, and costs associated with the technology. This approach allows use of the technology by onsite groups for compliance monitoring tasks (e.g. Environmental Restoration and Waste Management), while following parallel research and development organizations the opportunity to evaluate the long term performance and to make modifications or improvements to the technology. This probationary period also provides regulatory organizations, potential industrial partners, and potential users with the opportunity to evaluate the technology's performance and its utility for implementation in environmental characterization and monitoring programs.

342 (WSRC-MS–95-0478) **HyTech - The Hydrogen Technology Laboratory at Savannah River.** Motyka, T.; Knight, J.R.; Heung, L.K.; Lee, M.W. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960601–2: 11. world hydrogen energy conference: designing the energy

link, Stuttgart (Germany), 23-27 Jun 1996). Order Number DE96009651. Source: OSTI; NTIS; INIS; GPO Dep.

SRS recently announced the formation of the Hydrogen Technology Laboratory (HyTech) to work with industry and government in developing technologies based on the site's four decades of experience with tritium and other forms of H. HyTech will continue to sustain the site's ongoing role in H technology applications for defense programs. In addition, the laboratory will work with the chemical, transportation, power, medical, and other industries to develop and test related technologies. HyTech, which is located in the Savannah River Technology Center, will make use of its facilities and staff, as well as the infrastructure within the site's Tritium Facilities. More than 80 SRS scientists, engineers, and technical professionals with backgrounds in chemistry, engineering, materials science, metallurgy, physics, and computer science will work with the laboratory. This paper describes some of HyTech's current initiatives in the area of H storage, transportation, and energy applications.

343 (WSRC-TR-94-100-12) **SRTC Monthly Report December 1994.** Ferrell, J.M. Westinghouse Savannah River Co., Aiken, SC (United States). 19 Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060145. Source: OSTI; NTIS; GPO Dep.

This is the Savannah River Technology Center monthly report for December 1994.

SUBSURFACE CONTAMINANTS

Refer also to citation(s) 20, 127, 144, 145, 212, 215, 219, 220, 232, 242, 243, 246, 253, 657, 666, 670, 671, 703, 707, 738, 750, 821, 823, 824, 834, 938, 943, 962, 988, 998, 999, 1037, 1039, 1192, 1259, 1260, 1263, 1998, 2009, 2024, 2031, 2034, 2037, 2043, 2068, 2079, 2090, 2113, 2118, 2122, 2123, 2128, 2190, 2192, 2240, 2280, 2287, 2307, 2308, 2310, 2311, 2312, 2326, 2327, 2360, 2382, 2383, 2397, 2486, 2496, 2540, 2548, 2590, 2622, 2626

344 (ANL–95/7) **Surveillance of Site A and Plot M report for 1994.** Golchert, N.W. Argonne National Lab., IL (United States). May 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95013276. Distribution: UC-2020. Source: OSTI; NTIS; INIS; GPO Dep.

The results of the environmental surveillance program conducted at Site A/Plot M in the Palos Forest Preserve area for 1994 are presented. The surveillance program is the ongoing remedial action that resulted from the 1976-1978 radiological characterization of the site. That study determined that very low levels of hydrogen-3 (as tritiated water) had migrated from the burial ground and were present in two nearby hand-pumped picnic wells. The current program consists of sample collection and analysis of air, surface and subsurface water, and bottom sediment. The results of the analyses are used to (1) monitor the migration pathway of water from the burial ground (Plot M) to the hand-pumped picnic wells, (2) establish if buried radionuclides other than hydrogen-3 have migrated, and (3) generally characterize the radiological environment of the area. Hydrogen-3 in the Red Gate Woods picnic wells was still detected this year, but the average and maximum concentrations were significantly less than found earlier. Tritiated water continues to be detected in a number of wells, boreholes, dolomite holes, and a surface stream. For many years it was the only radionuclide found to have migrated in measurable quantities. Analyses since 1984 have indicated the presence of low levels of strontium-90 in water from a number of boreholes next to Plot M. The available data does not allow a firm conclusion as to whether the presence of this nuclide represents recent migration or movement that may have occurred before Plot M was capped. The results of the surveillance program continue to indicate that the radioactivity remaining at Site A/Plot M does not endanger the health or safety of the public visiting the site, using the picnic area, or living in the vicinity.

345 (ANL/CMT/CP–88385) **Transport through low porosity media – microstructure and uncertainty analysis.** Tam, S.W.; Steindler, M.J. Argonne National Lab., IL (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960421–31: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96008398. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. RADIONUCLIDE MIGRATION/computerized simulation; SOILS/radionuclide migration; RADIOACTIVE WASTES/underground disposal; POROSITY; SOILS; GROUND WATER; MONTE CARLO METHOD; BENTONITE

346 (ANL/EA/CP–84187) **Options for improving hazardous waste cleanups using risk-based criteria.** Elcock, D. Argonne National Lab., Washington, DC (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950646–27: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95013712. Source: OSTI; NTIS; INIS; GPO Dep.

This paper explores how risk- and technology-based criteria are currently used in the RCRA and CERCLA cleanup programs. It identifies ways in which risk could be further incorporated into RCRA and CERCLA cleanup requirements and the implications of risk-based approaches. The more universal use of risk assessment as embodied in the risk communication and risk improvement bills before Congress is not addressed. Incorporating risk into the laws and regulations governing hazardous waste cleanup, will allow the use of the best scientific information available to further the goal of environmental protection in the United States while containing costs. and may help set an example for other countries that may be developing cleanup programs, thereby contributing to enhanced global environmental management.

347 (ANL/EA/CP–85472) **A Bayesian/geostatistical approach to the design of adaptive sampling programs.** Johnson, R.L. (Argonne National Lab., IL (United States). Environmental Assessment Div.). Argonne National Lab., IL (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950159–2: Geostatistics for environmental and geotechnical applications, Phoenix, AZ (United States), 26-27 Jan 1995). Order Number DE95013500. Source: OSTI; NTIS; GPO Dep.

Traditional approaches to the delineation of subsurface contamination extent are costly and time consuming. Recent advances in field screening technologies present the possibility for adaptive sampling programs–programs that adapt or change to reflect sample results generated in the field. A coupled Bayesian/geostatistical methodology can be used to guide adaptive sampling programs. A Bayesian approach quantitatively combines "soft" information regarding contaminant location with "hard" sampling results. Soft information can include historical information, non-intrusive geophysical survey data, preliminary transport modeling results, past experience with similar sites, etc. Soft information is used to build an initial conceptual image of where contamination is likely to be. As samples are collected and analyzed, indicator kriging is used to update the initial conceptual image. New sampling locations are selected to minimize the uncertainty associated with contaminant extent. An example is provided that illustrates the methodology.

348 (ANL/EA/CP–86379) **Streamlined RI/FS planning for the groundwater operable unit at the Weldon Spring Site.** Picel, M.H.; Durham, L.A.; Blunt, D.L.; Hartmann, H.M. Argonne National Lab., IL (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–43: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96007243. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) is conducting cleanup activities at the chemical plant area of the Weldon Spring Site located in St. Charles County, Missouri, about 48 km (30 mi) west of St. Louis and 22 km (14 mi) southwest of the City of St. Charles. The 88-ha (217-acre) chemical plant area is chemically and radioactively contaminated as a result of uranium processing activities conducted by the U.S. Atomic Energy Commission during the 1950s and 1960s. The Army also used the chemical plant area for the production of explosives in the 1940s. The Weldon Spring Site chemical plant area was listed on the National Priorities List (NPL) in 1989. Adjacent to the chemical plant area is another NPL site known as the Weldon Spring Ordnance Works. The ordnance works area is a former explosive production facility that manufactured trinitrotoluene (TNT) and dinitrotoluene (DNT) during World War II. The ordnance works area covers 7,000 ha (17,232 acres); cleanup of this site is managed by the U.S. Army Corps of Engineers (CE).

349 (ANL/EA/CP–87306) **Optimized remedial groundwater extraction using linear programming.** Quinn, J.J. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–38: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96005536. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater extraction systems are typically installed to remediate contaminant plumes or prevent further spread of contamination. These systems are expensive to install and maintain. A traditional approach to designing such a wellfield uses a series of trial-and-error simulations to test the effects of various well locations and pump rates. However, the optimal locations and pump rates of extraction wells are difficult to determine when objectives related to the site hydrogeology and potential pumping scheme are considered. This paper describes a case study of an application of linear programming theory to determine optimal well placement and pump rates. The objectives of the pumping scheme were to contain contaminant migration and reduce contaminant concentrations while minimizing the total amount of water pumped and treated. Past site activities at the area under study included disposal of contaminants in pits. Several groundwater plumes have been identified, and others may be present. The area of concern is bordered on three sides by a wetland, which receives a portion of its input budget as groundwater discharge from the pits. Optimization of the containment pumping scheme was intended to meet three goals: (1) prevent discharge of contaminated groundwater to the wetland, (2) minimize the total water pumped and treated (cost benefit), and (3) avoid dewatering of the wetland (cost and ecological benefits). Possible well locations were placed at known source areas. To constrain the problem, the optimization program was instructed to prevent any flow toward the wetland along a user-specified border. In this manner, the optimization routine selects well locations and pump rates so that a groundwater divide is produced along this boundary.

350 (ANL/EA/CP–87307) **Application of a computationally efficient geostatistical approach to characterizing variably spaced water-table data.** Quinn, J.J. Argonne National Lab., IL (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–44: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96007241. Source: OSTI; NTIS; INIS; GPO Dep.

Geostatistical analysis of hydraulic head data is useful in producing unbiased contour plots of head estimates and relative errors. However, at most sites being characterized, monitoring wells are generally present at different densities, with clusters of wells in some areas and few wells elsewhere. The problem that arises when kriging data at different densities is in achieving adequate resolution of the grid while maintaining computational efficiency and working within software limitations. For the site considered, 113 data points were available over a 14-mi^2 study area, including 57 monitoring wells within an area of concern of 1.5 mi^2. Variogram analyses of the data indicate a linear model with a negligible nugget effect. The geostatistical package used in the study allows a maximum grid of 100 by 100 cells. Two-dimensional kriging was performed for the entire study area with a 500-ft grid spacing, while the smaller zone was modeled separately with a 100-ft spacing. In this manner, grid cells for the dense area and the sparse area remained small relative to the well separation distances, and the maximum dimensions of the program were not exceeded. The spatial head results for the detailed zone were then nested into the regional output by use of a graphical, object-oriented database that performed the contouring of the geostatistical output. This study benefitted from the two-scale approach and from very fine geostatistical grid spacings relative to typical data separation distances. The combining of the sparse, regional results with those from the finer-resolution area of concern yielded contours that honored the actual data at every measurement location. The method applied in this study can also be used to generate reproducible, unbiased representations of other types of spatial data.

351 (ANL/EAD/TM–42) **Derivation of guidelines for uranium residual radioactive material in soil at the former Baker Brothers, Inc., Site, Toledo, Ohio.** Nimmagadda, M.; Kamboj, S.; Yu, C. Argonne National Lab., IL (United States). Apr 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95012410. Source: OSTI; NTIS; INIS; GPO Dep.

Residual radioactive material guidelines for uranium in soil were derived for the former Baker Brothers, Inc., site in Toledo, Ohio. This site has been identified for remedial action under the U.S. Department of Energy's (DOE's) Formerly Utilized Sites Remedial Action Program (FUSRAP). Single-nuclide and total-uranium guidelines were derived on the basis of the requirement that following remedial action, the 50-year committed effective dose equivalent to a hypothetical individual living or working in the immediate vicinity of the site should not exceed a dose constraint of 30 mrem/yr for the current use and likely future use scenarios or a dose limit of 100 mrem/yr for less likely future use scenarios. The DOE residual radioactive material guideline computer code, RESRAD, was used in this evaluation; RESRAD implements the methodology described in the DOE manual for establishing residual radioactive material guidelines. Three scenarios were considered; each assumed that for a period of 1,000 years following remedial action, the site would be used without radiological restrictions. The three scenarios varied with regard to the type of site use, time spent at the site by the exposed individual, and sources of food and water consumed. The evaluation indicates that the dose constraint of 30 mrem/yr would not be exceeded for uranium (including uranium-234, uranium-235, and uranium-238) within 1,000 years, provided that the soil concentration of total combined uranium (uranium-234, uranium-235, and uranium-238) at the former Baker Brothers site did not exceed 710 pCi/g for Scenario A (industrial worker, current use) or 210 pCi/g for Scenario B (resident - municipal water supply, a likely future use). The dose limit of 100 mrem/yr would not be exceeded at the site if the total uranium concentration of the soil did not exceed 500 pCi/g for Scenario C (subsistence farmer - on-site well water, a plausible but unlikely future use).

352 (ANL/EAD/TM–49) **Floodplain/wetlands assessment for the remediation of Vicinity Property 9 at the Weldon Spring Site, Weldon Spring, Missouri.** Lonkhuyzen, R.A. Van (Argonne National Lab., IL (United States). Environmental Assessment Div.). Argonne National Lab., IL (United States). Nov 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96005924. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) proposes to excavate contaminated soil at Vicinity Property 9 (VP9), a 0.64-ha (1.6-acre) parcel near the Weldon Spring Site in Missouri. A palustrine wetland approximately 0.10 ha (0.25 acre) in size within VP9 would be excavated. Site restoration should allow palustrine wetland to become reestablished. No long-term impacts to floodplains are expected.

353 (ANL/ER/CP–86429) **Integration of geophysics within the Argonne expedited site characterization Program at a site in the southern High Plains.** Hastings, B.; Hildebrandt, G.; Meyer, T.; Saunders, W.; Burton, J.C. Argonne National Lab., IL (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950450–8: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95011792. Source: OSTI; NTIS; GPO Dep.

An Argonne National Laboratory Expedited Site Characterization (ESC) program was carried out at a site in the central United States. The Argonne ESC process emphasizes an interdisciplinary approach in which all available information is integrated to produce as complete a picture as possible of the geologic and hydrologic controls on contaminant distribution and transport. As part of this process, all pertinent data that have been collected from previous investigations are thoroughly analyzed before a decision is made to collect additional information. A seismic reflection program recently concluded at the site had produced inconclusive results. Before we decided whether another acquisition program was warranted, we examined the existing data set to evaluate the quality of the raw data, the appropriateness of the processing sequence, and the integrity of the interpretation. We decided that the field data were of sufficient quality to warrant reprocessing and reinterpretation. The main thrust of the reprocessing effort was to enhance the continuity of a shallow, low-frequency reflection identified as a perching horizon within the Ogallala formation. The reinterpreted seismic data were used to locate the boundaries of the perched aquifer, which helped to guide the Argonne ESC drilling and sampling program. In addition, digitized geophysical well log data from previous drilling programs were reinterpreted and integrated into the geologic and hydrogeologic model.

354 (ANL/ES/CP–85247) **Ultrasonic process for remediation of organics-contaminated groundwater/wastewater.** Wu, J.M.; Peters, R.W. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-9505217–3: Air & Waste Management Association Policy meeting, Washington, DC (United States), 10-12 May 1995). Order Number DE95013690. Source: OSTI; NTIS; INIS; GPO Dep.

A technology is being developed that employs ultrasonic-wave energy for remediation of groundwater/wastewater contaminated with volatile organic compounds such as carbon tetrachloride (CCl_4) and trichloroethylene (TCE). This paper presents the updated results of a laboratory investigation of ultrasonic groundwater remediation using synthetic groundwaters prepared with laboratory deionized water. Key process parameters investigated included steady-state temperature, contaminant concentration, solution pH, sonication time, and intensity of the applied ultrasonics-wave energy. High destruction efficiencies of the target contaminants were achieved, and the sonication time required for a given degree of destruction decreased with increasing intensity of the applied ultrasonic energy. The sonication time can be further reduced by adding a chemical oxidant such as hydrogen peroxide.

355 (ANL/ES/CP–86536) **Plutonium mobility studies in soil sediment decontaminated by means of a soil-washing technology.** Negri, M.C. (Argonne National Lab., IL (United States)); Orlandini, K.A.; Swift, N.; Carfagno, D. Argonne National Lab., IL (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9505101–7: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE95013719. Source: OSTI; NTIS; INIS; GPO Dep.

The ACT*DE*CON^{SM} process extracts plutonium from contaminated soils/sediments by means of a series of washings with a blend of chemicals, that includes a chelating agent, an oxidant, and carbonates. At the end of the process, the Pu level in the soil is lowered to 25-30 pCi/g from an initial contamination level averaging 500 pCi/g. The radionuclide still present in the soil at the end of the treatment must be strongly immobilized in or onto the soil particles to minimize the risk of its percolation to the aquifer and/or uptake by vegetation. This paper reports the investigation of residual Pu mobility as K_d (distribution coefficient) in the treated soil/sediment. Six batches of contaminated soil were treated simultaneously by means of the ACT*DE*CON^{SM} process. Some batches of the treated soil were amended with a standard fertilizer treatment of compost and nutrient and brought to pH 8.5. The treated soil, treated and fertilized soil, and the untreated controls were then incubated at 18°C for 90 days. At four different times, a small aliquot of soil was retrieved from each of the batches and contacted with rainwater for six days to determine the Pu solid/liquid distribution and K_d. Results indicated that a higher total amount of Pu was leached from the untreated soil, probably as a consequence of the higher content of available/exchangeable Pu in this soil compared with the treated ones. Treated/fertilized soils showed Pu leaching at intermediate levels between those for treated and untreated soils, at least for the first 30 days of incubation. K_d values at the beginning of the incubation period were significantly lower in the untreated and treated/fertilized soils compared with those for the treated-only, but at 90 days, these values were substantially equal among the three different soils. Traces of the chelant were detectable only in treated, unfertilized soil.

356 (BHI–00046-Rev.1) **Safety assessment for the proposed pilot-scale treatability tests for the 200-UP-1 and 200-ZP-1 groundwater operable units. Revision 1.** Lehrschall, R.R. (IT Hanford, Inc., Richland, WA (United States)); Oestreich, D.K. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1994. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005866. Source: OSTI; NTIS; INIS; GPO Dep.

This safety assessment provides an analysis of the proposed pilot-scale treatability test activities to be and conducted within the 200 Area groundwater operable units on the Hanford Site. The 200-UP-1 and 200-ZP-1 operable units are located in the 200 West Area of the Hanford Site. These tests will evaluate an ion exchange (IX) water purification treatment system and granular activated carbon (GAC). A detailed engineering analysis of (GAC) adsorption for remediation of groundwater contamination. A detailed engineering analysis of the IX treatment system. The principal source of information for this assessment, states that the performance objective of the treatment systems is to remove 90% of the uranium and technetium-99 (^{99}Tc) from the extracted groundwater at the 200-UP-1 site. The performance objective for 200-ZP-1 is to remove 90% of the carbon tetrachloride (CCl_4), chloroform, and trichloroethylene (TCE) from the extracted groundwater.

357 (BHI–00055-Rev.1) **Qualitative risk assessment for the 100-NR-2 Operable Unit. Revision 1.** IT Corporation (IT Corp., Las Vegas, NV (United States)). Bechtel Hanford, Inc., Richland, WA (United States); IT Corp., Las Vegas, NV (United States). Mar 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005867. Source: OSTI; NTIS; INIS; GPO Dep.

This qualitative risk assessment provides information about the 100- NR-2 Groundwater Operable Unit of the Hanford reservation. Topics discussed in this report are: data evaluation; human health risk assessment overview; ecological evaluations; summary of uncertainty; results of both the ecological and human health evaluations; toxicity assessment; risk characterization; and a summary of contaminants of potential concern.

358 (BHI–00079-Rev.) **Groundwater protection plan for the Environmental Restoration Disposal Facility.** Weekes, D.C.; Jaeger, G.K.; McMahon, W.J.; Ford, B.H. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005929. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the groundwater protection plan for the Environmental Restoration Disposal Facility (ERDF) Project. This plan is prepared based on the assumption that the ERDF will receive waste containing hazardous/dangerous constituents, radioactive constituents, and combinations of both. The purpose of this plan is to establish a groundwater monitoring program that (1) meets the intent of the applicable or relevant and appropriate requirements, (2) documents baseline groundwater conditions, (3) monitors those conditions for change, and (4) allows for modifications to groundwater sampling if required by the leachate management program. Groundwater samples indicate the occurrence of preexisting groundwater contamination in the uppermost unconfined aquifer below the ERDF Project site, as a result of past waste-water discharges in the 200 West Area. Therefore, it is necessary for the ERDF to establish baseline groundwater quality conditions and to monitor changes in the baseline over time. The groundwater monitoring program presented in this plan will provide the means to assess onsite and offsite impacts to the groundwater. In addition, a separate leachate management program will provide an indication of whether the liners are performing within design standards.

359 (BHI–00124) **Integrated test plan for the field demonstration of the supported liquid membrane unit.** Dunks, K.L.; Hodgson, K.M. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005708. Source: OSTI; NTIS; INIS; GPO Dep.

This Integrated Test Plan describes the operation and testing of a hybrid reverse osmosis (RO)/coupled transport (CT) groundwater remediation test unit, also referred to as the Environmental Restoration Technology Demonstrations at the Hanford Site. The SLM will be used to remove uranium, technetium-99, and nitrate from a selected groundwater source at the Hanford Site. The overall purpose of this test is to determine the efficiency of the RO/CT membranes operating in a hybrid unit, the ease of operating and maintaining the SLM, and the amount of secondary waste generated as a result of processing. The goal of the SLM is to develop a RO/CT process that will be applicable for removing contaminants from almost any contaminated water. This includes the effluents generated as part of the day-to-day operation of most any US Department of Energy (DOE) site. The removal of contaminants from the groundwaters before they reach the Columbia River or offsite extraction wells will reduce the risk that the population will be exposed to these compounds and will reduce the cost of subsequent groundwater cleanup.

360 (BHI–00135-Rev.1) **N-Springs barrier wall drilling program data package. Revision 1.** Johnson, V.M.; Lindsey, K.A.; Serne, J.R.; Edrington, R.S.; Mitchell, T.H. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005051. Source: OSTI; NTIS; INIS; GPO Dep.

This revision provides results of geotechnical site characterization field work performed from September 1994 to February 1995 by the Environmental Restoration Contractor (ERC) to support the proposed installation of 3,000-ft-long sheet-pile wall at N-Springs. N-Springs, which is located along the banks of the Columbia River at 100-N Area, was contaminated during the operation of the 1301-N and 1325-N liquid waste disposal facilities (LWDF). The work scope included the following: blow count sampling to determine relative penetration resistance of formation; geologic logging of the Hanford formation, the Ringold Formation, and the Ringold upper mud; geohydrologic characterization of the Ringold upper mud and unit E; soil chemistry; and elevation of the Ringold upper mud. The purpose of this report is to present a compilation of data gathered during field activities.

361 (BHI–00147-Rev.02) **N Springs pump-and-treat well design. Revision 2.** Borghese, J.V.; Edrington, R.S.; Walker, L.D. Bechtel Hanford, Inc., Richland, WA (United States). Jun 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005056. Source: OSTI; NTIS; INIS; GPO Dep.

Past practices in the 100-N Area have resulted in contamination of soils and underlying groundwater. The release of large volumes of water to the 1301-N and 1325-N liquid waste disposal facilities (LWDF) has resulted in transport of contaminants, particularly ^{90}Sr, to the Columbia River. Since the shutdown of N Reactor in 1987, the releases to the LWDF have been discontinued. Results from groundwater monitoring programs indicate that the principal contaminants in the groundwater downgradient of the 1301-N and 1325-N cribs are tritium and ^{90}Sr. Other radionuclides are also present, but these are below regulatory limits. The scope of this document is to provide guidelines and design criteria for two extraction wells, one injection well, and rehabilitation of well 199-N-14. The new extraction and injection wells will be drilled to the bottom of the unconfined aquifer and completed with a fully penetrating screen. The extraction wells will be screened across the entire aquifer so that water samples can be collected at discrete intervals. The results of sample analyses and analysis of geophysical logs should indicate zones of higher contamination. Once this determination has been made, the zone of higher contamination can be packed off within the well so that water is pumped from this zone.

362 (BHI–00149) **200-UP-1 vertical profiling activity summary report.** Ford, B.H. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005059. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes and interprets hydrochemical results collected in support of the 200-UP-1 Groundwater Operable Unit Contaminant Vertical Profiling Activity. Two primary contaminants of concern (uranium and technetium-99 [^{99}Tc]) and two secondary contaminants (nitrate and carbon tetrachloride) are present in the groundwater along the southeastern edge of the 200 West Area. These contaminants are the subject of 200-UP-1 operable unit investigation activities. Contaminant distribution maps are presented. Potential source units for uranium, ^{99}Tc, and nitrate within the mapped area are the 216-U-1 and 216-U-2 cribs, the 216-U-8 crib, and the 216-U-12 crib. The 216-U-16 crib is important in that effluent disposal to it provided hydraulic driving force for the movement of contaminants to groundwater beneath the 216-U-1 and 216-U-2 cribs. The data and interpretations presented in this report will be used to support characterization and remedial decisions for the 200-UP-1 operable unit.

363 (BHI–00158) **Review of selected 100-N waste sites related to N-Springs remediation projects.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005053. Source: OSTI; NTIS; INIS; GPO Dep.

This document has been prepared in support of the environmental restoration program at the US Department of Energy's Hanford Site near Richland, Washington, by the Bechtel Hanford, Inc. Facility and Waste Site Research Office. It provides historical information that documents and characterizes selected waste sites that are related to the N-Springs remediation projects. The N-Springs are a series of small, inconspicuous groundwater seepage springs located along the Columbia River shoreline near the 100-N Reactor. The spring site is hydrologically down-gradient from several 100-N Area liquid waste sites that are believed to have been the source(s) of the effluents being discharged by the springs. This report documents and characterizes these waste sites, including the 116-N-1 Crib and Trench, 116-N-3 Crib and Trench, unplanned releases, septic tariks, and a backwash pond.

364 (BHI–00159) **Design criteria for, the 200-ZP-1 interim remedial measure.** Mudge, J.F.; Olson, J.W. Bechtel Hanford, Inc., Richland, WA (United States). Aug 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005054. Source: OSTI; NTIS; INIS; GPO Dep.

The Interim Remedial Measure Proposed Plan for the 200-ZP-1 Operable Unit recommended a pump and treat action to contain contaminated groundwater and limit further degradation of groundwater due to elevated concentrations of carbon tetrachloride, chloroform, and trichloroethylene in the 200-ZP-1 Operable Unit. This design criteria document defines the Project. The Project encompasses: site preparation; development of groundwater wells for monitoring, extraction, and injection; extraction and injection equipment; construction of a treatment system with support buildings/utilities; management; engineering design, analysis, and reporting; and operation and maintenance. A groundwater pump and treat system, hereafter the System, will be composed of extraction wells, a piping network, treatment equipment, water storage, and injection wells. Based upon engineering judgment, the selected technology in the proposed plan (DOE-RL 1994a) is air stripping of the organic contaminants followed by vapor-phase adsorption onto granulated activated carbon (GAC); liquid-phase GAC may be required as a polishing step. The Treatment Equipment refers to air stripping towers, adsorption vessels, water pumps, air blowers, instrumentation, and control devices which will be procured as a turn-key system.

365 (BHI–00161) **Risk-based decision analysis for groundwater operable units.** Chiaramonte, G.R. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005055. Source: OSTI; NTIS; INIS; GPO Dep.

This document proposes a streamlined approach and methodology for performing risk assessment in support of interim remedial measure (IRM) decisions involving the remediation of contaminated groundwater on the Hanford Site.

This methodology, referred to as "risk-based decision analysis," also supports the specification of target cleanup volumes and provides a basis for design and operation of the groundwater remedies. The risk-based decision analysis can be completed within a short time frame and concisely documented. The risk-based decision analysis is more versatile than the qualitative risk assessment (QRA), because it not only supports the need for IRMs, but also provides criteria for defining the success of the IRMs and provides the risk-basis for decisions on final remedies. For these reasons, it is proposed that, for groundwater operable units, the risk-based decision analysis should replace the more elaborate, costly, and time-consuming QRA.

366 (BHI–00164-Rev.1) **N Springs expedited response action performance monitoring plan. Revision 1.** Bechtel Hanford, Inc., Richland, WA (United States). Aug 1995. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005057. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater contained in the 100-NR-2 Operable Unit is contaminated with various radionuclides derived from waste water disposal practices and spills associated with 100-N Reactor operations. Of primary concern is the presence of high levels of ^{90}Sr in the groundwater and the discharge of ^{90}Sr-contaminated groundwater to the nearby Columbia River through historic river bank seeps known as "N Springs." A pump-and-treat system is being installed to remove ^{90}Sr contamination from the groundwater as part of the N Springs expedited response action (ERA). The groundwater extraction system will consist of four extraction and two injection wells with a proposed initial treatment capacity of 50 gal/min. The proposed location of the groundwater extraction system relative to the ^{90}Sr groundwater plume is presented.

367 (BHI–00180-Rev.) **Geophysical investigation of the 120-KE-3 and 118-K-2 sites, 100-KR-2 operable unit.** Bergstrom, K.A.; Mitchell, T.H.; Bolin, B.J. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96006964. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical investigations using ground-penetrating radar (GPR) and electromagnetic induction (EMI) were conducted at two waste sites, 120-KE-3 and 118-K-2, in the 100-K Area (Figure 1). Both of the sites are located within Operable Unit 100-KR-2. The 120-KE-3 waste site (Figure 2), also known as the 183-Filter Water Facility Trench and 100-KE-3, received sulfuric acid sludge from sulfuric acid storage tanks that were contaminated with 700 kg of mercury. The trench is documented as 3 ft wide by 3 ft deep by 40 ft long. However, part or all of the trench was excavated when an outside contractor attempted to recover the mercury (Carpenter and Cote 1994). Therefore, the actual size of the "disturbed area" from the trench and subsequent excavation is unknown. The objective of the geophysical investigation was to locate the original or reworked trench. The 118- K-2 site (Figure 3) was reportedly used to dispose radioactive sludge from the 116-KE-4 and 116-KW-3 retention basins. The size of the "trench" is unknown and documentation shows it in two different locations. No other information si available on the site. The objective of the investigation was to locate the trench.

368 (BHI–00185-Rev.) **Reevaluation of the N-Springs barrier wall.** Knepp, A.J.; Serne, J.R.; Ford, B.H.; Connelly, M.P.; Jacksha, G.L. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005937. Source: OSTI; NTIS; INIS; GPO Dep.

The quantity of the radioactive isotope ^{90}Sr entering the Columbia River at N-Springs is estimated to be 1.6 Ci over 10 years (0.16 Ci/yr). This new estimate is based on data collected during the installation of eight boreholes along the alignment of a proposed sheet pile barrier. New information was used to refine the hydrogeologic conceptualization of groundwater flow and contaminant transport at N-Springs. this revised estimate is significantly lower than the original estimate of 1.2 Ci/yr. Barrier walls of 2,000 ft and 3,000 ft in length were estimated to allow 0.03 Ci/yr. Barrier walls of 2,000 ft and 3,000 ft in length were estimated to allow 0.03. Ci/yr and 0.004 ci/yr of ^{90}Sr, respectively, to enter the Columbia River. Strontium-90 is found preferentially on soil between the historical water table and the current water table and in the area between the 1301-N crib and the N-Springs wells NS-1 through NS-6. Past operations of the 1301-N and 1325-N Liquid Waste Disposal Facilities elevated the pre-existing groundwater table by approximately 20 ft in some locations, bringing contaminated liquids into contact with soils that are now found above the existing water table. An approximately 1500-ft-long erosional feature was identified along the proposed barrier wall alignment encompassing these N-Springs wells. Strontium-90 found on soils in portions of this area are in direct contact with Columbia River water. Low concentrations found in N-Springs wells support the conclusion that the exchange of ^{90}Sr with the Columbia River is minimal.

369 (BHI–00187) **Engineering evaluation/ conceptual plan for the 200-UP-1 groundwater operable unit interim remedial measure.** Myers, D.A.; Swanson, L.C.; Weeks, R.S.; Giacinto, J.; Gustafson, F.W.; Ford, B.H.; Wittreich, C.; Parnell, S.; Green, J. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005050. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an engineering evaluation and conceptual plan for an interim remedial measure (ERM) to address a uranium and technetium-99 groundwater plume and an associated nitrate contamination plume in the 200-UP-1 Groundwater Operable Unit located in the 200 West Area of the Hanford Site. This report provides information regarding the need and potentially achievable objectives and goals for an IRM and evaluates alternatives to contain elevated concentrations of uranium, technetium-99, nitrate, and carbon tetrachloride and to obtain information necessary to develop final remedial actions for the operable unit.

370 (BHI–00187-Rev.1) **Engineering evaluation/ conceptual plan for the 200-UP-1 groundwater operable unit interim remedial measure.** Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012117. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an engineering evaluation and conceptual plan for an interim remedial measure (IRM) to address an uranium and technetium 99 groundwater plume in the 200-UP-1 Groundwater Operable Unite located in the 200 West Area of the Hanford Site. This report provides information regarding the need for an IRM and its potential achievable objectives and goals. The report also evaluates alternatives to contain elevated concentrations of uranium and technetium 99 and to obtain information necessary to develop final remedial actions for the operable unit.

371 (BHI–00187-Rev.2) **Engineering evaluation/ conceptual plan for the 200-UP-1 Groundwater Operable Unit interim remedial measure. Revision 2.** Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009914. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an engineering evaluation and conceptual plan for an interim remedial measure (IRM) to address a uranium and technetium-99 groundwater plume in the 200-UP-1 Groundwater Operable Unit located in the 200 West Area of the Hanford Site. This report provides information regarding the need for an IRM and its potentially achievable objectives and goals. The report also evaluates alternatives to contain elevated concentrations of uranium and technetium-99 and to obtain information necessary to develop final remedial actions for the operable unit.

372 (BHI–00194) **200-ZP-1 Phase interim remedial measure conceptual design report.** Olson, J.W.; Windmueller, C.R.; Parnell, S.E.; Mudge, J.G. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1995. 306p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005873. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the conceptual design for a pump-and-treat system [interim remedial measure (IRM) system] to reduce the volatile organic compound (VOC) content of the 200-ZP-1 Operable Unit groundwater. This conceptual design is for the 200-ZP-1, phase 2 IRM. The IRM was defined and presented in the Engineering Evaluation/ Conceptual Plan for the 200-ZP-1 Operable Unit Interim Remedial Measure (BHI 1994) and the Interim Remedial Measure Proposed Plan for the 200-ZP-1 Operable Unit (DOE-RL 1994). The IRM consists of removing groundwater via extraction wells, treating via air stripping and vapor-phase granular activated carbon (GAC), and injection of treated water back into the aquifer. Air stripping and vapor-phase GAC were chosen because of their effectiveness at removing VOC from groundwater and adsorbing VOC in the vapor phase (EPA 1991a, 1991b). Following development of the conceptual plan, the design criteria were defined in the Design Criteria for the 200-ZP-1 Interim Remedial Measure (BHI 1995). These criteria present the basic objectives and criteria for the IRM. These criteria form the basis for the IRM design. The 200-ZP-1 IRM is composed of three phases. Phase I is a treatability test, currently underway south of the 234-5Z Plant in the 200 West Area, consisting of groundwater extraction, liquid-phase GAC treatment, and injection of treated water. Phase 2 expands the measure from a treatability test to a full-scale remedial measure. The phase 2 IRM will use air stripping and vapor-phase GAC treatment and will operate at 200 gpm. Phase 3 is an optional phase. If the performance of phase 2 justifies increasing the treatment rate, it will be increased up to a maximum of 500 gpm. This option is accounted for in the conceptual plan as an increase to 300 gpm in fiscal year 1996 and another increase to 500 gpm in fiscal year 1997.

373 (BHI–00345-Rev.1) **Pore water chromium concentration at 100-H Reactor Area adjacent to fall chinook salmon spawning habitat of the Hanford Reach, Columbia River. Revision 1.** Hope, S.J.; Peterson, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005832. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater underlying the 100-H Reactor Area discharges into the Columbia River in the vicinity of fall chinook salmon (Onchorynchus tshawytscha) spawning habitat within the Hanford Reach. Hexavalent chromium is a contaminant of concern that is found in the groundwater. The contaminant is considered toxic to aquatic ecological receptors, as its concentrations exceed the US Environmental Protection Agency's chronic ambient water quality criteria (AWQC) of 11 μg/L. A methodology was designed and implemented to successfully obtain pore water samples from salmon spawning habitat located near the 100-H Reactor Area. Background data were obtained from three transacts, each containing two sample sites, upstream at Vemita Bar. Pore water was obtained from the substrate by divers from a depth of 46 cm (18 in.), which is deeper than the 10 to 40 cm (4 to 16 in.) substrate depth typically excavated by fall chinook salmon during spawning. Chromium was detected at levels above AWQC at three of 31 sample sites. One explanation for not detecting chromium at the remaining sites is that the interface between river water flowing within the substrate and groundwater upwelling into the substrate is below the 45 cm (18 in.) depth that was sampled. The potential impacts of contaminated groundwater discharge on the success of salmon spawning are uncertain.

374 (BHI–00402) **Data validation summary report for the 100-HR-3 Round 8, Phases 1 and 2 groundwater sampling task.** Bechtel Hanford, Inc., Richland, WA (United States); Golder Associates, Inc., Golden, CO (United States). Jan 1996. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008013. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a summary of data validation results on groundwater samples collected for the 100-HR-3 Round 8 Groundwater Sampling task. The analyses performed for this project consisted of: metals, general chemistry, and radiochemistry. The laboratories conducting the analyses were Quanterra Environmental Services (QES) and Lockheed Analytical Services. As required by the contract and the WHC statement of work (WHC 1994), data validation was conducted using the Westinghouse data validation procedures for chemical and radiochemical analyses (WHC 1993a and 1993b). Sample results were validated to levels A and D as described in the data validation procedures. At the completion of validation and verification of each data package, a data validation summary was prepared and transmitted with the original documentation to Environmental Restoration Contract (ERC) for inclusion in the project QA record.

375 (BHI–00409) **Data validation summary report for the 100-BC-5 Operable Unit Round 8 Groundwater Sampling.** Kearney, A.T. (Kearney (A.T.), Inc., Chicago, IL (United States)). Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008048. Source: OSTI; NTIS; INIS; GPO Dep.

The information provided in this validation summary report includes data from the chemical analyses of samples from the 100-BC-5 Operable Unit Round 8 Groundwater Sampling Investigation. All of the data from this sampling event and their related quality assurance samples were reviewed and validated to verify that the reported sample results were of sufficient quality to support decisions regarding remedial actions performed at this site. Sample analyses included metals, general chemistry and radiochemistry.

376 (BHI–00410) **200-ZP-1 Semi-Annual Groundwater Sampling validation summary: March 1995.** Bechtel Hanford, Inc., Richland, WA (United States); Los Alamos Technical Associates, Inc., NM (United States). Feb 1996. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008194. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a summary of data validation results for groundwater samples collected from the 200-ZP-1 Semi-Annual Groundwater Sampling-March 1995 Project. The analyses performed for this project include the following: General Chemistry: anions (nitrate), and Volatiles: target compound list [TCL] + carbon tetrachloride [$CC1_4$], chloroform, trichloroethane [TCE]. The objectives of this project were to validate a minimum of 10% of the samples to level C as outlined in the data validation procedures (WHC 1993). In addition, this report provides a summary of the data as defined by laboratory performance criteria and project-specific data quality objectives to ensure the data are acceptable for use on the 200-ZP-1 Semi-Annual Groundwater Sampling-March 1995 Project.

377 (BHI–00416-Rev.2) **Risk-based decision analysis for the 200-BP-5 groundwater operable unit. Revision 2.** Chiaramonte, G.R. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005932. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents data from a risk analysis that was performed on three groundwater contaminant plumes within the 200-BP-5 Operable Unit. Hypothetical exposure scenarios were assessed based on current and future plume conditions. For current conditions, a hypothetical industrial groundwater scenarios were assumed. The industrial ingestion scenario, which is derived from HSRAM, was not used for drinking water and should not be implied by this risk analysis that the DOE is advocating use of this groundwater for direct human ingestion. Risk was calculated at each monitoring well using the observed radionuclide concentrations in groundwater from that well. The calculated values represent total radiological incremental lifetime cancer risk. Computer models were used to show the analytical flow and transport of contaminants of concern.

378 (BHI–00432) **Construction quality assurance report for the prototype surface barrier.** Buckmaster, M.A. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 595p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96004508. Source: OSTI; NTIS; INIS; GPO Dep.

This construction quality assurance (CQA) report follows the requirements of the prototype surface barrier CQA plan, describes the construction work sequence, and reports significant inspection activities for project W-263 and construction of the barrier over the 21 6-B-57 Crib. This report compiles the material testing into tabulation and block evaluations and reports the compliance requirements for each separate construction work activity (e.g., subgrade, composite asphalt barrier, and drainage layer). Each work activity is tied to the respective specification section and related design drawings. The report provides a basis for defining the work attested to by the CQA Officer.

379 (BHI–00446) **Well drilling summary report for well 199-N-106A.** Walker, L.D. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008046. Source: OSTI; NTIS; INIS; GPO Dep.

Past liquid waste disposal practices within the 100-N Area have resulted in the contamination of the underlying sediments and groundwater. The release of large volumes of liquid effluent to the 1301-N and 1325-N Liquid Waste Disposal Facilities caused the transport of ^{90}Sr and other contaminants to the groundwater. Further discussion of 100-N Area hydrogeology is provided in Hartman and Lindsey (1993). A pump-and-treat system combined with a vertical barrier is the preferred alternative for the N Springs Expedited Response Action. This document is a compilation of the data collected during the drilling of well 199-N-106A, an extraction well for the 100-N Pump-and-Treat Project.

380 (BHI–00456) **Preliminary engineering assessment of treatment alternatives for groundwater from the Hanford 200 Area 200-BP-5 plumes.** Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012120. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Preliminary Engineering Assessment of Treatment Alternatives (PEATA), an engineering evaluation of potential treatment alternatives for groundwater extracted from the 200-BP-5 Area's 216-BY Cribs and 216-B-5 Reverse Well plumes. The primary objective of the PEATA was to identify treatment technologies that are worth further consideration (i.e., treatability testing or a more refined engineering evaluation). It will also provide a basis for evaluating the results of the treatability testing that is currently being conducted on the presumptive remedy of ion exchange with disposal of spent resin and will serve as a guide for selection of other technologies for additional testing. Because there are little data or past experience with groundwater similar to the BY-Crib and B-5 Reverse Well Plumes, treatment efficiencies cannot be predicted with certainty and rigorous treatment system designs and costs cannot be developed. This applies to all alternatives, including the presumptive remedy of ion exchange. The approach for this study was to develop conceptual designs and approximate costs for the treatment technologies that were most likely to be effective on the BY-Crib and B-5 Reverse Well groundwater.

381 (BHI–00458) **200-UP-1 groundwater pump-and-treat Phase 1 quarterly report, September 1995–November 1995.** Myers, D.A.; Gustafson, F.W.; Wittreich, C.D. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009915. Source: OSTI; NTIS; GPO Dep.

A groundwater pump-and-treat activity is being performed in the 200-UP-1 Groundwater Operable Unit. The purpose of the pump and treat is to contain and treat elevated concentrations of uranium and technetium-99 in the 200-UP-1 Operable Unit and collect data on aquifer response to the pump and treat. The pump and treat began operations in

March 1994 as a pilot-scale treatability test to assess the effectiveness of an ion-exchange treatment system to remove uranium and technetium-99 from extracted groundwater. Pump-and-treat operations continued through August 1995, at which time the system was upgraded to increase the flow rate from 57 to 190 L/min, consistent with the interim remedial measure (IRM) proposed plan for 200-UP-1. Wells were installed to provide additional groundwater extraction and reinjection capacity, to enhance containment of high concentrations of uranium and technetium-99, and to improve aquifer response/remediation monitoring. The upgraded pump-and-treat system, referred to as the Phase 1 system, is expected to continue operating until an IRM record of decision is issued and implemented. This report summarizes and evaluates treatment, hydrologic, and geochemistry data collected for the initial quarter of 200-UP-1 Phase 1 pump-and-treat operations.

382 (BHI–00463) **Hazard classification for the 200-ZP-1 Operable Unit Phase 2 and 3 interim remedial measure.** Oestreich, D.K. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008964. Source: OSTI; NTIS; INIS; GPO Dep.

This safety assessment documents the Final Hazard Classification (FHC) for Phase 2 and 3 interim remedial measure (IRM) activities to be conducted in the 200 West Area of the Hanford Site. The 200-ZP-1 Phase 2 and 3 IRM activities will involve the air stripping of carbon tetrachloride (CCl_4) from extracted groundwater using a packed-bed stripper column followed by gas-phase adsorption of the CCl_4 from the stripper off-gas onto a granular activated carbon (GAC) bed. The stripper is designed to be operated at a feedwater flow rate of up to 1,893 L/min (500 gal/min) and to remove 13.6 kg/day (30.0 lb/day) of CCl_4. For Phase 2, which includes the initial year of operation, it is planned to operate the stripper at 568 L/min (150 gal/min). The process flow diagram for the Phase 2 and 3 system is shown.

383 (BHI–00464) **Hanford sitewide grounwater remediation - supporting technical information.** Chiaramonte, G.R. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012121. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Sitewide Groundwater Remediation Strategy was issued in 1995 to establish overall goals for groundwater remediation on the Hanford Site. This strategy is being refined to provide more detailed justification for remediation of specific plumes and to provide a decision process for long-range planning of remediation activities. Supporting this work is a comprehensive modeling study to predict movement of the major site plumes over the next 200 years to help plan the remediation efforts. The information resulting from these studies will be documented in a revision to the Strategy and the Hanford Site Groundwater Protection Management Plan. To support the modeling work and other studies being performed to refine the strategy, this supporting technical information report has been produced to compile all of the relevant technical information collected to date on the Hanford Site groundwater contaminant plumes. The primary information in the report relates to conceptualization of the source terms and available history of groundwater transport, and description of the contaminant plumes. The primary information in the report relates to conceptualization of the source terms and available history of groundwater transport, description of the contaminant plumes, rate of movement based on the conceptual model and monitoring data, risk assessment, treatability study information, and current approach for plume remediation.

384 (BHI–00465) **Aquifer test results, 200-UP-1 operable unit IRM plume: Wells 299-W19-39 and 299-W19-36.** Swanson, L.C. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008963. Source: OSTI; NTIS; INIS; GPO Dep.

An aquifer test was conducted at 200-UP-1 extraction well 299-W19-39 from September 6 to 8, 1995. The testing process consisted of pumping groundwater from the extraction well, using the surface treatment system to purify the water, and reinjecting the water through well 299-W19-36. Multiple observation wells were used to measure the response of the aquifer during the pumping and recovery phases of the test. Tables 1 and 2 list each well monitored and give well location and configuration information. Pretest monitoring initiated on August 31, 1995 was used to establish water-level trends and barometric pressure responses in the extraction, injection, and observation wells. Water-level monitoring continued for about 2 weeks after pumping ceased. The objectives of the aquifer test were to determine large-scale aquifer properties to confirm hydraulic conductivity input values used in previous numerical modeling work, to evaluate the long-term performance of the extraction and monitoring wells, and to estimate the radial extent of the drawdown cone (i.e., the expected capture area and depth). All of the test objectives were met. A discussion of the test results follows.

385 (BHI–00552) **Validtion summary report for the 200-UP-1 groundwater round 2.** Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005869. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a summary of data validation results on groundwater samples collected for the 200-UP-1 Groundwater Round 2 Project. The analyses performed for this project were as follows: metals; general chemistry including anions, total organic carbon, total dissolved solids, total suspended solids, and alkalinity; radiochemistry including gross alpha, technetium-99, strontium-90, iodine-129, plutonium-238/239/240, and total uranium; volatiles including volatile organics; and semivolatiles including semivolatile organics. This summary report validates sample delivery groups and provides a summary of the data as defined by laboratory performance criteria and project-specific data quality objectives to ensure that the data is acceptable for use on the 200-UP-1 Groundwater Round 2 Project.

386 (BHI–00553) **Validation summary report for the 100-KR-4 Groundwater Round 8.** Bechtel Hanford, Inc., Richland, WA (United States); Los Alamos Technical Associates, Inc., NM (United States). Jan 1996. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008049. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a summary of data validation results on groundwater samples collected for the 100-KR-4 Groundwater Round 8 Project. The analyses performed for this project were as follows: Metals: inductively coupled plasma (ICP) metals (filtered and unfiltered); General chemistry: anions (fluoride, chloride, nitrate, nitrite, phosphate, and sulfate) and turbidity; and Radiochemistry: carbon-14, gamma scan, gross alpha, gross beta, strontium-90, tritium, and uranium-234/235/238. The objectives of this project were to validate all sample delivery groups (SDG) at level D as defined in the data validation procedures.

387 (BHI–00554) **Validation summary report for the 100-HR-3 Groundwater Round 9 Phase 1 and 2.** Bechtel Hanford, Inc., Richland, WA (United States); Los Alamos Technical Associates, Inc., NM (United States). Feb 1996. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008045. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a summary of data validation results on groundwater samples collected for the 100-HR-3 Groundwater Round 9-Phase I and II Project. The analyses performed for this project were as follows: Metals–inductively coupled plasma (ICP) metals (filtered and unfiltered); General Chemistry–anions (fluoride, chloride, nitrate, nitrite, phosphate, and sulfate), turbidity, ammonia, nitrate+nitrite, and sulfide; and Radiochemistry–gross alpha, gross beta, technetium-99, tritium, and uranium-234/235/238. The objectives of this project were to validate sample detection limit as defined in the data validation procedures (WHC 1993). In addition, this report provides a summary of the data as defined by laboratory performance criteria and project-specific data quality objectives.

388 (BHI–00555-Rev.) **Data validation summary report for the 100-NR-2 operable unit groundwater sampling round 8.** Kearney, A.T. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005934. Source: OSTI; NTIS; INIS; GPO Dep.

The information provided in this validation summary report includes data from the chemical analyses of samples from the 100-NR-2 Operable Unit Round 8 Groundwater Sampling Investigation. Data from this sampling event and their related quality assurance (QA) samples were reviewed and validated in accordance with Westinghouse Hanford Company (WHC) guidelines at the requested level. Sample analyses included metals, general chemistry, and radiochemistry. Forty-eight (48) metals samples were analyzed by Quanterra Environmental Services (QES) and Lockheed Analytical Services (LAS). The metals samples were validated using WHC protocols specified in WHC (1992a). All metals data were qualified based on this guidance. The container for sample number BOGJW7 in Sample Delivery Group (SDG) No. W0721-QES was broken in transit and therefore no results were available for validation. Table 1 lists the metals SDGs that were validated for this sampling event.

389 (BHI–00556) **Data validation summary report for the 100-BC-5 Operable Unit Round 9 Groundwater Sampling. Revision 0.** Kearney, A.T. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 94p. Sponsored by USDOE, Washington; DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008208. Source: OSTI; NTIS; INIS; GPO Dep.

The information provided in this validation summary report includes chemical analyses of samples from 100-BC-5 Operable Unit Round 9 Groundwater sampling data. Data from this sampling event and their related quality assurance (QA) samples were reviewed and validated in accordance with Westinghouse Hanford Company (WHC) guidelines at the requested level. Sample analyses included metals, general chemistry, and radiochemistry. Sixty metals samples were analyzed by Quanterra Environmental Services (QES) and Lockheed Analytical Services (LAS). The metals samples were validated using WHC protocols specified in Data Validation Procedures for Chemical Analyses. All qualifiers assigned to the metals data were based on this guidance. The Table 1.1 lists the metals sample delivery group (SDG) that were validated for this sampling event.

390 (BHI–00557) **Data validation summary report for the 100-FR-3 Operable Unit Round 8 Groundwater.** Kearney, A.T. (Kearney (A.T.), Inc., Chicago, IL (United States)). Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 301p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008028. Source: OSTI; NTIS; INIS; GPO Dep.

The information provided in this validation summary report includes data from the chemical and radiochemical analyses of samples from the 100-FR-3 Operable Unit Groundwater Round 8. Data from this sampling event and their related quality assurance (QA) samples were reviewed and validated in accordance with Westinghouse Hanford Company (WHC) guidelines at the requested level.

391 (BHI–00607) **Aquifer test plan in support of N Springs ERA Performance Monitoring.** McMahon, W.J. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012139. Source: OSTI; NTIS; INIS; GPO Dep.

A series of aquifer tests is planned in October and November, 1995 at N Springs pump-and-treat extraction wells. Data collected during the tests will aid in the evaluation of system effectiveness and efficiency in reducing the flux of Strontium 90 into the Columbia River. This test plan describes the aquifer testing and the operations monitoring planned for the other extraction wells comprising the pump-and-treat system. This test plan will be revised as necessary when aquifer testing is planned at other wells and when other wells become available for testing. The goal of the aquifer testing and operations monitoring is to evaluate the impact of the pump-and-treat system on the aquifer and Strontium 90 contamination, and to enhance current knowledge of the aquifer flow system. This test plan provides technical guidance for conducting the aquifer tests, information on test design and operations monitoring, and data collection requirement for the tests.

392 (BHI–00608) **Hanford statewide groundwater flow and transport model calibration report.** Law, A.; Panday, S.; Denslow, C.; Fecht, K.; Knepp, A. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012122. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the development and calibration of a three-dimensional, finite element model (VAM3DCG) for the unconfined groundwater flow system at the Hanford Site. This flow system is the largest radioactively contaminated groundwater system in the United States. Eleven groundwater plumes have been identified containing organics, inorganics, and radionuclides. Because groundwater from the unconfined groundwater system flows into the Columbia River, the development of a groundwater flow model is essential to the long-term management of these plumes. Cost effective decision making requires the capability to predict the effectiveness of various remediation approaches. Some of the alternatives available to remediate groundwater include: pumping contaminated water from the ground for treatment with reinjection or to other disposal facilities; containment of plumes by means of impermeable walls, physical barriers, and hydraulic control measures; and, in some cases, management of groundwater via planned recharge and withdrawals. Implementation of these methods requires a knowledge of the groundwater flow system and how it responds to remedial actions.

393 (BHI–00701) **Groundwater cleanup discussion paper.** Vedder, B.L. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005878. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminated groundwater is present beneath a variety of locations at the Hanford Site. In many instances, extensive groundwater cleanup is unrealistic based upon existing remediation technologies and costs involved. Nevertheless, under the US Environmental Protection Agency's (EPA) interpretation of the Comprehensive Environmental Response Compensation and Liability Act of 1980 (CERCLA), contaminated groundwater generally must be cleaned up to meet maximum contamination levels (MCL) or maximum contamination level goals (MCLG) established under the Safe Drinking Water Act if the groundwater, prior to contamination, could have been used at some future date as a source of drinking water. In a similar manner, Resource Conservation and Recovery Act of 1976 (RCRA) standards require cleanup of groundwater at hazardous waste treatment, storage, and disposal units to meet MCLs unless alternate concentration limits (ACL) have been established. As "relevant and appropriate requirements" under CERCLA, these RCRA provisions typically must be met for contaminated groundwater at CERCLA sites. Because of these requirements, "Hanford groundwater must be remediated to meet drinking water standards unless a regulatory allowed alternative is authorized" (see Appendix A for further details pertaining to regulatory requirements for groundwater cleanup). Three primary regulatory alternatives exist that could be used to support less stringent groundwater restoration efforts. These are (1) reclassifying groundwater to administratively establish a non-drinking water source, (2) establishing ACLs for contaminant plumes, or (3) using one or more of the CERCLA waivers. This discussion paper provides implementation guidance relating to the ACL option.

394 (BHI–00719) **N-Springs aquifer test report for Well 199-N-103A.** McMahon, W.J. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005872. Source: OSTI; NTIS; INIS; GPO Dep.

An aquifer test was conducted at Well 199-N-103A during the week October 23-27, 1995, using equipment installed as part of the N Springs expedited response action (ERA) pump-and-treat. The test included both aquifer hydraulic and contaminant response to pumping. The test procedure is described in the aquifer test plan. All pumping, purge water, and monitoring equipment was previously installed for the pump-and-treat system. Execution of the test was coordinated with pump-and-treat operations to avoid disrupting the remediation system. Results are presented to support the evaluation criteria of the pump-and-treat system effectiveness at reducing the flux of ^{90}Sr to the Columbia River.

395 (BHI–00753) **100-N in situ treatment zone design and acquisition strategy plan.** Sykes, K.L. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008027. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a plan for the design and acquisition of the 100-N in situ treatment zone (ISTZ) treatability test and contains design and acquisition strategy information gathered from references. This treatability test is being conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to support the selection of long-term remedial alternatives for contaminated groundwater underlying the 100-N Area of the Hanford Site. The requirements for conducting the treatability test are presented in the In Situ Treatability Test Plan (DOE-RL, 1995). The purpose of this treatability test is to verify laboratory scale testing of the ISTZ technology under actual field conditions. This test will also provide preliminary construction information which will be included in the 100-NR-1 and 100-NR-2 Corrective Measures Study (CMS). Additional information such as effectiveness of the ISTZ as a long-term remedial action to address Strontium-90 (^{90}Sr) release to the Columbia River at N-Springs will be made available in the close-out report for this project.

396 (BHI–00764) **100-HR-3 and 100-KR-4 interim remedial measure pump-and-treat acquisition and design strategy plan.** Lau, E.; Winters, J.N. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012125. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a plant for the acquisition/design for the 100-HR-3 and 100-KR-4 groundwater pump-and-treat systems. These pump- and-treat systems are the proposed plan for the interim remedial measure at the 100-HR-3 and 100-KR-4 Operable Units.

397 (BHI–00770) **100-HR-3 and 100-KR-4 pump-and-treat drilling description of work.** Auten, J.E.; Myers, D.A. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012123. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the installation of wells necessary to implement the 100-HR-3 and 100-KR-4 Interim Remedial Action. the placement of wells is based on numerical modeling and requirements contained in the Record of Decision dated 4-1-1996. All of the wells drilled for this project will be designed as potential production wells. Five wells will be drilled in the 100-H Area to supplement seven existing wells. Initially, three of the wells will be injection wells; the remaining two wells will be used for compliance monitoring wells. These wells will be used in conjunction with two existing wells. In the 100-K Area, thirteen wells will be drilled to supplement two existing wells; five of the wells be used as extraction wells, four of the wells will be used as injection wells, and the remaining four wells will be used as compliance monitoring wells.

398 (BNL–52469) **Overview of research and development in subsurface fate and transport modeling.**

Sullivan, T.M. (Brookhaven National Lab., Upton, NY (United States)); Chehata, M. Brookhaven National Lab., Upton, NY (United States). May 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE95012459. Distribution: UC-2010. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy is responsible for the remediation of over 450 different subsurface-contaminated sites. Contaminant plumes at these sites range in volume from several to millions of cubic yards. The concentration of contaminants also ranges over several orders of magnitude. Contaminants include hazardous wastes such as heavy metals and organic chemicals, radioactive waste including tritium, uranium, and thorium, and mixed waste, which is a combination of hazardous and radioactive wastes. The physical form of the contaminants includes solutes, nonaqueous phase liquids (NAPLs), and vapor phase contaminants such as volatilized organic chemicals and radon. The subject of contaminant fate and transport modeling is multi-disciplinary, involving hydrology, geology, microbiology, chemistry, applied mathematics, computer science, and other areas of expertise. It is an issue of great significance in the United States and around the world. As such, many organizations have substantial programs in this area. In gathering data to prepare this report, a survey was performed of research and development work that is funded by US government agencies to improve the understanding and mechanistic modeling of processes that control contaminant movement through subsurface systems. Government agencies which fund programs that contain fate and transport modeling components include the Environmental Protection Agency, Nuclear Regulatory Commission, Department of Agriculture, Department of Energy, National Science Foundation, Department of Defense, United States Geological Survey, and National Institutes of Health.

399 (BNL--61458) **Effect of groundwater on soil-structure interaction.** Xu, J. (Brookhaven National Lab., Upton, NY (United States)); Bandyopadhyay, K.K.; Kassir, M.K. Brookhaven National Lab., Upton, NY (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740--69: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95014518. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents results of a parametric study performed to investigate the effect of pore water in saturated soils on the response of nuclear containment structures to seismic motions. The technique employed uses frequency domain algorithm which incorporates impedances for both dry and saturated soils into an SSI model. A frequency domain time history analysis is carried out using the computer code CARES for a typical PWR containment structure. Structural responses presented in terms of floor response spectra indicate that considering the presence of the pore water in soils could benefit the design of massive nuclear containment structures.

400 (CONF-940815--117) **White Oak Creek embayment sediment retention structure design and construction.** Van Hoesen, S.D. (Oak Ridge National Lab., TN (United States)); Kimmell, B.L.; Page, D.G.; Wilkerson, R.B.; Hudson, G.R.; Kauschinger, J.L.; Zocolla, M. Oak Ridge National Lab., TN (United States). [1994]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE96009620. Source: OSTI; NTIS; INIS; GPO Dep.

White Oak Creek is the major surface water drainage throughout the Department of Energy (DOE) Oak Ridge National Laboratory (ORNL). Samples taken from the lower portion of the creek revealed high levels of Cesium 137 and lower level of Cobalt 60 in near surface sediment. Other contaminants present in the sediment included: lead, mercury, chromium, and PCBs. In October 1990, DOE, US Environmental Protection Agency (EPA), and Tennessee Department of Environment and Conservation (TDEC) agreed to initiate a time critical removal action in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to prevent the transport of the contaminated sediments into the Clinch River system. This paper discusses the environmental, regulatory, design, and construction issues that were encountered in conducting the remediation work.

401 (CONF-950483--11) **Subsurface microbial communities and degradative capacities during trichloroethylene bioremediation.** Pfiffner, S.M.; Ringelberg, D.B.; Hedrick, D.B.; Phelps, T.J.; Palumbo, A.V. Oak Ridge National Lab., TN (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international in situ and on-site bioreclamation symposium; San Diego, CA (United States); 24-27 Apr 1995. Order Number DE96010666. Source: OSTI; NTIS; INIS; GPO Dep.

Subsurface amendments of air, methane, and nutrients were investigated for the in situ stimulation of trichloroethylene- degrading microorganisms at the US DOE Savannah River Integrated Demonstration. Amendments were injected into a lower horizontal well coupled with vacuum extraction from the vadose zone horizontal well. The amendments were sequenced to give increasingly more aggressive treatments. Microbial populations and degradative capacities were monitored in groundwaters samples bi-monthly.

402 (CONF-9504123--2) **Biological tracer for waste site characterization.** Strong-Gunderson, J. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Innovative concepts technology and business opportunities; Denver, CO (United States); 20-21 Apr 1995. Order Number DE95014598. Source: OSTI; NTIS; INIS; GPO Dep.

Remediating hazardous waste sites requires detailed site characterization. In groundwater remediation, characterizing the flow paths and velocity is a major objective. Various tracers have been used for measuring groundwater velocity and transport of contaminants, colloidal particles, and bacteria and nutrients. The conventional techniques use dissolved solutes, dyes. and gases to estimate subsurface transport pathways. These tracers can provide information on transport and diffusion into the matrix, but their estimates for groundwater flow through fractured regions are very conservative. Also, they do not have the same transport characteristics as bacteria and suspended colloid tracers, both of which must be characterized for effective in-place remediation. Bioremediation requires understanding bacterial transport and nutrient distribution throughout the acquifer, knowledge of contaminants s mobile colloidal particles is just essential.

403 (CONF-950646–21) **Chemical oxidation of volatile and semi-volatile organic compounds in soil.** Gates, D.D.; Siegrist, R.L.; Cline, S.R. Oak Ridge National Lab., TN (United States). [1995]. 16p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995. Order Number DE95013048. Source: OSTI; NTIS; INIS; GPO Dep.

Subsurface contamination with fuel hydrocarbons or chlorinated hydrocarbons is prevalent throughout the Department of Energy (DOE) complex and in many sites managed by the Environmental Protection Agency (EPA) Superfund program. The most commonly reported chlorinated hydrocarbons (occurring $>$ 50% of DOE contaminated sites) were trichloroethylene (TCE), 1, 1, 1,-trichloroethane (TCA), and tetrachloroethylene (PCE) with concentrations in the range of 0.2 μg/kg to 12,000 mg/kg. The fuel hydrocarbons most frequently reported as being present at DOE sites include aromatic compounds and polyaromatic compounds such as phenanthrene, pyrene, and naphthalene. The primary sources of these semi-volatile organic compounds (SVOCs) are coal waste from coal fired electric power plants used at many of these facilities in the past and gasoline spills and leaks. Dense non-aqueous phase liquids (DNAPLs) can migrate within the subsurface for long periods of time along a variety of pathways including fractures, macropores, and micropores. Diffusion of contaminants in the non-aqueous, aqueous, and vapor phase can occur from the fractures and macropores into the matrix of fine-textured media. As a result of these contamination processes, removal of contaminants from the subsurface and the delivery of treatment agents into and throughout contaminated regions are often hindered, making rapid and extensive remediation difficult.

404 (CONF-950868–33) **Waste and cost reduction using dual wall reverse circulation drilling with multilevel groundwater sampling for contaminant plume delineation.** Smuin, D.R. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From ER '95: environmental remediation conference: committed to results; Denver, CO (United States); 13-18 Aug 1995. Order Number DE96003047. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the drilling and sampling methods used to delineate a groundwater contaminant plume at the Paducah Gaseous Diffusion Plant (PGDP) during the Groundwater Monitoring IV characterization. The project was unique in that it relied upon dual wall reverse circulation drilling instead of the traditional hollow stem auger method. The Groundwater Monitoring program sought to characterize the boundaries, both vertically and horizontally, of the northeast plume which contains both ^{99}Tc and trichloroethene. This paper discusses the strengths and weaknesses of the drilling method used by investigators.

405 (CONF-951006–10) **Estimation of contaminant transport in groundwater beneath radioactive waste disposal facilities.** Wang, J.C.; Tauxe, J.D.; Lee, D.W. Oak Ridge National Lab., TN (United States). 25 May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE95014577. Source: OSTI; NTIS; INIS; GPO Dep.

Performance assessments are required for low-level radioactive waste disposal facilities to demonstrate compliance with the performance objectives, consider human exposures from water, air, and inadvertent intruder pathways. Among these, the groundwater pathway analysis usually involves complex numerical simulations with results which are often difficult to verify and interpret. This paper presents a technique to identify and simplify the essential parts of the groundwater analysis. The transport process of radionuclides including infiltration of precipitation, leachate generation, and advection and dispersion in the groundwater is divided into several steps. For each step, a simple analytical model is constructed and refined to capture the dominant phenomena represented in the complex analysis included in a site-specific performance assessment. This step-wise approach provides a means for gaining insights into the transport process and obtaining reasonable estimates of relevant quantities for facility design and site evaluation.

406 (CONF-960539–2) **Relating groundwater and sediment chemistry to microbial characterization at a BTEX-contaminated site.** Pfiffner, S.M. (Oak Ridge National Lab., TN (United States)); Palumbo, A.V.; McCarthy, J.F.; Gibson, T. Oak Ridge National Lab., TN (United States). 1996. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 18. symposium on biotechnology for fuels and chemicals; Gatlinburg, TN (United States); 5-9 May 1996. Order Number DE96012081. Source: OSTI; NTIS; INIS; GPO Dep.

The National Center for Manufacturing Science is investigating bioremediation of petroleum hydrocarbon at a site in Belleville, Michigan. As part of this study we examined the microbial communities to help elucidate biodegradative processes currently active at the site. We observed high densities of aerobic hydrocarbon degraders and denitrifiers in the less-contaminated sediments. Low densities of iron and sulfate reducers were measured in the same sediments. In contrast, the highly-contaminated sediments showed low densities of aerobic hydrocarbon degraders and denitrifiers and high densities of iron and sulfate reducers. Methanogens were also found in these highly-contaminated sediments. These contaminated sediments also showed a higher biomass, by phospholipid fatty acids, and greater ratios of phospholipid fatty acids which indicate stress within the microbial community. Aquifer chemistry analyses indicated that the more-contaminated area was more reduced and had lower sulfate than the less-contaminated area. These conditions suggest that the subsurface environment at the highly-contaminated area had progressed into sulfate reduction and methanogensis. The less-contaminated area, although less reduced, also appeared to be progressing into primarily iron- and sulfate-reducing microbial communities. The proposed treatment to stimulate bioremediation includes addition of oxygen and nitrate. Groundwater chemistry and microbial analyses revealed significant differences resulted from the injection of dissolved oxygen and nitrate in the subsurface. These differences included increases in pH and Eh and large decreases in BTEX, dissolved iron, and sulfate concentrations at the injection well.

407 (CONF-960804–8) **Discovery, interception, and treatment of a groundwater plume: Oak Ridge National Laboratory.** Lee, R. (Oak Ridge National Lab., TN (United States). Energy Div.); Ketelle, D. Oak Ridge National Lab.,

TN (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009633. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological groundwater plume was discovered to be discharging into a surface stream and portions of the storm drain network at Oak Ridge National Laboratory (ORNL). A CERCLA removal action was initiated to address the discharges. The plume was found to be migrating 65 degrees oblique to the overall hydraulic gradient and was identified only after historic data were analyzed and field tests were performed under the working hypothesis of stratabound flow and transport. A detailed geologic and hydrologic analysis was performed that accurately predicted the 3-dimensional plume configuration from a single point datum where significantly elevated contaminant levels were found in a bedrock core hole. Subsequent sampling found that direct discharges of contamination existed in the stream only in the location of the predicted stratum. The affected storm drain outfall discharges were suspected to be the major contributors to ^{90}Sr surface water risk from ORNL. Thus, the selected removal action focused on eliminating the known seepage to the storm drain network. Intercept system operations reduced the total surface water ^{90}Sr flux by about 90%. Ongoing investigations seek to identify the source of the plume with the hope that the intercept system may eventually be deactivated. However, the efficiency of the system exceeded expectations and demonstrated that a good understanding of the hydrodynamics is a prerequisite to success. The relatively trouble free operation of the system also indicates that simple technologies can serve as effective measures to address immediate problems.

408 (DOE/AL–050520.0000) **Remedial action plan and site design for stabilization of the inactive uranium mill tailings site at Falls City, Texas. Remedial action selection report, attachment 2, geology report; attachment 3, groundwater hydrology report; and attachment 4, water resources protection strategy. Final report.** Texas State Government, Falls City, TX (United States). Sep 1992. 736p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC04-87AL20532. Order Number DE96013586. Source: OSTI; NTIS; INIS; GPO Dep.

The uranium processing site near Falls City, Texas, was one of 24 inactive uranium mill sites designated to be remediated by the U.S. Department of Energy (DOE) under Title I of the Uranium Mill Tailings Radiation Control Act of 1978 (UMTRCA). The UMTRCA requires that the U.S. Nuclear Regulatory Commission (NRC) concur with the DOE's remedial action plan (RAP) and certify that the remedial action conducted at the site complies with the standards promulgated by the U.S. Environmental Protection Agency (EPA). The RAP, which includes this summary remedial action selection report (RAS), serves a two-fold purpose. First, it describes the activities proposed by the DOE to accomplish long-term stabilization and control of the residual radioactive materials at the inactive uranium processing site near Falls City, Texas. Second, this document and the remainder of the RAP, upon concurrence and execution by the DOE, the State of Texas, and the NRC, becomes Appendix B of the Cooperative Agreement between the DOE and the State of Texas.

409 (DOE/AL/62350–21F-Rev.1-Attach.3-App.A) **Remedial Action Plan and Site Design for stabilization of the inactive Uranium Mill Tailings sites at Slick Rock, Colorado: Appendix A to Attachment 3, Tables. Final.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 605p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000225. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains tables of data on ground water quality for the study on ground water hydrology, which is attachment 3 of this series of reports.

410 (DOE/AL/62350–43-Rev.2) **Baseline risk assessment of ground water contamination at the Monument Valley uranium mill tailings site Cane Valley, Arizona.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96011537. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase I) and the Ground Water Project (Phase II). Under the UMTRA Surface Project, tailings, radioactive contaminated soil, equipment, and materials associated with the former uranium ore processing at UMTRA Project sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to minimize further contamination of ground water. Surface cleanup at the Monument Valley UMTRA Project site near Cane Valley, Arizona, was completed in 1994. The Ground Water Project evaluates the nature and extent of ground water contamination that resulted from the uranium ore processing activities. The Ground Water Project is in its beginning stages. Human health may be at risk from exposure to ground water contaminated by uranium ore processing. Exposure could occur by drinking water pumped out of a hypothetical well drilled in the contaminated areas. Adverse ecological and agricultural effects may also result from exposure to contaminated ground water. For example, livestock should not be watered with contaminated ground water. A risk assessment describes a source of contamination, how that contamination reaches people and the environment, the amount of contamination to which people or the ecological environment may be exposed, and the health or ecological effects that could result from that exposure. This risk assessment is a site-specific document that will be used to evaluate current and potential future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site investigations will be used to determine a compliance strategy to comply with the UMTRA ground water standards.

411 (DOE/AL/62350–57-Rev.2) **Baseline risk assessment of groundwater contamination at the uranium mill tailings site, near Gunnison, Colorado. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1996. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013531. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the second site-specific risk assessment document prepared for the Ground Water Project at the Gunnison site. A preliminary risk assessment was conducted in 1990 to determine whether long-term use of ground water from private wells near the Gunnison site had the potential for adverse health effects. Due to the results of that preliminary risk assessment, the residents were provided bottled water on an interim basis. In July 1994, the residents and the nearby Valco cement/concrete plant were given the option to connect to anew alternate water supply system, eliminating the bottled water option. This document evaluates current and potential future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will be used to determine whether more action is needed to protect human health and the environment and to comply with the EPA standards.

412 (DOE/AL/62350–65-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings site near Riverton, Wyoming. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000235. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project consists of two phases: the Surface Project and the Ground Water Project. At the UMTRA Project site near Riverton, Wyoming, Surface Project cleanup occurred from 1988 to 1990. Tailings and radioactively contaminated soils and materials were taken from the Riverton site to a disposal cell in the Gas Hills area, about 60 road miles (100 kilometers) to the east. The surface cleanup reduces radon and other radiation emissions and minimizes further ground water contamination. The UMTRA Project's second phase, the Ground Water Project, will evaluate the nature and extent of ground water contamination at the Riverton site that has resulted from the uranium ore processing activities. Such evaluations are used at each site to determine a strategy for complying with UMTRA ground water standards established by the US Environmental Protection Agency (EPA) and if human health risks could result from exposure to ground water contaminated by uranium ore processing. Exposure could hypothetically occur if drinking water were pumped from a well drilled in an area where ground water contamination might have occurred. Human health and environmental risks may also result if people, plants, or animals are exposed to surface water that has mixed with contaminated ground water.

413 (DOE/AL/62350–70-Rev.1) **Guidance document for preparing water sampling and analysis plans for UMTRA Project sites. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000234. Source: OSTI; NTIS; INIS; GPO Dep.

A water sampling and analysis plan (WSAP) is prepared for each Uranium Mill Tailings Remedial Action (UMTRA) Project site to provide the rationale for routine ground water sampling at disposal sites and former processing sites. The WSAP identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequency for the routine ground water monitoring stations at each site. This guidance document has been prepared by the Technical Assistance Contractor (TAC) for the US Department of Energy (DOE). Its purpose is to provide a consistent technical approach for sampling and monitoring activities performed under the WSAP and to provide a consistent format for the WSAP documents. It is designed for use by the TAC in preparing WSAPs and by the DOE, US Nuclear Regulatory Commission, state and tribal agencies, other regulatory agencies, and the public in evaluating the content of WSAPS.

414 (DOE/AL/62350–72-Rev.2) **UMTRA project technical assistance contractor quality assurance implementation plan for surface and ground water, Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003086. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the Technical Assistance Contractor (TAC) Quality Assurance Implementation Plan (QAIP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project. The QAIP outlines the primary requirements for integrating quality functions for TAC technical activities applied to the surface and ground water phases of the UMTRA Project. The QA program is designed to use monitoring, audit, and surveillance activities as management tools to ensure that UMTRA Project activities are carried out in amanner to protect public health and safety, promote the success of the UMTRA Project, and meet or exceed contract requirements.

415 (DOE/AL/62350–87-Rev.1) **UMTRA Project water sampling and analysis plan, Durango, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000239. Source: OSTI; NTIS; INIS; GPO Dep.

Planned, routine ground water sampling activities at the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site in Durango, Colorado, are described in this water sampling and analysis plan. The plan identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequency for the routine monitoring stations at the site. The ground water data are used to characterize the site ground water compliance strategies and to monitor contaminants of potential concern identified in the baseline risk assessment (DOE, 1995a). Regulatory basis for routine ground water monitoring at UMTRA Project sites is derived from the US EPA regulations in 40 CFR Part 192 (1994) and EPA standards of 1995 (60 FR 2854). Sampling procedures are guided by the UMTRA Project standard operating procedures (SOP) (JEG, n.d.), the Technical Approach Document (TAD) (DOE, 1989), and the most effective technical approach for the site.

416 (DOE/AL/62350–90S) **Supplement to the UMTRA Project water sampling and analysis plan, Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000240. Source: OSTI; NTIS; INIS; GPO Dep.

The Ambrosia Lake Uranium Mill Tailings Remedial Action (UMTRA) Project site is in McKinley County, New Mexico. As part of UMTRA surface remediation, residual radioactive materials were consolidated on the site in a disposal cell that was completed July 1995. The need for ground water monitoring was evaluated and found not to be necessary beyond the completion of the remedial action because the ground water in the uppermost aquifer is classified as limited use.

417 (DOE/AL/62350–95-Rev.1) **UMTRA Project water sampling and analysis plan, Canonsburg, Pennsylvania. Revision 1.** Jacobs Engineering Group, Inc.,

Albuquerque, NM (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000656. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action was completed at the US Department of Energy (DOE) Canonsburg and Burrell Uranium Mill Tailings Remedial Action (UMTRA) Project sites in southwestern Pennsylvania in 1985 and 1987, respectively. The Burrell disposal site, included in the UMTRA Project as a vicinity property, was remediated in conjunction with the remedial action at Canonsburg. On 27 May 1994, the Nuclear Regulatory Commission (NRC) accepted the DOE final Long-Term Surveillance Plan (LTSP) (DOE, 1993) for Burrell thus establishing the site under the general license in 10 CFR §40.27 (1994). In accordance with the DOE guidance document for long-term surveillance (DOE, 1995), all NRC/DOE interaction on the Burrell site's long-term care now is conducted with the DOE Grand Junction Projects Office in Grand Junction, Colorado, and is no longer the responsibility of the DOE UMTRA Project Team in Albuquerque, New Mexico. Therefore, the planned sampling activities described in this water sampling and analysis plan (WSAP) are limited to the Canonsburg site. This WSAP identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequencies for routine monitoring at the Canonsburg site for calendar years 1995 and 1996. Currently, the analytical data further the site characterization and demonstrate that the disposal cell's initial performance is in accordance with design requirements.

418 (DOE/AL/62350–97-Rev.1) **UMTRA project water sampling and analysis plan, Falls City, Texas. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000447. Source: OSTI; NTIS; INIS; GPO Dep.

Planned, routine ground water sampling activities at the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site near Falls City, Texas, are described in this water sampling and analysis plan (WSAP). The following plan identifies and justifies the sampling locations, analytical parameters, and sampling frequency for the routine monitoring stations at the site. The ground water data are used for site characterization and risk assessment. The regulatory basis for routine ground water monitoring at UMTRA Project sites is derived from the US Environmental Protection Agency (EPA) regulations in 40 CFR Part 192. Sampling procedures are guided by the UMTRA Project standard operating procedures (SOP) (JEG, n.d.), the Technical Approach Document (TAD) (DOE, 1989), and the most effective technical approach for the site. The Falls City site is in Karnes County, Texas, approximately 8 miles [13 kilometers southwest of the town of Falls City and 46 mi (74 km) southeast of San Antonio, Texas. Before surface remedial action, the tailings site consisted of two parcels. Parcel A consisted of the mill site, one mill building, five tailings piles, and one tailings pond south of Farm-to-Market (FM) Road 1344 and west of FM 791. A sixth tailings pile designated Parcel B was north of FM 791 and east of FM 1344.

419 (DOE/AL/62350–99-Rev.1) **UMTRA Project water sampling and analysis plan, Salt Lake City, Utah. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95015576. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan describes planned, routine ground water sampling activities at the US Department of Energy Uranium Mill Tailings Remedial Action Project site in Salt Lake City, Utah. This plan identifies and justifies sampling locations, analytical parameters, detection limits, and sampling frequencies for routine monitoring of ground water, sediments, and surface waters at monitoring stations on the site.

420 (DOE/AL/62350–116-Rev.1) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Green River, Utah. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96002053. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (phase 1) and the Ground Water Project (phase 2). For the UMTRA Project site located near Green River, Utah, the Surface Project cleanup occurred from 1988 to 1989. The tailings and radioactively contaminated soils and materials were removed from their original locations and placed into a disposal cell on the site. The disposal cell is designed to minimize radiation emissions and minimize further contamination of ground water beneath the site. The UMTRA Project's second phase, the Ground Water Project, evaluates the nature and extent of ground water contamination resulting from uranium processing and determines a strategy for ground water compliance with the Environmental Protection Agency (EPA) ground water standards established for the UMTRA Project. For the Green River site, the risk assessment helps determine whether human health risks result from exposure to ground water contaminated by uranium processing. This risk assessment report is the first site-specific document prepared for the UMTRA Ground Water Project at the Green River site. What follows is an evaluation of current and possible future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will be used to determine what is necessary, if anything, to protect human health and the environment while complying with EPA standards.

421 (DOE/AL/62350–117S) **Supplement to the UMTRA Project water sampling and analysis plan, Riverton, Wyoming.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000658. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) supplement supports the regulatory and technical basis for water sampling at the Riverton, Wyoming, Uranium Mill Tailings Remedial Action (UMTRA) Project site, as defined in the 1994 WSAP document for Riverton (DOE, 1994). Further, the supplement serves to confirm the Project's present understanding of the site relative to the hydrogeology and contaminant distribution as well as the intent to continue to use the sampling strategy as presented in the 1994 WSAP document for Riverton. Ground water and surface water monitoring activities are derived from the US Environmental Protection Agency regulations in 40 CFR Part 192 and 60

FR 2854. Sampling procedures are guided by the UMTRA Project standard operating procedures (JEG, n.d.), the Technical Approach Document (DOE, 1989), and the most effective technical approach for the site. Additional site-specific documents relevant to the Riverton site are the Riverton Baseline Risk Assessment (BLRA) (DOE, 1995a) and the Riverton Site Observational Work Plan (SOWP) (DOE, 1995b).

422 (DOE/AL/62350–118S) **Supplement to the UMTRA Project water sampling and analysis plan, Mexican Hat, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000655. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) supplement supports the regulatory and technical basis for water sampling at the Mexican Hat, Utah, Uranium Mill Tailings Remedial Action (UMTRA) Project site, as defined in the 1994 WSAP document for Mexican Hat (DOE, 1994). Further, the supplement serves to confirm our present understanding of the site relative to the hydrogeology and contaminant distribution as well as our intention to continue to use the sampling strategy as presented in the 1994 WSAP document for Mexican Hat. Ground water and surface water monitoring activities are derived from the US Environmental Protection Agency regulations in 40 CFR Part 192 (1991) and 60 FR 2854 (1995). Sampling procedures are guided by the UMTRA Project standard operating procedures (JEG, n.d.), the Technical Approach Document (DOE, 1989), and the most effective technical approach for the site. Additional site-specific documents relevant to the Mexican Hat site are the Mexican Hat Long-Term Surveillance Plan (currently in progress), and the Mexican Hat Site Observational Work Plan (currently in progress).

423 (DOE/AL/62350–121-Rev.1) **UMTRA project water sampling and analysis plan, Naturita, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000448. Source: OSTI; NTIS; INIS; GPO Dep.

Planned, routine ground water sampling activities for calendar year 1995 to 1997 at the US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site near Naturita, Colorado, are described in this water sampling and analysis plan. The following plan identifies and justifies the sampling locations, analytical parameters, detection limits, sampling frequency, and specific rationale for each routine monitoring station at the site. The regulatory basis for routine ground water monitoring at UMTRA Project sites is derived from the US Environmental Protection Agency (EPA) regulations in 40 CFR Part 192. Sampling procedures are guided by the UMTRA Project standard operating procedures (SOP) (JEG, n.d.), the Technical Approach Document (TAD) (DOE, 1989), and the most effective technical approach for the site.

424 (DOE/AL/62350–122S) **Supplement to the UMTRA Project water sampling and analysis plan, Monument Valley, Arizona.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000654. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) supplement supports the regulatory and technical basis for water sampling at the Riverton, Wyoming, Uranium Mill Tailings Remedial Action (UMTRA) Project site, as defined in the 1994 WSAP document for Riverton (DOE, 1994). Further, the supplement serves to confirm the Project's present understanding of the site relative to the hydrogeology and contaminant distribution as well as the intent to continue to use the sampling strategy as presented in the 1994 WSAP document for Riverton. Ground water and surface water monitoring activities are derived from the US Environmental Protection Agency regulations in 40 CFR Part 192 and 60 FR 2854. Sampling procedures are guided by the UMTRA Project standard operating procedures (JEG, n.d.), the Technical Approach Document (DOE, 1989), and the most effective technical approach for the site. Additional site-specific documents relevant to the Riverton site are the Riverton Baseline Risk Assessment (BLRA) (DOE, 1995a) and the Riverton Site Observational Work Plan (SOWP) (DOE, 1995b).

425 (DOE/AL/62350–125S) **Supplement to the UMTRA Project water sampling and analysis plan, Maybell, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000659. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan (WSAP) supplement supports the regulatory and technical basis for water sampling at the Maybell, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project site, as defined in the 1994 WSAP document for Maybell (DOE, 1994a). Further, this supplement serves to confirm our present understanding of the site relative to the hydrogeology and contaminant distribution as well as our intention to continue to use the sampling strategy as presented in the 1994 WSAP document for Maybell. Ground water and surface water monitoring activities are derived from the US Environmental Protection Agency regulations in 40 CFR Part 192 (1994) and 60 CFR 2854 (1 995). Sampling procedures are guided by the UMTRA Project standard operating procedures (JEG, n.d.), the Technical Approach Document (DOE, 1989), and the most effective technical approach for the site. Additional site-specific documents relevant to the Maybell site are the Maybell Baseline Risk Assessment (currently in progress), the Maybell Remedial Action Plan (RAP) (DOE, 1994b), and the Maybell Environmental Assessment (DOE, 1995).

426 (DOE/AL/62350–132-Rev.2) **UMTRA Project water sampling and analysis plan, Gunnison, Colorado. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000653. Source: OSTI; NTIS; INIS; GPO Dep.

Surface remedial action at the Gunnison Uranium Mill Tailings Remedial Action Project site began in 1992; completion is expected in 1995. Ground water and surface water will be sampled semiannually at the Gunnison processing site (GUN-01) and disposal site (GUN-08). Results of previous water sampling at the Gunnison processing site indicate that ground water in the alluvium is contaminated by the former uranium processing activities. Background ground water conditions have been established in the uppermost aquifer (Tertiary gravels) at the Gunnison disposal site. Semiannual water sampling is scheduled for the spring and fall. Water quality sampling is conducted at the processing site (1) to ensure protection of human health and the environment, (2) for ground water compliance monitoring during remedial action construction, and (3) to define the extent of contamination. At the processing site, the frequency and duration of sampling will be dependent upon the nature and extent of residual contamination and the compliance strategy chosen. The monitor well locations provide a representative distribution of sampling points to characterize ground water quality and ground water flow conditions in the vicinity of the sites. The list of analytes has been modified with time to reflect constituents that are related to uranium processing activities and the parameters needed for geochemical evaluation.

427 (DOE/AL/62350–133-Rev.1-Ver.6) **UMTRA Project water sampling and analysis plan, Grand Junction, Colorado. Revision 1, Version 6.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000691. Source: OSTI; NTIS; INIS; GPO Dep.

This water sampling and analysis plan describes the planned, routine ground water sampling activities at the Grand Junction US DOE Uranium Mill Tailings Remedial Action (UMTRA) Project site (GRJ-01) in Grand Junction, Colorado, and at the Cheney Disposal Site (GRJ-03) near Grand Junction. The plan identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequencies for the routine monitoring stations at the sites. Regulatory basis is in the US EPA regulations in 40 CFR Part 192 (1994) and EPA ground water quality standards of 1995 (60 FR 2854). This plan summarizes results of past water sampling activities, details water sampling activities planned for the next 2 years, and projects sampling activities for the next 5 years.

428 (DOE/AL/62350–134-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings site near Salt Lake City, Utah. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000238. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project consists of two phases: the first is the Surface Project, and the second is the Ground Water Project. For the UMTRA Project site known as the Vitro site, near Salt Lake City, Utah, Surface Project cleanup occurred from 1985 to 1987. The UMTRA Project's second phase, the Ground Water Project, evaluates the nature and extent of ground water contamination resulting from uranium processing and determines a strategy for ground water compliance with the Environmental Protection Agency (EPA) ground water standards established for the UMTRA Project. A risk assessment is the process of describing a source of contamination and showing how that contamination may reach people and the environment. The amount of contamination people or the environment may be exposed to is calculated and used to characterize the possible health or environmental effects that may result from this exposure. This risk assessment report is the first site-specific document prepared for the UMTRA Ground Water Project at the Vitro site. The results of this report and further site characterization of the Vitro site will be used to determine what is necessary, if anything, to protect human health and the environment while complying with EPA standards.

429 (DOE/AL/62350–145-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings site near Lakeview, Oregon. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004146. Source: OSTI; NTIS; INIS; GPO Dep.

Surface cleanup at the Uranium Mill Tailings Remedial Action (UMTRA) Project site near Lakeview, Oregon was completed in 1989. The Ground Water Project evaluates the nature and extent of ground water contamination that resulted from the uranium ore processing activities. The Ground Water Project is in its beginning stages. Human health may be at risk from exposure to ground water contaminated by uranium ore processing. Exposure could occur by drinking water pumped out of a hypothetical well drilled in the contaminated areas. Ecological risks to plants or animals may result from exposure to surface water and sediment that have received contaminated ground water. A risk assessment describes a source of contamination, how that contamination reaches people and the environment, the amount of contamination to which people or the ecological environment may be exposed, and the health or ecological effects that could result from that exposure. This risk assessment is a site-specific document that will be used to evaluate current and potential future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will determine whether any action is needed to protect human health or the ecological environment.

430 (DOE/AL/62350–145-Rev.2) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Lakeview, Oregon. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008307. Source: OSTI; NTIS; GPO Dep.

The U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase I) and the Ground Water Project (Phase II). Under the UMTRA Surface Project, tailings, contaminated soil, equipment, and materials associated with the former uranium ore processing at UMTRA Project sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to minimize further contamination of ground water. Surface cleanup at the UMTRA Project site near Lakeview, Oregon, was completed in 1989. The mill operated from February 1958 to November 1960. The Ground Water Project evaluates the nature and extent of ground water contamination that resulted from the uranium ore processing activities. The Ground Water Project is in its beginning stages. Human health may be at risk from exposure to ground water contaminated by uranium ore processing. Exposure could occur by drinking water pumped out of a hypothetical well drilled in the contaminated areas. Ecological risks to plants or animals may result from exposure to surface water and sediment that have received contaminated ground water. A risk assessment describes a source of contamination, how that contamination reaches people and the environment, the amount of contamination to which people or the ecological environment may be exposed, and the health or ecological effects that could result from that exposure. This risk assessment is a site-specific document that will be used to evaluate current and potential future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will determine whether any action is needed to protect human health or the ecological environment.

431 (DOE/AL/62350–146S) **Supplement to the UMTRA project water sampling and analysis plan, Slick Rock, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000660. Source: OSTI; NTIS; INIS; GPO Dep.

The water sampling and analysis plan (WSAP) provides the regulatory and technical basis for ground water and surface water sampling at the Uranium Mill Tailings Remedial Action (UMTRA) Project Union Carbide (UC) and North Continent (NC) processing sites and the Burro Canyon disposal site near Slick Rock, Colorado. The initial WSAP was finalized in August 1994 and will be completely revised in accordance with the WSAP guidance document (DOE, 1995) in late 1996. This version supplements the initial WSAP, reflects only minor changes in sampling that occurred in 1995, covers sampling scheduled for early 1996, and provides a preliminary projection of the next 5 years of sampling and monitoring activities. Once surface remedial action is completed at the former processing sites, additional and more detailed hydrogeologic characterization may be needed to develop the Ground Water Program conceptual ground water model and proposed compliance strategy. In addition, background ground water quality needs to be clearly defined to ensure that the baseline risk assessment accurately estimated risks from the contaminants of potential concern in contaminated ground water at the UC and NC sites.

432 (DOE/AL/62350–147-Rev.1) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Sites near Slick Rock, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000662. Source: OSTI; NTIS; INIS; GPO Dep.

Two UMTRA (Uranium Mill Tailings Remedial Action) Project sites are near Slick Rock, Colorado: the North Continent site and the Union Carbide site. Currently, no one uses the contaminated ground water at either site for domestic or agricultural purposes. However, there may be future land development. This risk assessment evaluates possible future health problems associated with exposure to contaminated ground water. Since some health problems could occur, it is recommended that the contaminated ground water not be used as drinking water.

433 (DOE/AL/62350–157-Rev.) **Site observational work plan for the UMTRA Project site at Falls City, Texas.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95015575. Source: OSTI; NTIS; INIS; GPO Dep.

Produced by the US Department of Energy (DOE), this site observational work plan (SOWP) will be used to determine site-specific activities to comply with the US Environmental Protection Agency (EPA) ground water standards at this Uranium Mill Tailings Remedial Action (UMTRA) Project site. The purpose of the SOWP is to recommend a site-specific ground water compliance strategy at the Falls City UMTRA Project site. The Falls City SOWP presents a comprehensive summary of site hydrogeological data, delineates a conceptual model of the aquifer system, and discusses the origins of milling-related ground water contamination. It also defines the magnitude of ground water contamination, potential environmental and health risks associated with ground water contamination and data gaps, and targets a proposed compliance strategy.

434 (DOE/AL/62350–158-Rev.) **Site Observational Work Plan for the UMTRA Project Site at Shiprock, New Mexico. Revision.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1995. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016288. Source: OSTI; NTIS; INIS; GPO Dep.

The site observational work plan (SOWP) for the Shiprock, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project Site is one of the first documents for developing an approach for achieving ground water compliance at the site. This SOWP applies Shiprock site information to a regulatory compliance framework, which identifies strategies for meeting ground water compliance at the site. The compliance framework was developed in the UMTRA ground water programmatic environmental impact statement.

435 (DOE/AL/62350–159S) **Supplement to the site observational work plan for the UMTRA project site at Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004148. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide additional and more detailed information to supplement review of the site observational work plan (SOWP) (DOE, 1995) for the Ambrosia Lake, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project site. This document includes a discussion of the average linear velocity of the ground water in the alluvium and a discussion of the ground water quality of the alluvium, weathered Mancos Shale, and the Tres Hermanos-C Member of the Mancos Shale. The data from a 1989 aquifer test were analyzed using the curve-matching software AQTESOLV and then compared with the original results. A hydrograph of the ground water elevations in monitoring wells screened in the alluvium is presented to show how the ground water elevations change with time. Stiff and Piper diagrams were created to describe the changes in ground water geochemistry in the alluvium/weathered Mancos Sahel unit, the Tres Hermanos-C Sandstone unit, the Tres Hermanos-B Sandstone unit, and the Dakota Sandstone. Background information on other related topics such as site history, cell construction, soil characteristics, and well construction are presented in the SOWP. A geologic cross section depicts the conceptual model of the hydrostratigraphy and ground water chemistry of the Ambrosia Lake site. Hydrogeologic information of each hydrostratigraphic unit is presented.

436 (DOE/AL/62350–159S(2/96)) **Supplement to the site observational work plan for the UMTRA Project Site at Ambrosia Lake, New Mexico.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96007544. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide additional and more detailed information to supplement review of the site observational work plan (SOWP) for the Ambrosia Lake, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project site. This document includes a discussion of (1) the average linear velocity of the ground water in the alluvium; (2) the ground water quality of the alluvium, weathered Mancos Shale, and the Tres Hermanos-C Member of the Mancos Shale; and (3) the fate and transport of contaminants from the uppermost aquifer to the Westwater Canyon Member of the Morrison Formation. The data from a 1989 aquifer test were analyzed using the curve-matching software AQTESOLV and then compared with the original results. A hydrograph of the ground water elevations in monitoring wells screened in the alluvium is presented to show how the ground water elevations change with time. Stiff and Piper diagrams were created to describe the changes in ground water geochemistry in the alluvium/ weathered Mancos Shale unit, the Tres Hermanos-C Sandstone unit, the Tres Hermanos-B Sandstone unit, and the Dakota Sandstone. Background information on other related topics such as site history, cell construction, soil characteristics, and well construction are presented in the SOWP. Figure 1 is a geologic cross section depicting the conceptual model of the hydrostratigraphy and ground water chemistry of the Ambrosia Lake site. Table 1 presents hydrogeologic information of each hydrostratigraphic unit.

437 (DOE/AL/62350–175-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings site near Durango, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000237. Source: OSTI; NTIS; INIS; GPO Dep.

For the UMTRA .Project site located near Durango, Colorado (the Durango site), the Surface Project cleanup occurred from 1986 to 1991. An evaluation was made to determine whether exposure to ground water contaminated by uranium processing could affect people's health. Exposure could occur from drinking water pumped from a hypothetical well drilled in the contaminated ground water area. In addition, environmental risks may result if plants or animals are exposed to contaminated ground water, or surface water that has mixed with contaminated ground water. This risk assessment report is the first site-specific document prepared for the UMTRA Ground Water Project at the Durango site. The results of this report and further site characterization of the Durango site will be used to determine what is necessary to protect public health and the environment, and to comply with the EPA standards.

438 (DOE/AL/62350–177) **Ground water work breakdown structure dictionary.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95011234. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the activities that are necessary to assess in ground water remediation as specified in the UMTRA Project. These activities include the following: site characterization; remedial action compliance and design documentation; environment, health, and safety program; technology assessment; property access and acquisition activities; site remedial actions; long term surveillance and licensing; and technical and management support.

439 (DOE/AL/62350–179) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Sites near Rifle, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1995. 252p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95013503. Source: OSTI; NTIS; INIS; GPO Dep.

The ground water project evaluates the nature and extent of ground water contamination resulting from the uranium ore processing activities. This report is a site specific document that will be used to evaluate current and future impacts to the public and the environment from exposure to contaminated ground water. Currently, no one is using the ground water and therefore, no one is at risk. However, the land will probably be developed in the future and so the possibility of people using the ground water does exist. This report examines the future possibility of health hazards resulting from the ingestion of contaminated drinking water, skin contact, fish ingestion, or contact with surface waters and sediments.

440 (DOE/AL/62350–179-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings sites near Rifle, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000236. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase 1) and the Ground Water Project (Phase 2). Under the UMTRA Surface Project, tailings, radioactive contaminated soil, equipment, and materials associated with the former uranium ore processing sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to prevent further ground water contamination. The Ground Water Project evaluates the nature and extent of ground water contamination resulting from the uranium ore processing activities. Two UMTRA Project sites are near Rifle, Colorado: the Old Rifle site and the New Rifle site. Surface cleanup at the two sites is under way and is scheduled for completion in 1996. The Ground Water Project is in its beginning stages. A risk assessment identifies a source of contamination, how that contamination reaches people and the environment, the amount of contamination to which people or the environment may be exposed, and the health or environmental effects that could result from that exposure. This report is a site-specific document that will be used to evaluate current and future impacts to the public and the environment from exposure to contaminated ground water. This evaluation and further site characterization will be used to determine if action is needed to protect human health or the environment.

441 (DOE/AL/62350–179-Rev.2) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Sites near Rifle, Colorado. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 252p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008003. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase I) and the Ground Water Project (Phase II). Under the UMTRA Surface Project, tailings, radioactive contaminated soil, equipment, and materials associated with the former uranium ore processing sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to prevent further ground water contamination. The Ground Water Project evaluates the nature and extent of ground water contamination resulting from the uranium ore processing activities. Two UMTRA Project sites are near Rifle, Colorado: the Old Rifle site and the New Rifle site. Surface cleanup at the two sites is under way and is scheduled for completion in 1996. The Ground Water Project is in its beginning stages. A risk assessment identifies a source of contamination, how that contamination reaches people and the environment, the amount of contamination to which people or the environment may be exposed, and the health or environmental effects that could result from that exposure. This report is a site-specific document that will be used to evaluate current and future impacts to the public and the environment from exposure to contaminated ground water. This evaluation and further site characterization will be used to determine if action is needed to protect human health or the environment. Human health risk may result from exposure to ground water contaminated from uranium ore processing. Exposure could occur from drinking water obtained from a well placed in the areas of contamination. Furthermore, environmental risk may result from plant or animal exposure to surface water and sediment that have received contaminated ground water.

442 (DOE/AL/62350–190) **Private well/spring position paper, Rifle, Colorado, sites.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95011233. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the hydrogeochemical relationship between the New and Old Rifle processing sites and 15 domestic wells in their vicinity. The relationship of the domestic wells to the Old and New Rifle tailings sites requires clarification due to recent advances in understanding of Rifle site conceptual models. In order to form a bridge from the Rifle remedial action plan (RAP) and the recent baseline risk assessment to this position paper, several issues require discussion. First, through analysis of long-term ground water level data, the hydraulic gradient between the former tailings and private wells and springs was assessed. Second, in the Rifle RAP there was not a strong emphasis placed on describing regional influences on water quality in the vicinity of the processing sites. This document uses available information coupled with theory of regional ground water flow to describe regional flow systems north of Rifle. Third, the definition of background water quality from the RAP has been refined in several ways. Also, for the recent baseline risk assessment, all alluvial wells used to define background for the sites were located east of Old Rifle. In the RAP, alluvial background wells were also placed between the sites (downgradient of Old Rifle). Two additional wells were installed for the recent baseline risk assessment upgradient of Old Rifle which verified that several of the older wells (RFO-01-0597 and -0598) were in locations representative of background.

443 (DOE/AL/62350–191) **Report of ground water monitoring for expansion of the golf course, Salt Lake City, Utah, vitro processing site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95013501. Source: OSTI; NTIS; INIS; GPO Dep.

To determine the potential impacts of the proposed golf course expansion on the south side of the Vitro site, ground water data from the UMTRA Vitro processing site were evaluated in response to the U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project Office request. Golf in the Round, Inc., has proposed an expansion of the present driving range to include a 9-hole golf course on the UMTRA Vitro processing site, which is owned by the Central Valley Water Reclamation Facility (CVWRF). An expanded golf course would increase irrigation and increase the amount of water that could infiltrate the soil, recharging the unconfined aquifer. Increased water levels in the aquifer could alter the ground water flow regime; contaminants in the shallow ground water could then migrate off the site or discharge to surface water in the area. Dewatering of the unconfined aquifer on CVWRF property could also impact site contaminant migration; a significant amount of ground water extraction at CVWRF could reduce the amount of contaminant migration off the site. Since 1978, data have been collected at the site to determine the distribution of tailings materials (removed from the site from 1985 to 1987) and to characterize the presence and migration of contaminants in sediments, soils, surface water, and ground water at the former Vitro processing site. Available data suggest that irrigating an expanded golf course may cause contamination to spread more rapidly within the unconfined aquifer. The public is not at risk from current Vitro processing site activities, nor is risk expected due to golf course expansion. However, ecological risk could increase with increased surface water contamination and the development of ground water seeps.

444 (DOE/AL/62350–192) **Ground water elevation monitoring at the Uranium Mill Tailings Remedial Action Salt Lake City, Utah, Vitro processing site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95011232. Source: OSTI; NTIS; INIS; GPO Dep.

In February 1994, a ground water level monitoring program was begun at the Vitro processing site. The purpose of the program was to evaluate how irrigating the new golf driving range affected ground water elevations in the unconfined aquifer. The program also evaluated potential impacts of a 9-hole golf course planned as an expansion of the driving range. The planned golf course expansion would increase the area to be irrigated and, thus, the water that could infiltrate the processing site soil to recharge the unconfined aquifer. Increased water levels in the aquifer could alter the ground water flow regime; contaminants in ground water could migrate off the site or could discharge to bodies of surface water in the area. The potential effects of expanding the golf course have been evaluated, and a report is being prepared. Water level data obtained during this monitoring program indicate that minor seasonal mounding may be occurring in response to irrigation of the driving range. However, the effects of irrigation appear small in comparison to the effects of precipitation. There are no monitor wells in the area that irrigation would affect most; that data limitation makes interpretations of water levels and the possibility of ground water mounding uncertain. Limitations of available data are discussed in the conclusion.

445 (DOE/AL/62350–193) **UMTRA ground water sampling techniques: Comparison of the traditional and**

low flow methods. Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016205. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the potential changes in water quality data that may occur with the conversion from MBV (multiple bore volume) to LF (low flow) sampling and provides two examples of how such a change might impact Project decisions. The existing scientific literature on LF sampling is reviewed and the new LF data from three UMTRA Uranium Mill Tailings Remedial Action Project sites are evaluated seeking answers to the questions posed above. Several possible approaches, that the UMTRA Project may take to address issues unanswered by the literature are presented and compared, and a recommendation is offered for the future direction of the LF conversion effort.

446 (DOE/AL/62350–194) **Comment and response document for the ground water protection strategy for the Uranium Mill Tailings Site at Green River, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000657. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) responses to comments from both the US Nuclear Regulatory Commission (NRC) and the state of Utah are provided in this document. The Proposed Ground Water Protection Strategy for the Uranium Mill Tailings Site at Green River, Utah, presents the proposed (modified) ground water protection strategy for the disposal cell at the Green River disposal site for compliance with Subpart A of 40 CFR Part 192. Before the disposal cell was constructed, site characterization was conducted at the Green River Uranium Mill Tailings Remedial Action (UMTRA) Project site to determine an acceptable compliance strategy. Results of the investigation are reported in detail in the final remedial action plan (RAP) (DOE, 1991a). The NRC and the state of Utah have accepted the final RAP. The changes in this document relate only to a modification of the compliance strategy for ground water protection.

447 (DOE/AL/62350–195) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Naturita, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000440. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (phase I), and the Ground Water Project (phase II). For the UMTRA Project site located near Naturita, Colorado (the Naturita site), phase I involves the removal of radioactively contaminated soils and materials and their transportation to a disposal site at Union Carbide Corporation's Upper Burbank Repository at Uravan, Colorado, about 13 road miles (mi) (21 kilometers [km]) to the northwest. No uranium mill tailings are involved because the tailings were removed from the Naturita site and placed at Coke Oven, Colorado, during 1977 to 1979. Phase II of the project will evaluate the nature and extent of ground water contamination resulting from uranium processing and its effect on human health or the environment; and will determine site-specific ground water compliance strategies in accordance with the US Environmental Protection Agency (EPA) ground water standards established for the UMTRA Project. Human health risks could occur from drinking water pumped from a hypothetical well drilled in the contaminated ground water area. Environmental risks may result if plants or animals are exposed to contaminated ground water, or surface water that has received contaminated ground water. Therefore, a risk assessment is conducted for the Naturita site. This risk assessment report is the first site-specific document prepared for the Ground Water Project at the Naturita site. What follows is an evaluation of current and possible future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will be used to determine whether any action is needed to protect human health or the environment.

448 (DOE/AL/62350–195-Rev.1) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Naturita, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003077. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project, and the Ground Water Project. For the UMTRA Project site located near Naturita, Colorado, phase I involves the removal of radioactively contaminated soils and materials and their transportation to a disposal site at Union Carbide Corporation's Upper Burbank Repository at Uravan, Colorado. The surface cleanup will reduce radon and other radiation emissions from the former uranium processing site and prevent further site-related contamination of ground water. Phase II of the project will evaluate the nature and extent of ground water contamination resulting from uranium processing and its effect on human health and the environment, and will determine site-specific ground water compliance strategies in accordance with the US Environmental Protection Agency (EPA) ground water standards established for the UMTRA Project. Human health risks could occur from drinking water pumped from a hypothetical well drilled in the contaminated ground water area. Environmental risks may result if plants or animals are exposed to contaminated ground water or surface water that has mixed with contaminated ground water. Therefore, a risk assessment was conducted for the Naturita site. This risk assessment report is the first site-specific document prepared for the Ground Water Project at the Naturita site. What follows is an evaluation of current and possible future impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will be used to determine whether any action is needed to protect human health or the environment.

449 (DOE/AL/62350–196) **Work plan for monitor well installation water and sediment sample collection aquifer testing and topographic surveying at the Riverton, Wyoming, UMTRA Project Site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000450. Source: OSTI; NTIS; INIS; GPO Dep.

Investigations conducted during preparation of the site observational work plan (SOWP) at the Uranium Mill Tailings Remedial Action (UMTRA) Project site support a proposed natural flushing ground water compliance strategy, with institutional controls. However, additional site-specific data are needed to reduce uncertainties in order to confirm the applicability and feasibility of this proposed compliance strategy option. This proposed strategy will be analyzed in the site-specific environmental assessment. The purpose of this work plan is to summarize the data collection objectives to fill those data needs, describe the data collection activities that will be undertaken to meet those objectives, and elaborate on the data quality objectives which define the procedures that will be followed to ensure that the quality of these data meet UMTRA Project needs.

450 (DOE/AL/62350–201) **Site observational work plan for the UMTRA Project site at Monument Valley, Arizona.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96002052. Source: OSTI; NTIS; INIS; GPO Dep.

The site observational work plan (SOWP) for the Monument Valley, Arizona, US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site is one of the first site-specific documents developed to achieve ground water compliance at the site. This SOWP applies information about the Monument Valley site to a regulatory compliance framework that identifies strategies that could be used to meet ground water compliance. The compliance framework was developed in the UMTRA Ground Water programmatic environmental impact statement (DOE, 1995). The DOE's goal is to implement a cost-effective site strategy that complies with the US Environmental Protection Agency (EPA) ground water standards and protects human health and the environment. The compliance strategy that emerges in the final version of the SOWP will assess potential environmental impacts and provide stakeholder a forum for review and comment. When the compliance strategy is acceptable, it will be detailed in a remedial action plan that will be subject to review by the state and/or tribe and concurrence by the US Nuclear Regulatory Commission (NRC). Information available for the preparation of this SOWP indicates active remediation is the most likely compliance strategy for the Monument Valley site. Additional data are needed to determine the most effective remediation technology.

451 (DOE/AL/62350–201(3/96)) **Site observational work plan for the UMTRA Project site at Monument Valley, Arizona.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 597p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96009934. Source: OSTI; NTIS; INIS; GPO Dep.

The site observational work plan (SOWP) for the Monument Valley, Arizona, US Department of Energy (DOE) Uranium Mill Tailings Remedial Action(UMTRA) Project site is one of the first site-specific documents developed to achieve ground water compliance at the site. This SOWP applies information about the Monument Valley site to a regulatory compliance framework that identifies strategies that could be used to meet ground water compliance. The compliance framework was developed in the UMTRA Ground Water programmatic environmental impact statement (DOE, 1996). The DOE's goal is to implement a cost-effective site strategy that complies with the US Environmental Protection Agency (EPA) ground water standards and protects human health and the environment. The compliance strategy that emerges in the final version of the SOWP will be evaluated in the site-specific environmental assessment to determine potential environmental impacts and provide stakeholders a forum for review and comment. When the compliance strategy is acceptable, it will be detailed in a remedial action plan that will be subject to review by the state and/or tribe and concurrence by the US Nuclear Regulatory Commission (NRC). Information for the preparation of this SOWP indicates active remediation is the most likely compliance strategy for the Monument Valley site. Additional data are needed to determine the most effective remediation technology.

452 (DOE/AL/62350–209) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Maybell, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000449. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase I) and the Ground Water Project (Phase II). Under the UMTRA Surface Project, tailings, radioactive contaminated soil, building foundations, and materials associated with the former processing of uranium ore at UMTRA sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to prevent further contamination of ground water. One UMTRA Project site is near Maybell, Colorado. Surface cleanup at this site is under way and is scheduled for completion in 1996. The tailings are being stabilized in-place at this site. The disposal area has been withdrawn from public use by the DOE and is referred to as the permanent withdrawal area. The Ground Water Project evaluates the nature and extent of ground water contamination resulting from past uranium ore processing activities. The Ground Water Project at this site is in its beginning stages. This report is a site-specific document that will be used to evaluate current and future potential impacts to the public and the environment from exposure to contaminated ground water. The results of this evaluation and further site characterization will determine whether any action is needed to protect human health or the environment. Currently, no points of exposure (e.g. a drinking water well); and no receptors of contaminated ground water have been identified at the Maybell site. Therefore, there are no current human health and ecological risks associated with exposure to contaminated ground water. Furthermore, if current site conditions and land- and water-use patterns do not change, it is unlikely that contaminated ground water would reach people or the ecological communities in the future.

453 (DOE/AL/62350–209-Rev.1) **Baseline risk assessment of ground water contamination at the Uranium Mill Tailings Site near Maybell, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96006185. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project consists of the Surface Project (Phase I) and the Ground Water Project (Phase II). Under the UMTRA Surface Project, tailings, contaminated soil, building foundations, and materials associated with the former processing of uranium ore at UMTRA Project sites are placed into disposal cells. The cells are designed to reduce radon and other radiation emissions and to prevent further contamination of ground water. One UMTRA

Project site is near Maybell, Colorado. Surface cleanup at this site began in 1995 and is scheduled for completion in 1996. The tailings are being stabilized in place at this site. The disposal area has been withdrawn from public use by the DOE and is referred to as the permanent withdrawal area. The Ground Water Project evaluates the nature and extent of ground water contamination resulting from past uranium ore processing activities. The Ground Water Project at this site is in its beginning stages. This report is a site-specific document that will be used to evaluate current and future potential impacts to the public and the environment from exposure to contaminated ground water. The results presented in this document and other evaluations will determine whether any action is needed to protect human health or the environment.

454 (DOE/AL/62350–213-Rev.2) **Work plan for preliminary investigation of organic constituents in ground water at the New Rifle site, Rifle, Colorado. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004143. Source: OSTI; NTIS; INIS; GPO Dep.

A special study screening for Appendix 9 (40 CFR Part 264) analytes identified the New Rifle site as a target for additional screening for organic constituents. Because of this recommendation and the findings in a recent independent technical review, the US Department of Energy (DOE) has requested that the Technical Assistance Contractor (TAC) perform a preliminary investigation of the potential presence of organic compounds in the ground water at the New Rifle Uranium Mill Tailings Remedial Action (UMTRA) Project site, Rifle, Colorado. From 1958 to 1972, organic chemicals were used in large quantities during ore processing at the New Rifle site, and it is possible that some fraction was released to the environment. Therefore, the primary objective of this investigation is to determine whether organic chemicals used at the milling facility are present in the ground water. The purpose of this document is to describe the work that will be performed and the procedures that will be followed during installation of ground water well points at the New Rifle site. The selection of analytes and the procedures for collecting ground water samples for analysis of organic constituents are also described.

455 (DOE/AL/62350–214) **UMTRA project water sampling and analysis plan, Tuba City, Arizona.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96007515. Source: OSTI; NTIS; INIS; GPO Dep.

Planned, routine ground water sampling activities at the U.S. Department of Energy (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site in Tuba City, Arizona, are described in the following sections of this water sampling and analysis plan (WSAP). This plan identifies and justifies the sampling locations, analytical parameters, detection limits, and sampling frequency for the stations routinely monitored at the site. The ground water data are used for site characterization and risk assessment. The regulatory basis for routine ground water monitoring at UMTRA Project sites is derived from the U.S. Environmental Protection Agency (EPA) regulations in 40 CFR Part 192 (1994) and the final EPA standards of 1995 (60 FR 2854). Sampling procedures are guided by the UMTRA Project standard operating procedures (SOP) (JEG, n.d.), and the most effective technical approach for the site.

456 (DOE/AL/62350–215) **Site observational work plan for the UMTRA project site at Grand Junction, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004142. Source: OSTI; NTIS; INIS; GPO Dep.

This site observational work plan (SOWP) is one of the first Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project documents developed to select a compliance strategy that meets the UMTRA ground water standards for the Grand Junction site. This SOWP applies information about the Grand Junction site to the compliance strategy selection framework developed in the UMTRA Ground Water Project draft programmatic environmental impact statement. This risk-based, decision-making framework identifies the decision logic for selecting compliance strategies that could be used to meet the ground water standards. The US Department of Energy (DOE) goal is to implement a cost-effective site strategy that complies with the ground water standards and protects human health and the environment. Based on an evaluation of the site characterization and risk assessment data available for the preparation of this SOWP, DOE proposes that the most likely compliance strategy for the Grand Junction site is no remediation with the application of supplemental standards. This proposed strategy is based on a conceptual site model that indicates site-related contamination is confined to a limited-use aquifer as defined in the ground water standards. The conceptual model demonstrates that the uranium processing-related contamination at the site has affected the unconfined alluvial aquifer, but not the deeper confined aquifer.

457 (DOE/AL/62350–215(3/96)) **Site observational work plan for the UMTRA Project Site at Grand Junction, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96006187. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has prepared this initial site observational work plan (SOWP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project site in Grand Junction, Colorado. This SOWP is one of the first UMTRA Ground Water Project documents developed to select a compliance strategy that meets the UMTRA ground water standards (40 CFR Part 192, as amended by 60 FR 2854) for the Grand Junction site. This SOWP applies information about the Grand Junction site to the compliance strategy selection framework developed in the UMTRA Ground Water Project draft programmatic environmental impact statement (PEIS). This risk-based, decision-making framework identifies the decision logic for selecting compliance strategies that could be used to meet the ground water standards. The DOE goal is to use the observational method to implement a cost-effective site strategy that complies with the ground water standards and protects human health and the environment. Based on an evaluation of the site characterization and risk assessment data available for the preparation of this SOWP, DOE proposes that the most likely compliance strategy for the Grand Junction site is no remediation based on the application of supplemental standards. This proposed strategy is based on a conceptual site model that indicates site-related contamination is confined to a limited-use aquifer as defined in the ground water standards.

458 (DOE/AL/62350–219) **Buffer zone monitoring plan for the Dos Rios subdivision, Gunnison, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96007516. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a plan for water quality monitoring at the Dos Rios subdivision (Units 2, 3, and the Island Unit) that is intended to satisfy the informational needs of residents who live southwest (downgradient) of the former Gunnison processing site. Water quality monitoring activities described in this report are designed to protect the public from residual contamination that entered the ground water as a result of previous uranium milling operations. Requirements presented in this monitoring plan are also included in the water sampling and analysis plan (WSAP) for the Gunnison Uranium Mill Tailings Remedial Action (UMTRA) Project site. The Gunnison WSAP is a site-specific document prepared by the U.S. Department of Energy (DOE) that provides background, guidance, and justification for future ground water sampling and analysis activities for the UMTRA Project Gunnison processing and disposal sites. The WSAP will be updated annually, as additional water quality data are collected and interpreted, to provide ongoing protection for public health and the environment.

459 (DOE/AL/62350–220) **UMTRA Ground Water Project management action process document.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96006184. Source: OSTI; NTIS; INIS; GPO Dep.

A critical U.S. Department of Energy (DOE) mission is to plan, implement, and complete DOE Environmental Restoration (ER) programs at facilities that were operated by or in support of the former Atomic Energy Commission (AEC). These facilities include the 24 inactive processing sites the Uranium Mill Tailings Radiation Control Act (UMTRCA) (42 USC Section 7901 et seq.) identified as Title I sites, which had operated from the late 1940s through the 1970s. In UMTRCA, Congress acknowledged the potentially harmful health effects associated with uranium mill tailings and directed the DOE to stabilize, dispose of, and control the tailings in a safe and environmentally sound manner. The UMTRA Surface Project deals with buildings, tailings, and contaminated soils at the processing sites and any associated vicinity properties (VP). Surface remediation at the processing sites will be completed in 1997 when the Naturita, Colorado, site is scheduled to be finished. The UMTRA Ground Water Project was authorized in an amendment to the UMTRCA (42 USC Section 7922(a)), when Congress directed DOE to comply with U.S. Environmental Protection Agency (EPA) ground water standards. The UMTRA Ground Water Project addresses any contamination derived from the milling operation that is determined to be present at levels above the EPA standards.

460 (DOE/AL/62350–227) **Position paper on the applicability of supplemental standards to the uppermost aquifer at the Uranium Mill Tailings Vitro Processing Site, Salt Lake City, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96006186. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the results of the evaluation of the potential applicability of supplemental standards to the uppermost aquifer underlying the Uranium Mill Tailings Remedial Action (UMTRA) Project, Vitro Processing Site, Salt Lake City, Utah. There are two goals for this evaluation: provide the landowner with information to make an early qualitative decision on the possible use of the Vitro property, and evaluate the proposed application of supplemental standards as the ground water compliance strategy at the site. Justification of supplemental standards is based on the contention that the uppermost aquifer is of limited use due to wide-spread ambient contamination not related to the previous site processing activities. In support of the above, this report discusses the site conceptual model for the uppermost aquifer and related hydrogeological systems and establishes regional and local background water quality. This information is used to determine the extent of site-related and ambient contamination. A risk-based evaluation of the contaminants' effects on current and projected land uses is also provided. Reports of regional and local studies and U.S. Department of Energy (DOE) site investigations provided the basis for the conceptual model and established background ground water quality. In addition, a limited field effort (4 through 28 March 1996) was conducted to supplement existing data, particularly addressing the extent of contamination in the northwestern portion of the Vitro site and site background ground water quality. Results of the field investigation were particularly useful in refining the conceptual site model. This was important in light of the varied ground water quality within the uppermost aquifer. Finally, this report provides a critical evaluation, along with the related uncertainties, of the applicability of supplemental standards to the uppermost aquifer at the Salt Lake City Vitro processing site.

461 (DOE/AL/62350–229) **Report of ground water monitoring for expansion of the golf course, Salt Lake City, Utah, Vitro Processing Site. Revision 0.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008001. Source: OSTI; NTIS; INIS; GPO Dep.

Ground water elevations of the shallow unconfined aquifer have been monitored at the Uranium Mill Tailings Remedial Action (UMTRA) Project, Vitro Processing site, Salt Lake City, Utah, for the purposes of characterizing ground water flow conditions and evaluating the effects of irrigation of the golf driving range. Data collected, to date, show that the water table reached its highest level for the year during March and April 1995. From May through July 1995, the water table elevations decreased in most monitor wells due to less precipitation and higher evapotranspiration. Review and evaluation of collected data suggest that irrigation of the golf driving range will have negligible effects on water levels and ground water flow patterns if rates of irrigation do not significantly exceed future rates of evapotranspiration.

462 (DOE/AL/62350–050510-GRNO-Rev.2-Ver.5) **Ground water protection strategy for the Uranium Mill Tailings Site at Green River, Utah. Final, Revision 2, Version 5: Appendix E to the remedial action plan and site design for stabilization of the inactive uranium mill tailings site at Green River, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000661. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this appendix is to provide a ground water protection strategy for the Uranium Mill Tailings Remedial

Action (UMTRA) Project disposal site at Green River, Utah. Compliance with the US Environmental Protection Agency (EPA) ground water protection standards will be achieved by applying supplemental standards (40 CFR § 192.22(a); 60 FR 2854) based on the limited use ground water present in the uppermost aquifer that is associated with widespread natural ambient contamination (40 CFR § 192.11(e); 60 FR 2854). The strategy is based on new information, including ground water quality data collected after remedial action was completed, and on a revised assessment of disposal cell design features, surface conditions, and site hydrogeology. The strategy will result in compliance with Subparts A and C of the EPA final ground water protection standards (60 FR 2854). The document contains sufficient information to support the proposed ground water protection strategy, with monitor well information and ground water quality data included as a supplement. Additional information is available in the final remedial action plan (RAP) (DOE, 1991a), the final completion report (DOE, 1991b), and the long-term surveillance plan (LTSP) (DOE, 1994a).

463 (DOE/EA–1155) **Environmental assessment of ground water compliance activities at the Uranium Mill Tailings Site, Spook, Wyoming. Revision 0.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008308. Source: OSTI; NTIS; GPO Dep.

This document is an environmental assessment of the Spook, Wyoming, Uranium Mill Tailings Remedial Action (UMTRA) Project site. It analyzes the impacts of the U.S. Department of Energy (DOE) proposed action for ground water compliance. The proposed action is to comply with the U.S. Environmental Protection Agency (EPA) standards for the UMTRA Project sites (40 CFR Part 192) by meeting supplemental standards based on the limited use ground water at the Spook site. This proposed action would not require site activities, including ground water monitoring, characterization, or institutional controls. Ground water in the uppermost aquifer was contaminated by uranium processing activities at the Spook site, which is in Converse County, approximately 48 miles (mi) (77 kilometers [km]) northeast of Casper, Wyoming. Constituents from the site infiltrated and migrated into the uppermost aquifer, forming a plume that extends approximately 2500 feet (ft) (800 meters [m]) downgradient from the site. The principal site-related hazardous constituents in this plume are uranium, selenium, and nitrate. Background ground water in the uppermost aquifer at the site is considered limited use. It is neither a current nor a potential source of drinking water because of widespread, ambient contamination that cannot be cleaned up using treatment methods reasonably employed in public water supply systems (40 CFR § 192.11 (e)). Background ground water quality also is poor due to first, naturally occurring conditions (natural uranium mineralization associated with an alteration front), and second, the effects of widespread human activity not related to uranium milling operations (uranium exploration and mining activities). There are no known exposure pathways to humans, animals, or plants from the contaminated ground water in the uppermost aquifer because it does not discharge to lower aquifers, to the surface, or to surface water.

464 (DOE/EIS–0198) **Draft programmatic environmental impact statement for the Uranium Mill Tailings Remedial Action Ground Water Project.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1995. 251p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95011264. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is responsible for performing remedial action to bring surface and ground water contaminant levels at 24 inactive uranium processing sites into compliance with the US Environmental Protection Agency (EPA) standards. DOE is accomplishing this through the Uranium Mill Tailings Remedial Action (UMTRA) Surface and Ground Water Projects. Remedial action will be conducted with the concurrence of the US Nuclear Regulatory Commission (NRC) and the full participation of affected states and Indian tribes. Uranium processing activities at most of 24 the inactive mill sites resulted in the contamination of ground water beneath and, in some cases, downgradient of the sites. This contaminated ground water often has elevated levels of constituents such as uranium and nitrate. The purpose of the UMTRA Ground Water Project is to eliminate, or reduce to acceptable levels, the potential health and the environmental consequences of milling activities by meeting the EPA standards in areas where ground water has been contaminated. The first step in the UMTRA Ground Water Project is the preparation of this programmatic environmental impact statement (PEIS). This document analyzes potential impacts of four programmatic alternatives, including the proposed action. The alternatives do not address site-specific ground water compliance strategies. Rather, the PEIS is a planning document that provides a framework for conducting the Ground Water Project; assesses the potential programmatic impacts of conducting the Ground Water Project; provides a method for determining the site-specific ground water compliance strategies; and provides data and information that can be used to prepare site-specific environmental impacts analyses more efficiently.

465 (DOE/EIS–0198-Vol.1) **Preliminary final programmatic environmental impact statement for the Uranium Mill Tailings Remedial Action Ground Water Project. Volume 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96005293. Source: OSTI; NTIS; INIS; GPO Dep.

The first step in the UMTRA Ground Water Project is the preparation of this programmatic environmental impact statement (PEIS). This document analyzes the potential impacts of four alternative systems for conducting the ground water program. One of these systems is the proposed action. These alternatives do not address site-specific ground water compliance strategies, because the PEIS is a planning document only. It assesses the potential programmatic impacts of conducting the Ground Water Project, provides a method for determining the site-specific ground water compliance strategies, and provides data and information that can be used to prepare site-specific environmental impacts analyses more efficiently. This PEIS presents multiple ground water compliance strategies, each with its own set of potential impacts, that could be used to implement all the alternatives presented in the PEIS except the no action alternative. The no action alternative must be considered by law. It consists of taking no action to meet EPA standards. Implementing all PEIS alternatives (except no action) means applying a ground water compliance strategy or a combination of strategies that would result in site-specific impacts.

466 (DOE/EIS–0198-Vol.1(4/96)) **Final programmatic environmental impact statement for the Uranium Mill Tailings Remedial Action Ground Water Project. Volume 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1996. 285p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013507. Source: OSTI; NTIS; INIS; GPO Dep.

The first step in the UMTRA Ground Water Project is the preparation of this programmatic environmental impact statement (PEIS). This document analyzes the potential impacts of four alternatives for conducting the Ground Water Project. One of these alternatives is the proposed action. These alternatives do not address site-specific ground water compliance strategies because the PEIS is a planning document only. It assesses the potential programmatic impacts of conducting the Ground Water Project, provides a method for determining the site-specific ground water compliance strategies, and provides data and information that can be used to prepare site-specific environmental impacts analyses more efficiently. This PEIS differs substantially from a site-specific environmental impact statement because multiple ground water compliance strategies, each with its own set of potential impacts, could be used to implement all the alternatives except the no action alternative. In a traditional environmental impact statement, an impacts analysis leads directly to the defined alternatives. The impacts analysis for implementing alternatives in this PEIS first involves evaluating a ground water compliance strategy or strategies, the use of which will result in site-specific impacts. This PEIS impacts analysis assesses only the potential impacts of the various ground water compliance strategies, then relates them to the alternatives to provide a comparison of impacts.

467 (DOE/EIS–0198-Vol.2) **Preliminary final programmatic environmental impact statement for the Uranium Mill Tailings Remedial Action Ground Water Project. Volume 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96005294. Source: OSTI; NTIS; INIS; GPO Dep.

Volume 2 of the programmatic environmental impact statement (PIES) is a comment and response document; it is the collection of the 577 comments received on the draft PEIS. The US Department of Energy's (DOE) response to each comment is provided after each comment. If the comment resulted in a change to the PEIS, the affected section number of the PEIS is provided in the response. Comments 1 through 259 were received at public hearings. Comments were recorded on flip charts and by notetakers. DOE representatives were present to hear the comments and respond to them. The DOE's written response is provided after each comment. Comments 260 through 577 were received in writing at the hearings, and from various federal, tribal, and state agencies and from individuals during the public comment period. Copies of the written comments follow the comments and responses.

468 (DOE/EIS–0198-Vol.2(4/96)) **Final programmatic environmental impact statement for the Uranium Mill Tailings Remedial Action Ground Water Project. Volume 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1996. 293p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013508. Source: OSTI; NTIS; INIS; GPO Dep.

The first step in the UMTRA Ground Water Project is the preparation of a programmatic environmental impact statement. It assesses the potential programmatic impacts of conducting the Ground Water Project, provides a method for determining the site-specific ground water compliance strategies, and provides data and information that can be used to prepare site-specific environmental impacts analyses more efficiently. This volume of the programmatic environmental impact statement (PEIS) is a comment and response document. It is the collection of the comments received on the draft PEIS.

469 (DOE/EM–0248) **Contaminant plumes containment and remediation focus area. Technology summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Jun 1995. 244p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016125. Source: OSTI; NTIS; INIS; GPO Dep.

EM has established a new approach to managing environmental technology research and development in critical areas of interest to DOE. The Contaminant Plumes Containment and Remediation (Plumes) Focus Area is one of five areas targeted to implement the new approach, actively involving representatives from basic research, technology implementation, and regulatory communities in setting objectives and evaluating results. This document presents an overview of current EM activities within the Plumes Focus Area to describe to the appropriate organizations the current thrust of the program and developing input for its future direction. The Plumes Focus Area is developing remediation technologies that address environmental problems associated with certain priority contaminants found at DOE sites, including radionuclides, heavy metals, and dense non-aqueous phase liquids (DNAPLs). Technologies for cleaning up contaminants of concern to both DOE and other federal agencies, such as volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and other organics and inorganic compounds, will be developed by leveraging resources in cooperation with industry and interagency programs.

470 (DOE/EM–0268-96003563) **ResonantSonic drilling. Innovative technology summary report.** Oak Ridge National Lab., TN (United States); Colorado Center for Environmental Management, Denver, CO (United States). Apr 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG34-91RF00117. Order Number DE96003563. Source: OSTI; NTIS; INIS; GPO Dep.

The technology of ResonantSonic drilling is described. This technique has been demonstrated and deployed as an innovative tool to access the subsurface for installation of monitoring and/or remediation wells and for collection of subsurface materials for environmental restoration applications. The technology uses no drilling fluids, is safe and can be used to drill slant holes.

471 (DOE/EM–0269) **In situ air stripping using horizontal wells. Innovative technology summary report.** Stone and Webster Environmental Technology and Services, Boston, MA (United States); Lawrence Livermore National Lab., CA (United States). Apr 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG34-91RF00117. Order Number DE96003564. Source: OSTI; NTIS; INIS; GPO Dep.

In-situ air stripping employs horizontal wells to inject or sparge air into the ground water and vacuum extract VOC'S from vadose zone soils. The horizontal wells provide better access to the subsurface contamination, and the air sparging eliminates the need for surface ground water treatment systems and treats the subsurface in-situ. A full-scale demonstration was conducted at the Savannah River Plant in an area polluted with trichloroethylene and tetrachloroethylene. Results are described.

472 (DOE/EM–0270) **In situ bioremediation using horizontal wells. Innovative technology summary report.** Oak Ridge National Lab., TN (United States). Apr 1995. 30p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003565. Source: OSTI; NTIS; INIS; GPO Dep.

In Situ Bioremediation (ISB) is the term used in this report for Gaseous Nutrient Injection for In Situ Bioremediation. This process (ISB) involves injection of air and nutrients (sparging and biostimulation) into the ground water and vacuum extraction to remove Volatile Organic Compounds (VOCs) from the vadose zone concomitant with biodegradation of the VOCs. This process is effective for remediation of soils and ground water contaminated with VOCs both above and below the water table. A full-scale demonstration of ISB was conducted as part of the Savannah River Integrated Demonstration: VOCs in Soils and Ground Water at Nonarid Sites. This demonstration was performed at the Savannah River Site from February 1992 to April 1993.

473 (DOE/EM–0271) **Dynamic underground stripping. Innovative technology summary report.** Stone and Webster Environmental Technology and Services, Boston, MA (United States); Lawrence Livermore National Lab., CA (United States). Apr 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG34-91RF00117. Order Number DE96003566. Source: OSTI; NTIS; INIS; GPO Dep.

Dynamic Underground Stripping (DUS) is a combination of technologies targeted to remediate soil and ground water contaminated with organic compounds. DUS is effective both above and below the water table and is especially well suited for sites with interbedded sand and clay layers. The main technologies comprising DUS are steam injection at the periphery of a contaminated area to heat permeable subsurface areas, vaporize volatile compounds bound to the soil, and drive contaminants to centrally located vacuum extraction wells; electrical heating of less permeable sediments to vaporize contaminants and drive them into the steam zone; and underground imaging such as Electrical Resistance Tomography to delineate heated areas to ensure total cleanup and process control. A full-scale demonstration was conducted on a gasoline spill site at Lawrence Livermore National Laboratory in Livermore, California from November 1992 through December 1993.

474 (DOE/EM–0272) **Six phase soil heating. Innovative technology summary report.** Stone and Webster Environmental Technology and Services, Boston, MA (United States); Lawrence Livermore National Lab., CA (United States). Apr 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG34-91RF00117. Order Number DE96003567. Source: OSTI; NTIS; INIS; GPO Dep.

Six Phase Soil Heating (SPSH) was developed to remediate soils contaminated with volatile and semi-volatile organic compounds. SPSH is designed to enhance the removal of contaminates from the subsurface during soil vapor extraction. The innovation combines an emerging technology, six-phase electric heating, with a baseline technology, soil vapor extraction, to produce a more efficient in situ remediation systems for difficult soil and/or contaminate applications. This document describes the technology and reports on field demonstrations conducted at Savannah River and the Hanford Reservation.

475 (DOE/EM–0273) **Frozen soil barrier technology. Innovative technology summary report.** Oak Ridge National Lab., TN (United States). Apr 1995. 20p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003568. Source: OSTI; NTIS; INIS; GPO Dep.

The technology of using refrigeration to freeze soils has been employed in large-scale engineering projects for a number of years. This technology bonds soils to give load-bearing strength during construction; to seal tunnels, mine shafts, and other subsurface structures against flooding from groundwater; and to stabilize soils during excavation. Examples of modern applications include several large subway, highway, and water supply tunnels. Ground freezing to form subsurface frozen soil barriers is an innovative technology designed to contain hazardous and radioactive contaminants in soils and groundwater. Frozen soil barriers that provide complete containment ("V"configuration) are formed by drilling and installing refrigerant piping (on 8-ft centers) horizontally at approximately 45° angles for sides and vertically for ends and then recirculating an environmentally safe refrigerant solution through the piping to freeze the soil porewater. Freeze plants are used to keep the containment structure at subfreezing temperatures. A full-scale containment structure was demonstrated from May 12 to October 10, 1994, at a nonhazardous site on SEG property on Gallaher Road, Oak Ridge, Tennessee.

476 (DOE/EM–0278) **The Western Environmental Technology Office (WETO), Butte, Montana. Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Mar 1996. 61p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007145. Source: OSTI; NTIS; INIS; GPO Dep.

The Western Environmental Technology Office (WETO) is a multi-purpose engineering test facility located in Butte, Montana, and is managed by MSE, Inc. WETO seeks to contribute to environmental research by emphasizing projects to develop heavy metals removal and recovery processes, thermal vitrification systems, and waste minimization/pollution prevention technologies. WETO's environmental technology research and testing activities focus on the recovery of usable resources from waste. In one of WETO's areas of focus, groundwater contamination, water from the Berkeley Pit, located near the WETO site, is being used in demonstrations directed toward the recovery of potable water and metal from the heavy metal-bearing water. The Berkeley Pit is part of an inactive copper mine near Butte that was once part of the nation's largest open-pit mining operation. The Pit contains approximately 25 billion gallons of Berkeley Pit groundwater and surface water containing many dissolved minerals. As part of DOE/OST's Resource Recovery Project (RRP), technologies are being demonstrated to not only clean the contaminated water but to recover metal values such as copper, zinc, and iron with an estimated gross value of more than $100 million. When recovered, the Berkeley Pit waters could benefit the entire Butte valley with new water resources for fisheries, irrigation, municipal, and industrial use. At WETO, the emphasis is on environmental technology development and commercialization activities, which will focus on mine cleanup, waste treatment, resource recovery, and water resource management.

477 (DOE/EM–0296) **Subsurface contaminants focus area.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 296p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013524. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Enregy (DOE) Subsurface Contaminants Focus Area is developing technologies to address environmental problems associated with hazardous and radioactive contaminants in soil and groundwater that exist throughout the DOE complex, including radionuclides, heavy metals; and dense non-aqueous phase liquids (DNAPLs). More than 5,700 known DOE groundwater plumes have contaminated over 600 billion gallons of water and 200 million cubic meters of soil. Migration of these plumes threatens local and regional water sources, and in some cases has already adversely impacted off-site rsources. In addition, the Subsurface Contaminants Focus Area is responsible for supplying technologies for the remediation of numerous landfills at DOE facilities. These landfills are estimated to contain over 3 million cubic meters of radioactive and hazardous buried Technology developed within this specialty area will provide efective methods to contain contaminant plumes and new or alternative technologies for development of in situ technologies to minimize waste disposal costs and potential worker exposure by treating plumes in place. While addressing contaminant plumes emanating from DOE landfills, the Subsurface Contaminants Focus Area is also working to develop new or alternative technologies for the in situ stabilization, and nonintrusive characterization of these disposal sites.

478 (DOE/EW/53023–T12) **Hazardous materials in aquatic environments of the Mississippi River Basin. Quarterly progress report, July 1, 1995–September 30, 1995.** Tulane Univ., New Orleans, LA (United States). [1995]. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE96002884. Source: OSTI; NTIS; GPO Dep.

This report is the quarterly progress report for July through September 1995 for work done by Tulane and Xavier Universities under DOE contract number DE-FG01-93-EW53023. Accomplishments for various tasks including administrative activities, collaborative cluster projects, education projects, initiation projects, coordinated instrumentation facility, and an investigators' retreat are detailed in the report.

479 (DOE/ID/13042–49) **Estimation of hydraulic properties and development of a layered conceptual model for the Snake River plain aquifer at the Idaho National Engineering Laboratory, Idaho.** Frederick, D.B.; Johnson, G.S. Idaho Univ., Moscow, ID (United States). Water Resources Research Inst. Feb 1996. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. Order Number DE96011926. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho INEL Oversight Program, in association with the University of Idaho, Idaho Geological Survey, Boise State University, and Idaho State University, developed a research program to determine the hydraulic properties of the Snake River Plain aquifer and characterize the vertical distribution of contaminants. A straddle-packer was deployed in four observation wells near the Idaho Chemical Processing Plant at the Idaho National Engineering Laboratory. Pressure transducers mounted in the straddle-packer assembly were used to monitor the response of the Snake River Plain aquifer to pumping at the ICPP production wells, located 2600 to 4200 feet from the observation wells. The time-drawdown data from these tests were used to evaluate various conceptual models of the aquifer. Aquifer properties were estimated by matching time-drawdown data to type curves for partially penetrating wells in an unconfined aquifer. This approach assumes a homogeneous and isotropic aquifer. The hydraulic properties of the aquifer obtained from the type curve analyses were: (1) Storativity = 3 x 10^{-5}, (2) Specific Yield = 0.01, (3) Transmissivity = 740 ft^2/min, (4) Anisotropy (Kv:Kh)= 1:360.

480 (DOE/ID/13042–50) **Characterizing aquifer hydrogeology and anthropogenic chemical influences on groundwater near the Idaho Chemical Processing Plant, Idaho National Engineering Laboratory, Idaho.** Fromm, J.M. Idaho State Univ., Pocatello, ID (United States). 1995. 322p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-91ID13042. Order Number DE96011925. Source: OSTI; NTIS; INIS; GPO Dep.

A conceptual model of the Eastern Snake River Plain aquifer in the vicinity of monitoring well USGS-44, downgradient of the Idaho Chemical Processing Plant (ICPP) on the Idaho National Engineering Laboratory (INEL), was developed by synthesis and comparison of previous work (40 years) and new investigations into local natural hydrogeological conditions and anthropogenic influences. Quantitative tests of the model, and other recommendations are suggested. The ICPP recovered fissionable uranium from spent nuclear fuel rods and disposed of waste fluids by release to the regional aquifer and lithosphere. Environmental impacts were assessed by a monitoring well network. The conceptual model identifies multiple, highly variable, interacting, and transient components, including INEL facilities multiple operations and liquid waste handling, systems; the anisotropic, in homogeneous aquifer; the network of monitoring and production wells, and the intermittent flow of the Big Lost River. Pre anthropogenic natural conditions and early records of anthropogenic activities were sparsely or unreliably documented making reconstruction of natural conditions or early hydrologic impacts impossible or very broad characterizations.

481 (DOE/ID–22128) **Thickness of surficial sediment at and near the Idaho National Engineering Laboratory, Idaho.** Anderson, S.R.; Liszewski, M.J.; Ackerman, D.J. Geological Survey, Idaho Falls, ID (United States). Jun 1996. 22p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). Order Number DE96014158. Source: OSTI; NTIS; INIS; US Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.

Thickness of surficial sediment was determined from natural-gamma logs in 333 wells at and near the Idaho National Engineering Laboratory in eastern Idaho to provide reconnaissance data for future site-characterization studies. Surficial sediment, which is defined as the unconsolidated clay, silt, sand, and gravel that overlie the uppermost basalt flow at each well, ranges in thickness from 0 feet in seven wells drilled through basalt outcrops east of the Idaho

Chemical Processing Plant to 313 feet in well Site 14 southeast of the Big Lost River sinks. Surficial sediment includes alluvial, lacustrine, eolian, and colluvial deposits that generally accumulated during the past 200 thousand years. Additional thickness data, not included in this report, are available from numerous auger holes and foundation borings at and near most facilities.

482 (DOE/MC/29111-96/CO570) **Surfactant-enhanced aquifer remediation at the Portsmouth Gaseous Diffusion Plant.** Jackson, R.E.; Londergan, J.T.; Pickens, J. INTERA, Inc., Austin, TX (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29111. (CONF-9510108–38: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003695. Source: OSTI; NTIS; INIS; GPO Dep.

Many DOE facilities are situated in areas of sand and gravel which have become polluted with dense, nonaqueous phase liquids or DNAPLs, such as chlorinated solvents, from the various industrial operations at these facilities. The presence of such DNAPLs in sand and gravel aquifers is now recognized as the principal factor in the failure of standard ground-water remediation methods, i.e., "pump-and-treat" operations, to decontaminate such systems. The principal objective of this study is to demonstrate that multi-component DNAPLs can be readily solubilized in sand and gravel aquifers by dilute surfactant solutions.

483 (DOE/MC/29114–5174) **SoilSaw™ demonstration. Final report, September 1992–January 1995.** Saugier, K.; Isaac, R.E. Halliburton NUS, Houston, TX (United States). Feb 1996. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29114. Order Number DE96004443. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has identified leaking underground storage tanks and buried mixed waste at numerous sites within the DOE complex. Preventing these wastes from entering the environment is a challenging task. One method of preventing waste migration is to isolate the contaminants using subsurface containment barriers. Isolation and containment can be accomplished by both in situ and ex situ methods. This report describes a novel in situ construction method of forming vertical containment barriers (slurry walls) using the SoilSaw™ Barrier System. The SoilSaw™ Barrier System is shown to be a feasible process for constructing subsurface vertical containment barriers to depths of fifty feet. The process is most efficient in sandy soil (including free flowing sand) with barrier construction rates of over 130 square feet per minute. Productivity diminishes to approximately 30 square feet per minute as soils become harder and more cohesive. The present hardware is designed to form a barrier of approximately 12 inch in width. Additional barrier widths can be constructed with this technology by application of wider jet heads. The requirement for a varied arrangement of barrier widths is an increase in hydraulic horse power and additional jet heads.

484 (DOE/MC/29117–5061) **Stabilization and reuse of heavy metal contaminated soils by means of quicklime sulfate salt treatment. Final report, September 1992–February 1995.** Dermatas, D. Stevens Inst. of Tech., Hoboken, NJ (United States). Center for Environmental Engineering. Aug 1995. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29117. Order Number DE96000601. Source: OSTI; NTIS; INIS; GPO Dep.

Capillary and hydraulic flows of water in porous media contaminated by heavy metal species often result in severe aquifer contamination. In the present study a chemical admixture stabilization approach is proposed, where heavy metal stabilization/immobilization is achieved by means of quicklime-based treatment. Both in-situ treatment by injection and on-site stabilization by excavation, mixing, and compaction will be investigated. In addition, the potential to reuse the resulting stabilized material as readily available construction material will also be investigated. The heavy metals under study include: arsenic, chromium, lead, and mercury. The proposed technical approach consists of three separate phases. During phase A, both artificial and naturally occurring contaminated soil mixes were treated, and then tested for stress-strain properties, leachability, micromorphology, mineralogical composition, permeability, setting time, and durability. In such a way, the effectiveness of the proposed remediation technology was verified, the treatment approach was optimized, and the underlying mechanisms responsible for stabilization were established. During phase B, the proposed technology will be tested for two DOE-site subscale systems, involving naturally occurring contaminated soil, using the same testing methodology as the one outlined for phase A. Provided that the proposed technology is proven effective for the subscale systems, a field application will be demonstrated. Again process quality monitoring will be performed by testing undisturbed samples collected from the treated sites, in the same fashion as for the previous phases. Following completion of the proposed study, a set of comprehensive guidelines for field applications will be developed. 42 refs., 196 figs., 26 tabs.

485 (DOE/MC/29121–5126) **Remote mining for in-situ waste containment. Final report.** Martinelli, D. (and others); Banta, L.; Peng, S. West Virginia Univ. Research Corp., Morgantown, WV (United States). Oct 1995. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29121. Order Number DE96000646. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the findings of a study conducted at West Virginia University to determine the feasibility of using a combination of longwall mining and standard landfill lining technologies to mitigate contamination of groundwater supplies by leachates from hazardous waste sites.

486 (DOE/MC/30360–96/CO614) **Laboratory "proof of principle" investigation for the acoustically enhanced remediation technology.** Iovenitti, J.L. (and others); Spencer, J.W.; Hill, D.G. Weiss Associates, Emeryville, CA (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC30360. (CONF-9510108–4: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003453. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a three phase program of Weiss Associates which investigates the systematics of using acoustic excitation fields (AEFs) to enhance the in-situ remediation of contaminated soil and ground water under both saturated and unsaturated conditions. The focus in this particular paper is a laboratory proof of principle investigation. The field deployment and engineering viability of acoustically enhanced remediation technology is also examined.

487 (DOE/MC/31177–96/C0623) **Field portable detection of VOCs using a SAW/GC system.** Staples, E.J. Aero Power Systems, Inc., Berkeley, CA (United States). 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31177. (CONF-9510108–47: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004624. Source: OSTI; NTIS; GPO Dep.

This paper describes research on a fast gas chromatography (GC) vapor analysis system which uses a new type of surface acoustic wave (SAW) detector technology to characterize organic compounds in soils and groundwater. Field testing of GC/SAW was performed at the Savannah River plant.

488 (DOE/MC/31178–96/CO612) **Steerable/distance enhanced penetrometer delivery system.** Amini, A.; Shenhar, J.; Lum, K.D. UTD, Inc., Newington, VA (United States). 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31178. (CONF-9510108–34: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003684. Source: OSTI; NTIS; INIS; GPO Dep.

The first steps toward contaminant plume contaminant and remediation are detection and mapping of the plume. Penetrometers can be used to map the plume efficiently and also provide the means for in-situ sampling and remediation. In traditional penetrometer applications, the instrumentation package located at the tip measures soil resistance. However, for environmental monitoring purposes, an array of environmental sensors is packed inside the penetrometer rods for in-situ sampling and analysis, or for collection of laboratory samples. At present, penetrometer applications are limited primarily to vertical pushes and because of their heavy weight, the use of penetrometer trucks over shallow buried storage tanks is restricted. To close the technology gap in the use of penetrometers for environmental purposes, UTD took the initiative by developing a new position location device referred to as POLO (short for POsition LOcator), which provides real-time position location without blocking downhole access for environmental sensors. The next step taken was the initiation of work to make penetrometers steerable and capable of greater penetration capabilities. The product of this work will be a relatively lightweight vibratory steerable penetrometer that can provide greater penetration capability than traditional penetrometers of the same weight, permitting applications over shallow buried storage tanks.

489 (DOE/MC/31185–96/CO619) **Development of the integrated in situ Lasagna process.** Ho, S. (and others); Athmer, C.; Sheridan, P. Monsanto Co., St. Louis, MO (United States). 1995. 18p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AR21-94MC31185. (CONF-9510108–37: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003638. Source: OSTI; NTIS; INIS; GPO Dep.

Contamination in deep, low permeability soils poses a significant technical challenge to in-situ remediation efforts. Poor accessibility to the contaminants and difficulty in uniform delivery of treatment reagents have rendered existing in-situ methods such as bioremediation, vapor extraction, and pump and treat rather ineffective when applied to low permeability soils present at many contaminated sites.

490 (DOE/MC/32108–96/CO616) **Surfactant-modified zeolites as permeable barriers to organic and inorganic groundwater contaminants.** Bowman, R.S.; Sullivan, E.J. New Mexico Inst. of Mining and Technology, Socorro, NM (United States). 1995. 6p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AR21-95MC32108. (CONF-9510108–16: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003466. Source: OSTI; NTIS; INIS; GPO Dep.

We have shown in laboratory experiments that natural zeolites treated with hexadecyltrimethylammonium (HDTMA) are effective sorbents for nonpolar organics, inorganic cations, and inorganic anions. Due to their low cost (~$0.75/kg) and granular nature, HDTMA-zeolites appear ideal candidates for reactive, permeable subsurface barriers. The HDTMA-zeolites are stable over a wide range of pH (3-13), ionic strength (1 M Cs^+ or Ca^{2+}), and in organic solvents. Surfactant-modified zeolites sorb nonpolar organics (benzene, toluene, xylene, chlorinated aliphatics) via a partitioning mechanism, inorganic cations (Pb^{2+}) via ion exchange and surface complexation, and inorganic anions (CrO_4^{2-}, SeO_4^{2-},SO_4^{2-}) via surface precipitation.

491 (DOE/MC/32114–96/CO625) **Development of HUMASORB™, a lignite derived humic acid for removal of metals and organic contaminants from groundwater.** Sanjay, H.G.; Srivastava, K.C.; Walia, D.S. ARCTECH, Inc., Chantilly, VA (United States). 1995. 14p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AR21-95MC32114. (CONF-9510108–40: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003741. Source: OSTI; NTIS; INIS; GPO Dep.

Heavy metal and organic contamination of surface and groundwater systems is a major environmental concern. The contamination is primarily due to improperly disposed industrial wastes. The presence of toxic heavy metal ions, volatile organic compounds (VOCs) and pesticides in water is of great concern and could affect the safety of drinking water. Decontamination of surface and groundwater can be achieved using a broad spectrum of treatment options such as precipitation, ion-exchange, microbial digestion, membrane separation, activated carbon adsorption, etc. The state of the art technologies for treatment of contaminated water however, can in one pass remediate only one class of contaminants, i.e., either VOCs (activated carbon) or heavy metals (ion exchange). This would require the use of at a minimum, two different stepwise processes to remediate a site. The groundwater contamination at different Department of Energy (DOE) sites (e.g., Hanford) is due to the presence of both VOCs and heavy metals. The two-step approach increases the cost of remediation. To overcome the sequential treatment of contaminated streams to remove both organics and metals, a novel material having properties to remove both classes of contaminants in one step is being developed as part of this project.

492 (DOE/NV/11040–T1) **Summary of hydrogeologic controls on ground-water flow at the Nevada Test Site, Nye County, Nevada.** Laczniak, R.J.; Cole, J.C.; Sawyer, D.A.; Trudeau, D.A. Geological Survey, Carson City, NV (United States). 1996. 128p. Sponsored by US-DOE, Washington, DC (United States). DOE Contract AI08-91NV11040. Order Number DE96012361. Source: OSTI; NTIS; INIS; GPO Dep.

Includes maps.

The underground testing of nuclear devices has generated substantial volumes of radioactive and other chemical contaminants below ground at the Nevada Test Site (NTS). Many of the more radioactive contaminants are highly toxic and are known to persist in the environment for thousands of years. In response to concerns about potential health hazards, the US Department of Energy, under its Environmental Restoration Program, has made NTS the subject of a long-term investigation. Efforts will assess whether byproducts of underground testing pose a potential hazard to the health and safety of the public and, if necessary, will evaluate and implement steps to remediate any of the identified dangers. Ground-water flow is the primary mechanism by which contaminants can be transported significant distances away from the initial point of injection. Flow paths between contaminant sources and potential receptors are separated by remote areas that span tens of miles. The diversity and structural complexity of the rocks along these flow paths complicates the hydrology of the region. Although the hydrology has been studied in some detail, much still remains uncertain about flow rates and directions through the fractured-rock aquifers that transmit water great distances across this arid region. Unique to the hydrology of NTS are the effects of underground testing, which severely alter local rock characteristics and affect hydrologic conditions throughout the region. This report summarizes what is known and inferred about ground-water flow throughout the NTS region. The report identifies and updates what is known about some of the major controls on ground-water flow, highlights some of the uncertainties in the current understanding, and prioritizes some of the technical needs as related to the Environmental Restoration Program. 113 refs.

493 (DOE/OR--01-1393/V3&D2) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek Operable Unit. Volume 3. Risk assessment information. Appendixes E, F.** Oak Ridge National Lab., TN (United States). Mar 1996. 755p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER--315/V3&D2). Order Number DE96013719. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OUs). This document is Volume 3 of the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

494 (DOE/OR--2006) **Aqueous-stream uranium-removal technology cost/benefit and market analysis.** Kapline Enterprises, Inc., Knoxville, TN (United States). Mar 1994. 247p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016400. Source: OSTI; NTIS; INIS; GPO Dep.

The primary purpose of this report is to present information that was gathered by Kapline Enterprises, Inc. (KEI) in order to help the Department of Energy (DOE) determine the merit of continued biosorption research funding. However, in the event that funding is continued, it is also intended to help the researchers in their efforts to develop a better uranium-removal process. This report (1) provides a comparison of DOE sites that may utilize aqueous-stream, uranium-removal biosorption technology, (2) presents a comparison of the biosorption and ion exchange processes, and (3) establishes performance criteria by which the project can be measured. It also attempts to provide focus for biosorbent ground-water-remediation research and to ask questions that need to be answered. This report is primarily a study of the US market for technologies that remove uranium from aqueous streams, but it also addresses the international market-particularly for Germany. Because KEI's access to international market information is extremely limited, the material presented in this report represents a best effort to obtain this data. Although uranium-contaminated aqueous streams are a problem in other countries as well, the scope of this report is primarily limited to the US and Germany for two reasons: (1) Germany is the country of the biosorbent-CRADA partner and (2) time constraints.

495 (DOE/OR--2035) **Demonstration test and evaluation of ultraviolet/ultraviolet catalyzed peroxide oxidation for groundwater remediation at Oak Ridge K-25 Site.** Oak Ridge National Lab., TN (United States); Schafer (W.J.) Associates, Inc., Chelmsford, MA (United States); Vulcan Peroxidation Systems, Inc., Tucson, AZ (United States). [1994]. 249p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22000. Order Number DE95016634. Source: OSTI; NTIS; GPO Dep.

In the Ultraviolet/Ultraviolet Catalyzed Groundwater Remediation program, W.J. Schafer Associates, Inc. (WJSA) demonstrated, tested and evaluated a new ultraviolet (UV) lamp integrated with an existing commercial technology employing UV catalyzed peroxide oxidation to destroy organics in groundwater at an Oak Ridge K-25 site. The existing commercial technology is the perox-pure™ process of Peroxidation Systems Incorporated (PSI) that employs standard UV lamp technology to catalyze H_2O_2 into OH radicals, which attack many organic molecules. In comparison to classical technologies for remediation of groundwater contaminated with organics, the perox-pure™ process not only is cost effective but also reduces contaminants to harmless by-products instead of transferring the contaminants from one medium to another (such as in activated carbon or air stripping). Although the perox-pure™ process is cost effective against many organics, it is not effective for some organic contaminants of interest to DOE such as TCA, which has the highest concentration of the organics at the K-25 test site. Contaminants such as TCA are treated more readily by direct photolysis using short wavelength UV light. WJSA has been developing a unique UV lamp which is very efficient in the short UV wavelength region. Consequently, combining this UV lamp with the perox-pure™ process results in a means for treating essentially all organic contaminants. In the program reported here, the new UV lamp lifetime was improved and the lamp integrated into a PSI demonstration trailer. Even though this UV lamp operated at less than optimum power and UV efficiency, the destruction rate for the TCA was more than double that of the commercial unit. An optimized UV lamp may double again the destruction rate; i.e., a factor of four greater than the commercial system.

496 (DOE/OR/21548–567) **Work plan for the remedial investigation/feasibility study for the groundwater operable units at the Chemical Plant Area and the Ordnance Works Area, Weldon Spring, Missouri.** Argonne National Lab., IL (United States); USDOE Weldon Spring Site Remedial Action Project, MO (United States). Aug 1995. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21548 ; W-31109-ENG-38. Order Number DE95017588. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) and the US Army Corps of Engineers (CE) are conducting cleanup activities at two properties, the chemical plant area and the ordnance works area, located adjacent to one another in St. Charles County, Missouri. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, DOE and CE are evaluating conditions and potential responses at the chemical plant area and at the ordnance works area, respectively, to address groundwater and surface water contamination. This work plan provides a comprehensive evaluation of areas that are relevant to the (GWOUs) of both the chemical plant and the ordnance works area. Following areas or media are addressed in this work plan: groundwater beneath the chemical plant area (including designated vicinity properties described in Section 5 of the RI for the chemical plant area [DOE 1992d]) and beneath the ordnance works area; surface water and sediment at selected springs, including Burgermeister Spring. The organization of this work plan is as follows: Chapter 1 discusses the objectives for conducting the evaluation, including a summary of relevant site information and overall environmental compliance activities to be undertaken; Chapter 2 presents a history and a description of the site and areas addressed within the GWOUs, along with currently available data; Chapter 3 presents a preliminary evaluation of areas included in the GWOUs, which is based on information given in Section 2, and discusses data requirements; Chapter 4 presents rationale for data collection or characterization activities to be carried out in the remedial investigation (RI) phase, along with brief summaries of supporting documents ancillary to this work plan; Chapter 5 discusses the activities planned for GWOUs under each of the 14 tasks for an remedial (RI/FS); Chapter 6 presents proposed schedules for RI/FS for the GWOUS; and Chapter 7 explains the project management structure.

497 (DOE/RL–94-36-4) **Quarterly report of RCRA groundwater monitoring data for period October 1 through December 31, 1994.** Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 429p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012821. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford Site interim-status groundwater monitoring projects are conducted as either background, indicator parameter evaluation, or groundwater quality assessment monitoring programs as defined in the Resource Conservation and Recovery Act of 1976 (RCRA); and "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (Title 40 Code of Federal Regulations [CFR] Part 265), as amended. Compliance with the 40 CFR 265 regulations is required by the Washington Administrative Code (WAC) 173-303. This report contains data from Hanford Site groundwater monitoring projects. The location of each facility is shown. Westinghouse Hanford Company (WHC) manages the RCRA groundwater monitoring projects for federal facilities on the Hanford Site. Performing project management, preparing groundwater monitoring plans, well network design and installation, specifying groundwater data needs, performing quality control (QC) oversight, data management, and preparing project sampling schedules are all parts of this responsibility. Pacific Northwest Laboratory (PNL) administers the contract for analytical services and provides groundwater sampling services to WHC for the RCRA groundwater monitoring program. This quarterly report contains data received between October and December 1994, which are the cutoff dates for this reporting period. This report may contain not only data from the October through December quarter, but also data from earlier sampling events that were not previously reported.

498 (DOE/RL–94-102) **Proposed plan for interim remedial measure at the 100-HR-3 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017545. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan identifies the preferred alternative for an interim remedial measure at the 100-HR-3 Operable Unit, located at the Hanford Site. It also summarizes other alternatives evaluated for interim remedial measures in this operable unit. The intent of an interim remedial measure is to speed up actions to address contaminated areas that pose threats to human health or the environment. This Proposed Plan is intended to be a fact sheet for public review that briefly describes the remedial alternatives that have been analyzed, identifies the preferred alternative, and summarizes the information relied upon to recommend the preferred alternative. The preferred alternative presented in this Proposed Plan is to remove contaminated groundwater from the 100-HR-3 Operable Unit, treat it by ion exchange, and dispose of treated groundwater by using upgradient injection wells to return it to the aquifer.

499 (DOE/RL–94-102-Rev.1) **Proposed plan for interim remedial measure at the 100-HR-3 Operable Unit. Revision 1.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017501. Source: OSTI; NTIS; INIS; GPO Dep.

Operable Unit, located at the Hanford Site. It also summarizes other alternative evaluated for interim remedial measures in this operable unit. The intent of an interim remedi measure is to speed up actions to address contaminate areas that pose threats to human health or environment. This Proposed Plan is intended to be a fact sheet for public review that briefly describes the remedial alternatives that have been analyzed, identifies the preferred alternative, and summarizes the information relied upon to recommend the preferred alternative. The preferred alternative presented in this Proposed Plan is to remove contaminated groundwater from the 100-HR-3 Operable Unit, treat it by ion exchange, and dispose of treated groundwater by using upgradient injection wells to return it to the aquifer.

500 (DOE/RL–95-02) **Treatability test report for the 200-UP-1 Operable Unit, Hanford Site.** Bechtel National,

Inc., Richland, WA (United States). Jul 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017532. Source: OSTI; NTIS; INIS; GPO Dep.

A pilot-scale groundwater treatability test was performed in the 200-UP-1 Operable Unit located in the 200 West Area of the Hanford Site. The primary focus of the pilot-scale test was to assess the performance, operating parameters, and costs associated with the operation of an aboveground ion-exchange treatment system designed to remove uranium and technetium-99 from extracted 200-UP-1 groundwater. Laboratory-scale tests were also performed obtain additional contaminant loading data at different flow rates for the ion-exchange resin used in the treatment system and to assess the performance of other ion-exchange resins. The tests were also used to asses resins in removing nitrate contamination from the groundwater. The pilot-scale test treated approximately 1 million gallons of extracted groundwater. Monitoring of the treatment system indicated that the ion-exchange process achieved a greater that 99% efficiency at removing uranium and technetium from the extracted groundwater. The ion-exchange process provided to be ineffective at removing nitrates (using the resin selected for this test) with little or no change in the average nitrate concentrations. The laboratory-scale flow-through column test results indicated that contact times did not have a major effect on technetium or uranium loading rates and capacities within the range tested. This indicates that the resin kinetics support the 5.7-minute contact time used in the operation of the pilot-scale treatment system. The batch equilibrium tests identified several resins effective at treating for uranium and technetium including the resin used in the pilot-scale system. None of these resins exhibited a significant capacity for nitrates.

501 (DOE/RL--95-26) **Interim remedial measure proposed plan for the 200-UP-1 operable unit, Hanford, Washington, Revision 0.** USDOE Richland Operations Office, WA (United States). Aug 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017529. Source: OSTI; NTIS; INIS; GPO Dep.

This interim remedial measure (IRM) proposed plan describes an interim action that is proposed for the 200-UP-1 Groundwater Operable Unit (200-UP-1) located in the 200 West Area of the U.S. Department of Energy's (DOE) Hanford Site. The Hanford Site is a 560-square mile federal facility located near the city of Richland in Benton County, Washington. The 200-UP-1 addresses certain groundwater contaminants in southern portions of the 200 West Area. The objectives of this IRM are to contain elevated concentrations of uranium and technetium-99 in 200-UP-1 and collect data on aquifer and contaminant response to the remediation measure. Monitoring data indicate that the highest concentrations of these contaminants are within the boundary of the 200 West Area. However, lower concentrations of these contaminants have migrated beyond the 200 West Area boundary.

502 (DOE/RL--95-30) **200-ZP-1 Operable Unit Treatability Test Report.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jul 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017544. Source: OSTI; NTIS; INIS; GPO Dep.

A pilot-scale treatability test was performed in the 200-ZP-1 groundwater operable unit, located in the 200 West Area of the Hanford Site. The performance of the test was based on the Treatability Test Plan for the 200-ZP-1 Operable Unit (DOE-RL 1994b) and an agreement between the US Department of Energy (DOE), the US Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology) documented in the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Change Control Form M-13-93-03). The pilot-scale treatability test was conducted on the volatile organic compound (VOC) contaminant plume associated with the 200-ZP-1 Operable Unit and focused on assessing the performance of an aboveground treatment system with respect to its ability to remove carbon tetrachloride, chloroform, and trichloroethylene from extracted groundwater.

503 (DOE/RL--95-32) **In Situ Remediation Integrated Program: FY 1994 program summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Apr 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011333..Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) established the Office of Technology Development (EM-50) as an element of the Office of Environmental Management (EM) in November 1989. In an effort to focus resources and address priority needs, EM-50 introduced the concept of integrated programs (IPs) and integrated demonstrations (IDs). The In Situ Remediation Integrated Program (ISR IP) focuses research and development on the in-place treatment of contaminated environmental media, such as soil and groundwater, and the containment of contaminants to prevent the contaminants from spreading through the environment. Using in situ remediation technologies to clean up DOE sites minimizes adverse health effects on workers and the public by reducing contact exposure. The technologies also reduce cleanup costs by orders of magnitude. This report summarizes project work conducted in FY 1994 under the ISR IP in three major areas: treatment (bioremediation), treatment (physical/chemical), and containment technologies. Buried waste, contaminated soils and groundwater, and containerized waste are all candidates for in situ remediation. Contaminants include radioactive waste, volatile and nonvolatile organics, heavy metals, nitrates, and explosive materials.

504 (DOE/RL--95-69-2) **RCRA groundwater monitoring data. Quarterly report, April 1, 1995–June 30, 1995.** Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005130. Source: OSTI; NTIS; INIS; GPO Dep.

Nineteen Resource Conservation and Recovery Act of 1976 (RCRA) groundwater monitoring projects are conducted at the Hanford Site. These projects include treatment, storage, and disposal facilities for both solid and liquid waste. The groundwater monitoring programs described in this report comply with the interim-status federal (Title 40 Code of Federal Regulation [CFR] Part 265) and state (Washington Administrative Code [WAC] 173-303-400) regulations. The RCRA projects are monitored under one of three programs: background monitoring, indicator parameter evaluation, or groundwater quality assessment. Westinghouse Hanford Company (WHC) manages the RCRA groundwater monitoring projects on the Hanford Site. Performing project management, preparing groundwater monitoring plans, well network design and installation, specifying groundwater data needs, performing quality control (QC) oversight, data management, and preparing project sampling schedules are all parts of this responsibility. Pacific Northwest Laboratory (PNL) administers the contract for analytical services to WHC for the RCRA groundwater monitoring program. This quarterly report contains data received between April and June 1995, which are the cutoff dates for this reporting period. This report may contain not only data from the April through June quarter, but also data from earlier sampling events that were not previously reported.

505 (DOE/RL–95-69-3) **Quarterly report of RCRA groundwater monitoring data for period July 1–September 30, 1995.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 351p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006860. Source: OSTI; NTIS; INIS; GPO Dep.

Nineteen RCRA groundwater monitoring projects are conducted at the Hanford site. They include treatment, storage, and disposal facilities for both solid and liquid waste. Groundwater monitoring programs described in this report comply with the interim- and final- status federal and state regulations. The RCRA projects are monitored under one of the following programs: background monitoring, indicator parameter evaluation, or groundwater quality assessment or detection. This quarterly report contains data received between July 1 and Sept. 30, 1995, which are the cutoff dates for this reporting period. This report may contain not only data from the July-Sept. quarter, but also data from earlier sampling events not previously reported.

506 (DOE/RL–95-89) **Iodine-129 contamination: Nature, extent, and treatment technologies.** Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008183. Source: OSTI; NTIS; INIS; GPO Dep.

This document was prepared to satisfy the requirements of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-15-81B. The document provides information on the known nature and extent of iodine-129 (^{129}I) contamination in the soil and groundwater of the 200 Area Plateau, lists potential applicable or relevant and appropriate requirements, and describes the available treatment methods to remediate ^{129}I contamination in both groundwater and soils. The radioactive isotope ^{129}I was generated at the Hanford Site during plutonium production and processing. A portion of this ^{129}I was released to the soils in process effluent waste streams at the separations plants in the 200 East and 200 West Areas. As a result of this effluent discharge, ^{129}I has impacted the groundwater in the unconfined aquifer. The ^{129}I contamination plumes are large and diffuse, with areas of higher activity located near the original disposal sites. The highest activity encountered in Hanford Site groundwater is 86.1 pCi/L near the S Plant in the 200 West Area. The highest activity noted for the 200 East Area plume is 12.4 pCi/L in a well located near the Plutonium/Uranium Extraction (PUREX) Plant. Iodine-129-contaminated groundwater from the low-activity, leading edge of the contaminant plume has reached the Columbia River. The 15.7 million year half-life, high mobility, and bioaccumulation tendency of this radioisotope contribute to the concern about potential risks to human health and the environment. The very low number of ^{129}I detections to date is likely due to the fact that site investigations have not been conducted at the source operable unit cribs where ^{129}I-bearing process wastes were disposed. As a result, it cannot currently be determined whether any cribs present a continuing or future source of ^{129}I contamination to the groundwater.

507 (DOE/RL–95-99) **100-FR-3 groundwater/soil gas supplemental limited field investigation report.** USDOE Richland Operations Office, WA (United States). Apr 1996. 40p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013564. Source: OSTI; NTIS; INIS; GPO Dep.

In 1993, a Limited Field Investigation (LFI) was conducted for the 100-FR-3 Operable Unit which identified trichloroethylene (TCE) as a contaminant of potential concern (COPC) (DOE-RL 1994). In groundwater samples collected for the LFI, TCE was detected in well 199-177-1 at a concentration exceeding the U.S. Environmental Protection Agency (EPA) maximum contaminant level (5 μg/L) and Washington State groundwater criteria (3 μg/L). With the concurrence of the EPA and the Washington State Department of Ecology (Ecology), a supplemental LFI was conducted to determine the extent and potential source of TCE groundwater contamination associated with the 100-FR-3 Operable Unit. This report summarizes the activities and results of the groundwater/soil gas supplemental LFI for the 100-FR-3 Operable Unit. The primary objective of this investigation was to assess the lateral distribution of TCE in shallow (3 to 5 ft below the water table) groundwater associated with the 100-FR-3 Operable Unit. The second objective was to assess soil gas (3 to 5 concentrations in the study area in an attempt to identify potential sources of TCE and develop a correlation between soil gas and groundwater concentrations). Finally, the third objective of the investigation was to refine the site conceptual model.

508 (DOE/RL–95-101) **An analysis of potential impacts to the groundwater monitoring networks in the Central Plateau. Revision 0.** Department of Energy, Richland, WA (United States). Richland Operations Office. [1996]. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005876. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of an evaluation of potential impacts to the four groundwater monitoring projects operating in the Central Plateau of the Hanford Site. It specifically fulfills Milestone M-15-81A of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). Milestone M-15-81A specifies the evaluation of the potential impacts to the groundwater monitoring well systems in the Central Plateau caused by the following activities: reduction of liquids discharged to soil, proposed and operational liquid treatment facilities, and proposed pump-and-treat systems. For this report, an "impact" is defined as a restriction of the ability to draw samples from a well and/or a reduction of the ability of a monitoring well to meet its intended purpose (such as the detection of contaminant seepage from a facility). Approximately 20% (74 wells) of the groundwater monitoring wells potentially will experience sampling problems by the year 2005 due to the declining water table in the Central Plateau. Reduction of discharges to the B Pond complex and operation of the Treated Effluent Disposal System will directly cause four additional wells to potentially experience sampling problems. Approximately 90 monitoring wells (35 of which are Resource Conservation and Recovery Act of 1976 [RCRA] wells) will be potentially affected by the operation of pump-and-treat systems in the 200 West Area. Most of the impacts will be caused by local changes to groundwater flow directions that will potentially reduce the ability of the RCRA well network to monitor a limited number of RCRA facilities.

509 (DOE/RL–96-01) **Annual report for RCRA groundwater monitoring projects at Hanford Site facilities for 1995.** Hartman, M.J. Westinghouse Hanford Co., Richland, WA (United States). Feb 1996. 580p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96009932. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the annual hydrogeologic evaluation of 19 Resource Conservation and Recovery Act of 1976 facilities and 1 nonhazardous waste facility at the US Department of Energy's Hanford Site. Although most of the facilities no longer receive dangerous waste, a few facilities continue to receive dangerous waste constituents for treatment, storage, or disposal. The 19 Resource Conservation and Recovery Act facilities comprise 29 waste management units. Nine of the units are monitored under groundwater quality assessment status because of elevated levels of contamination indicator parameters. The impact of those units on groundwater quality, if any, is being investigated. If dangerous waste or waste constituents have entered groundwater, their concentration profiles, rate, and extent of migration are evaluated. Groundwater is monitored at the other 20 units to detect leakage, should it occur. This report provides an interpretation of groundwater data collected at the waste management units between October 1994 and September 1995. Groundwater quality is described for the entire Hanford Site. Widespread contaminants include nitrate, chromium, carbon tetrachloride, tritium, and other radionuclides.

510 (DOE/RL–96-59) **200-BP-5 operable unit treatability test report.** USDOE Richland Operations Office, WA (United States). Apr 1996. 411p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013575. Source: OSTI; NTIS; INIS; GPO Dep.

The 200-BP-5 Operable Unit was established in response to recommendations presented in the 200 East Groundwater Aggregate Area Management Study Report (AAMSR) (DOE-RL 1993a). Recognizing different approaches to remediation, the groundwater AAMSR recommended separating groundwater from source and vadose zone operable units and subdividing 200 East Area groundwater into two operable units. The division between the 200-BP-5 and 200-PO-1 Operable Units was based principally on source operable unit boundaries and distribution of groundwater plumes derived from either B Plant or Plutonium/Uranium Extraction (PUREX) Plant liquid waste disposal sites.

511 (EML–567) **Inventory of site-derived ^{36}Cl in the Snake River plain aquifer, Idaho National Engineering Laboratory, Idaho.** Beasley, T.M. Department of Energy, New York, NY (United States). Environmental Measurements Lab. Feb 1995. 51p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95014966. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste management practices at the U.S. Department of Energy's Idaho National Engineering Laboratory (INEL) in Idaho have introduced ^{36}Cl ($T_{1/2}$ = 301,000 yr) into the Snake River Plain aquifer underlying the site. The ^{36}Cl is believed to originate from neutron activation of stable ^{35}Cl in nuclear fuels (principally) and in reactor cooling/process water. Wastewater releases of ^{3}H at the INEL have been documented by the site operators for the period 1952 to 1988. During this time, approximately 1.2 PBq of ^{3}H (30,000 Ci) were introduced to the subsurface through disposal wells and seepage ponds. By sampling a number of monitoring and production wells downgradient from points of introduction, ^{3}H movement and dispersion in the groundwater have been documented by the U.S. Geological Survey. The present report uses these historical ^{3}H release and monitoring data to choose hydrologic parameters (matrix porosity and plume penetration depth) that produce concordance between the ^{3}H release estimates and the inventory calculated from measurements of ^{3}H in the subsurface. These parameters are then applied to ^{36}Cl isopleths to generate an estimated ^{36}Cl inventory in the subsurface. Using assumptions about irradiation times, neutron fluxes, and total fuel processed, as little as 23 g of stable chloride impurity in fuel elements would be adequate to produce the amount of ^{36}Cl estimated to be in the groundwaters underlying the site. The highest atom concentration of ^{36}Cl measured onsite (222×10^{10} atoms 1^{-1}) corresponds to an activity level of ~4 pCi 1^{-1} and represents 0.2 percent of the U.S. Environmental Protection Agency's (EPA) drinking water standard for this radionuclide (2000 pCi 1^{-1}).

512 (FEMP/SUB–095) **Horizontal grout barrier project results of the latest testing.** Riedel, K.W. (PARSONS Environmental Remedial Action Project, Fairfield, OH (United States)); Ridenour, D.E.; Walker, J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Mar 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950868–15: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96000317. Source: OSTI; NTIS; INIS; GPO Dep.

Throughout United States Department of Energy (DOE) sites are situations where storage tanks and pits are leaking or have the potential to leak contamination into the soil. Subsequent leaching from rain and groundwater flow disperses the contamination far from the original site and, in some cases, into aquifers which serve as a drinking water source. Fernald Environmental Restoration Management Corporation (FERMCO) at Fernald working with the DOE Office of Technology Development (OTD) and two subcontractors, is pursuing the goal of placing a barrier beneath the contamination to prevent this dispersion. The technology being developed is an in situ approach based on directional drilling and jet grouting techniques developed in the oil fields. The unique barrier techniques being developed depend on innovative tooling and special grouts to install a horizontal barrier underground without disturbing the contaminated soils above. The initial tool designs were tested in December 1992 and were encouraging enough that the DOE agreed to fund continued development. A second set of designs were tested in August 1994. The testing results were less than expected but did provide a number of lessons learned. This paper reports on the third set of tool designs and the results of testing these tools prior to the full demonstration project at Fernald.

513 (GJPO-WMP–96) **Geochemical study of groundwater at Sandia National Laboratories/New Mexico and Kirtland Air Force Base.** Rust Geotech, Inc., Grand Junction, CO (United States). Oct 1995. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL96907. Order Number DE96013678. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Grand Junction Projects Office (GJPO) and its contractor, Rust Geotech, support the Kirtland Area Office by assisting Sandia National Laboratories/New Mexico (Sandia/NM) with remedial action, remedial design, and technical support of its Environmental Restoration Program. To aid in determining groundwater origins and flow paths, the GJPO was tasked to provide interpretation of groundwater geochemical data. The purpose of this investigation was to describe and analyze the groundwater geochemistry of the Sandia/NM Kirtland Air Force Base (KAFB). Interpretations of groundwater origins are made by using these data and the results of "mass balance" and "reaction path' modeling. Additional maps and plots were compiled to more fully comprehend the geochemical distributions. A more complete set of these data representations are provided in the appendices. Previous interpretations of groundwater-flow paths that were based on well-head, geologic, and geochemical data are presented in various reports and were used as the basis for developing the models presented in this investigation.

514 (INEL–94/0012-Rev.3) **Overview of groundwater and surface water standards pertinent to the Idaho National Engineering Laboratory. Revision 3.** Lundahl, A.L.; Williams, S.; Grizzle, B.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1995. 318p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Contract C95-175686. Order Number DE96009711. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents an overview of groundwater- and surface water-related laws, regulations, agreements, guidance documents, Executive Orders, and DOE orders pertinent to the Idaho National Engineering Laboratory. This document is a summary and is intended to help readers understand which regulatory requirements may apply to their particular circumstances. However, the document is not intended to be used in lieu of applicable regulations. Unless otherwise noted, the information in this report reflects a summary and evaluation completed July 1, 1995. This document is considered a Living Document, and updates on changing laws and regulations will be provided.

515 (INEL–95/0169-Rev.1) **Development of a regional groundwater flow model for the area of the Idaho National Engineering Laboratory, Eastern Snake River Plain Aquifer.** McCarthy, J.M. (and others); Arnett, R.C.; Neupauer, R.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1995. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002196. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents a study conducted to develop a regional groundwater flow model for the Eastern Snake River Plain Aquifer in the area of the Idaho National Engineering Laboratory. The model was developed to support Waste Area Group 10, Operable Unit 10-04 groundwater flow and transport studies. The products of this study are this report and a set of computational tools designed to numerically model the regional groundwater flow in the Eastern Snake River Plain aquifer. The objective of developing the current model was to create a tool for defining the regional groundwater flow at the INEL. The model was developed to (a) support future transport modeling for WAG 10-04 by providing the regional groundwater flow information needed for the WAG 10-04 risk assessment, (b) define the regional groundwater flow setting for modeling groundwater contaminant transport at the scale of the individual WAGs, (c) provide a tool for improving the understanding of the groundwater flow system below the INEL, and (d) consolidate the existing regional groundwater modeling information into one usable model. The current model is appropriate for defining the regional flow setting for flow submodels as well as hypothesis testing to better understand the regional groundwater flow in the area of the INEL. The scale of the submodels must be chosen based on accuracy required for the study.

516 (INEL–95/00230) **Design considerations for pump-and-treat remediation based on characterization of industrial injection wells: Lessons learned from the groundwater interim action at the test area north of the Idaho National Engineering Laboratory.** Cotten, G.B. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–27: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96004003. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is a 2,305 km^2 (890 mi^2) Federal Facility operated by the U.S. Department of Energy, Idaho Operations Office. The Test Area North (TAN) complex is located approximately 80 km (50 mi) northwest of Idaho Falls in the northern portion of the HSTEL and extends over an area of approximately 30 km^2 (12 mi^2). The Technical Support Facility (TSF) is centrally located within TAN and consists of several experimental and support facilities for conducting research and development activities on nuclear reactor performance. Operations at TAN were initiated in the early 1950s to support the U.S. Air Force aircraft nuclear propulsion project and have continued over the years with various experimental and testing facilities. The TSF-05 Injection well was used from 1953 to 1972 to dispose of TAN liquid wastes in the fractured basalt of the Snake River Plain Aquifer. Trichloroethylene (TCE) was first identified as a groundwater contaminant in 1987 when it was found in the TAN drinking water above acceptable levels. The TAN Groundwater Interim Action at the INEL was intended to provide both interim containment and clean-up of contaminated groundwater resulting from the 40-year old injection well, TSF-05. The primary decontamination objective of the Groundwater Treatment Facility (GWTF) is to remove volatile organic compounds, primarily TCE. A pump-and-treat technology using air stripping, carbon adsorption, and resin ion exchange for strontium-90 (^{90}Sr) was selected in the Operable Unit 1-07A Groundwater Interim Action Record of Decision. Operations started on February 16, 1994 and activities were suspended on January 23, 1995 due to the inability to meet Remedial Action Objectives (RAOs).

517 (INEL–95/0546) **Determination of radium in water.** Hohorst, F.A.; Huntley, M.W.; Hartenstein, S.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004072. Source: OSTI; NTIS; INIS; GPO Dep.

These detailed work instructions (DWIs) are tailored for the analysis of radium-226 and radium-228 in drinking water supplies from ground water and surface water sources and composites derived from them. The instructions have been adapted from several sources, including a draft EPA method. One objective was to minimize the generation of mixed wastes. Quantitative determinations of actinium-228 are made at 911 keV. The minimum detection level (MDL) for the gamma spectrometric measurements at this energy vary with matrix, volume, geometry, detector, background, and counting statistics. The range of MDL's for current detectors is 0.07 to 0.5 Bq/sample. Quantitative determinations of radium-226 are made by counting the high energy alpha particles which radium-226 progeny emit using liquid scintillation counting (LSC). The minimum detectable activity (MDA) is 3.8 E-3 Bq/sample. The maximum concentration which may be counted on available instruments without dilution is about 2 E + 5 Bq/sample. Typically, this determination of radium in a 2 L sample has a yield of 80%. If radium-228 is determined using a 16 h count after 50 h grow-in, the typical MDL is 1 E-9 to 8 E-9 μCi/mL (1 to 8 pCi/L). If radium-226 is determined using a 2.5 h count after 150 h grow-in, the typical MDA is about 1 E-10 μCi/mL (0. 1 pCi/L).

518 (INEL–95/0583) **Storm water monitoring report for the 1995 reporting period.** Braun, D.R.; Brock, T.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1995. 161p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009938. Source: OSTI; NTIS; INIS; GPO Dep.

This report includes sampling results and other relevant information gathered in the past year by LITCO's Environmental Monitoring and Water Resources Unit. This report presents analytical data collected from storm water discharges as a part of the Environmental Monitoring Storm Water Monitoring Program for 1994–1995 for facilities located on the Idaho National Engineering Laboratory (INEL). The 1995 reporting period is October 1, 1994 through September 30, 1995. The storm water monitoring program tracks information about types and amounts of pollutants present. Data are required for the Environmental Protection Agency and are transmitted via Discharge Monitoring Reports. Additional information resulting from the program contributes to Best Management Practice to control pollution in runoff as well as Storm Water Pollution Prevention Plans.

519 (INEL–95/0596) **UNSAT-H infiltration model calibration at the Subsurface Disposal Area, Idaho National Engineering Laboratory.** Martian, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003993. Source: OSTI; NTIS; INIS; GPO Dep.

Soil moisture monitoring data from the expanded neutron probe monitoring network located at the Subsurface Disposal Area (SDA) of the Idaho National Engineering Laboratory (INEL) were used to calibrate numerical infiltration models for 15 locations within and near the SDA. These calibrated models were then used to simulate infiltration into the SDA surficial sediments and underlying basalts for the entire operational period of the SDA (1952–1995). The purpose of performing the simulations was to obtain a time variant infiltration source term for future subsurface pathway modeling efforts as part of baseline risk assessment or performance assessments. The simulation results also provided estimates of the average recharge rate for the simulation period and insight into infiltration patterns at the SDA. These results suggest that the average aquifer recharge rate below the SDA may be at least 8 cm/yr and may be as high as 12 cm/yr. These values represent 38 and 57% of the average annual precipitation occurring at the INEL, respectively. The simulation results also indicate that the maximum evaporative depth may vary between 28 and 148 cm and is highly dependent on localized lithology within the SDA.

520 (INEL–95/0633) **Dig-face monitoring during excavation of a radioactive plume at Mound Laboratory, Ohio.** Josten, N.E.; Gehrke, R.J.; Carpenter, M.V. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007527. Source: OSTI; NTIS; INIS; GPO Dep.

A dig-face monitoring system consists of onsite hardware for collecting information on changing chemical, radiological, and physical conditions in the subsurface soil during the hazardous site excavation. A prototype dig-face system was take to Mount Laboratory for a first trial. Mound Area 7 was the site of historical disposals of ^{232}Th, ^{227}Ac, and assorted debris. The system was used to monitor a deep excavation aimed at removing ^{227}Ac-contaminated soils. Radiological, geophysical, and topographic sensors were used to scan across the excavation dig-face at four successive depths as soil was removed. A 3-D image of the contamination plumes was developed; the radiation sensor data indicated that only a small portion of the excavated soil volume was contaminated. The spatial information produced by the dig-face system was used to direct the excavation activities into the area containing the ^{227}Ac and to evaluate options for handling the separate ^{232}Th plume.

521 (INEL–95/0637) **Inverse modeling for field-scale hydrologic and transport parameters of fractured basalt.** Magnuson, S.O. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96006028. Source: OSTI; NTIS; INIS; GPO Dep.

A large-scale test of infiltration into a thick sequence Of fractured Snake River Plain basalts was performed during the summer of 1994 on the Idaho National Engineering Laboratory. Monitoring of moisture and tracer movement during this test provided a set of quantitative measurements from which to obtain a field-scale hydrologic description of the fractured basalts. An inverse modeling study using these quantitative measurements was performed to obtain the representative hydrologic description. This report describes the results of the inverse modeling study and includes the background and motivation for conducting the infiltration test; a brief overview of the infiltration test; descriptions of the calibration targets chosen for the simulation study, the simulation model, and the model implementation; and the simulation results with comparisons to hydrologic and tracer breakthrough data obtained from the infiltration test.

522 (INEL–96/0176) **The efficiency calibration and development of environmental correction factors for an in situ high-resolution gamma spectroscopy well logging system.** Giles, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1996. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013315. Source: OSTI; NTIS; INIS; GPO Dep.

A Gamma Spectroscopy Logging System (GSLS) has been developed to study sub-surface radionuclide contamination. Absolute efficiency calibration of the GSLS was performed using simple cylindrical borehole geometry. The calibration source incorporated naturally occurring radioactive material (NORM) that emitted photons ranging from 186-keV to 2,614-keV. More complex borehole geometries were modeled using commercially available shielding software. A linear relationship was found between increasing source thickness and relative photon fluence rates at the detector. Examination of varying porosity and moisture content showed that as porosity increases, relative photon fluence rates increase linearly for all energies. Attenuation effects due to iron, water, PVC, and concrete cylindrical shields were found to agree with previous studies. Regression analyses produced energy-dependent equations for efficiency corrections applicable to spectral gamma-ray well logs collected under non-standard borehole conditions.

523 (IS–5117) **Zero-tension lysimeters: An improved design to monitor colloid-facilitated contaminant transport in the vadose zone.** Thompson, M.L.; Scharf, R.L.; Shang, C. Ames Lab., IA (United States). 24 Apr 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. Order Number DE96000214. Source: OSTI; NTIS; INIS; GPO Dep.

There is increasing evidence that mobile colloids facilitate the long-distance transport of contaminants. The mobility of fine particles and macromolecules has been linked to the movement of actinides, organic contaminants, and heavy metals through soil. Direct evidence for colloid mobility includes the presence of humic materials in deep aquifers as well as coatings of accumulated clay, organic matter, or sesquioxides on particle or aggregate surfaces in subsoil horizons of many soils. The potential for colloid-facilitated transport of contaminants from hazardous-waste sites requires adequate monitoring before, during, and after in-situ remediation treatments. Zero-tension lysimeters (ZTLs) are especially appropriate for sampling water as it moves through saturated soil, although some unsaturated flow events may be sampled as well. Because no ceramic barrier or fiberglass wick is involved to maintain tension on the water (as is the case with other lysimeters), particles suspended in the water as well as dissolved species may be sampled with ZTLs. In this report, a ZTL design is proposed that is more suitable for monitoring colloid-facilitated contaminant migration. The improved design consists of a cylinder made of polycarbonate or polytetrafluoroethylene (PTFE) that is placed below undisturbed soil material. In many soils, a hydraulically powered tube may be used to extract an undisturbed core of soil before placement of the lysimeter. In those cases, the design has significant advantages over conventional designs with respect to simplicity and speed of installation. Therefore, it will allow colloid-facilitated transport of contaminants to be monitored at more locations at a given site.

524 (K/ER–306) **Microgravity survey of the Oak Ridge K-25 Site, Oak Ridge, Tennessee.** Kaufmann, R.D. Oak Ridge K-25 Site, TN (United States). May 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96010210. Source: OSTI; NTIS; INIS; GPO Dep.

Karst features are known to exist within the carbonate bedrock of the Oak Ridge K-25 Site and may play an important role in groundwater flow and contaminant migration. This report discusses the results of a microgravity survey of the Oak Ridge K-25 Site. The main objective of the survey is to identify areas containing bedrock cavities. Secondary objectives included correlating the observed gravity to the geology and to variations in overburden thickness. The analysis includes 11 profile lines that are oriented perpendicular to the geologic strike and major structures throughout the K-25 Site. The profile lines are modeled in an effort to relate gravity anomalies to karst features such as concentrations of mud-filled cavities. Regolith thickness and density data provided by boreholes constrain the models. Areally distributed points are added to the profile lines to produce a gravity contour map of the site. In addition, data from the K-901 area are combined with data from previous surveys to produce a high resolution map of that site. The K-25 Site is located in an area of folded and faulted sedimentary rocks within the Appalachian Valley and Ridge physiographic province. Paleozoic age rocks of the Rome Formation, Knox Group, and Chickamauga Supergroup underlie the K-25 Site and contain structures that include the Whiteoak Mountain Fault, the K-25 Fault, a syncline, and an anticline. The mapped locations of the rock units and complex structures are currently derived from outcrop and well log analysis.

525 (LA–12912-MS) **Environmental geochemistry for surface and subsurface waters in the Pajarito Plateau and outlying areas, New Mexico.** Blake, W.D.; Goff, F.; Adams, A.I.; Counce, D. Los Alamos National Lab., NM (United States). May 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95015015. Source: OSTI; NTIS; GPO Dep.

This report provides background information on waters in the Los Alamos and Santa Fe regions of northern New Mexico. Specifically, the presented data include major element, trace element, and isotope analyses of 130 water samples from 94 different springs, wells, and water bodies in the area. The region considered in this study extends from the western edge of the Valles Caldera to as far east as Santa Fe Lake. For each sample, the presented analysis includes fourteen different major elements, twenty-six trace elements, up to five stable isotopes, and tritium. In addition, this data base contains certain characteristics of the water that are calculated from the aforementioned raw data, including the water's maximum and minimum residence times, as found from tritium levels assuming no contamination, the water's recharge elevation, as found from stable isotopes, and the charge balance of the water. The data in this report are meant to provide background information for investigations in groundwater hydrology and geochemistry, and for environmental projects. For the latter projects, the presented information would be useful for determining the presence of contamination it any one location by enabling one to compare potential contaminant levels to the background levels presented here. Likely locations of interest are those possibly effected by anthropogenic activities, including locations in and around Los Alamos National Laboratory, White Rock Canyon, and developed areas in the Rio Grande Valley.

526 (LA–12913-MS) **Natural background geochemistry, geomorphology, and pedogenesis of selected soil profiles and Bandelier Tuff, Los Alamos, New Mexico.** Longmire, P.A.; Reneau, S.L.; Watt, P.M.; McFadden, L.D.; Gardner, J.N.; Duffy, C.J.; Ryti, R.T. Los Alamos National Lab., NM (United States). May 1996. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96010649. Source: OSTI; NTIS; GPO Dep.

To determine the environmental impact of Los Alamos National Laboratory's activities on surface waters, groundwaters, soils, sediments, and Bandelier Tuff requires thorough knowledge of the background-element chemistry for both geological and hydrological media. Background media are defined as soils, sediments, rocks, surface waters, and groundwaters unaffected by Laboratory operations. Background element concentrations in soils and the Bandelier Tuff are presented in this report; element and solute distributions within sediments, surface waters, and groundwaters will be addressed in future studies. Statistical and geochemical comparisons of background samples and contaminated or nonbackground samples are needed to identify and evaluate environmental contamination.

527 (LA–12968-MS) **The unsaturated hydraulic characteristics of the Bandelier Tuff.** Rogers, D.B.; Gallaher, B.M. Los Alamos National Lab., NM (United States). Sep 1995. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96000894. Source: OSTI; NTIS; GPO Dep.

Report includes diskette designed to run on IBM PC compatible equipment.

This report summarizes the physical and, unsaturated hydraulic properties of the Bandelier Tuff determined from laboratory measurements made on core samples collected at Los Alamos National Laboratory. We fit new van Genuchten-type moisture retention curves to this data, which was categorized according to member of the Bandelier Tuff and subunit of the Tshirege Member. Reasonable consistency was observed for hydraulic properties and retention curves within lithologic units, while distinct differences were observed for those properties between units. With the moisture retention data, we constructed vertical profiles of in situ matric suction and hydraulic head. These profiles give an indication of the likely direction of liquid water movement within the unsaturated zone and allow comparison of core-scale and field-scale estimates of water flow and solute transport parameters. Our core-derived transport velocities are much smaller than values estimated from tritium, Cl, and NO_3 contamination found recently in boreholes. The contaminant tracer-derived transport velocities from Los Alamos Canyon are greater than corederived values found for the Otowi Member, and for Mortandad Canyon, greater than core-derived values for that borehole. The significant difference found for Mortandad Canyon suggests that fracture or other fast-path transport may be important there. The relatively small difference between observed and predicted velocities at Los Alamos Canyon may mean that vadose zone transport there occurs by unsaturated matrix flow.

528 (LA–12978-MS) **Cesium sorption and desorption on selected Los Alamos soils.** Kung, K.S.; Chan, J.; Longmire, P.; Fowler, M. Los Alamos National Lab., NM (United States). Aug 1995. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95016709. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory experiments were conducted to evaluate the sorptivity of cesium onto Los Alamos soils under controlled experimental conditions. Four soil profiles were collected and each soil profile which is broken into layers according to previously identified soil horizons were studied. Batch sorption isotherms were studied to quantify the chemical reactivity of each soil horizon toward cesium ion. Radioactive cesium-137 was used as sorbent and gamma counting was used to quantify the amount of sorption. Desorption experiments were conducted after the sorption experiments. Batch desorption isotherms were studied to quantify the desorption of presorbed cesium from these Los Alamos soils. This study suggests cesium may sorb strongly and irreversibly on most Los Alamos soils. The amount of cesium sorption and desorption is possibly related to the clay content of the soil sample since subsurface sample has a higher clay content than that of surface sample.

529 (LA–13108-MS) **Sorption and desorption of cesium and strontium on TA-2 and TA-41 soils and sediments.** Kung, K. Stephen; Li, Benjamin W.; Longmire, P.A.; Fowler, M.M. Los Alamos National Lab., NM (United States). Apr 1996. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96009346. Source: OSTI; NTIS; INIS; GPO Dep.

Current environmental monitoring has detected radioactive contaminants in alluvial groundwater, soils, and sediments in the TA-2 and TA-41 areas along the north central edge of Los Alamos National Laboratory. Because of this contamination, this study was initiated. The objective of this study is to quantify the sorptivity of cesium and strontium onto TA-2 and TA-41 site specific soil samples under a controlled environment in the laboratory. The purposes of this work are to determine cesium and strontium sorption coefficient for these sit specific soils and to evaluate the potential transport of cesium and strontium. Based on this information, a risk assessment and remediation strategy can be developed.

530 (LA-SUB–95-27-1) **SAMFT1D: Single-phase and multiphase flow and transport in 1 dimension. Version 2.0, Documentation and user's guide.** Wu, Y.S. (HydroGeoLogic, Inc., Herndon, VA (United States)); Huyakorn, P.S.; Panday, S.; Park, N.S.; Kool, J.B. Los Alamos National Lab., NM (United States); HydroGeoLogic, Inc., Herndon, VA (United States). Sep 1991. 297p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95007639. Source: OSTI; NTIS; GPO Dep.

This report documents a one-dimensional numerical model, SAMFT1D, developed to simulate single-phase and multiphase fluid flow and solute transport in variably saturated porous media. The formulation of the governing equations and the numerical procedures used in the code for single-phase and multiphase flow and transport are presented. The code is constructed to handle single-phase as well as two or three-phase flow conditions using two integrated sets of computational modules. The fully implicit scheme is used in the code for both single-phase and multiphase flow simulations. Either the Crank-Nicholson scheme or the fully implicit scheme may be used in the transport simulation. The single-phase modules employ the Galerkin and upstream weighted residual finite element techniques to model flow and transport of water (aqueous phase) containing dissolved single-species contaminants concurrently or sequentially, and include the treatment of various boundary conditions and physical processes. The multiphase flow modules use block-centered finite difference techniques to simulate two or three-phase flow problems, and treat different boundary conditions in terms of source/sink terms fully implicitly. Whereas the multiphase solute transport modules employ finite element schemes to handle single-species transport in multiphase fluid systems. This document has been produced as a user's manual. It contains detailed information on the code structure along with instructions for input data preparation and sample input and printed output for selected test problems. Also included are instructions for job set up and simulation restart procedures.

531 (LA-SUB--95-27-2) **SAMFT2D: Single-phase and multiphase flow and transport in 2 dimensions. Version 2, Documentation and user's guide.** Huyakorn, P.S. (HydroGeoLogic, Inc., Herndon, VA (United States)); Wu, Y.S.; Panday, S.; Park, N.S.; Kool, J.B. Los Alamos National Lab., NM (United States); HydroGeoLogic, Inc., Herndon, VA (United States). Sep 1991. 317p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95013053. Source: OSTI; NTIS; GPO Dep.

This report documents a two-dimensional finite element model, SAMFT2D, developed to simulate single-phase and multiphase fluid flow and solute transport in variably saturated porous media. The formulations of the governing equations and the numerical procedures used in the code for single-phase and multiphase flow and transport are presented. The code is constructed to handle single-phase as well as two- or three-phase flow conditions using two integrated sets of computational modules. A fully implicit time-stepping scheme is used in the code for both single-phase and multiphase flow simulations. Either the Crank-Nicholson scheme or the fully implicit scheme may be used in the transport simulation. The single-phase modules employ the conventional Galerkin and upstream-weighted residual finite element techniques to model flow and transport of water (aqueous phase) containing dissolved single-species contaminants concurrently or sequentially, and include the treatment of various boundary conditions and physical processes. The multiphase flow modules use the Galerkin schemes with upstream weighting of phase mobilities to simulate two- or three-phase flow problems, and treat different boundary conditions in terms of source/sink terms fully implicitly. The multiphase solute transport modules employ the upstream-weighted residual schemes to handle single-species transport in multiphase fluid systems. Several example problems are presented to verify the code and to demonstrate its utility. These problems range from one-phase unsaturated flow and transport to two- and three-phase flow problems including gravity and capillary effects and associated transport simulations.

532 (LA-SUB--95-27-3) **SAMFT3D: Single-phase and multiphase flow and transport in 3 dimensions. Version 1.0, Documentation and user's guide.** Los Alamos National Lab., NM (United States); HydroGeoLogic, Inc., Herndon, VA (United States). Sep 1991. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95013054. Source: OSTI; NTIS; GPO Dep.

SAMFT3D is a three-dimensional, finite element code designed to simulate single-phase and multiphase fluid flow and contaminant transport in porous media. This report documents the single-phase version of the code. The single-phase computational modules have been developed to simulate flow and solute transport in fully or variable saturated porous media. The formulation of the governing equations and the numerical procedures used in these modules are presented. The flow equation is approximated using the Galerkin finite element method. For variably saturated flow problems, nonlinearities due to unsaturated soil properties are treated using Picard or Newton-Raphson iterations. The contaminant transport simulation can account for advection, hydrodynamic dispersion, linear equilibrium sorption, and first-order degradation. Transport of a single component can be handled. The transport equation is approximated using a upstream weighted residual method. Several test problems are presented to verify the code and to demonstrate its utility. These problems range from single one-dimensional to complex three-dimensional problems. This document has been produced as a user's manual. It contains brief information on the code structure along with detailed instructions for input data preparation and sample input and printed output for selected test problems. Also included are instructions for setting up a simulation run and restart procedures.

533 (LA-SUB--96-77-Vol.1) **Laboratory analysis of soil hydraulic properties of TA-49 soil samples. Volume I: Report summary.** Los Alamos National Lab., NM (United States); Stephens (Daniel B.) and Associates, Inc., Albuquerque, NM (United States). Apr 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96011888. Source: OSTI; NTIS; INIS; GPO Dep.

The Hydrologic Testing Laboratory at Daniel B. Stephens & Associates, Inc. (DBS&A) has completed laboratory tests on TA-49 soil samples as specified by Mr. Daniel A. James and summarized in Table 1. Tables 2 through 12 give the results of the specified analyses. Raw laboratory data and graphical plots of data (where appropriate) are contained in Appendices A through K. Appendix L lists the methods used in these analyses. A detailed description of each method is available upon request. Thermal properties were calculated using methods reviewed by Campbell and covered in more detail in Appendix K. Typically, soil thermal conductivities are determined using empirical fitting parameters (five in this case), Some assumptions are also made in the equations used to reduce the raw data. In addition to the requested thermal property measurements, calculated values are also presented as the best available internal check on data quality. For both thermal conductivities and specific heats, calculated and measured values are consistent and the functions often cross. Interestingly, measured thermal conductivities tend to be higher than calculated thermal conductivities around typically encountered in situ moisture contents (±5 percent). While we do not venture an explanation of the difference, sensitivity testing of any problem requiring nonisothermal modeling across this range is in order.

534 (LA-SUB--96-77-Vol.2) **Measurement of unsaturated hydraulic conductivity in the Bandelier Tuff at Los Alamos.** Conca, J. (Northwest Environmental Services, Testing and Training, Richland, WA (United States)); Mockler, T.J. Los Alamos National Lab., NM (United States); Stephens (Daniel B.) and Associates, Inc., Albuquerque, NM (United States). Apr 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96011887. Source: OSTI; NTIS; INIS; GPO Dep.

Hydraulic conductivities, K, were experimentally determined as a function of volumetric water content, θ, in Bandelier Tuff cores from Los Alamos, New Mexico. These data were used to determine the feasibility of applying a new unsaturated flow technology (UFA™) to further hydrologic studies of tuffaceous rocks at Los Alamos. The $K(\theta)$ relationships for eight cores of Bandelier Tuff from boreholes AAA and AAB were measured using the UFA and, together with their in situ water contents, were used to determine transient water flux into these samples at the time of sampling. If the system is at steady-state, then these flux values correspond to the recharge through those points, a situation often encountered in semi-arid to arid regions such as Los

Alamos and other sites in the western United States. Samples AAA 9956, AAB 0011, AAB 0012 and AAB 0040 exhibited fluxes of 6 x 10^{-8} cm/s, 4.8 x 10^{-7} cm/s, 2.8 x 10^{-7} cm/s and 2.4 x 10^{-8} cm/s, respectively, indicating significant flux. Samples AAB 0063, AAB 0065, AAB 0072 and AAB 0081 had very low water contents suggesting fluxes less than 10^{-10} cm/s, and appear to be close to their residual water contents. Assuming that the samples AAB 0063, AAB 0065, AAB 0072 and AAB 0081 were not accidentally dried out during handling, these results imply that these samples have zero recharge and that redistribution of moisture at these horizons is controlled more by vapor diffusion than by advection. The vapor diffusivities in these cores can be determined using the new UFA gas permeameter. Samples AAA 9956, AAB 0011, AAB 0012 and AAB 0040 appear to be controlled by advection.

535 (LA-UR--95-2467) **Cost effectiveness of in situ bioremediation at Savannah River.** Saaty, R.P.; Showalter, W.E.; Booth, S.R. Los Alamos National Lab., NM (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950483--6: 3. international in situ and on-site bioreclamation symposium, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE95016900. Source: OSTI; NTIS; INIS; GPO Dep.

In situ bioremediation (ISBR) is an innovative new remediation technology for the removal of chlorinated solvents from contaminated soils and groundwater. The principal contaminant at the Savannah River Integrated Demonstration is tricloroethylene (TCE) a volatile organic compound (VOC). A 384-day test run at Savannah River, sponsored by the US Department of Energy (DOE), Office of Technology Development (EM-50), furnished information about the performance and applications of ISBR. In situ bioremediation, as tested, is based on two distinct processes occurring simultaneously; the physical process of in situ air stripping and the biological process of bioremediation. Both processes have the potential to remediate some amount of contamination. A quantity of VOCs, directly measured from the extracted airstream, was removed from the test area by the physical process of air stripping. The biological process is difficult to examine. However, the results of several tests performed at the SRID and independent numerical modeling determined that the biological process remediated an additional 40% above the physical process. Given these data, the cost effectiveness of this new technology can be evaluated.

536 (LA-UR--96-512) **Rectangular Schlumberger resistivity arrays for delineating vadose zone clay-lined fractures in shallow tuff.** Miele, M. (ICF Kaiser, Rancho Cordova, CA (United States)); Laymon, D.; Gilkeson, R.; Michelotti, R. Los Alamos National Lab., NM (United States). 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960477--2: 9. annual symposium on the application of geophysics to engineering and environmental problems, Denver, CO (United States), 15 Apr - 1 May 1996). Order Number DE96008703. Source: OSTI; NTIS; INIS; GPO Dep.

Rectangular Schlumberger arrays can be used for 2-dimensional lateral profiling of apparent resistivity at a unique current electrode separation, hence single depth of penetration. Numerous apparent resistivity measurements are collected moving the potential electrodes (fixed MN spacing) within a rectangle of defined dimensions. The method provides a fast, cost-effective means for the collection of dense resistivity data to provide high-resolution information on subsurface hydrogeologic conditions. Several rectangular Schlumberger resistivity arrays were employed at Los Alamos National Laboratory (LANL) from 1989 through 1995 in an area adjacent to and downhill from an outfall pipe, septic tank, septic drainfield, and sump. Six rectangular arrays with 2 AB spacings were used to delineate lateral low resistivity anomalies that may be related to fractures that contain clay and/or vadose zone water. Duplicate arrays collected over a three year time period exhibited very good data repeatability. The properties of tritium make it an excellent groundwater tracer. Because tritium was present in discharged water from all of the anthropogenic sources in the vicinity it was used for this purpose. One major low resistivity anomaly correlates with relatively high tritium concentrations in the tuff. This was determined from borehole samples collected within and outside of the anomalous zone. The anomaly is interpreted to be due to fractures that contain clay from the soil profile. The clay was deposited in the fractures by aeolian processes and by surface water infiltration. The fractures likely served as a shallow vadose zone groundwater pathway.

537 (LA-UR--96-1723) **Radionuclides in an underground environment.** Thompson, J.L. Los Alamos National Lab., NM (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9609156--1: NRC-4/nuclear and radiochemistry meeting, St. Malo (France), Sep 1996). Order Number DE96011294. Source: OSTI; NTIS; INIS; GPO Dep.

In the 100 years since Becquerel recognized radioactivity, mankind has been very successful in producing large amounts of radioactive materials. We have been less successful in reaching a consensus on how to dispose of the billions of curies of fission products and transuranics resulting from nuclear weapons testing, electrical power generation, medical research, and a variety of other human endeavors. Many countries, including the United States, favor underground burial as a means of disposing of radioactive wastes. There are, however, serious questions about how such buried wastes may behave in the underground environment and particularly how they might eventually contaminate water, air and soil resources on which we are dependent. This paper describes research done in the United States in the state of Nevada on the behavior of radioactive materials placed underground. During the last thirty years, a series of "experiments" conducted for other purposes (testing of nuclear weapons) have resulted in a wide variety of fission products and actinides being injected in rock strata both above and below the water table. Variables which seem to control the movement of these radionuclides include the physical form (occlusion versus surface deposition), the chemical oxidation state, sorption by mineral phases of the host rock, and the hydrologic properties of the medium. The information gained from these studies should be relevant to planning for remediation of nuclear facilities elsewhere in the world and for long-term storage of nuclear wastes.

538 (LBL--36739) **Injectable barriers for waste isolation.** Persoff, P. (Lawrence Berkeley National Lab., CA (United States). Earth Sciences Div.); Finsterle, S.; Moridis, G.J.; Apps, J.; Pruess, K.; Muller, S.J. Lawrence Berkeley Lab., CA (United States). Mar 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-950828--19: 1995 National heat transfer conference, Portland, OR (United States), 5-9 Aug

1995). Order Number DE96000134. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper the authors report laboratory work and numerical simulation done in support of development and demonstration of injectable barriers formed from either of two fluids: colloidal silica or polysiloxane. Two principal problems addressed here are control of gel time and control of plume emplacement in the vadose zone. Gel time must be controlled so that the viscosity of the barrier fluid remains low long enough to inject the barrier, but increases soon enough to gel the barrier in place. During injection, the viscosity must be low enough to avoid high injection pressures which could uplift or fracture the formation. To test the grout gel time in the soil, the injection pressure was monitored as grouts were injected into sandpacks. When grout is injected into the vadose zone, it slumps under the influence of gravity, and redistributes due to capillary forces as it gels. The authors have developed a new module for the reservoir simulator TOUGH2 to model grout injection into the vadose zone, taking into account the increase of liquid viscosity as a function of gel concentration and time. They have also developed a model to calculate soil properties after complete solidification of the grout. The numerical model has been used to design and analyze laboratory experiments and field pilot tests. The authors present the results of computer simulations of grout injection, redistribution, and solidification.

539 (LBL–37067) **Air barriers for waste containment in the subsurface.** Moridis, G.J.; Pruess, K. Lawrence Berkeley Lab., CA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9503116–9: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95012373. Source: OSTI; NTIS; GPO Dep.

The increase of air saturation in a soil alters significantly its hydraulic characteristics by reducing its the relative permeability to liquids. This realization led to the concept that air injection could be used in the context of remedial strategies to create low permeability barriers to contaminated water and NAPL migration. Air offers a number of significant advantages as a barrier fluid: it is not a contaminant, already exists in the vadose zone, is abundant, easily available, free of charge, and has well-known thermodynamic properties. This report provides a brief summary of air barrier modeling results to date.

540 (LBL–37380) **Radionuclide behavior in water saturated porous media: Diffusion and infiltration coupling of thermodynamically and kinetically controlled radionuclide water - mineral interactions.** Spasennykh, M.Yu. (Vernadsky Institute of Geochemistry and Analytical Chemistry, Moscow (Russian Federation)); Apps, J.A. Lawrence Berkeley Lab., CA (United States). May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95016529. Source: OSTI; NTIS; INIS; GPO Dep.

A model is developed describing one dimensional radionuclide transport in porous media coupled with locally reversible radionuclide water-mineral exchange reactions and radioactive decay. Problems are considered in which radionuclide transport by diffusion and infiltration processes occur in cases where radionuclide water-solid interaction are kinetically and thermodynamically controlled. The limits of Sr-90 and Cs-137 migration are calculated over a wide range of the problem variables (infiltration velocity, distribution coefficients, and rate constants of water-mineral radionuclide exchange reactions).

541 (LBL–38095) **Analog site for fractured rock characterization. Annual report FY 1995.** Long, J.C.S. (and others); Loughty, C.; Faybishenko, B. Lawrence Berkeley Lab., CA (United States). Oct 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE96008559. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the accomplishments of the Analog Site for Fracture Rock Characterization Project during fiscal year 1995. This project is designed to address the problem of characterizing contaminated fractured rock. In order to locate contaminant plumes, develop monitoring schemes, and predict future fate and transport, the project will address the following questions: What parts of the system control flow-geometry of a fracture network? What physical processes control flow and transport? What are the limits on measurements to determine the above? What instrumentation should be used? How should it be designed and implemented? How can field tests be designed to provide information for predicting behavior? What numerical models are good predictors of the behavior of the system? The answers to these question can be used to help plan drilling programs that are likely to intersect plumes and provide effective monitoring of plume movement. The work is done at an "analogue" site, i.e., a site that is not contaminated, but has similar geology to sites that are contaminated, in order to develop tools and techniques without the financial, time and legal burdens of a contaminated site. The idea is to develop conceptual models and investigations tools and methodology that will apply to the contaminated sites in the same geologic regimes. The Box Canyon site, chosen for most of this work represents a unique opportunity because the Canyon walls allow us to see a vertical plane through the rock. The work represents a collaboration between the Lawrence Berkeley National Laboratory (LBL), Stanford University (Stanford), Idaho National Engineering Laboratory (INEL) and Parsons Environmental Engineering (Parsons). LBL and Stanford bring extensive experience in research in fractured rock systems. INEL and Parsons bring significant experience with the contamination problem at INEL.

542 (LBL–38262) **Numerical modeling of the groundwater contaminant transport for the Lake Karachai Area: The methodological approach and the basic two- dimensional regional model.** Petrov, A.V. (Ministry for Atomic Energy in Russia (Russian Federation)); Samsonova, L.M.; Vasil'kova, N.A.; Zinin, A.I.; Zinina, G.A. Lawrence Berkeley Lab., CA (United States). Jun 1994. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE96009141. Source: OSTI; NTIS; INIS; GPO Dep.

Methodological aspects of the numerical modeling of the groundwater contaminant transport for the Lake Karachay area are discussed. Main features of conditions of the task are the high grade of non-uniformity of the aquifer in the fractured rock massif and the high density of the waste solutions, and also the high volume of the input data: both on the part of parameters of the aquifer (number of pump tests) and on the part of observations of functions of processes (long-time observations by the monitoring well grid). The modeling process for constructing the two dimensional regional model is described, and this model is presented as the basic model for subsequent full three-dimensional modeling in sub-areas of interest. Original powerful mathematical apparatus and computer codes for finite-difference numerical modeling are used.

543 (LBNL–38825-Pt.1-2) **Two-dimensional analytical solutions for chemical transport in aquifers. Part 1. Simplified solutions for sources with constant concentration. Part 2. Exact solutions for sources with constant flux rate.** Shan, C.; Javandel, I. Lawrence Berkeley Lab., CA (United States). May 1996. 66p. Sponsored by USDOE, Washington, DC (United States);California State Government, Sacramento, CA (United States). DOE Contract AC03-76SF00098. Order Number DE96013125. Source: OSTI; NTIS; INIS; GPO Dep.

Analytical solutions are developed for modeling solute transport in a vertical section of a homogeneous aquifer. Part 1 of the series presents a simplified analytical solution for cases in which a constant-concentration source is located at the top (or the bottom) of the aquifer. The following transport mechanisms have been considered: advection (in the horizontal direction), transverse dispersion (in the vertical direction), adsorption, and biodegradation. In the simplified solution, however, longitudinal dispersion is assumed to be relatively insignificant with respect to advection, and has been neglected. Example calculations are given to show the movement of the contamination front, the development of concentration profiles, the mass transfer rate, and an application to determine the vertical dispersivity. The analytical solution developed in this study can be a useful tool in designing an appropriate monitoring system and an effective groundwater remediation method.

544 (ORNL/ER–203/R1) **Groundwater Quality Sampling and Analysis Plan for Environmental Monitoring Waste Area Grouping 6 at Oak Ridge National Laboratory. Environmental Restoration Program.** CDM Federal Programs Corp., Oak Ridge, TN (United States). Sep 1995. 113p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006582. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan addresses groundwater quality sampling and analysis activities that will be conducted in support of the Environmental Monitoring Plan for Waste Area Grouping (WAG) 6. WAG 6 is a shallow-burial land disposal facility for low-level radioactive waste at the Oak Ridge National Laboratory, a research facility owned by the US Department of Energy and managed by Martin Marietta Energy Systems, Inc. (Energy Systems). Groundwater sampling will be conducted by Energy Systems at 45 wells within WAG 6. The samples will be analyzed for various organic, inorganic, and radiological parameters. The information derived from the groundwater quality monitoring, sampling, and analysis will aid in evaluating relative risk associated with contaminants migrating off-WAG, and also will fulfill Resource Conservation and Recovery Act (RCRA) interim permit monitoring requirements. The sampling steps described in this plan are consistent with the steps that have previously been followed by Energy Systems when conducting RCRA sampling.

545 (ORNL/ER–300) **Work plan for the Oak Ridge National Laboratory groundwater program: Continuous groundwater collection.** Oak Ridge National Lab., TN (United States). Aug 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006537. Source: OSTI; NTIS; INIS; GPO Dep.

The continuous collection of groundwater data is a basic and necessary part of Lockeheed Martin Energy Systems' ORNL Environmental Restoration Area-Wide Groundwater Program. Continuous groundwater data consist primarily of continually recorded groundwater levels, and in some instances, specific conductivity, pH, and/or temperature measurements. These data will be collected throughout the ORNL site. This Work Plan (WP) addresses technical objectives, equipment requirements, procedures, documentation requirements, and technical instructions for the acquisition of the continuous groundwater data. Intent of this WP is to provide an approved document that meets all the necessary requirements while retaining the flexibility necessary to effectively address ORNL's groundwater problems.

546 (ORNL/ER–313) **Hydrologic data summary for the White Oak Creek watershed at Oak Ridge National Laboratory, Oak Ridge, Tennessee, January–December 1994.** Borders, D.M.; Ziegler, K.S.; Reece, D.K.; Watts, J.A.; Frederick, B.J.; McCalla, W.L.; Pridmore, D.J. Oak Ridge National Lab., TN (United States). Aug 1995. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006585. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication 4437.

This report summarizes, for the 12-month period January through December 1994, the available dynamic hydrologic data collected on the White Oak Creek (WOC) watershed as well as information collected on surface flow systems in the surrounding vicinity that may affect the quality or quantity of surface water in the watershed. The collection of hydrologic data is one component of numerous, ongoing Oak Ridge National Laboratory (ORNL) environmental studies and monitoring programs and is intended to characterize the quantity and quality of water in the surface flow system, assist with the planning and assessment of remedial action activities, provide long-term availability of data and quality assurance of these data, and support long-term measures of contaminant fluxes at a spatial scale to provide a comprehensive picture of watershed performance that is commensurate with future remedial actions.

547 (ORNL/ER–337) **Evaluation of ground freezing for environmental restoration at waste area grouping 5, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Gates, D.D. Oak Ridge National Lab., TN (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96011793. Source: OSTI; NTIS; INIS; GPO Dep.

A study to evaluate the feasibility of using ground freezing technology to immobilize tritium contaminants was performed as part of the Waste Area Grouping (WAG) 6 Technology Demonstrations initiated by the WAG 6 Record of Agreement. The study included a review of ground freezing technology, evaluation of this technology for environmental restoration, and identification of key technical issues. A proposed ground freezing demonstration for containment of tritium at a candidate Oak Ridge National Laboratory site was developed. The planning requirements for the demonstration were organized into seven tasks including site selection, site characterization, conceptual design, laboratory evaluation, demonstration design, field implementation, and monitoring design. A brief discussion of each of these tasks is provided. Additional effort beyond the scope of this study is currently being directed to the selection of a demonstration site and the identification of funding.

548 (ORNL/ER—350) **Wetland survey of the X-10 Bethel Valley and Melton Valley groundwater operable units at Oak Ridge National Labortory Oak Ridge, Tennessee.** Rosensteel, B.A. Oak Ridge National Lab., TN

(United States). Mar 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96008143. Source: OSTI; NTIS; INIS; GPO Dep.

Executive Order 11990, Protection of Wetlands, (May 24, 1977) requires that federal agencies avoid, to the extent possible, adverse impacts associated with the destruction and modification of wetlands and that they avoid direct and indirect support of wetlands development when there is a practicable alternative. In accordance with Department of Energy (DOE) Regulations for Compliance with Floodplains and Wetlands Environmental Review Requirements (Subpart B, 10 CFR 1022.11), surveys for wetland presence or absence were conducted in both the Melton Valley and the Bethel Valley Groundwater Operable Units (GWOU) on the DOE Oak Ridge Reservation (ORR) from October 1994 through September 1995. As required by the Energy and Water Development Appropriations Act of 1992, wetlands were identified using the criteria and methods set forth in the Wetlands Delineation Manual (Army Corps of Engineers, 1987). Wetlands were identified during field surveys that examined and documented vegetation, soils, and hydrologic evidence. Most of the wetland boundary locations and wetland sizes are approximate. Boundaries of wetlands in Waste Area Grouping (WAG) 2 and on the former proposed site of the Advanced Neutron Source in the upper Melton Branch watershed were located by civil survey during previous wetland surveys; thus, the boundary locations and areal sizes in these areas are accurate. The wetlands were classified according to the system developed by Cowardin et al. (1979) for wetland and deepwater habitats of the United States. A total of 215 individual wetland areas ranging in size from 0.002 ha to 9.97 ha were identified in the Bethel Valley and Melton Valley GWOUs. The wetlands are classified as palustrine forested broad-leaved deciduous (PFO1), palustrine scrub-shrub broad-leaved deciduous (PSS1), and palustrine persistent emergent (PEM1).

549 (ORNL/ER–366) **Waste area grouping 2 Phase I task data report: Ecological risk assessment and White Oak Creek watershed screening ecological risk assessment.** Efroymson, R.A. (and others); Jackson, B.L.; Jones, D.S. Oak Ridge National Lab., TN (United States). May 1996. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96011794. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an ecological risk assessment for Waste Area Grouping (WAG) 2 based on the data collected in the Phase I remedial investigation (RI). It serves as an update to the WAG 2 screening ecological risk assessment that was performed using historic data. In addition to identifying potential ecological risks in WAG 2 that may require additional data collection, this report serves to determine whether there are ecological risks of sufficient magnitude to require a removal action or some other expedited remedial process. WAG 2 consists of White Oak Creek (WOC) and its tributaries downstream of the Oak Ridge National Laboratory (ORNL) main plant area, White Oak Lake (WOL), the White Oak Creek Embayment of the Clinch River, associated flood plains, and the associated groundwater. The WOC system drains the WOC watershed, an area of approximately 16.8 km^2 that includes ORNL and associated WAGs. The WOC system has been exposed to contaminants released from ORNL and associated operations since 1943 and continues to receive contaminants from adjacent WAGs.

550 (ORNL/GWPO–0010) **CHEMFORM user's guide.** Sjoreen, A.; Toran, L. Oak Ridge National Lab., TN (United States). Jan 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/M–4988). Order Number DE96010092. Source: OSTI; NTIS; GPO Dep.

CHEMFORM is a DOS-based program which converts geochemical data files into the format read by the U.S. Geological Survey family of models: WATEQ4F, PHREEQE, or NETPATH. These geochemical models require data formatted in a particular order, which typically does not match data storage. CHEMFORM converts geochemical data that are stored in an ASCII file to input files that can be read by these models, without being re-entered by hand. The data may be in any order and format in the original file, as long as they are separated by blanks. The location of each data element in the input file is entered in CHEMFORM. Any required data that are not present in your file may also be entered. The positions of the data in the input file are saved to be used as defaults for the next run. CHEMFORM runs in two modes. In the first mode, it will read one input file and write one output file. The input file may contain data on multiple lines, and the user will specify both line number and position of each item in CHEMFORM. This mode facilitates the conversion of the input from one model to the format needed by another model. In the second mode, the CHEMFORM input files contains more than one water analysis. All the geochemical data for a given sample are stored on one line, and CHEMFORM writes an output file for each line. This mode is useful when many samples are available for a site in the same format (different monitoring points or samples taken at different times from one monitoring point).

551 (ORNL/GWPO–015) **Murt user's guide: A hybrid Lagrangian-Eulerian finite element model of multiple-pore-region solute transport through subsurface media.** Gwo, J.P. (Oak Ridge National Lab., TN (United States)); Jardine, P.M.; Yeh, G.T.; Wilson, G.V. Oak Ridge National Lab., TN (United States). Apr 1995. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M–4592). Order Number DE95017048. Source: OSTI; NTIS; INIS; GPO Dep.

Matrix diffusion, a diffusive mass transfer process,in the structured soils and geologic units at ORNL, is believe to be an important subsurface mass transfer mechanism; it may affect off-site movement of radioactive wastes and remediation of waste disposal sites by locally exchanging wastes between soil/rock matrix and macropores/fractures. Advective mass transfer also contributes to waste movement but is largely neglected by researchers. This report presents the first documented 2-D multiregion solute transport code (MURT) that incorporates not only diffusive but also advective mass transfer and can be applied to heterogeneous porous media under transient flow conditions. In this report, theoretical background is reviewed and the derivation of multiregion solute transport equations is presented. Similar to MURF (Gwo et al. 1994), a multiregion subsurface flow code, multiplepore domains as suggested by previous investigators (eg, Wilson and Luxmoore 1988) can be implemented in MURT. Transient or steady-state flow fields of the pore domains can be either calculated by MURF or by modelers. The mass transfer process is briefly discussed through a three-pore-region multiregion solute transport mechanism. Mass transfer equations that describe mass flux across pore region interfaces are also presented and parameters needed to calculate mass transfer coefficients detailed. Three applications of MURT (tracer injection problem, sensitivity analysis of advective and diffusive mass transfer, hillslope ponding infiltration and secondary source problem) were simulated and results discussed. Program structure of MURT and functions of MURT subroutiness are discussed so that users can adapt the code; guides for input data preparation are provided in appendices.

552 (ORNL/GWPO–0017) **An economic decision framework using modeling for improving aquifer remediation design.** James, B.R.; Gwo, J.P.; Toran, L.E. Oak Ridge National Lab., TN (United States). Nov 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006190. Source: OSTI; NTIS; INIS; GPO Dep.

Reducing cost is a critical challenge facing environmental remediation today. One of the most effective ways of reducing costs is to improve decision-making. This can range from choosing more cost- effective remediation alternatives (for example, determining whether a groundwater contamination plume should be remediated or not) to improving data collection (for example, determining when data collection should stoop). Uncertainty in site conditions presents a major challenge for effective decision-making. We present a framework for increasing the effectiveness of remedial design decision-making at groundwater contamination sites where there is uncertainty in many parameters that affect remediation design. The objective is to provide an easy-to-use economic framework for making remediation decisions. The presented framework is used to 1) select the best remedial design from a suite of possible ones, 2) estimate if additional data collection is cost-effective, and 3) determine the most important parameters to be sampled. The framework is developed by combining elements from Latin-Hypercube simulation of contaminant transport, economic risk-cost-benefit analysis, and Regional Sensitivity Analysis (RSA).

553 (ORNL/GWPO–019) **Determination of effective porosity of mudrocks: a feasibility study.** Dorsch, J. Oak Ridge National Lab., TN (United States). Nov 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006034. Source: OSTI; NTIS; GPO Dep.

Matrix diffusion is believed to be an important transport process within the double-porosity (primary sedimentary porosity and secondary fracture porosity) mudrock-dominated stratigraphic units on the Oak Ridge Reservation (ORR). Effective porosity is identified as an important parameter for evaluating and modeling matrix diffusion as a transport process. This report identifies, summarizes and evaluates petrophysical techniques, which can be used to determine the effective porosity of mudrock. Most of the techniques found their original application in the petroleum industry for the evaluation of reservoir rocks.

554 (ORNL/GWPO–023) **Simulation of a field scale tritium tracer experiment in a fractured, weathered shale using discrete-fracture/matrix-diffusion and equivalent porous medium models.** Stafford, P.L. (Univ. of Tennessee, Knoxville, TN (United States). Dept. of Geological Sciences). Oak Ridge National Lab., TN (United States). May 1996. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/M–4987). Order Number DE96009666. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Univ. of Tennessee, Knoxville, TN (US).

Simulations of a tritium tracer experiment in fractured shale saprolite, conducted at the Oak Ridge National Laboratory, were performed using 1D and 2D equivalent porous medium (EPM) and discrete-fracture/matrix-diffusion (DFMD) models. The models successfully reproduced the general shape of the breakthrough curves in down-gradient monitoring wells which are characterized by rapid first arrival, a slow-moving center of mass, and a persistent "tail" of low concentration. In plan view, the plume shows a large degree of transverse spreading with the width almost as great as the length. EPM models were sensitive to dispersivity coefficient values which had to be large (relative to the 3.7m distance between the injection and monitoring wells) to fit the tail and transverse spreading. For example, to fit the tail a longitudinal dispersivity coefficient, α_L, of 0.8 meters for the 2D simulations was used. To fit the transverse spreading, a transverse dispersivity coefficient, α_T, of 0.8 to 0.08 meters was used indicating an α_L/α_T ratio between 10 and 1. Transverse spreading trends were also simulated using a 2D DFMD model using a few larger aperture fractures superimposed onto an EPM. Of the fracture networks studied, only those with truncated fractures caused transverse spreading. Simulated tritium levels in all of the cases were larger than observed values by a factor of approximately 100. Although this is partly due to input of too much tritium mass by the models it appears that dilution in the wells, which were not purged prior to sampling, is also a significant factor. The 1D and 2D EPM models were fitted to monitoring data from the first five years of the experiment and then used to predict future tritium concentrations.

555 (ORNL/GWPO–025) **Effective porosity and pore-throat sizes of mudrock saprolite from the Nolichucky Shale within Bear Creek Valley on the Oak Ridge Reservation: Implications for contaminant transport and retardation through matrix diffusion.** Dorsch, J. (Oak Ridge National Laboratory, TN (United States)); Katsube, T.J. Oak Ridge National Lab., TN (United States). May 1996. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96014595. Source: OSTI; NTIS; GPO Dep.

Specimens of saprolite developed from mudrock of the Nolichucky Shale (Upper Cambrian, Conasauga Group) from the Whiteoak Mountain thrust sheet on the Oak Ridge Reservation (ORR) were analyzed. Petrophysical techniques include helium porosimetry and mercury porosimetry. Petrophysical data obtained from the laboratory experiments include effective porosity, pore-throat sizes and their distribution, specimen bulk-density, and specimen grain-density. It is expected that the data from this study will significantly contribute to constraining the modeling of the hydrologic behavior of saprolite developed from mudrock of the Conasauga Group in general and from the Nolichucky Shale specifically.

556 (ORNL/TM–12851) **Cometabolic bioreactor demonstration at the Oak Ridge K-25 Site: Final report.** Lucero, A.J.; Donaldson, T.L.; Jennings, H.L.; Morris, M.I.; Palumbo, A.V.; Herbes, S.E. Oak Ridge National Lab., TN (United States). Aug 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000848. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory (ORNL) conducted a demonstration of cometabolic technology for bioremediation of groundwater contaminated with trichloroethylene (TCE) and other chlorinated solvents. The technology demonstration was located at a seep from the K-1070-C/D Classified Burial Ground at the Oak Ridge K-25 Site. The technology demonstration was designed to evaluate the performance of two different types of cometabolic processes. In both cases, the TCE is cometabolized in the sense that utilization of a different primary substrate is necessary to obtain the simultaneous cometabolism of TCE. Trichloroethylene alone is unable to support growth and maintenance of the microorganisms. Methanotrophic (methane-utilizing) technology was demonstrated first; aromatic-utilizing microorganisms were demonstrated later. The demonstration was based on scaleup of laboratory and bench-scale prototype equipment that was used to establish the technical feasibility of the processes.This report documents the operation of the methanotrophic bioreactor system to treat the seep water at the demonstration site. The initial objectives were to demonstrate stable operation of the bioreactors and associated equipment, including the pretreatment and effluent polishing steps; and evaluate the biodegradation of TCE and other organics in the seep water for the three operating modes–air oxidation pretreatment, steam-stripping pretreatment, and no pretreatment.

557 (ORNL/TM–12903) **Evaluation of improved techniques for the removal of ^{90}Sr and ^{137}Cs from process wastewater and groundwater: Chabazite zeolite baseline study.** Bostick, D.T.; Arnold, W.D. Jr.; Taylor, P.A.; McTaggart, D.R.; Burgess, M.W.; Guo, B. Oak Ridge National Lab., TN (United States). Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95011627. Source: OSTI; NTIS; INIS; GPO Dep.

Standard waste treatment procedures for the removal of ^{90}Sr and ^{137}Cs from contaminated groundwater and process wastewaters generate large volumes of secondary contaminated wastes. Several new sorbent materials, ion exchangers, and other processes hold the promise of treating large volumes of contaminated water while minimizing the generation of secondary low-level radioactive wastes. As part of the Efficient Separations/Processes-Integrated Program (ESPIP), these new treatment techniques will be compared with standard processes to define their effectiveness for the removal of radioactive strontium (Sr) and cesium (Cs), as well as to gauge the quantity of secondary radioactive waste generated by the new processes. This report summarizes the efforts made to design standardized testing procedures to evaluate the sorption characteristics of a baseline wastewater treatment technique. Definition of the experimental procedures, as well as a summary of the benchmark sorption technique, will provide the framework with which to compare newly evolving treatment technologies. Accomplishments include selecting the feed strewn to the Process Waste Treatment Plant (PWTP) at Oak Ridge National Laboratory as representative of the prototypical contaminated wastewater of many DOE sites. Samples from the PWTP feed stream were collected and analyzed for metals, anions, total Sr and Cs, radioactive Sr and Cs, alkalinity, pH, and density. The cumulative sample data were used to formulate a simulant that will be used as a standard waste surrogate for comparative testing of selected treatment methods.

558 (ORNL/TM–12912) **Dual wall reverse circulation drilling with multi-level groundwater sampling for groundwater contaminant plume delineation at Paducah Gaseous Diffusion Plant, Paducah, Kentucky.** Smuin, D.R.; Morti, E.E.; Zutman, J.L.; Pickering, D.A. Oak Ridge National Lab., TN (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95015798. Source: OSTI; NTIS; INIS; GPO Dep.

Dual wall reverse circulation (DWRC) drilling was used to drill 48 borings during a groundwater contaminant investigation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky. This method was selected as an alternative to conventional hollow stem auger drilling for a number of reasons, including the expectation of minimizing waste, increasing the drilling rate, and reducing the potential for cross contamination of aquifers. Groundwater samples were collected from several water-bearing zones during drilling of each borehole. The samples were analyzed for volatile organic compounds using a field gas chromatograph. This approach allowed the investigation to be directed using near-real-time data. Use of downhole geophysical logging, in conjunction with lithologic descriptions of borehole cuttings, resulted in excellent correlation of the geology in the vicinity of the contaminant plume. The total volume of cuttings generated using the DWRC drilling method was less than half of what would have been produced by hollow stem augering; however, the cuttings were recovered in slurry form and had to be dewatered prior to disposal. The drilling rate was very rapid, often approaching 10 ft/min; however, frequent breaks to perform groundwater sampling resulted in an average drilling rate of < 1 ft/min. The time required for groundwater sampling could be shortened by changing the sampling methodology. Analytical results indicated that the drilling method successfully isolated the various water bearing zones and no cross contamination resulted from the investigation.

559 (ORNL/TM–13003) **Refinement of the Kansas City Plant site conceptual model with respect to dense non-aqueous phase liquids (DNAPL).** Korte, N.E. (Oak Ridge National Lab., TN (United States)); Hall, S.C.; Baker, J.L. Oak Ridge National Lab., TN (United States). [1995]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000846. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents a refinement of the site conceptual model with respect to dense non-aqueous phase liquid (DNAPL) at the US Department of Energy Kansas City Plant (KCP). This refinement was prompted by a review of the literature and the results of a limited study that was conducted to evaluate whether pools of DNAPL were present in contaminated locations at the KCP. The field study relied on the micropurge method of sample collection. This method has been demonstrated as a successful approach for obtaining discrete samples within a limited aquifer zone. Samples were collected at five locations across 5-ft well screens located at the base of the alluvial aquifer at the KCP. The hypothesis was that if pools of DNAPL were present, the dissolved concentration would increase with depth. Four wells with highly contaminated groundwater were selected for the test. Three of the wells were located in areas where DNAPL was suspected, and one where no DNAPL was believed to be present. The results demonstrated no discernible pattern with depth for the four wells tested. A review of the data in light of the available technical literature suggests that the fine-grained nature of the aquifer materials precludes the formation of pools. Instead, DNAPL is trapped as discontinuous ganglia that are probably widespread throughout the aquifer. The discontinuous nature of the DNAPL distribution prevents the collection of groundwater samples with concentrations approaching saturation. Furthermore, the results indicate that attempts to remediate the aquifer with conventional approaches will not result in restoration to pristine conditions because the tortuous groundwater flow paths will inhibit the efficiency of fluid-flow-based treatments.

560 (ORNL/TM–13055) **Groundwater, A century of word evolution.** Diefendorf, A.F. Oak Ridge National Lab., TN (United States). Aug 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000315. Source: OSTI; NTIS; INIS; GPO Dep.

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Words, especially those that apply directly to more than one discipline, often become the object of intense debate among professionals in those disciplines. This is particularly true with those people who have to deal with technical jargon on a day-to-day basis and who are concerned that scientific facts get communicated in as clear and concise a manner as possible. Communications regarding environmental restoration projects for the US Department of Energy are no exception. Lockheed Martin Energy Systems, Inc., its subcontractors and other prime contractors often disagree about the spelling and use of compound words. This frequently results in inconsistent spelling between project reports and incorrect spelling of referenced document titles. The following discussion is an attempt to provide an objective, in-depth examination of the evolution of one particular word and recommendations for its proper and consistent use. This discussion is the result of an extensive literature search conducted within the library system at Oak Ridge National Laboratory as well as the personal geologic libraries of the author and colleagues. The author has attempted to cite only those works produced by recognized names in the related disciplines or those works that constitute common references or glossaries.

561 (ORNL/TM–13099) **Evaluation of improved technologies for the removal of ^{90}Sr and ^{137}Cs from process wastewater and groundwater: FY 1995 status.** Bostick, D.T. (Oak Ridge National Lab., TN (United States)); Arnold, W.D. Jr.; Burgess, M.W.; McTaggart, D.R.; Taylor, P.A.; Guo, B. Oak Ridge National Lab., TN (United States). Mar 1996. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96009669. Source: OSTI; NTIS; INIS; GPO Dep.

A number of new sorbents are currently being developed for the removal of ^{90}Sr and ^{137}Cs from contaminated, caustic low-level liquid waste (LLLW). These sorbents are potentially promising for use in the cleanup of contaminated groundwater and process wastewater containing the two radionuclides. The goal of this subtask is to evaluate the new sorbents to determine whether their associated treatment technology is more selective for the decontamination of wastewater streams than that of currently available processes. Activities during fiscal year 1995 have included completing the characterization of the standard treatment technology, ion exchange on chabazite zeolite. Strontium and cesium sorption on sodium-modified zeolite was observed in the presence of elevated concentrations of wastewater components: sodium, potassium, magnesium, and calcium. The most significant loss of nuclide sorption was noted in the first 0- to 4-meq/L addition of the cations to a wastewater simulant. Radionuclide sorption on the pretreated zeolite was also determined under dynamic flow conditions. Resorcinol-formaldehyde (R-F) resin, which was developed at the Savannah River Site, was selected as the first new sorbent to be evaluated for wastewater treatment. Nuclide sorption on this resin was greater when the resin had been washed with ultrapure water and air dried prior to use.

562 (PNL–10522) **Hanford stakeholder participation in evaluating innovative technologies: VOC product line, Passive soil vapor extraction using borehole flux tunable hybrid plasma.** Peterson, T.; McCabe, G.; Niesen, K.; Serie, P. Pacific Northwest Lab., Richland, WA (United States). May 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011869. Source: OSTI; NTIS; INIS; GPO Dep.

A three-phased stakeholder participation program was conducted to support the Volatile Organic Compounds Arid Site Integrated Demonstration (VOC-Arid ID). The US DOE's Office of Technology Development (OTD) sponsored and directed the VOC-Arid ID. Its purpose was to develop and demonstrate new technologies for remediating VOC contamination in soil and ground water. The integrated demonstration, hosted by the Hanford site in Washington State, is being transitioned into the Department of Energy's (DOE) Plume Focus Area. The Plume Focus Area has the same basic objectives as the ID, but is broader in scope and is a team effort with technology developers and technology users. The objective is to demonstrate a promising technology once, and if results warrant deploy it broadly across the DOE complex and in private sector applications.

563 (PNL–10605) **Hanford Site Long-term Surface Barrier Development Program: Fiscal year 1994 highlights.** Petersen, K.L.; Link, S.O.; Gee, G.W. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016683. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Surface Barrier Development Program was organized in 1985 to test the effectiveness of various barrier designs in minimizing the effects of water infiltration; plant, animal and human intrusion; and wind and water erosion on buried wastes, plus preventing or minimizing the emanation of noxious gases. A team of scientists from the Pacific Northwest Laboratory (PNL) and engineers from Westinghouse Hanford Company (WHC) direct the barrier development effort. ICF Kaiser Hanford Company, in conjunction with WHC and PNL, developed design drawings and construction specifications for a 5-acre prototype barrier. The highlight of efforts in FY 1994 was the construction of the prototype barrier. The prototype barrier was constructed on the Hanford Site at the 200 BP-1 Operable Unit of the 200 East Area. Construction was completed in August 1994 and monitoring instruments are being installed so experiments on the prototype barrier can begin in FY 1995. The purpose of the prototype barrier is to provide insights and experience with issues regarding barrier design, construction, and performance that have not been possible with individual tests and experiments conducted to date. Additional knowledge and experience was gained in FY 1994 on erosion control, physical stability, water infiltration control, model testing, Resource Conservation and Recovery Act (RCRA) comparisons, biointrusion control, long-term performance, and technology transfer.

564 (PNL–10698) **Hanford Site ground-water monitoring for 1994.** Dresel, P.E. (and others); Thorne, P.D.;

Luttrell, S.P. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 370p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001345. Source: OSTI; NTIS; INIS; GPO Dep.

Report includes diskette designed to run on IBM PC or compatible equipment.

This report presents the results of the Ground-Water Surveillance Project monitoring for calendar year 1994 on the Hanford Site, Washington. Hanford Site operations from 1943 onward produced large quantities of radiologic and chemical waste that have impacted ground-water quality on the Site. Monitoring of water levels and ground-water chemistry is performed to track the extent of contamination and trends in contaminant concentrations. The 1994 monitoring was also designed to identify emerging ground-water quality problems. The information obtained is used to verify compliance with applicable environmental regulations and to evaluate remedial actions. Data from other monitoring and characterization programs were incorporated to provide an integrated assessment of Site ground-water quality. Additional characterization of the Site's geologic setting and hydrology was performed to support the interpretation of contaminant distributions. Numerical modeling of sitewide ground-water flow also supported the overall project goals. Water-level monitoring was performed to evaluate ground-water flow directions, to track changes in water levels, and to relate such changes to changes in site disposal practices. Water levels over most of the Hanford Site continued to decline between June 1993 and June 1994. These declines are part of the continued response to the cessation of discharge to U Pond and other disposal facilities. The low permeability in this area which enhanced mounding of waste-water discharge has also slowed the response to the reduction of disposal.

565 (PNL–10786) **Clean option: Berkeley Pit water treatment and resource recovery strategy.** Gerber, M.A.; Orth, R.J.; Elmore, M.R.; Monzyk, B.F. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000746. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE), Office of Technology Development, established the Resource Recovery Project (RRP) in 1992 as a five-year effort to evaluate and demonstrate multiple technologies for recovering water, metals, and other industrial resources from contaminated surface and groundwater. Natural water resources located throughout the DOE complex and the and western states have been rendered unusable because of contamination from heavy metals. The Berkeley Pit, a large, inactive, open pit copper mine located in Butte, Montana, along with its associated groundwater system, has been selected by the RRP for use as a feedstock for a test bed facility located there. The test bed facility provides the infrastructure needed to evaluate promising technologies at the pilot plant scale. Data obtained from testing these technologies was used to assess their applicability for similar mine drainage water applications throughout the western states and at DOE. The objective of the Clean Option project is to develop strategies that provides a comprehensive and integrated approach to resource recovery using the Berkeley Pit water as a feedstock. The strategies not only consider the immediate problem of resource recovery from the contaminated water, but also manage the subsequent treatment of all resulting process streams. The strategies also employ the philosophy of waste minimization to optimize reduction of the waste volume requiring disposal, and the recovery and reuse of processing materials.

566 (PNL–10817) **Hydrochemistry and hydrogeologic conditions within the Hanford Site upper basalt confined aquifer system.** Spane, F.A. Jr.; Webber, W.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001153. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Hanford Site Ground-Water Surveillance Project, Flow System Characterization Task. Pacific Northwest Laboratory examines the potential for offsite migration of contamination within the upper basalt confined aquifer system for the US Department of Energy (DOE). As part of this activity, groundwater samples were collected over the past 2 years from selected wells completed in the upper Saddle Mountains Basalt. The hydrochemical and isotopic information obtained from these groundwater samples provides hydrologic information concerning the aquifer-flow system. Ideally, when combined with other hydrologic property information, hydrochemical and isotopic data can be used to evaluate the origin and source of groundwater, areal groundwater-flow patterns, residence and groundwater travel time, rock/groundwater reactions, and aquifer intercommunication for the upper basalt confined aquifer system. This report presents the first comprehensive Hanford Sitewide summary of hydrochemical properties for the upper basalt confined aquifer system. This report provides the hydrogeologic characteristics (Section 2.0) and hydrochemical properties (Section 3.0) for groundwater within this system. A detailed description of the range of the identified hydrochemical parameter subgroups for groundwater in the upper basalt confined aquifer system is also presented in Section 3.0. Evidence that is indicative of aquifer contamination/aquifer intercommunication and an assessment of the potential for offsite migration of contaminants in groundwater within the upper basalt aquifer is provided in Section 4.0. The references cited throughout the report are given in Section 5.0. Tables that summarize groundwater sample analysis results for individual test interval/well sites are included in the Appendix.

567 (PNL–10835) **Comparison of constant-rate pumping test and slug interference test results at the Hanford Site B pond multilevel test facility.** Spane, F.A. Jr.; Thorne, P.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002033. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL), as part of the Hanford Site Ground-Water Surveillance Project, is responsible for monitoring the movement and fate of contamination within the unconfined aquifer to ensure that public health and the environment are protected. To support the monitoring and assessment of contamination migration on the Hanford Site, a sitewide 3-dimensional groundwater flow model is being developed. Providing quantitative hydrologic property data is instrumental in development of the 3-dimensional model. Multilevel monitoring facilities have been installed to provide detailed, vertically distributed hydrologic characterization information for the Hanford Site unconfined aquifer. In previous reports, vertically distributed water-level and hydrochemical data obtained over time from these multi-level monitoring facilities have been evaluated and reported. This report describes the B pond facility in Section 2.0. It also provides analysis results for a constant-rate pumping test (Section 3.0) and slug interference test (Section 4.0) that were conducted at a multilevel test facility located near B Pond (see Figure 1. 1) in the central part of the Hanford Site. A hydraulic test summary (Section 5.0) that focuses on the comparison of hydraulic property estimates obtained using the two test methods is also presented. Reference materials are listed in Section 6.0.

568 (PNL–10886) **Development of a three-dimensional ground-water model of the Hanford Site unconfined aquifer system: FY 1995 status report.** Wurstner, S.K.; Thorne, P.D.; Chamness, M.A.; Freshley, M.D.; Williams, M.D. Pacific Northwest Lab., Richland, WA (United States). Dec 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003996. Source: OSTI; NTIS; INIS; GPO Dep.

A three-dimensional numerical model of ground-water flow was developed for the uppermost unconfined aquifer at the Hanford Site in south-central Washington. Development of the model is supported by the Hanford Site Ground-Water Surveillance Project, managed by the Pacific Northwest National Laboratory, which is responsible for monitoring the sitewide movement of contaminants in ground water beneath the Hanford Site. Two objectives of the Ground-Water Surveillance Project are to (1) identify and quantify existing, emerging, or potential ground-water quality problems, and (2) assess the potential for contaminants to migrate from the Hanford Site through the ground-water pathway. Numerical models of the ground-water flow system are important tools for estimating future aquifer conditions and predicting the movement of contaminants through ground water. The Ground-Water Surveillance Project has supported development and maintenance of a two-dimensional model of the unconfined aquifer. This report describes upgrade of the two-dimensional model to a three-dimensional model. The numerical model is based on a three-dimensional conceptual model that will be continually refined and updated as additional information becomes available. This report presents a description of the three-dimensional conceptual model of ground-water flow in the unconfined aquifer system and then discusses the cur-rent state of the three-dimensional numerical model.

569 (PNL-SA–23468) **A demonstration of in situ bioremediation of CCL_4 at the Hanford Site.** Hooker, B.S.; Skeen, R.S.; Truex, M.J.; Peyton, B.M. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-951171–1: 23. Hanford symposium on health and the environment conference, Richland, WA (United States), 7-11 Nov 1995). Order Number DE95011412. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Department of Energy's VOC-Arid Integrated Demonstration Program (VOC/Arid-ID) is developing an in situ bioremediation technology to meet the need for a cost-effective method to clean ground water contaminated with chlorinated solvents, nitratés, or other organic and inorganic contaminants. Currently, a field demonstration of the technology is being conducted at the Hanford site in southeastern Washington state. The goal of this demonstration is to stimulate native denitrifying microorganisms to destroy carbon tetrachloride and nitrate. Contaminants are destroyed by mixing an electron donor (acetate) and an electron acceptor (nitrate) into the aquifer, using a matrix of recirculation wells. This work also evaluates the effectiveness.of applying scale-up techniques developed in the petrochemical industry to bioremediation. The scale-up process is based on combining fluid mixing and transport predictions with numerical descriptions for biological transport and reaction kinetics. This paper focuses on the necessity of this design approach to select nutrient feeding strategies that limit biofouling while actively destroying contaminants.

570 (PNL-SA–25595) **Theory and numerical application of subsurface flow and transport for transient freezing conditions.** White, M.D. (Pacific Northwest Lab., Richland, WA (United States). Earth and Environmental Sciences Center). Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9504192–1: 15. annual hydrology days conference, Ft. Collins, CO (United States), 3-7 Apr 1995). Order Number DE95014182. Source: OSTI; NTIS; INIS; GPO Dep.

Protective barriers are being investigated for the containment of radioactive waste within subsurface environments. Predicting the effectiveness of cryogenic barriers and near-surface barriers in temperate or arctic climates requires capabilities for numerically modeling subsurface flow and transport for freezing soil conditions. A predictive numerical model is developed herein to simulate the flow and transport of radioactive solutes for three-phase (water-ice-air) systems under freezing conditions. This physically based model simulates the simultaneous flow of water, air, heat, and radioactive solutes through variably saturated and variably frozen geologic media. Expressions for ice (frozen water) and liquid water saturations as functions of temperature, interfacial pressure differences, and osmotic potential are developed from nonhysteretic versions of the Brooks and Corey and van Genuchten functions for soil moisture retention. Aqueous relative permeability functions for variably saturated and variably frozen geologic media are developed from the Mualem and Burdine theories for predicting relative permeability of unsaturated soil. Soil deformations, caused by freezing and melting transitions, are neglected. Algorithms developed for predicting ice and liquid water saturations and aqueous-phase permeabilities were incorporated into the finite-difference based numerical simulator STOMP (Subsurface Transport Over Multiple Phases). Application of the theory is demonstrated by the solution of heat and mass transport in a horizontal cylinder of partially saturated porous media with differentially cooled ends, with the colder end held below the liquid water freezing point. This problem represents án essential capability for modeling cryogenic barriers in variably saturated geologic media.

571 (PNL-SA–25678) **The use of bench- and field-scale data for design of an in situ carbon tetrachloride bioremediation system.** Peyton, B.M. (and others); Truex, M.J.; Skeen, R.S. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950483–5: 3. international in situ and on-site bioreclamation symposium, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE95014194. Source: OSTI; NTIS; INIS; GPO Dep.

A suite of simulation models were developed as a design tool in support of an in situ bioremediation demonstration at the Hanford site in Washington state. The design tool, calibrated with field - and bench-scale data, was used to answer four field-scale system design questions: (1) What are the important reaction processes and kinetics? (2) How will biomass distribute in the aquifer in response to injected substrate? (3) What well configuration best ensures proper nutrient transport and process control? (4) What operating and monitoring strategy should be used to confirm effective remediation? This paper does not describe the design tool itself, but describes how the design tool was used to optimize field site design parameters such as well spacing, hydraulic control, contaminant destruction, and nutrient injection strategies.

572 (PNL-SA–25679) **Modeling biologically reactive transport in porous media.** Clement, T.P.; Hooker, B.S.; Skeen, R.S. Pacific Northwest Lab., Richland, WA (United States); Associated Western Universities, Inc., Salt Lake City, UT (United States). Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States);Associated Western Universities, Inc., Salt Lake City, UT (United States). DOE Contract AC06-76RL01830 ; FG07-93ER75912. (CONF-950420–27: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 May 1995). Order Number DE95014195. Source: OSTI; NTIS; INIS; GPO Dep.

A one-dimensional biofilm-based reactive transport model is developed to simulate biologically mediated substrate metabolism and contaminant destruction in saturated porous media. The resulting equations are solved by a finite-difference based, three-level, operator-split approach. The numerical solution procedure is stable, easy-to-code, and computationally efficient. As an example problem, biological denitrification and fortuitous CT destruction processes in one-dimensional porous media is studied. The simulation results of the example problem show that the present model can be successfully used to predict biological processes and nutrient/contaminant transport in saturated porous media.

573 (PNL-SA–26258) **Bench-scale/field-scale interpretations: Session overview.** Cunningham, A.B.; Peyton, B.M. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950483–4: 3. international in situ and on-site bioreclamation symposium, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE95014637. Source: OSTI; NTIS; INIS; GPO Dep.

In situ bioremediation involves complex interactions between biological, chemical, and physical processes and requires integration of phenomena operating at scales ranging from that of a microbial cell (10^{-6}) to that of a remediation site (10 to 1000 m). Laboratory investigations of biodegradation are usually performed at a relatively small scale, governed by convenience, cost, and expedience. However, extending the results from a laboratory-scale experimental system to the design and operation of a field-scale system introduces (1) additional mass transport mechanisms and limitations; (2) the presence of multiple phases, contants, and competing microorganisms (3) spatial geologic heterogeneities; and (4) subsurface environmental factors that may inhibit bacterial growth such as temperature, pH, nutrient, or redox conditions. Field bioremediation rates may be limited by the availability of one of the necessary constituents for biotransformation: substrate, contaminant, electron acceptor, nutrients, or microorganisms capable of degrading the target compound. The factor that limits the rate of bioremediation may not be the same in the laboratory as it is in the field, thereby leading, to development of unsuccessful remediation strategies.

574 (PNNL–10907) **Multimedia Environmental Pollutant Assessment System (MEPAS®): Groundwater pathway formulations.** Whelan, G. (Pacific Northwest National Lab., Richland, WA (United States)); McDonald, J.P.; Sato, C. Pacific Northwest National Lab., Richland, WA (United States). Jun 1996. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Source: OSTI (requests by U.S. Government Agencies and Their Contractors). Other requestors should be directed to Pacific Northwest National Laboratory.

Report and referenced software both copyrighted and available to government agencies and their contractors.

This report describes the mathematical formulations used for contaminant fate and transport in the groundwater pathway of the Multimedia Environmental Pollutant Assessment System (MEPAS). It is one in a series of reports that collectively describe the components of MEPAS. The groundwater component of the MEPAS methodology models solute transport through the groundwater environment (i.e., partially saturated and saturated zones). Specifically, this component provides estimates of groundwater contaminant fluxes at various transporting medium interfaces (e.g., water table or aquifer/river interface) and contaminant concentrations at withdrawal wells. Contaminant fluxes at transporting medium interfaces represent boundary conditions for the next medium in which contaminant migration and fate is to be simulated (e.g., groundwater contamination entering a surface-water environment). Contaminant concentrations at withdrawal wells provide contaminant levels for the exposure assessment component of MEPAS. A schematic diagram illustrating the groundwater environment is presented. The migration and fate of contaminants through the groundwater environment are described by the three-dimensional, advective-dispersive equation for solute transport. The results are based on semianalytical solutions (i.e., solutions that require numerical integration) that are well established in the scientific literature. To increase computational efficiency, limits of integration are also identified.

575 (PNNL–10912) **Stakeholder acceptance analysis: In-well vapor stripping, in-situ bioremediation, gas membrane separation system (membrane separation).** Peterson, T. Battelle Seattle Research Center, WA (United States). Dec 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (BSRC–800/95/021). Order Number DE96005841. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides stakeholder evaluations on innovative technologies to be used in the remediation of volatile organic compounds from soils and ground water. The technologies evaluated are; in-well vapor stripping, in-situ bioremediation, and gas membrane separation.

576 (PNNL–10914) **Stakeholder acceptance analysis ResonantSonic drilling.** Peterson, T. (Battelle Seattle Research Center, WA (United States)). Pacific Northwest Lab., Richland, WA (United States). Dec 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (BSRC–800/95/019). Order Number DE96006114. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents evaluations, recommendations, and requirements concerning ResonantSonic Drilling (Sonic Drilling), derived from a three-year program of stakeholder involvement. Sonic Drilling is an innovative method to reach contamination in soil and groundwater. The resonant sonic drill rig uses counter-rotating weights to generate energy, which causes the drill pipe to vibrate elastically along its entire length. In the resonant condition, forces of up to 200,000 pounds are transmitted to the drill bit face to create a cutting action. The resonant energy causes subsurface materials to move back into the adjacent formation, permitting the drill pipe to advance. This report is for technology developers and those responsible for making decisions about the use of technology to remediate contamination by volatile organic compounds. Stakeholders' perspectives help those responsible for technology deployment to make good decisions concerning the acceptability and applicability of sonic drilling to the remediation problems they face.

577 (PNNL–10950) **Environmental surveillance master sampling schedule.** Bisping, L.E. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96007517. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental surveillance of the Hanford Site and surrounding areas is conducted by the Pacific Northwest National Laboratory (PNNL) for the US Department of Energy (DOE). This document contains the planned 1996 schedules for routine collection of samples for the Surface Environmental Surveillance Project (SESP), Drinking Water Project, and Ground-Water Surveillance Project.

578 (PNNL–10977) **Laboratory testing of the in-well vapor-stripping system.** Gilmore, T.J.; Francois, O. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008811. Source: OSTI; NTIS; INIS; GPO Dep.

The Volatile organic Compounds-Arid Integrated Demonstration (VOC-Arid ID) was implemented by the US Department of Energy's (DOE's) Office of Technology Development to develop and test new technologies for the remediation of organic chemicals in the subsurface. One of the technologies being tested under the VOC-Arid ID is the in-well vapor-stripping system. The in-well vapor-stripping concept was initially proposed by researchers at Stanford University and is currently under development through a collaboration between workers at Stanford University and DOE's Pacific Northwest National Laboratory. The project to demonstrate the in-well vapor-stripping technology is divided into three phases: (1) conceptual model and computer simulation, (2) laboratory testing, and (3) field demonstration. This report provides the methods and results of the laboratory testing in which a full-scale replica was constructed and tested above ground in a test facility located at DOE's Hanford Site, Washington. The system is a remediation technology designed to preferentially extract volatile organic compounds (VOCs) from contaminated groundwater by converting them to a vapor phase.

579 (SAND–93-7038) **South Fence Road – Phase 1 field operations summary.** McCord, J.P. (INTERA, Inc., Albuquerque, NM (United States)); Neel, D. Sandia National Labs., Albuquerque, NM (United States); INTERA, Inc., Albuquerque, NM (United States); GRAM, Inc., Albuquerque, NM (United States). Mar 1996. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010868. Source: OSTI; NTIS; INIS; GPO Dep.

The South Fence Road (SFR) project is part of the Sandia National Laboratories, New Mexico (SNL/NM) Site-Wide Hydrogeologic Characterization (SWHC) task. The SWHC task has as its objective the reduction of uncertainty about the rate and direction of groundwater flow in the SNL/NM/Kirtland Air Force Base (KAFB) area. The SFR project area is located along the southern boundary of SNL/KAFB. This project area was selected to provide site-specific information related to geology and groundwater hydrology within the Hubbell Spring/Tijeras/Sandia fault complex. Specific objectives included determining the depth to the Santa Fe Group/bedrock contact, the depth to the water table, and the hydrogeologic complexities related to faulting. This report is a basic data report from the first phase of field operations associated with the drilling, logging, completion, and development of South Fence Road Wells SFR-1D and SFR-1S, SFR-2, SFR-3D and SFR-3S, and SFR-4. These test/monitoring wells were installed as part of Sandia National Laboratories, New Mexico, Environmental Restoration Project.

580 (SAND–94-2094) **Assessment of dry barriers for containment of mobile constituents in the unsaturated zone.** Morris, C.E. (Univ. of New Mexico, Albuquerque, NM (United States)); Thomson, B.M.; Stormont, J.C. Sandia National Labs., Albuquerque, NM (United States). Jan 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95010512. Source: OSTI; NTIS; INIS; GPO Dep.

A dry barrier may be formed by circulating dry air through a soil layer above or below a waste disposal site, thus reducing the soil moisture content to very low values. Drying a horizontal soil layer creates a barrier to vertical water movement in three ways. First, the drying removes water from the system, intercepting water infiltrating down from the surface. Second, drying a soil layer increases its water storage capacity so the soil will tend to retain rather than transmit water. Third, as a soil layer dries, moisture is removed from progressively smaller interstitial pores so that the hydraulic conductivity of the formation (for liquid flow) decreases. For example, the hydraulic conductivity of a typical sand may decrease by three orders of magnitude as its moisture content is reduced from 20 to 10 percent. This study analyzed the technical and economic feasibility of the subsurface dry barrier concept for containment of a migrating contaminant plume in unsaturated soil. The concept was shown to be a viable option for limiting aqueous migration of pollutants through unsaturated media, with estimated capital costs of between $130,000 and $260,000 for a 1-hectare barrier, and annual operating costs of $10,000 per year.

581 (SAND–95-2187) **Ground water flow velocity in the bank of the Columbia River, Hanford, Washington.** Ballard, S. (Sandia National Labs., Albuquerque, NM (United States). Geophysics Dept.). Sandia National Labs., Albuquerque, NM (United States). Dec 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96005044. Source: OSTI; NTIS; INIS; GPO Dep.

To properly characterize the transport of contaminants from the sediments beneath the Hanford Site into the Columbia River, a suite of In Situ Permeable Flow Sensors was deployed to accurately characterize the hydrologic regime in the banks of the river. The three dimensional flow velocity was recorded on an hourly basis from mid May to mid July, 1994 and for one week in September. The first data collection interval coincided with the seasonal high water level in the river while the second interval reflected conditions during relatively low seasonal river stage. Two flow sensors located approximately 50 feet from the river recorded flow directions which correlated very well with river stage, both on seasonal and diurnal time scales. During time intervals characterized by falling river stage, the flow sensors recorded flow toward the river while flow away from the river was recorded during times of rising river stage. The flow sensor near the river in the Hanford Formation recorded a component of flow oriented vertically downward, probably reflecting the details of the hydrostratigraphy in close proximity to the probe. The flow sensor near the river in the Ringold Formation recorded an upward component of flow which dominated the horizontal components most of the time. The upward flow in the Ringold probably reflects regional groundwater flow into the river. The magnitudes of the flow velocities recorded by the flow sensors were lower than expected, probably as a result of drilling induced disturbance of the hydraulic properties of the sediments around the probes. The probes were installed with resonant sonic drilling which may have compacted the sediments immediately surrounding the probes, thereby reducing the hydraulic conductivity adjacent to the probes and diverting the groundwater flow away from the sensors.

582 (SAND–96-0163) **Summary of field operations, well TRN-1.** Fritts, J.E. (GRAM, Inc., Albuquerque, NM (United States)); Thomas, E.; McCord, J.P. Sandia National Labs., Albuquerque, NM (United States); GRAM, Inc., Albuquerque, NM (United States); INTERA, Inc., Albuquerque, NM (United States). Mar 1996. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010967. Source: OSTI; NTIS; INIS; GPO Dep.

TRN-1 was drilled near the SE corner of Kirtland Air Force Base to a depth of 510 feet. This well is in the Site-Wide Hydrogeologic Characterization task field program, which is part of Sandia's Environmental Restoration Project. After drilling, the borehole was logged, plugged to a depth of 352 ft, and completed as a monitoring well. Sand pack interval is from 305 to 352 ft and the screen interval is from 320 to 340 ft. During field operations, important subsurface geologic and hydrologic data were obtained (drill cuttings, geophysical logs of alluvial cover). Identification of the Abo formation in the subsurface will be useful. The subsurface hydrologic data will help define the local hydrostratigraphic framework within the bedrock. Future aquifer testing will be conducted for transmissivity, etc.

583 (SAND–96-0164) **Summary of field operations Powerline Wells PL-1, PL-2, PL-3.** Foutz, W.L. (Lamb Associates, Inc., Albuquerque, NM (United States)). Sandia National Labs., Albuquerque, NM (United States); Lamb Associates, Inc., Albuquerque, NM (United States). Mar 1996. 102p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010910. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes field operations and hydrogeologic data obtained during installation of the Powerline monitoring/test wells near the western boundary of Kirtland Air Force Base. These wells were installed in 1994 as part of the Site-Wide Hydrogeologic Characterization Project saturated zone investigation. The Site-Wide Hydrogeologic Characterization Project is part of Sandia National Laboratories, New Mexico, Environmental Restoration Project. Three wells were drilled and completed at this location, and named PL-1, PL-2, and PL-3. They are located northwest of Tech Area 3, and are named after a high-voltage powerline located just south of the wells. The objectives of the Powerline wells were to determine the depth to water, complete 2 water table wells and a deeper Santa Fe Group well, to determine the geologic provenance of Santa Fe Group sediments at this location, and to obtain background core samples for radiological analysis. During these field operations, important subsurface hydrogeologic data were obtained. These data include drill cuttings and lithologic descriptions, core samples with background analytical data, geophysical logs, water quality parameters, and water levels. Aquifer tests at the Powerline location will generate data that may yield information on anisotropy in the Santa Fe Group and constrain numerical modeling results that indicate that there is a major northward component of groundwater flow from McCormick Ranch and Tech Area 3 test sites toward City of Albuquerque and KAFB well fields.

584 (SAND–96-0165) **Summary of field operations Magazine Road North Wells MRN-1 and MRN-2.** Fritts, J.E. (GRAM, Inc., Albuquerque, NM (United States)); McCord, J.P. Sandia National Labs., Albuquerque, NM (United States); GRAM, Inc., Albuquerque, NM (United States); INTERA, Inc., Albuquerque, NM (United States). Mar 1996. 97p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010869. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the field operations associated with the installation of the MRN-1 and MRN-2 test/monitoring wells. These wells were installed in December 1994 and January 1995 as part of the Site-Wide Hydrogeologic Characterization (SWHC) task field program. The SWHC task is part of the Sandia National Laboratories, New Mexico, Environmental Restoration Project carried out by the Environmental Operations Center, 7500. MRN-1 and MRN-2 are paired wells located near the western edge of Kirtland Air Force Base (KAFB), west of Technical Area 3 (TA3), and north of Magazine Road. (Note: MRN stands for Magazine Road North). During the MRN field operations, important subsurface geologic, hydrologic, chemical, and radiological data were obtained. Subsurface geologic data include descriptions of drill cuttings, core, and geophysical logs of the upper unit of the Santa Fe Group. The geology identified here can help determine the eastern limit of the ancestral Rio Grande lithofacies. Subsurface hydrologic data include borehole geophysical logs, and qualitative information obtained during well completion and development. In addition, future aquifer testing at the MRN site will generate data for the interpretation of aquifer parameters such as transmissivity. Samples were taken from core every 100 feet at MRN-1 for chemical and radiological analysis to provide background data for the Environmental Restoration Project.

585 (SAND–96-1031) **Recommendations for computer modeling codes to support the UMTRA groundwater restoration project.** Tucker, M.D. (Sandia National Labs., Albuquerque, NM (United States)); Khan, M.A. Sandia National Labs., Albuquerque, NM (United States). Apr 1996. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010899. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remediation Action (UMTRA) Project is responsible for the assessment and remedial action at the 24 former uranium mill tailings sites located in the US. The surface restoration phase, which includes containment and stabilization of the abandoned uranium mill tailings piles, has a specific termination date and is nearing completion. Therefore, attention has now turned to the groundwater restoration phase, which began in 1991. Regulated constituents in groundwater whose concentrations or activities exceed maximum contaminant levels (MCLs) or background levels at one or more sites include, but are not limited to, uranium, selenium, arsenic, molybdenum, nitrate, gross alpha, radium-226 and radium-228. The purpose of this report is to recommend computer codes that can be used to assist the UMTRA groundwater restoration effort. The report includes a survey of applicable codes in each of the following areas: (1) groundwater flow and contaminant transport modeling codes, (2) hydrogeochemical modeling codes, (3) pump and treat optimization codes, and (4) decision support tools. Following the survey of the applicable codes, specific codes that can best meet the needs of the UMTRA groundwater restoration program in each of the four areas are recommended.

586 (SAND–96-1459) **Technical considerations for the implementation of subsurface microbial barriers for restoration of groundwater at UMTRA sites.** Tucker, M.D. Sandia National Labs., Albuquerque, NM (United States). Jan 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96012418. Source: OSTI; NTIS; INIS; GPO Dep.

The Uranium Mill Tailings Remediation Action (UMTRA) Program is responsible for the assessment and remedial action at the 24 former uranium mill tailings sites located in the United States. The surface remediation phase, which has primarily focused on containment and stabilization of the abandoned uranium mill tailings piles, is nearing completion. Attention has now turned to the groundwater restoration phase. One alternative under consideration for groundwater restoration at UMTRA sites is the use of in-situ permeable reactive subsurface barriers. In this type of a system, contaminated groundwater will be allowed to flow naturally through a barrier filled with material which will remove hazardous constituents from the water by physical, chemical or microbial processes while allowing passage of the pore water. The subject of this report is a reactive barrier which would remove uranium and other contaminants of concern from groundwater by microbial action (i.e., a microbial barrier). The purpose of this report is to assess the current state of this technology and to determine issues that must be addressed in order to use this technology at UMTRA sites. The report focuses on six contaminants of concern at UMTRA sites including uranium, arsenic, selenium, molybdenum, cadmium and chromium. In the first section of this report, the fundamental chemical and biological processes that must occur in a microbial barrier to control the migration of contaminants are described. The second section contains a literature review of research which has been conducted on the use of microorganisms to immobilize heavy metals. The third section addresses areas which need further development before a microbial barrier can be implemented at an UMTRA site.

587 (UCRL-ID–120416) **Summary of the LLNL gasoline spill demonstration - dynamic underground stripping project.** Newmark, R.L.; Aines, R.D. Lawrence Livermore National Lab., CA (United States). 3 Apr 1995. 36p. Sponsored by USDOE, Washington, DC (United States);National Inst. of Environmental Health Sciences, Research Triangle Park, NC (United States). DOE Contract W-7405-ENG-48. Order Number DE95011415. Source: OSTI; NTIS; GPO Dep.

Underground spills of volatile hydrocarbons (solvents or fuels) can be difficult to clean up when the hydrocarbons are present both above and below the water table and are found in relatively impermeable clays. Years of groundwater pumping may not completely remove the contamination. Researchers at Lawrence Livermore National Laboratory (LLNL) and the College of Engineering at the University of California at Berkeley (UCB) have collaborated to develop a technique called Dynamic Underground Stripping to remove localized underground spills in a relatively short time. The U.S. Department of Energy's Office of Environmental Restoration and Waste Management has sponsored a full-scale demonstration of this technique at the LLNL gasoline spill site. When highly concentrated contamination is found above the standing water table, vacuum extraction has been very effective at both removing the contaminant and enhancing biological remediation through the addition of oxygen. Below the water table, however, these advantages cannot be obtained. For such sites where the contamination is too deep for excavation, there are currently no widely applicable cleanup methods. Dynamic Underground Stripping removes separate-phase organic contaminants below the water table by heating the subsurface above the boiling point of water, and then removing both contaminant and water by vacuum extraction. The high temperatures both convert the organic to vapor and enhance other removal paths by increasing diffusion and eliminating sorption. Because this method uses rapid, high-energy techniques in cleaning the soil, it requires an integrated system of underground monitoring and imaging methods to control and evaluate the process in real time.

588 (UCRL-JC–122299) **Effect of subsurface electrical heating and steam injection on the indigenous microbial community.** Krauter, P.; MacQueen, D.; Horn, J.; Bishop, D. Colorado School of Mines, Golden, CO (United States). Research Inst. Nov 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-960804–25: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010702. Source: OSTI; NTIS; GPO Dep.

Since the potential for contaminant bioremediation in steam treated subsurface environments has not been explored, the thermal remedial treatment of a gasoline spill at Lawrence Livermore National Laboratory's (LLNL) Livermore site provided an opportunity to study microbial community changes in the subsurface environment. Many terrestrial microorganisms die or become metabolically inactive if heated for a sufficient time at temperatures of 62-100°C thus thermal remediation techniques are expected to significantly alter the microbial community structure. We studied changes in community structure and population abundance as well as the characteristics of indigenous heat-tolerant microorganisms before and after steam treatment. Using fatty acid profiles from culturable microorganisms obtained from sediment cores before and after thermal treatment, a 90-98% decline in total microorganism populations in hot subsurface sediments (up to 94°C) was found. Surviving heat-tolerant microorganisms were found to possess elevated concentrations of saturated fatty acids in their lipid membranes. We also observed that some heat-tolerant microorganisms were capable of degrading gasoline compounds.

589 (UCRL-JC–122874) **Complex electrical resistance tomography of a subsurface PCE plume.** Ramirez,

A.; Daily, W,; LeBrecque, D. Lawrence Livermore National Lab., CA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-960477–5: 9. annual symposium on the application of geophysics to engineering and environmental problems, Denver, CO (United States), 15 Apr - 1 May 1996). Order Number DE96010245. Source: OSTI; NTIS; GPO; GPO Dep.

A controlled experiment was conducted to evaluate the performance of complex electrical resistivity tomography (CERT) for detecting and delineating free product dense non-aqueous phase liquid (DNAPL) in the subsurface. One hundred ninety liters of PCE were released at a rate of 2 liters per hour from a point 0.5 m below ground surface. The spill was conducted within a double walled tank where saturated layers of sand, bentonite and a sand/bentonite mixture were installed. Complex electrical resistance measurements were performed. Data were taken before the release, several times during, and then after the PCE was released. Magnitude and phase were measured at 1 and 64 Hz. Data from before the release were compared with those during the release for the purpose of imaging the changes in conductivity resulting from the plume. Conductivity difference tomographs showed a decrease in electrical conductivity as the DNAPL penetrated the soil. A pancake-shaped anomaly developed on the top of a bentonite layer at 2 m depth. The anomaly grew in magnitude and extent during the release and borehole television surveys data confirmed the anomaly to be free-product PCE whose downward migration was stopped by the low permeability clay. The tomographs clearly delineated the plume as a resistive anomaly.

590 (USGS-OFR–95-160) **Ground-water data for the Nevada Test Site and selected other areas in South-Central Nevada, 1992–1993.** Geological Survey, Denver, CO (United States). 1995. 50p. Sponsored by Department of the Interior, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AI08-86NV10583. Order Number DE96000244. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Information Services, Box 25286, MS 517, Denver Federal Center, Denver, CO (United States) 80225-0046; GPO Dep.

The US Geological Survey, in support of the US Department of Energy Environmental Restoration and Hydrologic Resources Management Programs, collects and compiles hydrogeologic data to aid in characterizing the regional and local ground-water flow systems underlying the Nevada Test Site and vicinity. This report presents selected ground-water data collected from wells and test holes at and in the vicinity of the Nevada Test Site. Depth-to-water measurements were made during water year 1993 at 55 sites at the Nevada Test Site and 43 regional sites in the vicinity of the Nevada Test Site. Depth to water ranged from 87.7 to 674.6 meters below land surface at the Nevada Test Site and from 6.0 to 444.7 meters below land surface at sites in the vicinity of the Nevada Test Site. Depth-to-water measurements were obtained using the wire-line, electric-tape, air-line, and steel-tape devices. Total measured ground-water withdrawal from the Nevada Test Site during the 1993 calendar year was 1,888.04 million liters. Annual ground-water withdrawals from 14 wells ranged from 0.80 million to 417.20 million liters. Tritium concentrations from four samples at the Nevada Test Site and from three samples in the vicinity of the Nevada Test Site collected during water year 1993 ranged from near 0 to 27,676.0 becquerels per liter and from near 0 to 3.9 becquerels per liter, respectively.

591 (USGS-OFR–95-284) **Ground-water data for the Nevada Test Site 1992, and for selected other areas in South-Central Nevada, 1952–1992.** Geological Survey, Denver, CO (United States). [1992]. 60p. Sponsored by Department of the Interior, Washington, DC (United States);USDOE, Washington, DC (United States). DOE Contract AI08-86NV10583. Order Number DE96000243. Source: OSTI; NTIS; INIS; U.S. Geological Survey, Information Services, Box 25286, MS 517, Denver Federal Center, Denver, CO (United States) 80225-0046; GPO Dep.

Ground-water data collected from wells and test holes at and in the vicinity of the Nevada Test Site have been compiled in a recently released report. These data were collected by the US Geological Survey, Department of the Interior, in support of the US Department of Energy, Environmental Restoration and Hydrologic Resources Management Programs. Depth-to-water measurements were made at 53 sites at the Nevada Test Site from October 1, 1991, to September 30, 1992, and at 60 sites in the vicinity of the Nevada Test Site from 1952 to September 30, 1992. For water year 1992, depth to water ranged from 288 to 2,213 feet below land surface at the Nevada Test Site and from 22 to 1,460 feet below land surface at sites in the vicinity of the Nevada Test Site. Total ground-water withdrawal data compiled for 12 wells at the Nevada Test Site during calendar year 1992 was more than 400 million gallons. Tritium concentrations in water samples collected from five test holes at the Nevada Test Site in water year 1992 did not exceed the US Environmental Protection Agency drinking, water limit.

592 (WHC-EP–0394-10) **Groundwater maps of the Hanford Site, December 1994.** Serkowski, J.A.; Hartman, M.J.; Sweeney, M.D. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017147. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a continuation of a series of reports (see Serkowski et al 1994) that the configuration of the uppermost unconfined aquifer beneath the Hanford Site. This series presents the results of the semiannual water level measurement program and the water table maps generated from these measurements. The reports document the changes in the groundwater level at the Hanford Site during the transition from nuclear material production to environmental restoration and remediation. In addition, these reports provide water level data to support the various site characterization and groundwater monitoring programs currently in progress on the Hanford Site.

593 (WHC-SA–2665) **Modeling groundwater contamination transport for the Hanford Environmental Disposal Facility.** Finfrock, S.H. Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950420–31: International conference on mathematics and computations, reactor physics, and environmental analyses, Portland, OR (United States), 30 Apr - 4 May 1995). Order Number DE95015741. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary groundwater analyses were performed for the Hanford Environmental Restoration Disposal Facility (ERDF) to demonstrate compliance With dose limit performance objectives in DOE Order 5820.2A. These analyses were designed to determine peak radionuclide concentrations in a theoretical drinking-water well 100 m downstream from the facility. The resulting peak concentrations can be used to determine inventory limits for the facility.

594 (WHC-SD-EN-AP-165-Rev.1) **Interim-status groundwater monitoring plan for the 216-B-63 trench. Revision 1.** Sweeney, M.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Jun 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015656. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the groundwater monitoring plan for interim-status detection-level monitoring of the 216-B-63 Trench. This is a revision of the initial groundwater monitoring plan prepared for Westinghouse Hanford Company (WHC) by Bjornstad and Dudziak (1989). The 216-B-63 Trench, located at the Hanford Site in south-central Washington State, is an open, unlined, earthern trench approximately 1.2 m (4 ft) wide at the bottom, 427 m (1400 ft) long, and 3 m (10 ft) deep that received wastewater containing hazardous waste and radioactive materials from B Plant, located in the 200 East Area. Liquid effluent discharge to the 216-B-63 Trench began in March 1970 and ceased in February 1992. The trench is now managed by Waste Tank Operations.

595 (WHC-SD-EN-AP-174) **Groundwater monitoring and assessment plan for the 100-K Area fuel storage basins.** Johnson, V.G.; Chou, C.J.; Lindberg, J.W. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050009. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Quality Objectives (DQO) process was used to develop a cost- effective groundwater monitoring and assessment plan for the nuclear fuel storage basins in the 100-K Area of the Hanford Site. The use of predicted contaminant dispersal rates and directions, indicator or surrogate measurements and proposed field screening measurements contribute to significantly reduced operational costs. A subsurface characterization logic is also presented for locating possible sources of strontium-90 and other contaminants in the soil column and groundwater in the vicinity of suspected sources.

596 (WHC-SD-EN-AP-180) **Groundwater Monitoring Plan for the 183-H Solar Evaporation Basins.** Hartman, M.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050004. Source: OSTI; NTIS; INIS; GPO Dep.

Groundwater monitoring at the 183-H Solar Evaporation Basins is regulated under Washington Administrative Code (WAC) 173-303-645. This document proposes a final-status, compliance monitoring program for the site. The monitoring network consists of eight existing wells: H4-6 and H3-2A (upgradient), H4-3, H4-4, H4-9, H4-12A, H4-18, and H4-12C (downgradient). Well H4-12C is completed at the base of the unconfined aquifer; the other wells are screened at the water table. Concentration limits are identified for 4 contaminants of concern: chromium (122 ppb), nitrate (45,000 ppb), technetium-99 (900 pCi/L), and uranium (20 μg/L). The limit for chromium was based on background concentrations because there are upgradient sources of chromium. The limits for the other constituents are maximum contaminant levels or drinking water standards. A set of four independent groundwater samples will be collected from each well semiannually. Samples will be analyzed for the following: * The constituents of concern (i.e., nitrate, chromium, uranium, and technetium-99) * Additional constituents to aid data interpretation (alkalinity, anions, and metals) * Field parameters routinely acquired at the well head (e.g., pH, conductivity, turbidity, and temperature). The tolerance-interval approach is the recommended statistical method. If concentration limits are exceeded, confirmation samples will be collected to reduce the chance of a false positive.

597 (WHC-SD-EN-AP-185) **Groundwater monitoring plan for the 300 Area process trenches.** Lindberg, J.W.; Chou, C.J.; Johnson, V.G. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013880. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the groundwater monitoring program for the Hanford Site 300 Area Process Trenches (300 APT). The 300 APT are a Resource Conservation and Recovery Act of 1976 (RCRA) regulated unit. The 300 APT are included in the Dangerous Waste Portion of the Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Permit No. WA890008967, and are subject to final-status requirements for groundwater monitoring. This document describes a compliance monitoring program for groundwater in the uppermost aquifer system at the 300 APT. This plan describes the 300 APT monitoring network, constituent list, sampling schedule, statistical methods, and sampling and analysis protocols that will be employed for the 300 APT. This plan will be used to meet groundwater monitoring requirements from the time the 300 APT becomes part of the Permit and through the postclosure care period until certification of final closure.

598 (WHC-SD-EN-WP-012-Rev.1) **Groundwater screening evaluation/monitoring plan: 200 Area Treated Effluent Disposal Facility (Project W-049H). Revision 1.** Barnett, D.B.; Davis, J.D.; Collard, L.B.; Freeman, P.B.; Chou, C.J. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 225p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014429. Source: OSTI; NTIS; INIS; GPO Dep.

This report consists of the groundwater screening evaluation required by Section S.8 of the State Waste Discharge Permit for the 200 Area TEDF. Chapter 1.0 describes the purpose of the groundwater monitoring plan. The information in Chapter 2.0 establishes a water quality baseline for the facility and is the groundwater screening evaluation. The following information is included in Chapter 2.0: Facility description;Well locations, construction, and development data; Geologic and hydrologic description of the site and affected area; Ambient groundwater quality and current use; Water balance information; Hydrologic parameters; Potentiometric map, hydraulic gradients, and flow velocities; Results of infiltration and hydraulic tests; Groundwater and soils chemistry sampling and analysis data; Statistical evaluation of groundwater background data; and Projected effects of facility operation on groundwater flow and water quality. Chapter 3.0 defines, based on the information in Chapter 2.0, how effects of the TEDF on the environment will be evaluated and how compliance with groundwater quality standards will be documented in accordance with the terms and conditions of the permit. Chapter 3.0 contains the following information:

Media to be monitored; Wells proposed as the point of compliance in the uppermost aquifer; Basis for monitoring well network and evidence of monitoring adequacy; Contingency planning approach for vadose zone monitoring wells; Which field parameters will be measured and how measurements will be made; Specification of constituents to be sampled and analyzed; and Specification of the sampling and analysis procedures that will be used. Chapter 4.0 provides information on how the monitoring results will be reported and the proposed frequency of monitoring and reporting. Chapter 5.0 lists all the references cited in this monitoring plan. These references should be consulted for additional or more detailed information.

599 (WHC-SD-ER5480-ER–001-Rev.1) **Hanford facilities tracer study report (315 Water Treatment Facility). Revision 1.** Ambalam, T. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). May 1995. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012799. Source: OSTI; NTIS; GPO Dep.

Reported are the results and findings of a tracer study to determine contact time for the disinfection process of 315 Water Treatment Facility at 300 Area. The study utilized fluoride as the tracer and contact times were determined for two flow rates. Interpolation of data and short circuiting effects are also discussed.

600 (WHC-SD-LEF-PLN–002-Rev.1) **200 Area TEDF effluent sampling and analysis plan.** Alaconis, W.C. (and others); Ballantyne, N.A.; Boom, R.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016342. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling analysis sets forth the effluent sampling requirements, analytical methods, statistical analyses, and reporting requirements to satisfy the State Waste Discharge Permit No. ST4502 for the Treated Effluent Disposal Facility. These requirements are listed below: Determine the variability in the effluent of all constituents for which enforcement limits, early warning values and monitoring requirements; demonstrate compliance with the permit; and verify that BAT/AKART (Best Available Technology/All know and Reasonable Treatment) source, treatment, and technology controls are being met.

601 (WHC-SD-LEF-RPT–001) **Liquid effluent Sampling and Analysis Plan (SAP) implementation summary report.** Lueck, K.J. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011677. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes liquid effluent analytical data collected during the Sampling and Analysis Plan (SAP) Implementation Program, evaluates whether or not the sampling performed meets the requirements of the individual SAPs, compares the results to the WAC 173-200 Ground Water Quality Standards. Presented in the report are results from liquid effluent samples collected (1992-1994) from 18 of the 22 streams identified in the Consent Order (No. DE 91NM-177) requiring SAPs.

602 (WHC-SD-SNF-ATR–004) **Acceptance test procedure for the 105-KW isolation barrier leak rate.** McCracken, K.J. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1995. 292p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013345. Source: OSTI; NTIS; INIS; GPO Dep.

This acceptance test procedure shall be used to: First establish a basin water loss rate prior to installation of the two isolation barriers between the main basin and the discharge chute in K-Basin West. Second, perform an acceptance test to verify an acceptable leakage rate through the barrier seals. This Acceptance Test Procedure (ATP) has been prepared in accordance with CM-6-1 EP 4.2, Standard Engineering Practices.

603 (WHC-SD-SNF-ER–006-Rev.1) **105-KE Basin isolation barrier leak rate test analytical development. Revision 1.** Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). 9 May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015599. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an analytical development in support of the proposed leak rate test of the 105-KE Basin. The analytical basis upon which the K-basin leak test results will be used to determine the basin leakage rates is developed in this report. The leakage of the K-Basin isolation barriers under postulated accident conditions will be determined from the test results. There are two fundamental flow regimes that may exist in the postulated K-Basin leakage: viscous laminar and turbulent flow. An analytical development is presented for each flow regime. The basic geometry and nomenclature of the postulated leak paths are denoted.

604 (WHC-SD-SNF-TRP–006) **105 K East isolation barrier acceptance analysis report.** McCracken, K.J. (ICF Kaiser Hanford Co., Richland, WA (United States)); Irwin, J.J. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014431. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to report and interpret the findings of the isolation barrier acceptance tests performed in 105KE/100K. The tests were performed in accordance with the test plan (McCracken 1995c) and acceptance test procedure (McCracken 1995a). The test report (McCracken 1995b) contains the test data. This document compares the test data (McCracken 1995b) against the criteria (McCracken 1995a, c). A discussion of the leak rate analytical characterization (Irwin 1995) describes how the flow characteristics and the flow rate will be determined using the test data from the test report (McCracken 1995b). The barriers must adequately control the leakage from the main basin to the discharge chute to less than the 1,500 gph (5,680 lph) Safety Analysis Report (SAR 1994) limit.

605 (WHC-SD-WM-OTR–171) **Operability test report for the TK-900 effluent monitoring station.** Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010595. Source: OSTI; NTIS; INIS; GPO Dep.

This operability test report provides the results of the operability test performed on the TK-900 liquid effluent collection system, installed near the east end of the 6 inch chemical sewer header, by Project W-007H. The system is part of BAT/AKART for the BCE liquid effluent stream.

606 (WSRC-MS--95-0187) **The Speciation of Groundwater Contaminated with Coal Pile Leachate at the Savannah River Site, South Carolina.** Denham, M.E.; Nichols, R.L. Westinghouse Savannah River Co., Aiken, SC (United States). 15 May 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9506198–1: International Association of Hydro-Geologists Congress: solutions, Edmonton (Canada), 4-10 Jun 1995). Order Number DE95060146. Source: OSTI; NTIS; INIS; GPO Dep.

Modeling the transport of contaminant metals and designing systems for their remediation requires an understanding of the metal's speciation. Thus, analysis of contaminant speciation and evaluation of the processes that can change the speciation should be done during characterization of the contaminated site. This approach is being used at the Savannah River Site for a metals contaminated site that will serve as a test platform for metals remediation technologies. The site is adjacent to a coal storage pile and the basin that contains the coal pile runoff. A network of well clusters allows definition of the plume, including profiles of contamination with depth. The groundwater is acidic (pH $\approx$ 2) and contains high concentrations of sulfate (up to 2300 mg/l) and metals, with chromium, nickel, cadmium and lead exceeding drinking water standards. Aluminum and total iron concentrations range up to 1326 mg/l and 7991 mg/l, respectively. Speciation calculations on dissolved contaminants indicate that as much as 65% of the lead, 54% of the cadmium, and 34% of the nickel may be present in sulfate complexes. Chromium occurs predominantly as Cr^{+3}. There is evidence that some contaminant metals may be associated with colloidal material. Contamination in the groundwater is stratified with concentrations decreasing over a depth range of 3 meters (10 feet). Fluid-rock interactions explain the non-uniform behavior of dissolved components with depth. Mass balance considerations suggest that the interactions are dominated by Kaolinite dissolution coupled with precipitation of phases containing aluminum, ferric iron, silica, and sulfate, as well as co- precipitation of contaminant metals.

607 (WSRC-MS--95-0303) **In situ bioremediation of chlorinated solvent with natural gas.** Rabold, D.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002956. Source: OSTI; NTIS; INIS; GPO Dep.

A bioremediation system for the removal of chlorinated solvents from ground water and sediments is described. The system involves the the in-situ injection of natural gas (as a microbial nutrient) through an innovative configuration of horizontal wells.

608 (WSRC-MS--96-0042) **Effects of closure cap and liner on contaminant release rates from grouted wastes.** Yu, A.D.; Fowler, J.R.; Bignell, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960482–9: Society of Computer Simulation (SCS) multiconference: high performance computing, New Orleans, LA (United States), 8-11 Apr 1996). Order Number DE96012429. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes a groundwater modeling study of waste disposal concepts using grouted waste forms. The focus of the study is on the effects of clay caps and concrete vaults on contaminant migration. The authors modeled three waste disposal scenarios: (1) Grouted waste was solidified in an earthen trench and covered with soil, there was no vault and no cap; (2) grouted waste was solidified in an earthen trench, the entire waste disposal facility was then closed under a clay cap; (3) grouted waste was solidified in a concrete vault and protected by the same closure as in 2. Because of the huge contrast in hydraulic conductivities and highly non-linear multi-phase flow characteristics, these waste disposal concepts presented a difficult problem for numerical simulation. Advanced fluid flow and contaminant transport codes were used to solve the problem. Among the codes tested, ECLIPSE out-performed other codes in speed, accuracy (smaller material balance errors) and capability in handling sophisticated scenarios. The authors used nitrate as a tracer for the simulation. Nitrate does not absorb in the solid phase and does not decay. As a result, predicted release rate based on nitrate is conservative. They also assumed that the facility is intact for 10,000 years. In other words, properties of the materials used for this study do not change with time. Predicted peak flux for the no vault and no closure case was 5.8×10^{-4} per year at 12 years. If a clay cap was installed, predicted peak flux was 8.5×10^{-5} per year at 110 years. If the grout was disposed in a concrete vault and covered by a clay cap, predicted peak flux became 4.4×10^{-6} per year at 8,000 years. Both concrete liner and clay cap can reduce the rate of contaminant release to the water table and delay the peak time.

609 (WSRC-RP--95-237) **Groundwater model recalibration and remediation well network design at the F-Area Seepage Basins.** Sadler, W.R. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1995. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002957. Source: OSTI; NTIS; INIS; GPO Dep.

On September 30, 1992, the South Carolina Department of Health and Environmental Control (SCDHEC) issued a Resource Conservation and Recovery Act (RCRA) Hazardous Waste Part B Permit prescribing remediation of contaminated groundwater beneath and downgradient of the F- and H-Area Seepage Basins at the Savannah River Site. The remediation outlined in the Part B Permit calls for a three phase approach. For the F-Area Seepage Basins, the first phase requires the "installation of an adequate number of pumping and injection wells or trenches, as appropriate, to capture and remediate those portions of-the contaminant plume delineated by the 10,000 pCi/ml tritium isoconcentration contour." Geochemical results from 1992 groundwater monitoring were used to delineate this isoconcentration contour in the Corrective Action Program (CAP) (WSRC, 1992a). The 1992 results were used based on SCDHEC written requirement to use the most recent data available at the time the CAP was formulated. The rationale used by SCDHEC in selecting the 10,000 pCi/ml tritium isoconcentration contour was that it also encompassed most of the other contaminants listed in the Groundwater Protection Standards. After extraction and treatment, the water is required to be reinjected into the aquifer due to the high levels of tritium still present in the treated water. The conceptual plan is to have recirculation of the tritium (as much as can practically be accomplished) to allow more time for radioactive decay before natural discharge to surface water.

610 (WSRC-TR-94-0616) **H-Area, K-Area, and Par Pond Sewage Sludge Application Sites Groundwater Monitoring Report. Fourth quarter 1994 and 1994 summary.** Chase, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060134. Source: OSTI; NTIS; GPO Dep.

Groundwater samples from the three wells at the H-Area Sewage Sludge Application Site (HSS wells) are analyzed quarterly for constituents as required by South Carolina Department of Health and Environmental Control Construction Permit 12,076. Samples from the three wells at the K-Area Sewage Sludge Application Site (KSS wells) and the three wells at the Par Pond Sewage Sludge Application Site (PSS wells) are analyzed quarterly for constituents required by SCDHEC Construction Permit 13,173. All samples are also analyzed as requested for other constituents as part of the Savannah River Site Groundwater Monitoring Program. Annual analyses for other constituents, primarily metals. also are required by the permits.

611 (WSRC-TR-95-0139-1) **Mixed Waste Management Facility groundwater monitoring report. First quarter 1995.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1995. 600p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001684. Source: OSTI; NTIS; INIS; GPO Dep.

During first quarter 1995, eleven constituents exceeded final Primary Drinking Water Standards (PDWS) in groundwater samples from downgradient monitoring wells at the mixed Waste Management Facility, the Old Burial Ground, the E-Area Vaults, the proposed Hazardous Waste/Mixed Waste Disposal Vaults, and the F-Area Sewage Sludge Application Site. No constituents exceeded final PDWS in samples from the upgradient monitoring wells during first quarter 1995. As in previous quarters, tritium and trichloroethylene were the most widespread elevated constituents. Antimony, chloroethene, copper, dichloromethane, gross alpha, lead, mercury, nonvolatile beta, and tetrachloroethylene also exceeded final PDWS in one or more wells. Elevated constituents were found in numerous Aquifer Zone IIB_2 (Water Table) and Aquifer Zone IIB_1 (Barnwell/McBean)wells. Elevated constituents were found in five Aquifer Unit IIA (Congaree) wells. The groundwater flow directions and rates in the three hydrostratigraphic units were similar to those of previous quarters.

612 (WSRC-TR-95-0144-1) **Metallurgical Laboratory Hazardous Waste Management Facility groundwater monitoring report. First quarter 1995.** Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001687. Source: OSTI; NTIS; INIS; GPO Dep.

During first quarter 1995, samples from AMB groundwater monitoring wells at the Metallurgical Laboratory Hazardous Waste Management Facility (Met Lab HWMF) were analyzed for selected heavy metals, field measurements, radionuclides, volatile organic compounds, and other constituents. Six parameters exceeded standards during the quarter. As in previous quarters, tetrachloroethylene and trichloroethylene exceeded final Primary Drinking Water Standards (PDWS). Total organic halogens exceeded its Savannah River Site (SRS) Flag 2 criterion during first quarter 1995 as in fourth quarter 1994. Aluminum, iron, and manganese, which were not analyzed for during fourth quarter 1994, exceeded the Flag 2 criteria in at least two wells each during first quarter 1995. Groundwater flow direction and rate in the M-Area Aquifer Zone were similar to previous quarters. Conditions affecting the determination of groundwater flow directions and rates in the Upper Lost Lake Aquifer Zone, Lower Lost Lake Aquifer Zone, and the Middle Sand Aquifer Zone of the Crouch Branch Confining Unit were also similar to previous quarters.

613 (WSRC-TR-95-0349) **Analysis of volatile organic compounds in groundwater samples by gas chromatography-mass spectrometry.** Bernhardt, J. Westinghouse Savannah River Co., Aiken, SC (United States). 23 Aug 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96003015. Source: OSTI; NTIS; GPO Dep.

The Savannah River Site contains approximately 1500 monitoring wells from which groundwater samples are collected. Many of these samples are sent off-site for various analyses, including the determination of trace volatile organic compounds (VOCs). This report describes accomplishments that have been made during the past year which will ultimately allow VOC analysis to be performed on-site using gas chromatography-mass spectrometry. Through the use of the on-site approach, it is expected that there will be a substantial cost savings. This approach will also provide split-sample analysis capability which can serve as a quality control measure for off-site analysis.

614 (WSRC-TR-95-0350) **Z-Area Saltstone Disposal Facility groundwater monitoring report. Second quarter 1995.** Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96006494. Source: OSTI; NTIS; GPO Dep.

The three monitoring wells at the Z-Area Saltstone Disposal Facility, ZBG 1, 1A, and 2, are sampled quarterly as part of the Savannah River Site Groundwater Monitoring Program and to comply with conditions of the facility's Industrial Waste Permit IWP-217, issued by the South Carolina Department of Health and Environmental Control (SCDHEC). During second quarter 1995, samples from wells ZBG 1 and 2 were analyzed for selected inorganic constituents, volatile organic compounds, selected radionuclides, and other constituents. Well ZBG 1A was dry and could not be sampled. Dichloromethane, a common laboratory contaminant, was detected above final Primary Drinking Water Standards (PDWS) in well ZBG 1 and was detected in this well's associated method blank during second quarter 1995. No other constituents exceeded final PDWS, SCDHEC proposed groundwater monitoring standards, or Savannah River Site flagging criteria in the ZBG wells during second quarter 1995. In previous quarters, wells ZBG 1 and 2 contained slightly elevated levels of tritium, similar to the tritium levels detected before Z Area began radioactive operations. The Z-Area Saltstone Disposal Facility blends low-level salt solutions with cement, slag, and flyash to form a nonhazardous cementitious waste that is pumped to aboveground disposal vaults.

MIXED WASTE CHARACTERIZATION, TREATMENT, AND DISPOSAL

Refer also to citation(s) 21, 35, 106, 116, 139, 158, 263, 346, 367, 401, 402, 403, 404, 406, 471, 473, 474, 476, 487, 491, 493, 503, 506, 535, 550, 553, 557, 562, 565, 569, 571, 573, 607, 611, 1180, 1209, 1261, 1262, 1265, 1300, 1304, 1317, 1336, 1339, 1341, 1345, 1346, 1500, 1614, 1811, 1942, 1976, 1989, 2008, 2010, 2024, 2114, 2118, 2137, 2141, 2142, 2192, 2255, 2275, 2287, 2291, 2303, 2304, 2314, 2365, 2366, 2367, 2377, 2382, 2392, 2413, 2414, 2415, 2416, 2417, 2421, 2431, 2447, 2456, 2460, 2481, 2488, 2492, 2519, 2521, 2535, 2638, 2647, 2648, 2654, 2655

615 (ANL/ACL–95/4) **A comparison of continuous pneumatic nebulization and flow injection-direct injection nebulization for sample introduction in inductively coupled plasma-mass spectrometry.** Crain, J.S.; Kiely, J.T. Argonne National Lab., IL (United States). Aug 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96009562. Source: OSTI; NTIS; INIS; GPO Dep.

Dilute nitric acid blanks and solutions containing Ni, Cd, Pb, and U (including two laboratory waste samples) were analyzed eighteen times over a two-month period using inductively coupled plasma-mass spectrometry (ICP-MS). Two different sample introduction techniques were employed: flow injection-direct injection nebulization (FI-DIN) and continuous pneumatic nebulization (CPN). Using comparable instrumental measurement procedures, FI-DIN analyses were 33% faster and generated 52% less waste than CPN analyses. Instrumental limits of detection obtained with FI-DIN and CPN were comparable but not equivalent (except in the case of Pb) because of nebulizer-related differences in sensitivity (i.e., signal per unit analyte concentration) and background. Substantial and statistically significant differences were found between FI-DIN and CPN Ni determinations, and in the case of the laboratory waste samples, there were also small but statistically significant differences between Cd determinations. These small (2 to 3%) differences were not related to polyatomic ion interference (e.g., $^{95}Mo^{16}O^{+}$), but in light of the time savings and waste reduction to be realized, they should not preclude the use of FI-DIN in place of CPN for determination of Cd, Pb, U and chemically.

616 (ANL/CMT-ACL/VU–83809) **Waste minimization via preparative scale high performance gel permeation chromatography.** Boparai, A.S.; Parish, K.J.; Kent, S.D.; Tsai, Y.; Joe, D.A. Argonne National Lab., IL (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950389–2-Vugraphs: Pittsburgh conference and exhibition on analytical chemistry and applied spectroscopy: stimulating the minds of today's and tomorrow's scientists, New Orleans, LA (United States), 5-10 Mar 1995). Order Number DE95011797. Source: OSTI; NTIS; INIS; GPO Dep.

The procedures developed here allow removal of radioactivity, as judged by removal of ^{152}Europium (III) from methylene chloride solutions of CLP analytes without significantly reducing recovery of organic compounds. This allows analysis of nonradioactive extracts on instrumentation maintained in a regular nonradioactive laboratory, resulting in a significant savings in cost.

617 (ANL/CMT/CP–84846) **Vitrification as a low-level radioactive mixed waste treatment technology at Argonne National Laboratory.** Mazer, J.J.; No, Hyo J. Argonne National Lab., IL (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950877–14: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95015713. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-East (ANL-E) is developing plans to use vitrification to treat low-level radioactive mixed wastes (LLMW) generated onsite. The ultimate objective of this project is to install a full-scale vitrification system at ANL-E capable of processing the annual generation and historic stockpiles of selected LLMW streams. This project is currently in the process of identifying a range of processible glass compositions that can be produced from actual mixed wastes and additives, such as boric acid or borax. During the formulation of these glasses, there has been an emphasis on maximizing the waste content in the glass (70 to 90 wt %), reducing the overall final waste volume, and producing a stabilized low-level radioactive waste glass. Crucible glass studies with actual mixed waste streams have produced alkali borosilicate glasses that pass the Toxic Characteristic Leaching Procedure (TCLP) test. These same glass compositions, spiked with toxic metals well above the expected levels in actual wastes, also pass the TCLP test. These results provide compelling evidence that the vitrification system and the glass waste form will be robust enough to accommodate expected variations in the LLMW streams from ANL-E. Approximately 40 crucible melts will be studied to establish a compositional envelope for vitrifying ANL-E mixed wastes. Also being determined is the identity of volatilized metals or off-gases that will be generated.

618 (ANL/CMT/CP–85434) **Development of low-level radioactive waste disposal capacity in the United States - progress or stalemate?.** Devgun, J.S. (Argonne National Lab., IL (United States)); Larson, G.S. Argonne National Lab., IL (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950917–19: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96005280. Source: OSTI; NTIS; INIS; GPO Dep.

It has been fifteen years since responsibility for the disposal of commercially generated low-level radioactive waste (LLW) was shifted to the states by the United States Congress through the Low-Level Radioactive Waste Policy Act of 1980 (LLRWPA). In December 1985, Congress revisited the issue and enacted the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA). No new disposal sites have opened yet, however, and it is now evident that disposal facility development is more complex, time-consuming, and controversial than originally anticipated. For a nation with a large nuclear power industry, the lack of availability of LLW disposal capacity coupled with a similar lack of high-level radioactive waste disposal capacity could adversely affect the future viability of the nuclear energy option. The U.S. nuclear power industry, with 109 operating reactors, generates about half of the LLW shipped to commercial disposal sites and faces dwindling access to waste disposal sites and escalating waste management costs. The other producers of LLW - industries, government (except the defense related research and production waste), academic institutions, and medical institutions that account for the remaining half of the commercial LLW - face the same storage and cost uncertainties. This paper will summarize the current status of U.S. low-level radioactive waste generation and the status of new disposal facility development efforts by the states. The paper will also examine the factors that have contributed to delays, the most frequently suggested alternatives, and the likelihood of change.

619 (ANL/CMT/CP--85710) **Vitrification of low-level radioactive mixed waste at Argonne National Laboratory.** Mazer, J.J.; Rosine, S.D.; No, H.J. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216--137: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012217. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-East (ANL-E) is proceeding with plans to use vitrification to treat low-level radioactive mixed wastes (LLMW) generated on-site. The objective is to install a full-scale vitrification system at ANL-E capable of processing the entire annual generation of selected LLMW streams. Crucible glass studies with actual mixed waste streams have produced sodium borosilicate glasses under conditions achievable in commercially available melters. These same glass compositions, spiked with toxic metals above the expected levels in actual wastes, pass the Toxicity Characteristic Leaching Procedure (TCLP) test. Earlier evaluations of the likely off-gases that will result from vitrification indicated that the primary off-gases will include compounds of SO_x, NO_x, and CO_2. These evaluations are being experimentally confirmed with a mass spectrometer analysis of the gases evolved from samples of the ANL-E wastes. The composition of the melter feed can be adjusted to minimize volatilization of some components, if necessary. The full-scale melter will be designed to handle the annual generation of at least three LLMW waste streams: evaporator concentrator bottoms sludge (ECB), storage tank sludge (STS), and HEPA filter media. Each waste stream is mixed waste by virtue of its failure to pass the TCLP test with respect to toxic metal leaching. Additional LLMW streams under consideration for vitrification include historical mixed waste glass from past operations and spent abrasive from a planned decontamination facility.

620 (ANL/CMT/CP--86906) **Apatite- and monazite-bearing glass-crystal composites for the immobilization of low-level nuclear and hazardous wastes.** Wronkiewicz, D.J.; Wolf, S.F.; DiSanto, T.S. Argonne National Lab., IL (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-951155--62: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96007217. Source: OSTI; NTIS; INIS; GPO Dep.

This study demonstrates that glass-crystal composite waste forms can be produced from waste streams containing high proportions of phosphorus, transition metals, and/or halides. The crystalline phases produced in crucible-scale melts include apatite, monazite, spinels, and a Zr-Si-Fe-Ti phase. These phases readily incorporated radionuclide and toxic metals into their crystal structures, while corrosion tests have demonstrated that glass-crystal composites can be up to 300-fold more durable than simulated high-level nuclear waste glasses, such as SRL 202U.

621 (ANL/DIS/CP--85160) **Applying automated data acquisition and management technology to bioremediation.** Widing, M.A.; Leser, C. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-9505101--2: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE95013370. Source: OSTI; NTIS; GPO Dep.

Operating a bioremediation process requires timely and accurate analysis of physical and chemical parameters that can affect the system. At a fuel oil spill site, the operation of an in-situ bioremediation system, consisting of fluid and nutrient injection, fluid withdrawal, and aeration cycles, is monitored by means of electronic downhole sensors and onsite chemical analysis. A data acquisition and management system was designed and implemented to rapidly analyze data for operational decision malting. A hardware suite, containing an electronic monitoring system data acquisition computer, and data analysis workstation, was also developed. Through the use of both commercial software products and custom software, suites of data management and analysis tools were provided. The data acquisition suite of software tools assisted in programming dataloggers, automatically recording monitored data, and integrating these data with manually sampled chemical data. The data analysis suite of software tools assisted in downloading data to remote workstations, sampling the database for trend analysis, and automating the interface to commercial analysis packages.

622 (ANL/DIS/CP--87032) **Factors affecting acceptability of radioactive metal recycling to the public and stakeholders.** Nieves, L.A.; Burke, C.J. Argonne National Lab., IL (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950786--2: 3. annual conference on the recycle and reuse of radioactive scrap metal, Knoxville, TN (United States), 31 Jul - 3 Aug 1995). Order Number DE95015643. Source: OSTI; NTIS; INIS; GPO Dep.

The perception of risk takes place within a cultural context that is affected by individual and societal values, risk information, personal experience, and the physical environment. Researchers have found that measures of "voluntariness of risk assumption," of "disaster potential," and of "benefit" are important in explaining risk acceptability. A review of cross-cultural studies of risk perception and risk acceptance, as well as an informal stakeholder survey, are used to assess the public acceptability of radioactive scrap metal recycling.

623 (ANL/DIS/CP--87708) **Accident analysis for the low-level mixed waste "No-Flame" option in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Folga, S. (Argonne National Lab., Argonne, IL (United States)); Kohout, E.; Mueller, C.J.; Nabelssi, B.; Wilkins, B.; Mishima, J. Argonne National Lab., IL (United States). 1996. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960212--17: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). . Order Number DE96006903. Source: OSTI; NTIS; INIS; GPO Dep.

This paper outlines the various steps pursued in performing a generic safety assessment of the various technologies considered for the low-level mixed waste (LLMW) "No-Flame" option in the US Department of Energy (DOE) Waste

Management Programmatic Environmental Impact Statement (WM PEIS). The treatment technologies for the "No-Flame" option differ from previous LLMW technologies analyzed in the WM PEIS in that the incineration and thermal desorption technologies are replaced by sludge washing, soil washing, debris washing, and organic destruction. A set of dominant waste treatment processes and accident scenarios were selected for analysis by means of a screening process. A subset of results (release source terms) from this analysis is presented.

624 (ANL/DIS/CP–89084) **Waste management facility accident analysis (WASTE ACC) system: software for analysis of waste management alternatives.** Kohout, E.F.; Folga, S.; Mueller, C.; Nabelssi, B. Argonne National Lab., IL (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960212–32: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006913. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the Waste Management Facility Accident Analysis (WASTE_ACC) software, which was developed at Argonne National Laboratory (ANL) to support the US Department of Energy's (DOE's) Waste Management (WM) Programmatic Environmental Impact Statement (PEIS). WASTE_ACC is a decision support and database system that is compatible with Microsoft® Windows™. It assesses potential atmospheric releases from accidents at waste management facilities. The software provides the user with an easy-to-use tool to determine the risk-dominant accident sequences for the many possible combinations of process technologies, waste and facility types, and alternative cases described in the WM PEIS. In addition, its structure will allow additional alternative cases and assumptions to be tested as part of the future DOE programmatic decision-making process. The WASTE_ACC system demonstrates one approach to performing a generic, systemwide evaluation of accident risks at waste management facilities. The advantages of WASTE_ACC are threefold. First, the software gets waste volume and radiological profile data that were used to perform other WM PEIS-related analyses directly from the WASTE_MGMT system. Second, the system allows for a consistent analysis across all sites and waste streams, which enables decision makers to understand more fully the trade-offs among various policy options and scenarios. Third, the system is easy to operate; even complex scenario runs are completed within minutes.

625 (ANL/EA/CP–84132) **Computer-aided waste management strategic planning and analysis.** Avci, H.I.; Kotek, T.J.; Koebnick, B.L. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950216–140: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012466. Source: OSTI; NTIS; INIS; GPO Dep.

A computational model called WASTE-MGMT has been developed to assist in the evaluation of alternative waste management approaches in a complex setting involving multiple sites, waste streams, and processing options. The model provides the quantities and characteristics of wastes processed at any facility or shipped between any two sites as well as environmental emissions at any facility within the waste management system. The model input is defined by three types of fundamental waste management data: (1) waste inventories and characteristics at the point of generation; (2) treatment, storage, and disposal facility characteristics; and (3) definitions of alternative management approaches. The model has been successfully used in the preparation of the US Department of Energy (DOE) Environmental Management Programmatic.Environmental Impact Statement (EM PEIS). Certain improvements are either being implemented or planned that would extend the usefulness and applicability of the WASTE-MGMT model beyond the EM PEIS and info the. strategic planning for management of wastes under the responsibility of DOE or other agencies.

626 (ANL/EA/CP–84317) **Facility accident analysis for low-level waste management alternatives in the US Department of Energy Waste Management Program.** Roglans-Ribas, J.; Mueller, C.; Nabelssi, B.; Folga, S.; Tompkins, M. Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950216–143: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012287. Source: OSTI; NTIS; INIS; GPO Dep.

The risk to human health of potential radiological releases resulting from facility accidents constitutes an important consideration in the US Department of Energy (DOE) waste management program. The DOE Office of Environmental Management (EM) is currently preparing a Programmatic Environmental Impact Statement (PEIS) that evaluates the risks associated with managing five types of radiological and chemical wastes in the DOE complex. Several alternatives for managing each of the five waste types are defined and compared in the EM PEIS. The alternatives cover a variety of options for storing, treating, and disposing of the wastes. Several treatment methods and operation locations are evaluated as part of the alternatives. The risk induced by potential facility accidents is evaluated for storage operations (current and projected waste storage and post-treatment storage) and for waste treatment facilities. For some of the five waste types considered, facility accidents cover both radiological and chemical releases. This paper summarizes the facility accident analysis that was performed for low-level (radioactive) waste (LLW). As defined in the EM PEIS, LLW includes all radioactive waste not classified as high-level, transuranic, or spent nuclear fuel. LLW that is also contaminated with chemically hazardous components is treated separately as low-level mixed waste (LLMW).

627 (ANL/EA/CP–84357) **Characterization of hazardous waste residuals from Environmental Restoration Program activities at DOE installations: Waste management implications.** Lazaro, M.A.; Esposito, M.P. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950216–146: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95012939. Source: OSTI; NTIS; INIS; GPO Dep.

Investigators at Argonne National Laboratory (ANL), with support from associates at the Pacific Northwest Laboratory (PNL), have assembled an inventory of the types and volumes of radioactive, toxic or hazardous, and mixed waste likely to be generated over the next 30 years as the US Department of Energy (DOE) implements its nationwide Environmental Restoration (ER) Program. The inventory and related analyses are being considered for integration into DOE's Programmatic Environmental Impact Statement

(PEIS) covering the potential environmental impacts and risks associated with alternative management practices and programs for wastes generated from routine operations. If this happens, the ER-generated waste could be managed under a set of alternatives considered under the PEIS and selected at the end of the current National Environmental Policy Act process.

628 (ANL/EA/CP–86211) **Developing RESRAD-BASELINE for environmental baseline risk assessment.** Cheng, Jing-Jy. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–41: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96007239. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

RESRAD-BASELINE is a computer code developed at Argonne developed at Argonne National Laboratory for the US Department of Energy (DOE) to perform both radiological and chemical risk assessments. The code implements the baseline risk assessment guidance of the US Environmental Protection Agency (EPA 1989). The computer code calculates (1) radiation doses and cancer risks from exposure to radioactive materials, and (2) hazard indexes and cancer risks from exposure to noncarcinogenic and carcinogenic chemicals, respectively. The user can enter measured or predicted environmental media concentrations from the graphic interface and can simulate different exposure scenarios by selecting the appropriate pathways and modifying the exposure parameters. The database used by PESRAD-BASELINE includes dose conversion factors and slope factors for radionuclides and toxicity information and properties for chemicals. The user can modify the database for use in the calculation. Sensitivity analysis can be performed while running the computer code to examine the influence of the input parameters. Use of RESRAD-BASELINE for risk analysis is easy, fast, and cost-saving. Furthermore, it ensures in consistency in methodology for both radiological and chemical risk analyses.

629 (ANL/EA/CP–86212) **A simplified model to estimate radiological doses from incineration of radioactive waste.** Stevens, L.E. (USDOE, Washington, DC (United States)); Ma, C.W.; Wheeler, T.; Nimmagadda, M.; LePoire, D.; Chen, S.Y.; Owens, K.W. Argonne National Lab., IL (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950542–1: 14. international symposium on thermal treatment technologies: incineration conference, Seattle, WA (United States), 8-12 May 1995). Order Number DE95013413. Source: OSTI; NTIS; INIS; GPO Dep.

A simplified calculational model permits a rapid yet realistic estimate of small, but potential radiological doses to onsite workers and the offsite public as a result of transportation, handling, storage, incineration, and maintenance of waste containing trace amount of radioactive materials which is to be processed at a treatment, storage, and disposal (TSD) facility. The model was developed on the basis of previous detailed studies of eight TSD facilities and builds in the essential features of a TSD facility. The model would provide an understanding of the potential human exposure associated with the radioactive contents in the chemical wastes.

630 (ANL/EA/CP–86245) **Issues related to estimating potential radiological doses from treatment, storage, and disposal facilities handling waste containing trace amounts of radioactive material.** Stevens, L.E. (USDOE, Washington, DC (United States)); Nimmagadda, M.; LePoire, D.; Chen, S.Y.; Ma, C.W.; Wheeler, T.; Owens, K.W. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–12: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95015636. Source: OSTI; NTIS; INIS; GPO Dep.

A simplified calculational model has been developed to permit a rapid, yet realistic, estimate of potential radiological doses to on-site workers and the off-site public from waste-handling operations at a treatment, storage, and disposal (TSD) facility. The waste-handling operations include transport, handling, storage, incineration, and landfilling of waste containing trace amounts of radioactive materials. The main objective of the model is to provide a radiological assessment methodology that can be used in a waste clearance strategy that addresses US Department of Energy mixed-waste moratorium issues. The model was developed on the basis of previous detailed studies of eight TSD facilities and incorporates the essential features of such a facility. The model provides a simplified physical concept of the potential human exposure associated with the radioactive contents of the chemical wastes. Issues pertaining to the development of the model, as well as application and future use, are discussed. Specifically, these issues include physical model approximations, isotope selection, waste-handling operations, and selection of input parameters. Also, pathway and isotope selection criteria are discussed relative to the previous TSD sites studied. This model is being considered for additional development as a waste clearance strategy tool.

631 (ANL/EA/CP–87799) **Potential waste-clearance strategy for U.S. Department of Energy waste processed at treatment, storage, and disposal facilities.** Stevens, L. (Dept. of Energy, Germantown, MD (United States). Office of Environmental Restoration and Waste Management); Chen, S.Y.; Pfingston, M. Argonne National Lab., IL (United States). 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960212–40: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006730. Source: OSTI; NTIS; INIS; GPO Dep.

Past practices at U.S. Department of Energy (DOE) field facilities may have resulted in the presence of minute amounts of radioactive contamination in some hazardous wastes shipped from these facilities. In May 1991, the DOE Office of Waste Operations issued a nationwide moratorium on shipping potentially mixed waste from DOE facilities to commercial treatment, storage, and disposal (TSD) facilities. A potential waste-clearance strategy was developed to address the DOE mixed-waste moratorium issues, which had resulted from a lack of existing regulations regarding volume contamination. A radiological assessment model was developed on the basis of the detailed radiological assessment performed for eight commercial hazardous waste TSD facilities. The model incorporates waste- and site-specific data to estimate potential radiological doses to on-site workers and the off-site public from waste-handling operations at a TSD facility. The described waste-clearance strategy would provide both DOE and commercial TSD facilities with a rapid and cost-effective methodology for assessing potential human exposures from the processing of chemical wastes contaminated with trace amounts of radionuclides. This strategy also has important potential applications for establishing site clearance limits to ensure that worker and public risks would remain well below regulatory limits. The clearance strategy issues pertaining to current free-release practice, dose limits, data requirements, and conservatism are discussed.

632 (ANL/EA/CP--88217) **Cost savings associated with landfilling wastes containing very low levels of uranium.** Boggs, C.J. (Argonne National Lab., Germantown, MD (United States)); Shaddoan, W.T. Argonne National Lab., IL (United States). 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960110--3: 29. midyear topical meeting of the Health Physics Society: naturally occuring and accelerator produced radioactive material - regulation and risk assessment, Scottsdale, AZ (United States), 7-10 Jan 1996). Order Number DE96006692. Source: OSTI; NTIS; INIS; GPO Dep.

The Paducah Gaseous Diffusion Plant (PGDP) has operated captive landfills (both residential and construction/demolition debris) in accordance with the Commonwealth of Kentucky regulations since the early 1980s. Typical waste streams allowed in these landfills include nonhazardous industrial and municipal solid waste (such as paper, plastic, cardboard, cafeteria waste, clothing, wood, asbestos, fly ash, metals, and construction debris). In July 1992, the U.S. Environmental Protection Agency issued new requirements for the disposal of sanitary wastes in a "contained landfill." These requirements were promulgated in the 401 Kentucky Administrative Record Chapters 47 and 48 that became effective 30 June 1995. The requirements for a new contained landfill include a synthetic liner made of high-density polyethylene in addition to the traditional 1-meter (3-foot) clay liner and a leachate collection system. A new landfill at Paducah would accept waste streams similar to those that have been accepted in the past. The permit for the previously existing landfills did not include radioactivity limits; instead, these levels were administratively controlled. Typically, if radioactivity was detected above background levels, the waste was classified as low-level waste (LLW), which would be sent off-site for disposal.

633 (ANL/EA/CP--88903) **Waste-clearance strategy for DOE waste processed at commercial facilities.** Chen, S.Y.; Pfingston, M.; LePoire, D. Argonne National Lab., IL (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9606116--26: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96010769. Source: OSTI; NTIS; INIS; GPO Dep.

In May 1991, a moratorium was issued on shipping potentially mixed waste from DOE facilities nationwide to commercial treatment, storage, and disposal facilities. A potential waste-clearance strategy was developed to address the DOE mixed-waste moratorium issues, which had resulted from a lack of exisitng volume contamination regulations. This strategy also has important potential applications for establishing site clearance limits that ensure worker and public risks remain well below regulatory limits.

634 (ANL/EA/CP--89877) **A review of the radiological treatment.** Mueller, C.J.; Folga, S.; Nabelssi, B.; Kohout, E. Argonne National Lab., IL (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960804--43: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96012700. Source: OSTI; NTIS; INIS; GPO Dep.

The Draft Waste Management Programmatic Environmental Impact Statement (WM PEIS) was released by the U.S. Department of Energy (DOE) for public comment on September 22, 1995. Prepared in accordance with the National Environmental Policy Act (NEPA), the Final WM PEIS is currently scheduled for release in late summer 1996. The Draft WM PEIS was published after about 3 years of effort to select and evaluated the best alternatives for treating, storing, and disposing of the 50-year legacy of radioactive and chemically hazardous wastes existing within the DOE complex. The evaluation examined the potential health and environmental impacts of integrated waste management alternatives for five categories of waste types at 54 DOE sites. A primary consideration as a potential source of human health impacts at all sites is that of radiological releases resulting from postulated accidents involving facilities used to treat radioactive wastes. This paper first provides a brief, updated summary of the approach used to define and perform treatment facility accident analyses in the Draft WM PEIS. It reviews the selection of dominant sequences for the major sites most affected by the preferred waste management alternatives and highlights the salient accident analysis results. Finally, it summarizes and addresses key public and state and federal agency comments relating to accident analysis that were received in the public comment process.

635 (ANL/EAD/TM--20-Draft) **Low-level waste inventory, characteristics, generation, and facility assessment for treatment, storage, and disposal alternatives considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Goyette, M.L. (Argonne National Lab., IL (United States). Environmental Assessment Div.). Argonne National Lab., IL (United States). Apr 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017832. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides technical support information for use in analyzing environmental impacts associated with US Department of Energy (DOE) low-level radioactive waste (LLW) management alternatives in the Waste Management (WM) Programmatic Environmental Impact Statement (PEIS). Waste loads treated and disposed of for each of the LLW alternatives considered in the DOE WM PEIS are presented. Waste loads are presented for DOE Waste Management (WM) wastes, which are generated from routine operations. Radioactivity concentrations and waste quantities for treatment and disposal under the different LLW alternatives are described for WM waste. Waste loads treated and disposed of for the LLW alternatives and subalternatives, or cases, addressed in the WM PEIS but not included in this report are presented in the Addendum.

636 (ANL/EAD/TM--23-Draft) **Supplemental information related to risk assessment for the off-site transportation of low-level waste for the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Monette, F.A. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Biwer, B.M.; LePoire, D.J.; Chen, S.Y. Argonne National Lab., IL (United States). Apr 1995. 481p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract W-31109-ENG-38. Order Number DE95017831. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents supplemental information to support the human health risk assessment conducted for the transportation of low-level waste (LLW) in support of the US Department of Energy Waste Management Programmatic Environmental Impact Statement (WM PEIS). Detailed descriptions of the transportation health risk assessment method and results of the assessment are presented in Appendix E of the WM PEIS and are not repeated in this report. This report presents additional information that is not presented in Appendix E but is necessary to conduct the transportation risk assessment for Waste Management (WM) LLW. Included are definitions of the LLW alternatives considered in the WM PEIS, data related to the inventory and to the physical and radiological characteristics of WM LLW, an overview of the risk assessment method, and detailed results of the assessment for each WM LLW case considered.

637 (ANL/EAD/TM–25-Draft) **Hazardous waste inventory, characteristics, generation, and facility assessment for treatment, storage, and disposal alternatives considered in the U.S. Department of Energy Waste Management Programmatic Environmental Impact Statement.** Lazaro, M.A. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Antonopoulos, A.A.; Policastro, A.J.; Esposito, M.P. Argonne National Lab., IL (United States). Apr 1995. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017830. Source: OSTI; NTIS; INIS; GPO Dep.

This report focuses on the generation of hazardous waste (HW) and the treatment, storage, and disposal (TSD) of HW being generated by routine US Department of Energy (DOE) facility operations. The wastes to be considered are managed by the DOE Waste Management (WM) Division (WM HW). The waste streams are to be sent to WM operations throughout the DOE complex under four management alternatives: No Action, Decentralization, Regionalized 1, and Regionalized 2. On-site and off-site capabilities for TSD are examined for each alternative. This report (1) summarizes the HW inventories and generated amounts resulting from WM activities, focusing on the largest DOE HW generators; (2) presents estimates of the annual amounts shipped off-site, as well as the amounts treated by various treatment technology groups; (3) describes the existing and planned treatment and storage capabilities of the largest HW-generating DOE installations, as well as the use of commercial TSD facilities by DOE sites; (4) presents applicable technologies (destruction of organics, deactivation/neutralization of waste, removal/recovery of organics, and aqueous liquid treatment); and (5) describes the four alternatives for consideration for future HW management, and for each alternative provides the HW loads and the approach used to estimate the source term for routine TSD operations. In addition, potential air emissions, liquid effluents, and solid residuals associated with each alternative are presented. Furthermore, this report is supplemented with an addendum that includes detailed information related to HW inventory, characteristics, generation, and facility assessment for the TSD alternatives. The addendum also presents source terms, emission rates, and throughput totals by alternative and treatment installation.

638 (ANL/EAD/TM–29-Draft-Vol.2) **Analysis of accident sequences and source terms at waste treatment and storage facilities for waste generated by USDOE Waste Management Operations: Volume 2, Appendixes A and B.** Mueller, C. (Argonne National Lab., IL (United States)); Nabelssi, B.; Roglans-Ribas, J.; Folga, S.; Policastro, A.; Freeman, W.; Jackson, R.; Turner, S.; Mishima, J. Argonne National Lab., IL (United States). Apr 1995. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE95017803. Source: OSTI; NTIS; INIS; GPO Dep.

This volume comprises two appendixes: Chemical source terms for low-level mixed waste accidents, and radionuclide releases from facility accidents (HLW, LLW, LLMW(alpha and nonalpha)).

639 (ANL/EAD/TM–29-Draft-Vol.3) **Analysis of accident sequences and source terms at waste treatment and storage facilities for waste generated by U.S. Department of Energy Waste Management Operations, Volume 3: Appendixes C-H.** Mueller, C. (and others); Nabelssi, B.; Roglans-Ribas, J. Argonne National Lab., IL (United States). Apr 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017804. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the Appendices for the Analysis of Accident Sequences and Source Terms at Waste Treatment and Storage Facilities for Waste Generated by the U.S. Department of Energy Waste Management Operations. The main report documents the methodology, computational framework, and results of facility accident analyses performed as a part of the U.S. Department of Energy (DOE) Waste Management Programmatic Environmental Impact Statement (WM PEIS). The accident sequences potentially important to human health risk are specified, their frequencies are assessed, and the resultant radiological and chemical source terms are evaluated. A personal computer-based computational framework and database have been developed that provide these results as input to the WM PEIS for calculation of human health risk impacts. This report summarizes the accident analyses and aggregates the key results for each of the waste streams. Source terms are estimated and results are presented for each of the major DOE sites and facilities by WM PEIS alternative for each waste stream. The appendices identify the potential atmospheric release of each toxic chemical or radionuclide for each accident scenario studied. They also provide discussion of specific accident analysis data and guidance used or consulted in this report.

640 (ANL/EAD/TM–30-Draft) **Waste-Mgmt: A computer model for calculation of waste loads, profiles, and emissions.** Kotek, T.J.; Avci, H.I.; Koebnick, B.L. Argonne National Lab., IL (United States). Apr 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017800. Source: OSTI; NTIS; INIS; GPO Dep.

WASTE-MGMT is a computational model that provides waste loads, profiles, and emissions for the U.S. Department of Energy's Waste Management Programmatic Environmental Impact Statement (WM PEIS). The model was developed to account for the considerable variety of waste types and processing alternatives evaluated by the WM PEIS. The model is table-driven, with three types of fundamental waste management data defining the input: (1) waste inventories and characteristics; (2) treatment, storage and disposal facility characteristics; and (3) alternative definition. The primary output of the model consists of tables of waste loads and contaminant profiles at facilities, as well as contaminant air releases for each treatment and storage facility at each site for each waste stream. The model is implemented in Microsoft® FoxPro® for MS-DOS® version 2.5 and requires a microcomputer with at least a 386 processor and a minimum 6 MBytes of memory and 10 MBytes of disk space for temporary storage.

641 (ANL/EAD/TM–32-Draft) **Information related to low-level mixed waste inventory, characteristics, generation, and facility assessment for treatment, storage, and disposal alternatives considered in the U.S. Department of Energy Waste Management programmatic environmental impact statement.** Wilkins, B.D.; Dolak, D.A.; Wang, Y.Y.; Meshkov, N.K. Argonne National Lab., IL (United States). Apr 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017802. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared to support the analysis of risks and costs associated with the proposed treatment of low-level mixed waste (LLMW) under management of the U.S. Department of Energy (DOE). The various waste management alternatives for treatment of LLMW have been defined in the DOE's Office of Waste Management Programmatic Environmental Impact Statement. This technical memorandum estimates the waste material throughput expected at each proposed LLMW treatment facility and analyzes potential radiological and chemical releases at each DOE site resulting from treatment of these wastes. Models have been developed to generate site-dependent radiological profiles and waste-stream-dependent chemical profiles for these wastes. Current site-dependent inventories and estimates for future generation of LLMW have been obtained from DOE's 1994 Mixed Waste Inventory Report (MWIR-2). Using treatment procedures developed by the Mixed Waste Treatment Project, the MWIR-2 database was analyzed to provide waste throughput and emission estimates for each of the different waste types assessed in this report. Uncertainties in the estimates at each site are discussed for waste material throughputs and radiological and chemical releases.

642 (ANL/EAD/TM–50) **Evaluation of radioactive scrap metal recycling.** Nieves, L.A.; Chen, S.Y.; Kohout, E.J.; Nabelssi, B.; Tilbrook, R.W.; Wilson, S.E. Argonne National Lab., IL (United States). Dec 1995. 471p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96005712. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the human health risks and environmental and socio-political impacts of options for recycling radioactive scrap metal (RSM) or disposing of and replacing it. Argonne National Laboratory (ANL) is assisting the US Department of Energy (DOE), Office of Environmental Restoration and Waste Management, Oak Ridge Programs Division, in assessing the implications of RSM management alternatives. This study is intended to support the DOE contribution to a study of metal recycling being conducted by the Task Group on Recycling and Reuse of the Organization for Economic Cooperation and Development. The focus is on evaluating the justification for the practice of recycling RSM, and the case of iron and steel scrap is used as an example in assessing the impacts. To conduct the evaluation, a considerable set of data was compiled and developed. Much of this information is included in this document to provide a source book of information.

643 (ANL/EMO/CP–85698) **Mixed and low-level radioactive waste disposal from the Argonne National Laboratory-East Map Tube Facility.** Wescott, J.B.; Moos, L.P. Argonne National Lab., IL (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950877–16: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95014096. Source: OSTI; NTIS; INIS; GPO Dep.

The Map Tube Facility was a storage unit for small, highly radioactive objects. The facility consisted of 129 cast-iron pipes cast vertically in a concrete monolithic structure. The objects were packaged and placed into the pipes for storage prior to disposal or reuse in research experiments. Deterioration of the facility allowed water to enter the pipes. Release of this contaminated water has resulted in radiological contamination of underlying soil and groundwater. Sediment, principally corrosion products, collected in the bottom of the pipes. Decontamination and decommissioning of the Map Tube Facility generated a large quantity of radioactive mixed and low-level waste. All low-level and mixed waste that can not be treated on-site is sent to the Westinghouse Hanford Company (WHC) in Richland, Washington for storage or disposal. Because of the difficulty and cost of disposing radioactive mixed waste, a great amount of effort was expended to limit the mixed waste volume. The final volume of mixed waste was approximately 99 percent less than originally generated with total waste disposal costs being reduced by roughly two-thirds.

644 (ANL/EMO/CP–89921) **Mixed waste disposal at Argonne National Laboratory-East.** Wescott, J. Argonne National Lab., IL (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960648–6: 21. annual conference of the National Association of Environmental Professionals: practical environmental directions - a changing agenda, Houston, TX (United States), 2-6 Jun 1996). Order Number DE96010800. Source: OSTI; NTIS; INIS; GPO Dep.

Off-site disposal of mixed waste was severely curtailed at the beginning of FY 96. During FY 95 Argonne National Laboratory-East (ANL-E) conducted a comprehensive characterization and packaging project to remove mixed waste from the ANL-E inventory. The mixed wastes were primarily historic material which had been stored on-site since 1987. The waste consisted of solid debris, sludges, ignitable and corrosive liquids, and water-reactive metal. All of the waste was contaminated with varying degrees of radioactivity. The first step in the characterization process was to review available documentation on the waste. Because of the historic nature of the material, most records were incomplete. Using the records as a guide, the waste was divided into groups that could each be sampled according to the physical nature of the material. Worker safety was an important consideration during the sampling phase, therefore, several precautions were taken to prevent spills or cause unnecessary chemical reactions in the material. Characterization activities were either completed entirely by ANL-E technicians or with assistance from specialized contractors. Once characterization of the waste was complete it was packaged for shipment to other DOE facilities for storage and eventual treatment. Because most of the mixed waste treatment systems were not yet operational, waste was packaged to ensure integrity for a long period of time. Fifty-five cubic meters of mixed waste was characterized and packaged during FY 95. Most of this material was sent off-site. However, the remainder was stored in a configuration that will provide better health and safety protection than previously afforded.

645 (ANL/EMO/CP–90484) **Solvent usage and recycling potential in a research and development setting.** Vivio, F.; Thuot, J.R.; Peters, R.W. Argonne National Lab., IL (United States). [1996]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960741–12: Pollution prevention conference, Chicago, IL (United States), 9-11 Jul 1996). Order Number DE96012758. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory utilizes thousands of gallons of chemicals each year. Laboratory wastes can be broadly characterized as coming from three focus areas: (1) restoration and decommissioning associated wastes generate larger quantities of waste on a one-time basis. The wastes may be non-hazardous to highly toxic and the quantities are variable. (2) Laboratory operations generate approximately 50% of all waste disposed. Operational waste can be characterized as less hazardous, reasonably consistent in nature, generally in larger quantities. (3) the final waste stream is small quantities of many different materials coming from many different waste streams. This waste stream is at the center of ANL's pollution prevention program. The research areas have implemented many pollution prevention techniques. Solvent substitution has been effective in reducing hazardous cleaning wastes, scintillation cocktail wastes, and other chlorinated wastes. Micro chemistry is effective at minimizing certain chemical process wastes, developing new analytical chemistry procedures has reduced and eliminated other waste forms. New instrumentation has provided first level reductions in many waste streams. Despite these new techniques solvent usage remains the largest research related waste stream. The present solvents are generated from instruments such as electrophoresis and high pressure liquid chromatographs (HPLC), solvent extractions, biological staining and cleaning practices. ANL recognizes the significant role recycling this waste stream is in Pollution Prevention Program implementation. ANL initiated a study to quantify solvent usage, characterization of the waste solvent, and match the purity requirements exploring all opportunities to substitute and recycle.

646 (ANL/ET/CP–87963) **Effects of aqueous environment on long-term durability of phosphate-bonded ceramic waste forms.** Singh, D.; Wagh, A.S.; Jeong, S.Y. Argonne National Lab., IL (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960212–33: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006736. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last few years, Argonne National Laboratory has been developing room-temperature-setting chemically-bonded phosphate ceramics for solidifying and stabilizing low-level mixed wastes. This technology is crucial for stabilizing waste streams that contain volatile species and off-gas secondary waste streams generated by high-temperature treatment of such wastes. Magnesium phosphate ceramic has been developed to treat mixed wastes such as ash, salts, and cement sludges. Waste forms of surrogate waste streams were fabricated by acid-base reactions between the mixtures of magnesium oxide powders and the wastes, and phosphoric acid or acid phosphate solutions. Dense and hard ceramic waste forms are produced in this process. The principal advantage of this technology is that the contaminants are immobilized by both chemical stabilization and subsequent microencapsulation of the reaction products. This paper reports the results of durability studies conducted on waste forms made with ash waste streams spiked with hazardous and radioactive surrogates. Standard leaching tests such as ANS 16.1 and TCLP were conducted on the final waste forms. Fates of the contaminants in the final waste forms were established by electron microscopy. In addition, stability of the waste forms in aqueous environments was evaluated with long-term water-immersion tests.

647 (ANL/ET/CP–88272) **Chemically bonded phosphate ceramics for stabilizing low-level radioactive wastes.** Jeong, S.; Wagh, A.S.; Singh, D. Argonne National Lab., IL (United States). Apr 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9604124–7: 98. annual meeting of the American Ceramic Society, Indianapolis, IN (United States), 14-17 Apr 1996). Order Number DE96009457. Source: OSTI; NTIS; INIS; GPO Dep.

Because phosphates. are natural mineral analogs of radioactive elements, chemically bonded phosphate ceramics were developed to stabilize low-level radioactive waste. Ash, Fe_2O_3, and $FePO_4$ wastes with 0.5 wt.% Ce^{3+}, added as a surrogate for U^{3+} and Pu^{3+} were stabilized in an $Mg_3(PO_4)_2$ ceramic at room temperature. The final waste forms exhibited high strength and low permeability to water. Cerium leaching from the final ash, Fe_2O_3, and $FePO_4$ waste forms, determined by the toxicity characteristic leaching procedure, was 0.095, 0.39, and 0.49 ppb, respectively. These values are several orders of magnitude below those of Ce from untreated waste. Detailed solubility characteristics of $CePO_4$ and microscopy of the waste form indicate that the extremely low leaching rate of Ce may be due to its chemical fixation as a monazite in the phosphate matrix, accompanied by its microencapsulation in the dense ceramic matrix of $Mg_3(PO_4)_2$ that contained very low solubility phases. These observations suggest that chemically bonded phosphate ceramics may be excellent candidate materials for stabilizing radioactive contaminants such as U and Pu.

648 (ANL/ET/CP–88344) **Leaching behavior of phosphate-bonded ceramic waste forms.** Singh, D.; Wagh, A.S.; Jeong, S.Y.; Dorf, M. Argonne National Lab., IL (United States). Apr 1996. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9604124–5: 98. annual meeting of the American Ceramic Society, Indianapolis, IN (United States), 14-17 Apr 1996). Order Number DE96009416. Source: OSTI; NTIS; INIS; GPO Dep.

Over the last few years, Argonne National Laboratory has been developing room-temperature-setting chemically bonded phosphate ceramics for solidifying and stabilizing low-level mixed wastes. This technology is crucial for stabilizing waste streams that contain volatile species and off-gas secondary waste streams generated by high-temperature treatment of such wastes. We have developed a magnesium phosphate ceramic to treat mixed wastes such as ash, salts, and cement sludges. Waste forms of surrogate waste streams were fabricated by acid-base reactions between the mixtures of magnesium oxide powders and the wastes, and phosphoric acid or acid phosphate solutions. Dense and hard ceramic waste forms are produced in this process. The principal advantage of this technology is that the contaminants are immobilized by both chemical stabilization and subsequent microencapsulation of the reaction products.

This paper reports the results of durability studies conducted on waste forms made with ash waste streams spiked with hazardous and radioactive surrogates. Standard leaching tests such as ANS 16.1 and TCLP were conducted on the final waste forms. Fates of the contaminants in the final waste forms were established by electron microscopy. In addition, stability of the waste forms in aqueous environments was evaluated with long-term water-immersion tests.

649 (ANL/ET/CP--88412) **Zirconium phosphate waste forms for low-temperature stabilization of cesium-137-containing waste streams.** Singh, D.; Wagh, A.S.; Tlustochowicz. Argonne National Lab., IL (United States). Apr 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9604124--6: 98. annual meeting of the American Ceramic Society, Indianapolis, IN (United States), 14-17 Apr 1996). Order Number DE96009415. Source: OSTI; NTIS; INIS; GPO Dep.

Novel chemically bonded phosphate ceramics are being developed and fabricated for low-temperature stabilization and solidification of waste streams that are not amenable to conventional high-temperature stabilization processes because volatiles are present in the wastes. A composite of zirconium-magnesium phosphate has been developed and shown to stabilize ash waste contaminated with a radioactive surrogate of ^{137}Cs. Excellent retainment of cesium in the phosphate matrix system was observed in Toxicity Characteristic Leaching Procedure tests. This was attributed to the capture of cesium in the layered zirconium phosphate structure by intercalation ion-exchange reaction. But because zirconium phosphate has low strength, a novel zirconium/magnesium phosphate composite waste form system was developed. The performance of these final waste forms, as indicated by compression strength and durability in aqueous environments, satisfy the regulatory criteria. Test results indicate that zirconium-magnesium-phosphate-based final waste forms present a viable technology for treatment and solidification of cesium-contaminated wastes.

650 (ANL/RE/CP--85598) **Structural and seismic analyses of waste facility reinforced concrete storage vaults.** Wang, C.Y. Argonne National Lab., IL (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950740--86: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95014091. Source: OSTI; NTIS; INIS; GPO Dep.

Facility 317 of Argonne National Laboratory consists of several reinforced concrete waste storage vaults designed and constructed in the late 1940's through the early 1960's. In this paper, structural analyses of these concrete vaults subjected to various natural hazards are described, emphasizing the northwest shallow vault. The natural phenomenon hazards considered include both earthquakes and tornados. Because these vaults are deeply embedded in the soil, the SASSI (System Analysis of Soil-Structure Interaction) code was utilized for the seismic calculations. The ultimate strength method was used to analyze the reinforced concrete structures. In all studies, moment and shear strengths at critical locations of the storage vaults were evaluated. Results of the structural analyses show that almost all the waste storage vaults meet the code requirements according to ACI 349--85. These vaults also satisfy the performance goal such that confinement of hazardous materials is maintained and functioning of the facility is not interrupted.

651 (BHI--00010-Rev.1) **Hanford Site Asbestos Abatement Plan (HSAAP). Revision 1.** Mewes, B.S. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005706. Source: OSTI; NTIS; GPO Dep.

The Hanford Site Asbestos Abatement Plan lists priorities for asbestos abatement activities to be conducted in Hanford Site facilities. This plan is based on original asbestos assessment data gathered in fiscal year 1989, and revised during fiscal year 1995 that evaluated 438 Hanford Site facilities for the presence and condition of asbestos. During fiscal year 1995, 18 facilities were omitted from the Hanford Site Asbestos Abatement Plan as a result of building demolition and asbestos abatement efforts. Asbestos-containing buildings are classified according to the potential risk asbestos poses to building personnel. This plan requires that asbestos condition update reports be prepared for all affected facilities. The reporting is completed by the asbestos coordinator for each of the affected facilities and transmitted to the Hanford Site Asbestos Abatement Plan manager annually. The plan manager uses this information to reprioritize future project lists. Currently, one facility is determined to be Class AI, indicating the highest potential for asbestos exposure. Class AI, A2, and BI facilities are the highest priority for asbestos abatement. Abatement of the Class AI and A2 facilities is scheduled through fiscal year 1996. Abatement activity in B1 facilities will reduce the risk for further Class "A" conditions to arise.

652 (BHI--00053) **Qualitative risk assessment for the 100-FR-1 source operable unit.** Corporation, I.T. Bechtel Hanford, Inc., Richland, WA (United States). Aug 1994. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005868. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the Qualitative risk assessment (QRA) for the waste sites associated with the 100-FR-1 Operable Unit. The QRA is an evaluation of risk for a predefined set of human and ecological exposure scenarios. It is not intended to replace or be a substitute for a baseline risk assessment. The QRA is streamlined to consider only two human health scenarios (frequent-and occasional-use) with four exposure pathways (soil ingestion, fugitive dust inhalation, inhalation of volatile organics, and external radiation exposure) and a limited ecological evaluation. The use of these scenarios and pathways was agreed to by the 100 Area Tri-Party unit managers.

653 (BHI--00117-Rev.2) **Nonradioactive Dangerous Waste Landfill supplemental information to the Hanford Facility Contingency Plan (DOE/RL-93-75).** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012110. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the Nonradioactive Dangerous Waste Landfill and is intended to be used as a supplement to DOE/RL-93-75, 'Hanford Facility Contingency Plan.' This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of the Washington Administrative Code, Chapter 173-303 for certain Resource, Conservation and Recovery Act of 1976 waste management units. The Nonradioactive

Dangerous Waste Landfill (located approximately 3.5 miles southeast of the 200 East Area at the Hanford Site) was used for disposal of nonradioactive dangerous waste from January 1975 to May 1985. Currently, there are no dangerous waste streams disposed in the Nonradioactive Dangerous Waste Landfill. Dangerous waste management activities are no longer required at the landfill. The landfill does not present a significant hazard to adjacent units, personnel, or the environment. It is unlikely that incidents presenting hazards to public health or the environment would occur at the Nonradioactive Dangerous Waste Landfill.

654 (BHI–00139-Rev.1) **Environmental Restoration Disposal Facility waste acceptance criteria. Revision 1.** Corriveau, C.E. Bechtel Hanford, Inc., Richland, WA (United States). [1996]. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005936. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Disposal Facility (ERDF) is designed to be an isolation structure for low-level radioactive remediation waste, chemically contaminated remediation waste, and remediation waste that contains both chemical and radioactive constituents (i.e., mixed remediation waste) produced during environmental remediation of Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) past-practice units at the Hanford Site. Remedial action wastes, which will become a structural component of the ERDF, include bulk soil, demolition debris, and miscellaneous wastes from burial grounds. These wastes may originate from CERCLA past-practice sites (i.e., operable units) in the 100 Areas, the 200 Areas, and the 300 Area of the Hanford Site.

655 (BHI–00141) **RARA FY 1994 summary report.** Hayward, W.M. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005060. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation Area Remedial Action (RARA) is responsible for the interim stabilization and maintenance of the majority of the inactive waste sites at Hanford. This equates to approximately 400 individual sites and 4,000 acres. Examples of waste sites include cribs, ponds, ditches, burial grounds, tanks, french drains, and unplanned release sites. Consistent with the site effort to reduce liquid waste disposal to the soil column and the site transition from production activities to environmental restoration, several new sites were deactivated, isolated, and transferred into the RARA project in July 1994. They were all Resource Conservation and Recovery Act of 1976 (RCRA) Treatment Storage and Disposal (TSD) Units: 216-A-36 B Crib, 216-A-37-1 Crib, 216-B-3 Pond and Ditch, 216-S-10 ditch, 216-U-12 Crib, and the Non-Radioactive Dangerous Waste Landfill. RARA activities are broken into two broad categories, interim stabilization and surveillance and maintenance. Interim stabilization addresses major corrective action for sites with radioactive surface contamination. Surface contamination is handled two ways. First, surface contamination may be collected using heavy equipment, and consolidated (preferably) on the waste site from which it originated then covered with a layer of soil or other material. Secondly, surface contamination may be covered with a layer of soil or other material. The method employed is dictated by whether surface contamination is associated with a waste site or has migrated onto areas not associated with a waste site. Waste sites are then revegetated or receive treatments of nonselective herbicide. Interim stabilization is required to minimize the spread of radioactive material from these individual waste sites. RARA has interim stabilized or decontaminated approximately 1,400 acres at Hanford over the last 14 years.

656 (BHI–00352-Rev.2) **Final hazard classification for N basin water filtration and sediment relocation operations.** Pisarcik, D.J.; Kretzschmar, S.P. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005935. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an auditable safety analysis and hazard classification for the filtration of basin water and the relocation of 105-N basin solids to the North Cask Pit within the basin complex. This report assesses the operation of the Water Filtration System and the Remotely Operated Sediment Extraction Equipment (ROSEE). These activities have an activity hazard classification of radiological. Inventories of potentially releasable nonradioactive hazardous materials are far below the reportable quantities of 40 CFR 302. No controls are required to maintain the releasable inventories of these materials below the reportable quantities. Descriptive material is included to provide a general understanding of the water filtration and sediment relocation processes. All equipment will be operated as described in work instructions and/or applicable procedures. Special controls associated with these activities are as follows: (1) A leak inspection of the ROSEE system shall be performed at least once every 5-hour period of sediment relocation operation. (2) A berm must be in place around the North Cask Pit to redirect a potential abovewater ROSEE system leak back to the basin.

657 (BHI–00395) **Design, operations, and maintenance of the soil vapor extraction systems for the 200 West Area Carbon Tetrachloride Expedited Response Action.** Tranbarger, R.K. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012119. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the design, operating, and maintenance guidelines for the soil vapor extraction (SVE) systems implemented as part of the 200 West Area Carbon Tetrachloride ERA. Additionally, this document provides general information regarding the ERA, the SVE system design, and the general approach towards soil vapor extraction. The remaining content of this document includes the following: regulatory compliance; summary of vadose zone physical and containment characteristics; past and present SVE system designs and potential design upgrades; general design and monitoring considerations for the SVE systems; descriptions of the SVE system components and their respective functions; safety requirements; operation of the SVE systems including startup, surveillances, shutdown, GAC canister changeouts, and wellfield characterization; monitoring requirements; SVE optimization; and instrument calibrations, preventive maintenance, and spare parts and site inventory requirements.

658 (BHI–00541-Rev.) **Radiological and hazardous material characterization report for the south portion of the 313 Building.** Harris, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005933. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the characterization was to determine the extent of radiological contamination and presence of hazardous materials, to allow the preparation of an accurate cost estimate, and to plan for pre-demolition cleanup work to support building isolation. The scope of services for the project included the following tasks: Records Review and Interviews; Site Reconnaissance; Radiological Survey; and Sampling and Analysis.

659 (BHI–00639-Rev.1) **120-D-1 (100-D) Ponds training plan. Revision 1.** Mitchem, G.B. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005879. Source: OSTI; NTIS; INIS; GPO Dep.

This is the Environmental Restoration Contractor Team personnel training plan for the 100-D Ponds treatment, storage and disposal unit. This plan is intended to meet the requirements of the WAC 173-303-330 and Hanford Dangerous Waste Permit. The Ponds received nonradioactive and nondangerous wastes as part of the Water Treatment Facility. However, sampling data have indicated a radioactive 'crust' over most of the settling pond bottom and radioactive contamination in the soils beneath the pond, as well as contamination by polychlorinated biphenyls and metals.

660 (BHI–00735) **202-S Hexone Facility supplemental information to the Hanford Facility Contingency Plan.** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008012. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the 202-S Hexone Facility and is intended to be used as a supplement to the Hanford Facility Contingency Plan. This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of WAC 173-303 for certain Resource Conservation and Recovery Act of 1976 (RCRA) waste management units. The 202-S Hexone Facility is not used to process radioactive or nonradioactive hazardous material. Radioactive, dangerous waste material is contained in two underground storage tanks, 276-S-141 and 276-S-142. These tanks do not present a significant hazard to adjacent facilities, personnel, or the environment. Currently, dangerous waste management activities are not being applied at the tanks. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the 202-S Hexone Facility.

661 (BHI–00736) **Bechtel Hanford, Inc./ERC team health and safety plan Environmental Restoration Disposal Facility operations.** Turney, S.R. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009916. Source: OSTI; NTIS; INIS; GPO Dep.

A comprehensive safety and health program is essential for reducing work-related injuries and illnesses while maintaining a safe and health work environment. This document establishes Bechtel Hanford, Inc. (BHI)/Environmental Restoration Contractor (ERC) team requirements, policies, and procedures and provides preliminary guidance to the Environmental Restoration Disposal Facility (ERDF) subcontractor for use in preparing essential safety and health documents. This health and safety plan (HASP) defines potential safety and health issues associated with operating and maintaining the ERDF. A site-specific HASP shall be developed by the ERDF subcontractor and shall be implemented before operations and maintenance work can proceed. An activity hazard analysis (AHA) shall also be developed to provide procedures to identify, assess, and control hazards or potential incidents associated with specific operations and maintenance activities.

662 (BHI–00747) **General design criteria for Richland Environmental Restoration Project.** Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008962. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides uniform general design criteria based on national consensus and commercial codes and standards for use in design, construction, and maintenance of facilities to support Richland Environmental Restoration Project activities at the Hanford Site. This general design criteria does not address high-level waste (HLW), as it is anticipated that HLW will not be encountered during Environmental Restoration Contractor (ERC) activities; however, should HLW be encountered relevant and appropriate design requirements will be addressed in site- or task-specific design basis documents. These criteria establish the basis for preparing performance-based specifications, subcontracts, and other work controlling documents. Required performance and Hanford Site-specific information, and a compilation of potentially applicable codes and standards, will be delineated by Bechtel Hanford, Inc. (BHI) in work controlling documents. The subcontractor or vendor will be required to identify the codes and standards used in designing, fabricating, erecting, installing, inspecting, testing, deactivating, decommissioning, demolishing, and operating facilities and equipment as appropriate, and submit to BHI for review.

663 (BHI–00752) **100-B/C demonstration project final report.** April, J.G.; Galbraith, M.J.; Lowe, J.A.; Naiknimbalkar, N.M. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009061. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the 100-B/C Demonstration Project was to initiate remedial action (RA) in the 100 Area source sites and to address uncertainties in remedial design (RD) planning. An engineering evaluation/cost analysis was performed on the 116-B-4, 116-B-5, and 116-C-1 sites within the 100-B/C Reactor Area and submitted for a 30-day public comment period starting on May 15, 1995. An action memorandum for this expedited response action was issued on June 28, 1995 for these three sites. A Streamlined Approach for Environmental Restoration (SAFER) workshop was conducted during April 1995 by the Tri-Parties to develop objectives for what is termed the 100-B/C Demonstration Project. The main objective of the 100-B/C Demonstration Project was to implement RA in the 100 Areas on selected waste sites, achieve cleanup standards, and address RD/RA uncertainties.

664 (BHI–00768) **100 and 300 Area Burial Ground remediation study.** Chiaramonte, G.R. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012134. Source: OSTI; NTIS; INIS; GPO Dep.

This burial ground study report documents the results of an evaluation of alternatives for remediation of Hanford 100 and 300 Area burial grounds. The current remediation baseline assumes that the contents of all burial grounds will be removed and disposed at the Environmental Restoration Disposal Facility (ERDF). This baseline assumes that this approach will remediate the sites to a level that "does not preclude any future use." This study evaluates alternatives to this approach which provide overall protection of human health and the environment, pose less worker risk, and are more cost effective, but may require some restrictions on the use of portions of the 100 and 300 Areas. Information is provided in this report to support future decision-making by the US Department of Energy (DOE), the regulators, and stakeholders.

665 (BHI–00774) **1907-DR Process Sewer Outfall soil contamination assessment sampling and analysis plan.** Hope, S.J. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012126. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling and analysis plan contains the field sampling plan (FSP) and the quality assurance project plan (QAPjP) for the sampling and analytical activities planned for the 1907-DR Process Sewer outfall soil contamination assessment. This sampling and analysis plan is presented in two sections: the FSP and the QAPjP. The FSP defines the sampling and analytical methodologies to be preformed during the assessment. The QAPjP provides information on the quality assurance/quality control parameters related to the sampling and analytical methodologies.

666 (BHI–00777) **Work plan for the excavation of contaminated materials from 100-D Ponds.** Ludowise, J.D.; Blumenkranz, B.D.; Moore, R.T.; Stankovich, M.T. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012127. Source: OSTI; NTIS; INIS; GPO Dep.

The D Ponds were used as a treatment, storage and/or disposal (TSD) facility under the Resource Conservation and Recovery Act of 1976 (OKRA). The D-Ponds waste site is located in the 100-DR-1 Operable Unit of the 100 Area at the Hanford Reservation. The site consists of two surface ponds (now dry) separated by an earthen dike. the south pond was used as a settling pond for waste water from the 100-D Area and contains the sediment material to be removed. The north pond was used as a percolation pond and received clarified overflow from the settling pond. Two horizontal pipes, buried in the earthen dike, connect the two ponds and allowed the water to overflow from the settling pond to the percolation pond. This work plan describes the work required to remediate the D-Ponds waste site. The actions needed to remediate the site include the removal and disposal of contaminated sediments, piping and debris. This remedial action is required to be complete by 1998. The U.S. Department of Energy, Richland Operations Office is voluntarily accelerating the cleanup.

667 (BHI–00789) **Final hazard classification of the 100-D Pond voluntary remediation project.** Adam, W.J. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012128. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the final hazard classification for the voluntary remediation activities to be conducted at the 100-D Pond Treatment, Storage, and Disposal Facility. Based on the inventories calculated from characterization data and the releasable inventory, these activities are classified as radiological.

668 (BHI–00806) **126-F-1 radiological investigation and downposting. Final report.** Smith, D.L. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009927. Source: OSTI; NTIS; INIS; GPO Dep.

The 126-F-1 ashpit is located in the 100 F Area of the Hanford Site, in the 100-FR-2 operable unit. This waste site is managed under the Radiation Area Remedial Action (RARA) project. As such, the area has undergone routine surveillance which indicated that the site may have been improperly posted as a contamination area. The ashpit was the result of coal fired plant operations in the 100 F Area. Coal ash contains various amounts of fly ash, bottom ash, and boiler slag. From 1944 to 1971, reactor cooling water was discharged to the 107-F retention basins via an above grade pipe. This paper traversed the north edge of the 126-F-1 ash pit. Effluent leakage from the pipeline led to the formation of a pond north of the pipeline. In addition, effluent flowed south into the ashpit. Ultimately, the pipeline was removed. The area north of the pipeline was included inside the 100 F concrete marker posts and as such was posted as an underground radioactive material area. At a later unspecified date, the entire ashpit was posted "Surface Contamination Area", then later as a "Contamination Area". Routine surveys indicated that radioactive contamination levels were low. This report details efforts that lead to the downposting of the 126-F-1 ashpit from contamination area to no posting or underground radioactive material.

669 (BNL–52478) **Polyethylene encapsulation full-scale technology demonstration. Final report.** Kalb, P.D.; Lageraaen, P.R. Brookhaven National Lab., Upton, NY (United States). Oct 1994. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96001638. Source: OSTI; NTIS; INIS; GPO Dep.

A full-scale integrated technology demonstration of a polyethylene encapsulation process, sponsored by the US Department of Energy (DOE) Office of Technology Development (OTD), was conducted at the Environmental & Waste Technology Center at Brookhaven National Laboratory (BNL.) in September 1994. As part of the Polymer Solidification National Effort, polyethylene encapsulation has been developed and tested at BNL as an alternative solidification technology for improved, cost-effective treatment of low-level radioactive (LLW), hazardous and mixed wastes. A fully equipped production-scale system, capable of processing 900 kg/hr (2000 lb/hr), has been installed at BNL. The demonstration covered all facets of the integrated processing system including pre-treatment of aqueous wastes, precise feed metering, extrusion processing, on-line quality control monitoring, and process control.

670 (BNL–62863) **Three multimedia models used at hazardous and radioactive waste sites.** Moskowitz, P.D. (Brookhaven National Lab., Upton, NY (United States)); Pardi, R.; Fthenakis, V.M.; Holtzman, S.; Sun, L.C.; Rambaugh, J.O.; Potter, S. Brookhaven National Lab., Upton, NY (United States). Feb 1996. 86p. Sponsored by USDOE,

Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States);Nuclear Regulatory Commission, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96008725. Source: OSTI; NTIS; INIS; GPO Dep.

Multimedia models are used commonly in the initial phases of the remediation process where technical interest is focused on determining the relative importance of various exposure pathways. This report provides an approach for evaluating and critically reviewing the capabilities of multimedia models. This study focused on three specific models MEPAS Version 3.0, MMSOILS Version 2.2, and PRESTO-EPA-CPG Version 2.0. These models evaluate the transport and fate of contaminants from source to receptor through more than a single pathway. The presence of radioactive and mixed wastes at a site poses special problems. Hence, in this report, restrictions associated with the selection and application of multimedia models for sites contaminated with radioactive and mixed wastes are highlighted. This report begins with a brief introduction to the concept of multimedia modeling, followed by an overview of the three models. The remaining chapters present more technical discussions of the issues associated with each compartment and their direct application to the specific models. In these analyses, the following components are discussed: source term; air transport; ground water transport; overland flow, runoff, and surface water transport; food chain modeling; exposure assessment; dosimetry/risk assessment; uncertainty; default parameters. The report concludes with a description of evolving updates to the model; these descriptions were provided by the model developers.

671 (BNL–62901) **Gamma irradiation testing of montan wax barrier materials for in-situ waste containment.** Soo, P.; Heiser, J. Brookhaven National Lab., Upton, NY (United States). Feb 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96009939. Source: OSTI; NTIS; INIS; GPO Dep.

A scoping study was carried out to quantify the potential use of a montan wax as a barrier material for subsurface use. If it possesses resistance to chemical and structural change, it could be used in a barrier to minimize the migration of contaminants from their storage or disposal locations. Properties that were evaluated included hardness, melting point, molecular weight, and biodegradation as a function of gamma radiation dose. The main emphasis was to quantify the wax's long-term ability to withstand radiation-induced mechanical, chemical, and microbial degradation.

672 (CONF-9001183–Exec.Summ.) **LLW Forum meeting report, January 24–26 1990.** Afton Associates, Inc., Washington, DC (United States). [1990]. 51p. Sponsored by USDOE, Washington, DC (United States). From Low level radioactive waste meeting; San Francisco, CA (United States); 24-26 Jan 1990. Order Number DE96013291. Source: OSTI; NTIS; INIS; GPO Dep.

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673 (CONF-9004379–Exec.Summ.) **Low-Level Waste Forum meeting report. Quarterly meeting, April 25–27, 1990.** Afton Associates, Inc., Washington, DC (United States). [1990]. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Austin, TX (United States); 25-27 Apr 1990. Order Number DE96013290. Source: OSTI; NTIS; GPO Dep.

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674 (CONF-9007264–Exec.Summ.) **Low-Level Waste Forum meeting report. Quarterly meeting, July 23–24, 1990.** Afton Associates, Inc., Washington, DC (United States). [1990]. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Minneapolis, MN (United States); 23-24 Jul 1990. Order Number DE96013289. Source: OSTI; NTIS; GPO Dep.

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675 (CONF-9010566–Exec.Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1990. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Miami, FL (United States); 17-19 Oct 1990. Order Number DE96013288. Source: OSTI; NTIS; GPO Dep.

This paper provides highlights from the October 1990 meeting of the Low Level Radioactive Waste Forum. Topics of discussion included: a special session on liability and financial assurance needs; proposal to dispose of mixed waste at federal facilities; state plans for interim storage; and hazardous materials legislation.

676 (CONF-9104440–Exec.Summ.) **LLW Forum meeting report, April 18–19, 1991.** Afton Associates, Inc., Washington, DC (United States). [1991]. 64p. Sponsored by USDOE, Washington, DC (United States). From Low level radioactive waste meeting; New Orleans, LA (United States); 18-19 Apr 1991. Order Number DE96013286. Source: OSTI; NTIS; INIS; GPO Dep.

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677 (CONF-9107286–Exec.Summ.) **Low-level Waste Forum meeting report. Quarterly meeting, July 25–26, 1991.** Afton Associates, Inc., Washington, DC (United States). [1991]. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Seattle, WA (United States); 25-26 Jul 1991. Order Number DE96013285. Source: OSTI; NTIS; INIS; GPO Dep.

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678 (CONF-9110558–Exec.Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1991. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Las Vegas, NV (United States); 10-11 Oct 1991. Order Number DE96013284. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains highlights from the 1991 fall meeting of the Low Level Radioactive Waste Forum. Topics included legal updates; US NRC updates; US EPA updates; mixed waste issues; financial assistance for waste disposal facilities; and a legislative and policy report.

679 (CONF-9204311–Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1992. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste spring meeting; Williamsburg, VA (United States); 27-29 Apr 1992. Order Number DE96013282. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides highlights from the spring meeting of the Low Level Radioactive Waste Forum. Topics of discussion included: state and compact reports; New York's challenge to the constitutionality of the Low-Level Radioactive Waste Amendments Act of 1985; DOE technical assistance for 1993; interregional import/export agreements; Department of Transportation requirements; superfund liability; nonfuel bearing components; NRC residual radioactivity criteria.

680 (CONF-9207253–Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1992. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste summer meeting; Leystone, CO (United States); 23-24 Jul 1992. Order Number DE96013281. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides highlights from the summer meeting of the Low Level Radioactive Waste Forum. Topics of discussion included: responsibility for nonfuel component disposal; state experiences in facility licensing; and volume projections.

681 (CONF-9210513–Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1992. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste fall meeting; Savannah, GA (United States); 22-23 Oct 1992. Order Number DE96013280. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides highlights from the 1992 fall meeting of the Low LEvel Radioactive Waste Forum. Topics included: disposal options after 1992; interregional agreements; management alternatives; policy; and storage.

682 (CONF-9301164–Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1993. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste winter meeting; San Diego, CA (United States); 27-29 Jan 1993. Order Number DE96013279. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides the results of the winter meeting of the Low Level Radioactive Waste Forum. Discussions were held on the following topics: new developments in states and compacts; adjudicatory hearings; information exchange on siting processes, storage surcharge rebates; disposal after 1992; interregional access agreements; and future tracking and management issues.

683 (CONF-9304305–Summ.) **Low-level Waste Forum meeting report. Spring meeting, April 28–30, 1993.** Afton Associates, Inc., Washington, DC (United States). [1993]. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste spring meeting; Austin, TX (United States); 28-30 Apr 1993. Order Number DE96013278. Source: OSTI; NTIS; INIS; GPO Dep.

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684 (CONF-9307231–Summ.) **Low-level Waste Forum meeting report. Summer meeting, July 21–23, 1993.** Afton Associates, Inc., Washington, DC (United States). [1993]. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level waste summer meeting; Santa Fe, NM (United States); 21-23 Jul 1993. Order Number DE96013277. Source: OSTI; NTIS; INIS; GPO Dep.

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685 (CONF-9310462–Summ.) **Low-level Waste Forum meeting report. Fall meeting, October 20–22, 1993.** Afton Associates, Inc., Washington, DC (United States). [1993]. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste Fall meeting; Williamsburg, VA (United States); 20-22 Oct 1993. Order Number DE96013276. Source: OSTI; NTIS; INIS; GPO Dep.

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686 (CONF-9401133–Summ.) **Low-level Waste Forum meeting report. Winter meeting, January 26–28, 1994.** Afton Associates, Inc., Washington, DC (United States). [1994]. 77p. Sponsored by USDOE, Washington, DC (United States);Washington State Government, Olympia, WA (United States). DOE Contract AC07-94ID13223. Contract C9400065. From Low level radioactive waste winter meeting; San Diego, CA (United States); 24-28 Jan 1994. Order Number DE96013275. Source: OSTI; NTIS; INIS; GPO Dep.

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687 (CONF-9404126–6) **Mixed Waste Integrated Program – Problem-oriented technology development.** Hart, P.W. (Dept. of Energy, Germantown, MD (United States)); Wolf, S.W.; Berry, J.B. Oak Ridge National Lab., TN (United States). [1994]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Mixed waste thermal treatment symposium; Denver, CO (United States); 12-14 Apr 1994. Order Number DE96009999. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Integrated Program (MWIP) is responding to the need for DOE mixed waste treatment technologies that meet these dual regulatory requirements. MWIP is developing emerging and innovative treatment technologies to determine process feasibility. Technology demonstrations will be used to determine whether processes are superior to existing technologies in reducing risk, minimizing life-cycle cost, and improving process performance. Technology development is ongoing in technical areas required to process mixed waste: materials handling, chemical/physical treatment, waste destruction, off-gas treatment, final forms, and process monitoring/control. MWIP is currently developing a suite of technologies to process heterogeneous waste. One robust process is the fixed-hearth plasma-arc process that is being developed to treat a wide variety of contaminated materials with minimal characterization. Additional processes encompass steam reforming, including treatment of waste under the debris rule. Advanced off-gas systems are also being developed. Vitrification technologies are being demonstrated for the treatment of homogeneous wastes such as incinerator ash and sludge. An alternative to conventional evaporation for liquid removal–freeze crystallization–is being investigated. Since mercury is present in numerous waste streams, mercury removal technologies are being developed.

688 (CONF-9404319–Summ.) **LLW Forum meeting report, April 25–27, 1994.** Afton Associates, Inc., Washington, DC (United States). [1994]. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste spring meeting; New Orleans, LA (United States); 25-27 Apr 1994. Order Number DE96013274. Source: OSTI; NTIS; INIS; GPO Dep.

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689 (CONF-940729–1) **Characterization of mercury forms in contaminated floodplain soils.** Barnett, M.O. (Oak Ridge National Lab., TN (United States)); Turner, R.R.; Henson, T.J.; Harris, L.A.; Melton, R.E.; Stevenson, R.J. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on mercury as a global pollutant; Whistler (Canada); 10-14 Jul 1994. Order Number DE96009632. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical form or speciation of Hg in the floodplain soils of the East Fork Poplar Creek in Oak Ridge TN, a site contaminated from past industrial activity, was investigated. Hg speciation in the soils is an important factor in controlling the fate and effect of mercury at the site and in assessing human health and ecological risk. Application of 3 different sequential extraction speciation schemes indicated the Hg at the site was predominantly relatively insoluble mercuric sulfide or metallic Hg, though the relative proportions of each did not agree well between procedures. Application of x-ray and electron beam studies to site soils confirmed the presence of metacinnabar, a form of mercuric sulfide, the first known evidence of authigenic mercuric sulfide formation in soils.

690 (CONF-9407212–Summ.) **LLW Forum meeting report, July 20–22, 1994.** Afton Associates, Inc., Washington, DC (United States). [1994]. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste summer meeting; Seattle, WA (United States); 20-22 Jul 1994. Order Number DE96013273. Source: OSTI; NTIS; INIS; GPO Dep.

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691 (CONF-940815–114) **Uncertainty analysis for low-level radioactive waste disposal performance assessment at Oak Ridge National Laboratory.** Lee, D.W.; Yambert, M.W.; Kocher, D.C. Oak Ridge National Lab., TN (United States). [1994]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE95014030. Source: OSTI; NTIS; INIS; GPO Dep.

A performance assessment of the operating Solid Waste Storage Area 6 (SWSA 6) facility for the disposal of low-level radioactive waste at the Oak Ridge National Laboratory has been prepared to provide the technical basis for demonstrating compliance with the performance objectives of DOE Order 5820.2A, Chapter 111.2 An analysis of the uncertainty incorporated into the assessment was performed which addressed the quantitative uncertainty in the data used by the models, the subjective uncertainty associated with the models used for assessing performance of the disposal facility and site, and the uncertainty in the models used for estimating dose and human exposure. The results of the uncertainty analysis were used to interpret results and to formulate conclusions about the performance assessment. This paper discusses the approach taken in analyzing the uncertainty in the performance assessment and the role of uncertainty in performance assessment.

692 (CONF-940815–118) **Case study of ^{137}Cesium plots remediation at Oak Ridge National Laboratory.** Bednarz, C.A.; Garrett, D.L. Oak Ridge National Lab., TN (United States). May 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE96009621. Source: OSTI; NTIS; INIS; GPO Dep.

The primary goal of the experiment was to evaluate the long-term, low-dose effect of radiation to the environment, particularly to vegetation i.e., fescue and insects in the event of a nuclear attack. In 1968, ^{137}Cs was fused at high temperatures with silica sand particles (100 uCi/g) and applied to the surface of four 33 x 33 ft plots. Four other plots were constructed at the site to serve as background controls and were not contaminated with ^{137}Cs. The particles ranged from 88 to 177 { micro} m in diameter and were spread at a load of 72 g/m^2 over the plots. The particle size distribution was selected to simulate particle diameters characteristic of weapons fallout. Each plot received approximately 2.2 Ci of ^{137}Cs, which resulted in a total of 8.8 Ci applied to the site. The cesium plots occupy approximately 6 acres of grassy fields 330 ft north of the Clinch River. The plots are enclosed by a perimeter fence approximately 1,000 ft x 250 ft. Each of the eight plots was enclosed with sheet metal that extended 18 in. below and 24 in. above the ground surface. ORNL researchers involved with the application of the cesium (circa 1968) believed the cesium fused silica particles would not migrate vertically more than 6 to 12 in. nor migrate horizontally in any direction because of the plot metal enclosures. However, soil samples taken from the plots revealed the cesium had migrated vertically to depths of 3 to 4 ft. and horizontally in a northwest plume of several feet. Because of direct radiation exposure concerns to workers and the public, a CERCLA interim action was taken to remediate the plots. The intent of the paper will be to explain the remediation and examine the challenges associated with the remediation focusing primarily on lessons learned.

693 (CONF-9410466–Summ.) **LLW Forum meeting report, October 26–27, 1994.** Afton Associates, Inc., Washington, DC (United States). [1994]. 66p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Williamsburg, VA (United States); 26-27 Oct 1994. Order Number DE96013272. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Radioactive Waste Forum (LLW Forum) is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties. This report details activities of the meeting held October 26-27, 1994.

694 (CONF-941102–46) **Determination of operating limits for radionuclides for a proposed landfill at Paducah Gaseous Diffusion Plant.** Wang, J.C.; Lee, D.W.; Ketelle, R.H.; Lee, R.R.; Kocher, D.C. Oak Ridge National Lab., TN (United States). 24 May 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); Washington, DC (United States); 13-18 Nov 1994. Order Number DE95014032. Source: OSTI; NTIS; INIS; GPO Dep.

The operating limits for radionuclides in sanitary and industrial wastes were determined for a proposed landfill at the Paducah Gaseous Diffusion Plant (PGDP), Kentucky. These limits, which may be very small but nonzero, are not mandated by law or regulation but are needed for rational operation. The approach was based on analyses of the potential contamination of groundwater at the plant boundary and the potential exposure to radioactivity of an intruder at the landfill after closure. The groundwater analysis includes (1) a source model describing the disposal of waste and the release of radionuclides from waste to the groundwater, (2) site-specific groundwater flow and contaminant transport calculations, and (3) calculations of operating limits from the dose limit and conversion factors. The intruder analysis includes pathways through ingestion of contaminated vegetables and soil, external exposure to contaminated soil, and inhalation of suspended activity from contaminated soil particles. In both analyses, a limit on annual effective dose equivalent of 4 mrem (0.04 mSv) was adopted. The intended application of the results is to refine the radiological monitoring standards employed by the PGDP Health Physics personnel to determine what constitutes radioactive wastes, with concurrence of the Commonwealth of Kentucky.

695 (CONF-950171–3) **Aluminum removal from washed sludge.** Egan, B.Z. (Oak Ridge National Lab., TN (United States)); Collins, J.L.; Ensor, D.D. Oak Ridge National Lab., TN (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient Separations and Processing Integrated Program (ESPIP) technical integration and exchange (TIE) meeting; Gaithersburg, MD (United States); 24-26 Jan 1995. Order Number DE96008642. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this project is to reduce the volume of storage tank sludge to be treated by removing the Al and other nonradioactive components. In initial sludge surrogate studies, Al, Cr, and Zn showed the highest solubility in NaOH solutions; Ce and Zr were the least soluble of the elements tested. Removal of Fe and Bi approached 2%, the rest of the elements studied showed <1% removal. Amount of Al removed increased as the NaOH conc. increased from 0.1 to 6 M. Sequential washing of the sludge surrogate with 3 M NaOH removed 84% of the Al, 39% of the Cr, and 65% of the Zn. Surrogate sludges containing U and Th were also studied.

696 (CONF-9501137–Summ.) **LLW Forum meeting report, January 31–February 3, 1995.** Afton Associates, Inc., Washington, DC (United States). [1995]. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; San Diego, CA (United States); 31 Jan - 3 Feb 1995. Order Number DE96013271. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Radioactive Waste Forum (LLW) is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties. This report details activities of the meeting held January 31-February 3, 1995.

697 (CONF-950216–161) **The effect of chemical composition on the PCT durability of mixed waste glasses from wastewater treatment sludges.** Resce, J.L. (Clemson Univ., SC (United States)); Ragsdale, R.G.; Overcamp, T.J.; Bickford, D.F.; Cicero, C.A. Westinghouse Savannah River Co., Aiken, SC (United States). 25 Jan 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. From Waste management '95; Tucson, AZ (United States); 26 Feb - 2 Mar 1995. Order Number DE96011209. Source: OSTI; NTIS; INIS; GPO Dep.

An experimental program has been designed to examine the chemical durability of glass compositions derived from the vitrification of simulated wastewater treatment sludges. These sludges represent the majority of low-level mixed wastes currently in need of treatment by the US DOE. The major oxides in these model glasses included SiO_2, Al_2O_3, B_2O_3, Na_2O, CaO and Fe_2O_3. In addition, three minor oxides, BaO, NiO, and PbO, were added as hazardous metals. The major oxides were each varied at two levels resulting in 32 experimental glasses. The chemical durability was measured by the 7-Day Product Consistency Test (PCT). The normalized sodium release rates (NRR_{Na}) of these glasses ranged from 0.01 to 4.99 g/m^2. The molar ratio of the glass-former to glass-modifier (F/M) was found to have the greatest effect on PCT durability. Glass-formers included SiO_2, Al_2O_3, and B_2O_3, while Na_2O, CaO, BaO, NiO, and PbO were glass-modifiers. As this ratio increased from 0.75 to 2.0, NRR_{Na} was found to decrease between one and two orders of magnitude. Another important effect on NRR_{Na} was the Na_2O/CaO ratio. As this ratio increased from 0.5 to 2.0, NRR_{Na} increased up to two orders of magnitude for the glasses with the low F/M ratio but almost no effect was observed for the glasses with the high F/M ratio. Increasing the iron oxide content from 2 to 18 mole% was found to decrease NRR_{Na} one order of magnitude for the glasses with low F/M but iron had little effect on the glasses with the high

F/M ratio. The durability also increased when 10 mole percent Al_2O_3 was included in low iron oxide glasses but no effect was observed with the high iron glasses. The addition of B_2O_3 had little effect on durability. The effects of other composition parameters on durability are discussed as well.

698 (CONF-950483–8) **Degradation of high concentrations of glycols, antifreeze, and deicing fluids.** Strong-Gunderson, J.M.; Wheelis, S.; Carroll, S.L.; Waltz, M.D.; Palumbo, A.V. Oak Ridge National Lab., TN (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international in situ and on-site bioreclamation symposium; San Diego, CA (United States); 24-27 Apr 1995. Order Number DE96003057. Source: OSTI; NTIS; GPO Dep.

Short communication. GLYCOLS/biodegradation; ANTIFREEZE/biodegradation; SOILS/remedial action; GLYCOLS; BIODEGRADATION; ANTIFREEZE; SOILS; AIRCRAFT; WASTE MANAGEMENT; TECHNOLOGY ASSESSMENT

699 (CONF-9504255–1) **The selective removal of ^{90}Sr and ^{137}Cs from liquid low-level waste at Oak Ridge National Laboratory.** Bostick, D.T.; Arnold, W.D.; Burgess, M.W.; Taylor, P.A.; Kent, T.E. Oak Ridge National Lab., TN (United States). 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From ESPIP task review meeting; Gaithersburg, MD (United States); 25 Apr 1995 - 26 Apr 1996. Order Number DE96010577. Source: OSTI; NTIS; INIS; GPO Dep.

Methods are being developed for the selective removal of the two principal radioactive contaminants, ^{90}Sr and ^{137}Cs, from liquid low-level waste generated and/or stored at Oak Ridge National Laboratory. These methods are to be used in a future centralized treatment facility at ORNL. Removal of ^{90}Sr in the proposed treatment flashed is based on coprecipitation from strongly alkaline waste by adding stable strontium to the waste solution. Ferric sulfate, added with the stable strontium, improves the ^{90}Sr removal and aids in the flocculation of the strontium carbonate ($SrCO_3$) precipitate. After separation of the solids, the resultant supernate is adjusted to pH 8 for the cesium removal treatment. Upon pH adjustment, aluminum originally present in the untreated alkaline waste precipitates and sorbs an additional amount of ^{90}Sr. Cesium is removed from the neutralized waste by two sequential treatments with potassium cobalt hexacyanoferrate (KCCF) slurry formed by the addition of potassium ferrocyanide ($K_4Fe(CN)_6$) and cobalt nitrate ($Co(NO_3)_2$) solutions. The cumulative decontamination factors (DFs) for ^{90}Sr and ^{137}Cs in benchscale studies are 4900 and 1×10^6, respectively, if high speed centrifugation is used for the liquid/solid separations. Efforts are now underway to evaluate process-scale techniques to perform the liquid/solid separations required for removal of $SrCO_3$ and ^{137}Cs-bearing hexacyanoferrate solids from the treated waste solution.

700 (CONF-9505359–Summ.) **Low-level waste forum meeting reports.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste meeting; Knoxville, TN (United States); 6-8 May 1995. Order Number DE96013270. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides highlights from the 1995 summer meeting of the Low Level radioactive Waste Forum. Topics included: new developments in state and compacts; federal waste management; DOE plans for Greater-Than-Class C waste management; mixed wastes; commercial mixed waste management; international export of rad wastes for disposal; scintillation cocktails; license termination; pending legislation; federal radiation protection standards.

701 (CONF-950828–6) **Rheological properties of the product slurry of the Nitrate to Ammonia and Ceramic (NAC) process.** Muguercia, I. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Yang, G.; Ebadian, M.A.; Lee, D.D.; Mattus, A.J.; Hunt, R.D. Oak Ridge National Lab., TN (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1995 National heat transfer conference; Portland, OR (United States); 5-9 Aug 1995. Order Number DE95007407. Source: OSTI; NTIS; INIS; GPO Dep.

The Nitrate to Ammonia and Ceramic (NAC) process is an innovative technology for immobilizing the liquid from Low Level radioactive Waste (LLW). An experimental study was conducted to measure the rheological properties of the pipe flow of the NAC product slurry. Test results indicate that the NAC product slurry has a profound rheological behavior. At low solids concentration, the slurry exhibits a typical dilatant fluid (or shear thinning)fluid. The transition from dilatant fluid to pseudo-plastic fluid will occur at between 25% to 30% solids concentration in temperature ranges of 50–80°C. Correlation equations are developed based on the test data.

702 (CONF-950828–25) **Convective heat transfer behavior of the product slurry of the nitrate to ammonia and ceramic (NAC) process.** Muguercia, I. (Florida International Univ., Miami, FL (United States). Dept. of Mechanical Engineering); Yang, G.; Ebadian, M.A.; Lee, D.D.; Mattus, A.J.; Hunt, R.D. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1995 National heat transfer conference; Portland, OR (United States); 5-9 Aug 1995. Order Number DE96003049. Source: OSTI; NTIS; INIS; GPO Dep.

The Nitrate to Ammonia and Ceramic (NAC) process is an innovative technology for immobilizing liquid form low level radioactive waste (LLW). An experimental study has been conducted to measure the heat transfer properties of the NAC product slurry. The results indicate that the heat transfer coefficient for both concentration slurries is much higher than that of pure water, which may be due to the higher conductivity of the gibbsite powder. For the 20% concentration slurry, the heat transfer coefficient increased as the generalized Reynolds number and slurry temperature increased. The heat transfer coefficient of 40% is a function of the Reynolds number only. The test results also indicate that the thermal entrance region can be observed only when the generalized Reynolds number is smaller than 1,000. The correlation equation is also developed based on the experimental data in this paper.

703 (CONF-950868–40) **A rational approach for evaluation and screening of treatment and disposal options for the solar pond sludges at Rocky Flats.** Dickerson, K.S. Oak Ridge National Lab., TN (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From ER '95: environmental remediation conference: committed to results; Denver, CO (United States); 13-18 Aug 1995. Order Number DE96005460. Source: OSTI; NTIS; INIS; GPO Dep.

This document consists of information about the treatment options for the sludge that is located in the evaporation ponds at the Rocky Flats Plant. The sludges are mixed low-level radioactive wastes whose composition and character were variable. Sludges similar to these are typically treated prior to ultimate disposal. Disposal of treated sludges includes both on-site and off-site options. The rational approach described in this paper is useful for technology evaluation and screening because it provides a format for developing objectives, listing alternatives, and weighing the alternatives against the objectives and against each other.

704 (CONF-9509377–Exc.) **Low-Level Waste (LLW) forum meeting report.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low-level radioactive waste forum; Salt Lake City, UT (United States); 26-28 Sep 1995. Order Number DE96013269. Source: OSTI; NTIS; INIS; GPO Dep.

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705 (CONF-9510319–1) **National procurement of private-sector treatment for U.S. Department of Energy mixed low-level wastes.** Berry, J.B. (Oak Ridge National Lab., TN (United States)); Jones, D.W.; Seeker, W.R.; Alex, L.J. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 11. annual model conference; Oak Ridge, TN (United States); 16-18 Oct 1995. Order Number DE96005733. Source: OSTI; NTIS; INIS; GPO Dep.

The cost of bringing DOE into compliance with the Federal Facilities Compliance Act may be dramatically reduced if the private sector treats DOE mixed low level waste. If the DOE clearly defines this market by using national procurement contracts, the private sector will be able to decide if investing in DOE waste treatment contracts is good business. DOE can structure the mixed waste treatment market to influence the profitability of the contracts and to influence the quality of private sector responses. National procurement contracts will incorporate advice from the private sector so that issues of concern to industry are adequately incorporated.

706 (CONF-951209–) **Proceedings: 17th annual US Department of Energy low-level radioactive waste management conference.** Lake, D. (ed.). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 480p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From 17. low-level radioactive waste management conference; Phoenix, AZ (United States); 12-14 Dec 1995. Order Number DE96005882. Source: OSTI; NTIS; INIS; GPO Dep.

Proceedings includes 4 diskettes designed to run on IBM PC compatible equipment.

Selected papers have been processed separately for inclusion in the Energy Science and Technology database. Also included are four 3.5' discs that are to accompany the report.

707 (CONF-951209–9) **Recent improvements to the SOURCE1 and SOURCE2 computer codes.** Icenhour, A.S.; Tharp, M.L. Oak Ridge National Lab., TN (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 17. low-level radioactive waste management conference; Phoenix, AZ (United States); 12-14 Dec 1995. Order Number DE96005645. Source: OSTI; NTIS; INIS; GPO Dep.

Performance assessments of low-level radioactive waste (LLW) disposal facilities often involve the use of computer codes to describe radionuclide releases from a waste form and the subsequent transport of radionuclides through the environment. The SOURCE1 and SOURCE2 computer codes are used to calculate radionuclide release rates (i.e., source terms) for LLW disposal facilities. These codes have been used to evaluate the source terms for Oak Ridge National Laboratory performance assessments. SOURCE1 is applicable to tumulus-type facilities, while SOURCE2 can be applied to silo, well-in-silo, well, and trench-type facilities. In addition to the calculation of radionuclide release rates, both SOURCE1 and SOURCE2 calculate the degradation of engineered barriers. This paper provides an overview of these codes and a description of recent improvements to the codes. Major improvements include incorporation of a new advective transport model into SOURCE1 and SOURCE2, development of a new model for SOURCE1 that calculates the degradation and failure of the tumulus pad and leachate collection system, improvement of routines for controlling water infiltration inputs, expansion of options for obtaining output summaries, and restructuring of SOURCE1 and SOURCE2 for sensitivity and uncertainty analyses. The status of code verification efforts is also presented.

708 (CONF-951209–10) **Analysis of operating costs a Low-Level Mixed Waste Incineration Facility.** Loghry, S.L.; Salmon, R.; Hermes, W.H. Oak Ridge National Lab., TN (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 17. low-level radioactive waste management conference; Phoenix, AZ (United States); 12-14 Dec 1995. Order Number DE96005554. Source: OSTI; NTIS; INIS; GPO Dep.

By definition, mixed wastes contain both chemically hazardous and radioactive components. These components make the treatment and disposal of mixed wastes expensive and highly complex issues because the different regulations which pertain to the two classes of contaminants frequently conflict. One method to dispose of low-level mixed wastes (LLMWs) is by incineration, which volatizes and destroys the organic (and other) hazardous contaminants and also greatly reduces the waste volume. The US Department of Energy currently incinerates liquid LLMW in its Toxic Substances Control Act (TSCA) Incinerator, located at the K-25 Site in Oak Ridge, Tennessee. This incinerator has been fully permitted since 1991 and to date has treated approximately 7×10^6 kg of liquid LLMW. This paper presents an analysis of the budgeted operating costs by category (e.g., maintenance, plant operations, sampling and analysis, and utilities) for fiscal year 1994 based on actual operating experience (i.e., a "bottoms-up" budget). These costs provide benchmarking guidelines which could be used in comparing incinerator operating costs with those of other technologies designed to dispose of liquid LLMW. A discussion of the current upgrade status and future activities are included in this paper. Capital costs are not addressed.

709 (CONF-960110–1) **Operating limit evaluation for disposal of uranium enrichment plant wastes.** Lee, D.W.; Kocher, D.C.; Wang, J.C. Oak Ridge National Lab., TN (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 29. midyear topical meeting of the Health Physics Society: naturally occuring and accelerator produced radioactive material - regulation and risk assessment; Scottsdale, AZ (United States); 7-10 Jan 1996. Order Number DE96004924. Source: OSTI; NTIS; INIS; GPO Dep.

A proposed solid waste landfill at Paducah Gaseous Diffusion Plant (PGDP) will accept wastes generated during normal plant operations that are considered to be non-radioactive. However, nearly all solid waste from any source or facility contains small amounts of radioactive material, due to the presence in most materials of trace quantities of such naturally occurring radionuclides as uranium and thorium. This paper describes an evaluation of operating limits, which are protective of public health and the environment, that would allow waste materials containing small amounts of radioactive material to be sent to a new solid waste landfill at PGDP. The operating limits are expressed as limits on concentrations of radionuclides in waste materials that could be sent to the landfill based on a site-specific analysis of the performance of the facility. These limits are advantageous to PGDP and DOE for several reasons. Most importantly, substantial cost savings in the management of waste is achieved. In addition, certain liabilities that could result from shipment of wastes to a commercial off-site solid waste landfill are avoided. Finally, assurance that disposal operations at the PGDP landfill are protective of public health and the environment is provided by establishing verifiable operating limits for small amounts of radioactive material; rather than relying solely on administrative controls. The operating limit determined in this study has been presented to the Commonwealth of Kentucky and accepted as a condition to be attached to the operating permit for the solid waste landfill.

710 (CONF-960212–74) **Effective use of risk assessments and the public comment process to achieve acceptable remediation goals for mercury-contaminated sites.** Miller, J.Q.; Barnett, M. Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment; Tucson, AZ (United States); 25-29 Feb 1996. Order Number DE96008680. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of recalculating risk levels using new information, the remediation goals and cleanup strategy for the Lower East Fork Poplar Creek floodplains have been significantly changed to reflect an important reduction in cleanup costs while ensuring protectionof human health and the environment. This project and its stakeholders have made the risk assessment more effective by better defining the contaminant and adjusting assessment parameters. As a result, the remediation goal initially set at 50 ppM Hg has been changed to 400 ppM, resulting in significant reductions in both the destruction of the floodplain landscape and project costs. Volume of soils to be excavated has been decreased from 1 million cubic yards to 25,000 cubic yards, and the cost has been reduced from about $1 billion to less than $20 million. The Record of Decision for Lower East Fork Poplar Creek was approved in August 1995.

711 (CONF-960271–5) **Treatment of spent electropolishing solution for removal of cobalt-60.** Taylor, P.A.; Youngblood, E.L.; Macon, R.J. Oak Ridge National Lab., TN (United States). Feb 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From American Institute of Chemical Engineers (AIChE) spring meeting; New Orleans, LA (United States); 26-29 Feb 1996. Order Number DE96006725. Source: OSTI; NTIS; INIS; GPO Dep.

The Irradiated Materials Examination and Testing (IMET) Facility at Oak Ridge National Laboratory electropolishes various types of irradiated metal specimens prior to examination of metallurgical and mechanical properties. The standard electropolishing solution used at IMET for most specimens consists of a 7:1 methanol/sulfuric acid mixture, with smaller amounts of a 3:1 methanol/nitric acid solution and a 10:6:1 methanol/2-butoxyethanol/perchloric acid solution also being used. Cobalt-60 is the primary source of gamma radiation in the spent solutions, with lesser amounts from manganese-54 and iron-59. A treatment method is needed to remove most of the Co-60 from these solutions to allow the waste solutions to be contact-handled for disposal. A wide range of adsorbents was tested for removing cobalt from the electropolishing solutions. No adsorbent was found that would treat full strength solution, but a complexing ion exchange resin (Chelex 100, BioRad Labs, or Amberlite IRC-718, Rohm and Haas Co.) will remove cobalt and other heavy metals from partially neutralized (pH=3) solution. A 5 wt% sodium hydroxide solution is used for pH adjustment, since more concentrated caustic caused sodium sulfate precipitates to form. Lab-scale column tests have shown that about 10 bed volumes of methanol/sulfuric acid solution, 30 bed volumes of methanol/nitric acid solution or 15 bed volumes of methanol/2-butoxyethanol/perchloric acid solution can be treated prior to initial Co-60 breakthrough.

712 (CONF-9602110–Summ.) **LLW Forum meeting report, February 13–16, 1996.** Afton Associates, Inc., Washington, DC (United States). [1996]. 57p. Sponsored by USDOE, Washington, DC (United States). From Low level radioactive waste meeting; San Diego, CA (United States); 13-16 Feb 1996. Order Number DE96013268. Source: OSTI; NTIS; INIS; GPO Dep.

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713 (CONF-9603137–2) **An experimental investigation of the reaction of hydrogen chloride with lead oxide under simulated hazardous waste incineration conditions.** Shor, J.T. (Oak Ridge National Lab., TN (United States)); Frazier, G.C. Oak Ridge National Lab., TN (United States). 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Western States section meeting; Tempe, AZ (United States); 11-12 Mar 1996. Order Number DE96008664. Source: OSTI; NTIS; GPO Dep.

To simulate the behavior of lead during hazardous waste incineration, pellets of sintered lead oxide were treated with hydrogen chloride at concentrations of 2000 and 4000 ppm in air in a laboratory tube furnace. The chemical reaction kinetics and mass transfer properties of the solid-gas and solid-liquid reactions were examined at temperatures between 260 and 680°C. Lead dichloride was found to form and became more volatile at elevated temperatures. At temperatures above 300°C, chemical reaction kinetic limitations were absent and mass transfer resistance in the developing liquid lead oxide, lead dichloride eutectic phases were controlling. Above 590°C, a curious anomaly occurred: The observed global reaction rate appeared to increase slightly while the volatilization of lead dichloride dropped during the initial stages of the reaction. A thick film of a lead oxychloride compound was found which displayed low lead dichloride activity. Below 590°C, a different lead oxychloride compound was identified by x-ray diffraction in which lead dichloride activity was high, and this compound was much more volatile than the oxychloride formed above 5900°C.

714 (CONF-9605200–Summ.) **LLW Forum meeting report.** Afton Associates, Inc., Washington, DC (United States). [1996]. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste forum meeting; Annapolis, MD (United States); 29-31 May 1996. Order Number DE96013267. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the Low-Level Radioactive Waste Forum (LLW Forum) meeting on May 29 through May 31, 1996.The LLW Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

715 (CONF-9606125–4) **An exposure assessment of radionuclide emissions associated with potential mixed-low level waste disposal facilities at fifteen DOE sites.** Lombardi, D.A.; Socolof, M.L. Oak Ridge National Lab., TN (United States). [1996]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From Air and Waste Management (AWM) annual meeting; Nashville, TN (United States); 23-28 Jun 1996. Order Number DE96008619. Source: OSTI; NTIS; INIS; GPO Dep.

A screening method was developed to compare the doses received via the atmospheric pathway at 15 potential DOE MLLW (mixed low-level waste) sites. Permissible waste concentrations were back calculated using the radioactivity NESHAP (National Emissions Standards for Hazardous Air Pollutants) in 40 FR 61 (DOE Order 5820.2A performance objective). Site-specific soil and meteorological data were used to determine permissible waste concentrations (PORK). For a particular radionuclide, perks for each site do not vary by more than one order of magnitude. perks of ^{14}C are about six orders of magnitude more restrictive than perks of ^{3}H because of differences in liquid/vapor partitioning, decay, and exposure dose. When comparing results from the atmospheric pathway to the water and intruder pathways, ^{14}C disposal concentrations were limited by the atmospheric pathway for most arid sites; for ^{3}H, the atmospheric pathway was not limiting at any of the sites. Results of this performance evaluation process are to be used for planning for siting of disposal facilities.

716 (CONF-960741–2) **Applying a life cycle decision methodology to Fernald waste management alternatives.** Yuracko, K.L. (Oak Ridge National Lab., TN (United States)); Gresalfi, M.; Yerace, P. Oak Ridge National Lab., TN (United States). 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From Pollution prevention conference; Chicago, IL (United States); 9-11 Jul 1996. Order Number DE96011932. Source: OSTI; NTIS; INIS; GPO Dep.

During the past five years, a number of U.S. Department of Energy (DOE) funded efforts have demonstrated the technical efficacy of converting various forms of radioactive scrap metal (RSM) into useable products. From the development of large accelerator shielding blocks, to the construction of low-level waste containers, technology has been applied to this fabrication process in a safe and stakeholder supported manner. The potential health and safety risks to both workers and the public have been addressed. The question remains: can products be fabricated from RSM in a cost efficient and market competitive manner? This paper presents a methodology for use within DOE to evaluate the costs and benefits of recycling and reusing some RSM, rather than disposing of this RSM in an approved burial site. This life cycle decision methodology, developed by both the Oak Ridge National Laboratory (ORNL) and DOE Fernald, is the focus of the following analysis.

717 (CONF-960804–10) **Fernald's dilemma: Do we recycle the radioactively contaminated metals, or do we bury them?.** Yuracko, K.L. (and others); Hadley, S.W.; Perlack, R.D. Oak Ridge National Lab., TN (United States). 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009396. Source: OSTI; NTIS; INIS; GPO Dep.

During the past five years, a number of U.S. Department of Energy (DOE) funded efforts have demonstrated the technical efficacy of converting various forms of radioactive scrap metal (RSM) into useable products. From the development of large accelerator shielding blocks, to the construction of low level waste containers, technology has been applied to this fabrication process in a safe and stakeholder supported manner. The potential health and safety risks to both workers and the public have been addressed. The question remains; can products be fabricated from RSM in a cost efficient and market competitive manner? This paper presents a methodology for use within DOE to evaluate the costs and benefits of recycling and reusing some RSM, rather than disposing of this RSM in an approved burial site. This life cycle decision methodology, developed by both the Oak Ridge National Laboratory (ORNL) and DOE Fernald is the focus of the following analysis.

718 (DOE/EIS–0200-D-Summ.) **Draft Waste Management Programmatic Environmental Impact Statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 70p. Sponsored by

USDOE, Washington, DC (United States). Order Number DE95017564. Source: OSTI; NTIS; INIS; GPO Dep.

This is a summary of the Draft klaste Management Programmatic Environmental Impact Statement, which has been prepared in accordance with the National Environmental Policy Act to evaluate management and siting alternatives for the treatment, storage and/or disposal of five types of radioactive and/or hazardous wastes. These waste types are: low-level radioactive waste; low-level mixed (with hazardous components) waste; transuranic waste; high-level radioactive waste; an hazardous waste. The alternatives were evaluated for waste stored, buried or to be generated from future operations over the next 20 years at 54 sites. For each waste type, the analyses contained in this document examined the potential health and environmental impacts of integrated waste management program alternatives involving multiple sites, as well as the potential cumulative impacts.

719 (DOE/EIS–0200-D-Vol.1) **Draft Waste Management Programmatic Environmental Impact Statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume 1.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 600p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017608. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Waste Management Programmatic Environmental Impact Statement (WM PEIS) is to provide environmental input for the Department of Energy's (DOE) proposed action of identifying future configurations for selected waste management facilities. Each future configuration considered is based on a different waste type. These include: low-level mixed waste, low-level waste, transuranic waste, high-level waste, and hazardous waste. The selected waste management facilities being considered for these different waste types are treatment and disposal facilities for low-level mixed waste; treatment and disposal facilities for low-level waste; treatment and storage facilities for transuranic waste in the event that treatment is required before disposal; storage facilities for treated (vitrified) high-level waste canisters; and treatment of nonwastewater hazardous waste by DOE and commercial vendors. In addition to the no action alternative, which includes only existing or approved waste management facilities, the alternatives evaluated in this PEIS for each of the waste type configurations include decentralized, regionalized, and centralized alternatives for using existing and operating new waste management facilities. The evaluation of environmental consequences in this PEIS includes the cumulative impacts of combining future configurations for the five waste types and analyzed the collective impacts of other past, present, and reasonably foreseeable future activities. Other issues associated with implementing the proposed action are also discussed. Discussion of these issues is included to provide further understanding of the decisions to be reached and to provide the opportunity for public input on improving DOE's Environmental Management Program.

720 (DOE/EIS–0200-D-Vol.2) **Draft Waste Management Programmatic Environmental Impact Statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume 2, Site data tables.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 400p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017609. Source: OSTI; NTIS; INIS; GPO Dep.

Volume 2 is an integral part of the Office of Environmental Managements (EM's) Waste Management Programmatic Environmental Impact Statement (WM PEIS), which portrays the impacts of EM's waste management activities at each of the 17 major DOE sites evaluated in the WM PEIS. Impacts are displayed for each of the 17 major sites in tabular form as a complement to the impact discussions in waste-type Chapters 6 through 10. The chapters present background information on each waste type, volume data, existing capacities for managing the wastes, and assumptions used in the waste-type analysis. Readers should refer to these chapters and to Chapter 5, "Impact Analysis Methodologies," for a more thorough discussion of the methodologies, assumptions and definitions associated with these impacts. A synopsis of key definitions and assumptions is also presented at the rear of this introductory section.

721 (DOE/EIS–0200-D-Vol.3) **Draft Waste Management Programmatic Environmental Impact Statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume 3, Appendix A: Public response to revised NOI, Appendix B: Environmental restoration, Appendix C, Environmental impact analysis methods, Appendix D, Risk.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 600p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017610. Source: OSTI; NTIS; INIS; GPO Dep.

Volume three contains appendices for the following: Public comments do DOE's proposed revisions to the scope of the waste management programmatic environmental impact statement; Environmental restoration sensitivity analysis; Environmental impacts analysis methods; and Waste management facility human health risk estimates.

722 (DOE/EIS–0200-D-Vol.4) **Draft Waste Management Programmatic Environmental Impact Statement for managing treatment, storage, and disposal of radioactive and hazardous waste. Volume 4, Appendix E: Transportation, Appendix F: Accidents, Appendix G: Waste minimization, Appendix H: Technology development, Appendix I: Minority and low-income population distribution.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 250p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95017611. Source: OSTI; NTIS; INIS; GPO Dep.

Volume four contains appendices for the following: radioactive and hazardous waste transportation risk assessments; treatment and storage facility accidents; waste minimization; technology development; and distribution of minority and low-income populations at the 17 major waste management sites.

723 (DOE/EM–0251) **Landfill stabilization focus area: Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Jun 1995. 166p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016176. Source: OSTI; NTIS; INIS; GPO Dep.

Landfills within the DOE Complex as of 1990 are estimated to contain 3 million cubic meters of buried waste. The DOE facilities where the waste is predominantly located are at Hanford, the Savannah River Site (SRS), the Idaho National Engineering Laboratory (INEL), the Los Alamos National Laboratory (LANL), the Oak Ridge Reservation (ORR), the Nevada Test Site (NTS), and the Rocky Flats Plant (RFP). Landfills include buried waste, whether on pads or in trenches, sumps, ponds, pits, cribs, heaps and piles, auger holes, caissons, and sanitary landfills. Approximately half of all DOE buried waste was disposed of before 1970. Disposal regulations at that time permitted the commingling of various types of waste (i.e., transuranic, low-level radioactive, hazardous). As a result, much of the buried waste throughout the DOE Complex is presently believed to be contaminated with both hazardous and radioactive materials. DOE buried waste typically includes transuranic-contaminated radioactive waste (TRU), low-level radioactive waste (LLW), hazardous waste per 40 CFR 26 1, greater-than-class-C waste per CFR 61 55 (GTCC), mixed TRU waste, and mixed LLW. The mission of the Landfill Stabilization Focus Area is to develop, demonstrate, and deliver safer,more cost-effective and efficient technologies which satisfy DOE site needs for the remediation and management of landfills. The LSFA is structured into five technology areas to meet the landfill remediation and management needs across the DOE complex. These technology areas are: assessment, retrieval, treatment, containment, and stabilization. Technical tasks in each of these areas are reviewed.

724 (DOE/EM–0252) **Mixed waste characterization, treatment, and disposal focus area. Technology summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Jun 1995. 116p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016003. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents details about the technology development programs of the Department of Energy. In this document, waste characterization, thermal treatment processes, non-thermal treatment processes, effluent monitors and controls, development of on-site innovative technologies, and DOE business opportunities are applied to environmental restoration. The focus areas for research are: contaminant plume containment and remediation; mixed waste characterization, treatment, and disposal; high-level waste tank remediation; landfill stabilization; and decontamination and decommissioning.

725 (DOE/EM–0262) **Depleted uranium: A DOE management guide.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Oct 1995. 15p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96002432. Source: OSTI; INIS; NTIS; GPO Dep.

The U.S. Department of Energy (DOE) has a management challenge and financial liability in the form of 50,000 cylinders containing 555,000 metric tons of depleted uranium hexafluoride (UF_6) that are stored at the gaseous diffusion plants. The annual storage and maintenance cost is approximately $10 million. This report summarizes several studies undertaken by the DOE Office of Technology Development (OTD) to evaluate options for long-term depleted uranium management. Based on studies conducted to date, the most likely use of the depleted uranium is for shielding of spent nuclear fuel (SNF) or vitrified high-level waste (HLW) containers. The alternative to finding a use for the depleted uranium is disposal as a radioactive waste. Estimated disposal costs, utilizing existing technologies, range between $3.8 and $11.3 billion, depending on factors such as applicability of the Resource Conservation and Recovery Act (RCRA) and the location of the disposal site. The cost of recycling the depleted uranium in a concrete based shielding in SNF/HLW containers, although substantial, is comparable to or less than the cost of disposal. Consequently, the case can be made that if DOE invests in developing depleted uranium shielded containers instead of disposal, a long-term solution to the UF_6 problem is attained at comparable or lower cost than disposal as a waste. Two concepts for depleted uranium storage casks were considered in these studies. The first is based on standard fabrication concepts previously developed for depleted uranium metal. The second converts the UF_6 to an oxide aggregate that is used in concrete to make dry storage casks.

726 (DOE/EM–0268) **Integrated Thermal Treatment Systems study: US Department of Energy Internal Review Panel report.** Cudahy, J. (and others); Escarda, T.; Gimpel, R. USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Apr 1995. 96p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96010685. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's (DOE) Office of Technology Development (OTD) commissioned two studies to uniformly evaluate nineteen thermal treatment technologies. These studies were called the Integrated Thermal Treatment System (ITTS) Phase I and Phase II. With the advice and guidance of the DOE Office of Environmental Management's (EM's) Mixed Waste Focus Group, OTD formed an ITTS Internal Review Panel, composed of scientists and engineers from throughout the DOE complex, the U.S. Environmental Protection Agency (EPA), the California EPA, and private experts. The Panel met from November 15-18, 1994, to review and comment on the ITTS studies, to make recommendations on the most promising thermal treatment systems for DOE mixed low level wastes (MLLW), and to make recommendations on research and development necessary to prove the performance of the technologies on MLLW.

727 (DOE/EM–0268-96003365) **Integrated thermal treatment systems study. Internal review panel report.** Cudahy, J. (and others); Escarda, T.; Gimpel, R. USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Apr 1995. 95p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003365. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Office of Technology Development (OTD) commissioned two studies to evaluate nineteen thermal treatment technologies for treatment of DOE mixed low-level waste. These studies were called the Integrated Thermal Treatment System (ITTS) Phase I and Phase II. With the help of the DOE Office of Environmental Management (EM) Mixed Waste Focus Group, OTD formed an ITTS Internal Review Panel to review and comment on the ITTS studies. This Panel was composed of scientists and engineers from throughout the DOE complex, the U.S. Environmental Protection Agency, the California EPA, and private experts. The Panel met from November 15-18, 1994 to review the ITTS studies and to make recommendations on the most promising thermal treatment systems for DOE mixed low-level wastes and on research and development necessary to prove the performance of the technologies. This report describes the findings and presents the recommendations of the Panel.

728 (DOE/EM–0277) **1994 annual report on low-level radioactive waste management progress.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Apr 1995. 123p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96008370. Source: OSTI; NTIS; INIS; GPO Dep.

This report for calendar year 1994 summarizes the progress that states and compact regions made during the year in establishing new low-level radioactive waste disposal facilities. Although events that have occurred in 1995 greatly alter the perspective in terms of storage versus disposal, the purpose of this report is to convey the concerns as evidenced during calendar year 1994. Significant developments occurring in 1995 are briefly outlined in the transmittal letter and will be detailed in the report for calendar year 1995. The report also provides summary information on the volume of low-level radioactive waste received for disposal in 1994 by commercially operated low-level radioactive waste disposal facilities, and is prepared is in response to Section 7(b) of Title I of Public Law 99-240, the Low-Level Radioactive Waste Policy Amendments Act of 1985.

729 (DOE/EM–0280-Vol.1) **Complex-wide review of DOE's Low-Level Waste Management ES&H vulnerabilities. Volume I. Final report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). May 1996. 67p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011889. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) conducted a comprehensive complex-wide review of its management of low-level waste (LLW) and the radioactive component of mixed low-level waste (MLLW). This review was conducted in response to a recommendation from the Defense Nuclear Facilities Safety Board (DNFSB) which was established and authorized by Congress to oversee DOE. The DNFSB's recommendation concerning conformance with safety standards at DOE LLW sites was issued on September 8, 1994 and is referred to as Recommendation 94-2. DOE's Implementation Plan for its response to Recommendation 94-2 was submitted to the DNFSB on March 31, 1995. The DNFSB recommended that a complex-wide review of DOE's LLW management be initiated. The goal of the complex-wide review of DOE's LLW management system was to identify both programmatic and physical vulnerabilities that could lead to unnecessary radiation exposure of workers or the public or unnecessary releases of radioactive materials to the environment. Additionally, the DNFSB stated that an objective of the complex-wide review should be to establish the dimensions of the DOE LLW problem and support the identification of corrective actions to address safe disposition of past, present, and future volumes of LLW. The complex-wide review involved an evaluation of LLW management activities at 38 DOE facilities at 36 sites that actively manage LLW and MLLW.

730 (DOE/EM–0280-Vol.2) **Complex-wide review of DOE's Low-Level Waste Management ES&H vulnerabilities. Volume II. Final report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). May 1996. 77p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011890. Source: OSTI; NTIS; INIS; GPO Dep.

Volume I of this report presents a summary of DOE's complex-wide review of its low-level waste management system, including the assessment scope and methodology, site-specific and complex-wide vulnerabilities, and DOE's conclusions and recommendations. Volume II presents a more detailed discussion of the assessment methodology and evaluation instruments developed by the Assessment Working Group for identifying site-specific vulnerabilities, categorizing and classifying vulnerabilities, and identifying and analyzing complex-wide vulnerabilities. Attachments A and B of this volume contain, respectively, the Site Evaluation Survey and the Vulnerability Assessment Form used in those processes. Volume III contains the site-specific assessment reports for the 36 sites (38 facilities) assessed in the complex-wide review from which the complex-wide vulnerabilities were drawn.

731 (DOE/EM–0280-Vol.3) **Complex-wide review of DOE's low-level waste management ES&H vulnerabilities. Volume III. Final report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). May 1996. 479p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011891. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) conducted a comprehensive complex-wide review of the environment, safety, and health (ES&H) vulnerabilities associated with its management of low-level waste (LLW) and the radioactive component of mixed low-level waste (MLLW). This review was conducted in response to a recommendation from the Defense Nuclear Facilities Safety Board (DNFSB). The DNFSB's recommendation concerning conformance with safety standards at DOE LLW sites was issued on September 8, 1994 and is referred to as Recommendation 94-2. DOE submitted an Implementation Plan for its response to Recommendation 94-2 to the DNFSB on March 31, 1995. DOE has conducted this complex-wide review in accordance with that Implementation Plan and subsequent revisions. Among its conclusions and recommendations, the DNFSB recommended that a complex-wide review of LLW management, similar to that conducted by DOE for spent nuclear fuel, be initiated. As with the Spent Nuclear Fuel assessment and other recent vulnerability assessments conducted by DOE, the goal of the complex-wide review of DOE's LLW management system was to identify vulnerabilities that could lead to unnecessary radiation exposure of workers or the public or unnecessary releases of radioactive materials to the environment. Additionally, the DNFSB stated that an objective of the complex-wide review should be to establish the dimensions of the DOE LLW problem and support the identification of corrective actions to address safe disposition of past, present, and future volumes of LLW.

732 (DOE/EM–0280-Vol.3-App.) **Complex-wide review of DOE's Low-Level Waste Management ES&H vulnerabilities. Volume III appendices. Final report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). May 1996. 298p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011892. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) conducted a comprehensive complex-wide review of the environment, safety, and health (ES&H) vulnerabilities associated with its management of low-level waste (LLW) and the radioactive component of mixed low-level waste (MLLW). This review was conducted in response to a recommendation from the Defense Nuclear Facilities Safety Board (DNFSB). The DNFSB's recommendation concerning conformance with safety standards at DOE LLW sites was issued on September 8, 1994 and is referred to as Recommendation 94-2. DOE submitted an Implementation Plan for its response to Recommendation 94-2 to the DNFSB on March 31, 1995. DOE has conducted this complex-wide review in accordance with that Implementation Plan and subsequent revisions. Among its conclusions and recommendations, the DNFSB recommended that a complex-wide review of LLW management, similar to that conducted by DOE for spent nuclear fuel, be initiated. This document contains the Volume III Appendices.

733 (DOE/EM–0281) **Overview of non-thermal mixed waste treatment technologies: Treatment of mixed waste (ex situ); Technologies and short descriptions.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Science and Technology. Jul 1995. 57p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009146. Source: OSTI; NTIS; INIS; GPO Dep.

This compendium contains brief summaries of new and developing non- thermal treatment technologies that are candidates for treating hazardous or mixed (hazardous plus low-level radioactive) wastes. It is written to be all-encompassing, sometimes including concepts that presently constitute little more than informed "ideas". It bounds the universe of existing technologies being thought about or considered for application on the treatment of such wastes. This compendium is intended to be the very first step in a winnowing process to identify non-thermal treatment systems that can be fashioned into complete "cradle-to-grave" systems for study. The purpose of the subsequent systems paper studies is to investigate the cost and likely performance of such systems treating a representative sample of U.S. Department of Energy (DOE) mixed low level wastes (MLLW). The studies are called Integrated Non-thermal Treatment Systems (INTS) Studies and are being conducted by the Office of Science and Technology (OST) of the Environmental Management (EM) of the US Department of Energy. Similar studies on Integrated Thermal Treatment Systems have recently been published. These are not designed nor intended to be a "downselection" of such technologies; rather, they are simply a systems evaluation of the likely costs and performance of various non- thermal technologies that have been arranged into systems to treat sludges, organics, metals, soils, and debris prevalent in MLLW.

734 (DOE/EM–0282) **Description of recommended non-thermal mixed waste treatment technologies: Version 1.0.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Aug 1995. 184p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009149. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains description of the technologies selected for inclusions in the Integrated Nonthermal Treatment Systems (INTS) Study. The purpose of these descriptions is to provide a more complete description of the INTS technologies. It supplements the summary descriptions of candidate nonthermal technologies that were considered for the INTS.

735 (DOE/EM–0292) **Report to Congress: 1995 Annual report on low-level radioactive waste management progress.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Jun 1996. 38p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013349. Source: OSTI; NTIS; INIS; GPO Dep.

This report is prepared in response to the Low-Level Radioactive Waste Policy Act, Public Law 96-573, 1980, as amended by the Low-Level Radioactive Waste Policy Amendments Act of 1985, Public Law 99-240. The report summarizes the progress of states and compact regions during calendar year 1995 in establishing new disposal facilities for commercially-generated low-level radioactive waste. The report emphasizes significant issues and events that have affected progress, and also includes an introduction that provides background information and perspective on United States policy for low-level radioactive waste disposal.

736 (DOE/EM–0293) **Mixed waste characterization, treatment & disposal focus area.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 126p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013523. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Mixed Waste Characterization, Treatment, and Disposal Focus Area (referred to as the Mixed Waste Focus Area or MWFA) is to provide treatment systems capable of treating DOE's mixed waste in partnership with users, and with continual participation of stakeholders, tribal governments, and regulators. The MWFA deals with the problem of eliminating mixed waste from current and future storage in the DOE complex. Mixed waste is waste that contains both hazardous chemical components, subject to the requirements of the Resource Conservation and Recovery Act (RCRA), and radioactive components, subject to the requirements of the Atomic Energy Act. The radioactive components include transuranic (TRU) and low-level waste (LLW). TRU waste primarily comes from the reprocessing of spent fuel and the use of plutonium in the fabrication of nuclear weapons. LLW includes radioactive waste other than uranium mill tailings, TRU, and high-level waste, including spent fuel.

737 (DOE/EW/50614–T1) **Technical evaluation report for the demonstration of radio frequency soil decontamination at Site S-1.** Lyon, C.R. (Halliburton NUS Environmental Corp., Oak Ridge, TN (United States)); Blanchard, C.F.; Whitt, L.H. Halliburton NUS Environmental Corp., Oak Ridge, TN (United States); Air Force Air Materiel Command, Kelly AFB, TX (United States). Apr 1995. 600p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI01-92EW50614. Order Number DE96001698. Source: OSTI; NTIS; GPO Dep.

The Air Force's Armstrong Laboratory at Tyndall Air Force Base, Florida, has supported the research and development of Radio Frequency Soil Decontamination. Radio frequency soil decontamination is essentially a heat-assisted soil vapor extraction process. Site S-1 at Kelly Air Force Base, San Antonio, Texas, was selected for the demonstration of two patented techniques. The site is a former sump that collected spills and surface run-off from a waste petroleum, oils, and lubricants and solvent storage and transfer area. In 1993, a technique developed by the IIT Research Institute using an array of electrodes placed in the soil was demonstrated. In 1994, a technique developed by KAI Technologies, Inc. using a single applicator placed in a vertical borehole was demonstrated. Approximately 120 tons of soil were heated during each demonstration to a temperature of about 150 degrees Celsius.

738 (DOE/EW/53023–T10) **Tulane/Xavier University Hazardous Materials in Aquatic Environments of the Mississippi River Basin. Quarterly progress report, January 1, 1995–March 31, 1995.** Tulane Univ., New Orleans, LA (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG01-93EW53023. Order Number DE95011930. Source: OSTI; NTIS; INIS; GPO Dep.

This progress report covers activities for the period January 1 - March 31, 1995 on project concerning 'Hazardous Materials in Aquatic Environments of the Mississippi River Basin.' The following activities are each summarized by bullets denoting significant experiments/findings: biotic and abiotic studies on the biological fate, transport and ecotoxicity of toxic and hazardous waste in the Mississippi River Basin; assessment of mechanisms of metal-induced reproductive toxicity in quatic species as a biomarker of exposure; hazardous wastes in aquatic environments: biological uptake and metabolism studies; ecological sentinels of aquatic contamination in the lower Mississippi River system; bioremediation of selected contaminants in aquatic environments of the Mississippi River Basin; a sensitive rapid on-sit immunoassay for heavy metal contamination; pore-level flow, transport, agglomeration and reaction kinetics of microorganism; biomarkers of exposure and ecotoxicity in the Mississippi River Basin; natural and active chemical remediation of toxic metals, organics and radionuclides in the aquatic environment; expert geographical information systems for assessing hazardous wastes in aquatic environments; enhancement of environmental education; and a number of just initiated projects including fate and transport of contaminants in aquatic environments; photocatalytic remediation; radionuclide fate and modeling from Chernobyl.

739 (DOE/ID–10057(94)) **Idaho National Engineering Laboratory nonradiological waste management information for 1994 and record to date.** French, D.L.; Lisee, D.J.; Taylor, K.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002209. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides detailed data and graphics on airborne and liquid effluent releases, fuel oil and coal consumption, water usage, and hazardous and mixed waste generated for calendar year 1994. This report summarizes industrial waste data records compiled since 1971 for the Idaho National Engineering Laboratory (INEL). The data presented are from the INEL Nonradiological Waste Management Information System.

740 (DOE/ID–10512) **Department of Energy Idaho Operations Office evaluation of feasibility studies for private sector treatment of alpha and TRU mixed wastes.** EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002208. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is currently storing a large quantity of alpha contaminated mixed low level waste which will require treatment prior to disposal. The DOE Idaho Operations Office (DOE-ID) recognized that current knowledge and funding were insufficient to directly pursue services for the requisite treatment. Therefore, it was decided that private sector studies would be funded to clarify cost, regulatory, technology, and contractual issues associated with procuring treatment services. This report analyzes the three private sector studies procured and recommends a path forward for DOE in procuring retrieval, assay, characterization, and treatment services for INEL transuranic and alpha contaminated mixed low level waste. This report was prepared by a team of subject matter experts from the INEL referred to as the DOE-ID Evaluation Team.

741 (DOE/ID–10521/1) **Performance evaluation of the technical capabilities of DOE sites for disposal of mixed low-level waste. Volume 1: Executive summary.** Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–96-0721/1). Order Number DE96009068. Source: OSTI; NTIS; INIS; GPO Dep.

A team of analysts designed and conducted a performance evaluation (PE) to estimate the technical capabilities of fifteen Department of Energy sites for disposal of mixed low-level waste (i.e., waste that contains both low-level radioactive materials and hazardous constituents). Volume 1 summarizes the process for selecting the fifteen sites, the methodology used in the evaluation, and the conclusions derived from the evaluation. Volume 1 is an executive summary both of the PE methodology and of the results obtained from the PEs. While this volume briefly reviews the scope and method of analyses, its main objective is to emphasize the important insights and conclusions derived from the conduct of the PEs. Volume 2 provides details about the site-selection process, the performance-evaluation methodology, and the overall results of the analysis. Volume 3 contains detailed evaluations of the fifteen sites and discussions of the results for each site.

742 (DOE/ID–10521/2) **Performance evaluation of the technical capabilities of DOE sites for disposal of mixed low-level waste. Volume 2: Technical basis and discussion of results.** Waters, R.D. (and others); Gruebel, M.M.; Hospelhorn, M.B. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 215p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–96-0721/2). Order Number DE96008580. Source: OSTI; NTIS; INIS; GPO Dep.

A team of analysts designed and conducted a performance evaluation to estimate the technical capabilities of fifteen Department of Energy sites for disposal of mixed low-level waste (i.e., waste that contains both low-level radioactive materials and hazardous constituents). Volume 1 summarizes the process for selecting the fifteen sites, the methodology used in the evaluation, and the conclusions derived from the evaluation. Volume 2 first describes the screening process used to determine the sites to be considered in the PEs. This volume then provides the technical details of the methodology for conducting the performance evaluations. It also provides a comparison and analysis of the overall results for all sites that were evaluated. Volume 3 contains detailed evaluations of the fifteen sites and discussions of the results for each site.

743 (DOE/ID–10521/3) **Performance evaluation of the technical capabilities of DOE sites for disposal of mixed low-level waste: Volume 3, Site evaluations.** Waters, R.D.; Gruebel, M.M. (eds.). Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 750p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (SAND–96-0721/3). Order Number DE96009804. Source: OSTI; NTIS; INIS; GPO Dep.

A team of analysts designed and conducted a performance evaluation to estimate the technical capabilities of fifteen Department of Energy sites for disposal of mixed low-level waste (i.e., waste that contains both low-level radioactive materials and hazardous constituents). Volume 1 summarizes the process for selecting the fifteen sites, the methodology used in the evaluation, and the conclusions derived from the evaluation. Volume 2 provides details about the site-selection process, the performance-evaluation methodology, and the overall results of the analysis. Volume 3 contains detailed evaluations of the fifteen sites and discussion of the results for each site.

744 (DOE/ID–10524-Vol.1) **Mixed Waste Focus Area integrated technical baseline report, Phase 1: Volume 1.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 16 Jan 1996. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007509. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) established the Mixed Waste Characterization, Treatment, and Disposal Focus Area (MWFA) to develop and facilitate implementation of technologies required to meet the Department's commitments for treatment of mixed low-level and transuranic wastes. The mission of the MWFA is to provide acceptable treatment systems, developed in partnership with users and with participation of stakeholders, tribal governments, and regulators, that are capable of treating DOE's mixed waste. These treatment systems include all necessary steps such as characterization, pretreatment, and disposal. To accomplish this mission, a technical baseline is being established that forms the basis for determining which technology development activities will be supported by the MWFA. The technical baseline is the prioritized list of deficiencies, and the resulting technology development activities needed to overcome these deficiencies. This document presents Phase I of the technical baseline development process, which resulted in the prioritized list of deficiencies that the MWFA will address. A summary of the data and the assumptions upon which this work was based is included, as well as information concerning the DOE Office of Environmental Management (EM) mixed waste technology development needs. The next phase in the technical baseline development process, Phase II, will result in the identification of technology development activities that will be conducted through the MWFA to resolve the identified deficiencies.

745 (DOE/ID–10524-Vol.2) **Mixed waste focus area integrated technical baseline report. Phase I, Volume 2: Revision 0.** Idaho National Engineering Lab., Idaho Falls, ID (United States). 16 Jan 1996. 360p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007510. Source: OSTI; NTIS; INIS; GPO Dep.

This document (Volume 2) contains the Appendices A through J for the Mixed Waste Focus Area Integrated Technical Baseline Report Phase I for the Idaho National Engineering Laboratory. Included are: Waste Type Managers' Resumes, detailed information on wastewater, combustible organics, debris, unique waste, and inorganic homogeneous solids and soils, and waste data information. A detailed list of technology deficiencies and site needs identification is also provided.

746 (DOE/ID/12584–132) **Mixed-waste treatment – What about the residuals? A comparative analysis of MSO and incineration.** Oak Ridge National Lab., TN (United States); Rust Geotech, Inc., Grand Junction, CO (United States); USDOE Albuquerque Operations Office, NM (United States); USDOE Grand Junction Projects Office, CO (United States). Jun 1993. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO–114). Order Number DE96003843. Source: OSTI; NTIS; INIS; GPO Dep.

This report examines the issues concerning final waste forms, or residuals, that result from the treatment of mixed waste in molten salt oxidation (MSO) and incinerator systems. MSO is a technology with the potential to treat a certain segment of the waste streams at US Department of Energy (DOE) sites. MSO was compared with incineration because incineration is the best demonstrated available technology (BDAT) for the same waste streams. The Grand Junction Projects Office (GJPO) and Oak Ridge National Laboratory (ORNL) prepared this report for the DOE Office of Environmental Restoration (OER). The goals of this study are to objectively evaluate the anticipated residuals from MSO and incineration, examine regulatory issues for these final waste forms, and determine secondary treatment options. This report, developed to address concerns that MSO residuals present unique disposal difficulties, is part of a larger effort to successfully implement MSO as a treatment technology for mixed and hazardous waste. A Peer Review Panel reviewed the MSO technology in November 1991, and the implementation effort is ongoing under the guidance of the MSO Task Force.

747 (DOE/ID/12584–239) **Thermal desorption treatability test conducted with VAC*TRAX Unit.** Rust Geotech, Inc., Grand Junction, CO (United States). Jan 1996. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-MWTP–05). Order Number DE96005952. Source: OSTI; NTIS; INIS; GPO Dep.

In 1992, Congress passed the Federal Facilities Compliance Act, requiring the U.S. Department of Energy (DOE) to treat and dispose of its mixed waste in accordance with Resource Conservation and Recovery Act (RCRA) treatment standards. In response to the need for mixed-waste treatment capacity, where off-site commercial treatment facilities do not exist or cannot be used, the DOE Albuquerque Operations Office (DOE-AL) organized a Treatment Selection Team to match mixed waste with treatment options and develop a strategy for treatment of mixed waste. DOE-AL manages nine sites with mixed-waste inventories. The Treatment Selection Team determined a need to develop mobile treatment units (MTUs) to treat waste at the sites where the wastes are generated. Treatment processes used for mixed wastes must remove the hazardous component (i.e., meet RCRA treatment standards) and contain the radioactive component in a form that will protect the worker, public, and environment. On the basis of the recommendations of the Treatment Selection Team, DOE-AL assigned projects to the sites to bring mixed-waste treatment capacity on-line. The three technologies assigned to the DOE Grand Junction Projects Office (DOE-GJPO) include thermal desorption (TD), evaporative oxidation, and waste water evaporation.

748 (DOE/ID/12584–263) **U.S. Department of Energy Grand Junction Projects Office site environmental report for calendar year 1995.** Rust Geotech, Inc., Grand Junction, CO (United States). May 1996. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-ES–17). Order Number DE96013700. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents information pertaining to environmental activities conducted during calendar year 1995 at the US Department of Energy (DOE) Grand Junction Projects Office (GJPO) facility in Grand Junction, Colorado. Environmental activities conducted at the GJPO facility during 1995 were associated with mixed-waste treatment, site remediation, off-site dose modeling, and radiological and nonradiological monitoring. As part of the GJPO Mixed-Waste Treatment Program, on-site treatability studies were conducted in 1995 that made use of pilot-scale evaporative-oxidation and thermal-desorption units and bench-scale stabilization. DOE-GJPO used some of its own mixed-waste as well as samples received from other DOE sites for these treatability studies. These studies are expected to conclude in 1996. Removal of radiologically contaminated materials from GJPO facility buildings was conducted under the provisions of the Grand Junction Projects Office Remedial Action Project. Remediation activities included the removal of 394 metric tons of contaminated material from Buildings 18 and 28 and revegetation activities on the GJPO site; remediation was conducted in compliance with applicable permits.

749 (DOE/ID/12735–T36) **Projects at the Western Environmental Technology Office. Quarterly technical progress report, April 1–June 30, 1995.** MSE, Inc., Butte, MT (United States). [1995]. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. (MSE–14). Order Number DE95016479. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains brief outlines of the multiple projects under the responsibility of the Western Environmental Technology Office in Butte Montana. These projects include biomass remediation, remediation of contaminated soils, mine waste technology, and several other types of remediation.

750 (DOE/ID/12735–T37) **Projects at the Western Environmental Technology Office. Quarterly technical progress report, July 1, 1995–September 30, 1995.** MSE, Inc., Butte, MT (United States). [1996]. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE96004110. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this project is to demonstrate the technical and economic feasibility of commercializing a biotechnology that uses plants to remediate soils, sediments, surface waters, and groundwaters contaminated by heavy metals and radionuclides. This technology, known as phytoremediation, is particularly suited to remediation of soils or water where low levels of contaminants are widespread. Project objectives are to provide an accurate estimate of the capability and rate of phytoremediation for removal of contaminants of concern from soils and groundwaters at Department of Energy (DOE) sites and to develop data suitable for engineering design and economic feasibility evaluations, including methods for destruction or final disposition of plants containing contaminants of concern. The bioremediation systems being evaluated could be less expensive than soil removal and treatment systems, given the areal extent and topography of sites under consideration and the investment of energy and money in soil-moving and -treating processes. In situ technology may receive regulatory acceptance more easily than ex situ treatments requiring excavation, processing, and replacement of surface soils. In addition, phytoremediation may be viable for cleanup of contaminated waters, either as the primary treatment or the final polishing stage, depending on the contaminant concentrations and process economics considerations.

751 (DOE/ID/12735–T38) **Feasibility analysis of recycling radioactive scrap steel.** Nichols, F. (Manufacturing Sciences Corp., Woodland, WA (United States)); Balhiser, B.; Cignetti, N. MSE, Inc., Butte, MT (United States); Manufacturing Sciences Corp., Oak Ridge, TN (United States); Lockwood Greene Engineering, Oak Ridge, TN (United States); Centerline Engineering Corp., Wexford, PA (United States). Sep 1995. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE96004568. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is to: (1) establish a conceptual design that integrates commercial steel mill technology with radioactive scrap metal (RSM) processing to produce carbon and stainless steel sheet and plate at a grade suitable for fabricating into radioactive waste containers; (2) determine the economic feasibility of building a micro-mill in the Western US to process 30,000 tons of RSM per year from both DOE and the nuclear utilities; and (3) provide recommendations for implementation. For purposes of defining the project, it is divided into phases: economic feasibility and conceptual design; preliminary design; detail design; construction; and operation. This study comprises the bulk of Phase 1. It is divided into four sections. Section 1 provides the reader with a complete overview extracting pertinent data, recommendations and conclusions from the remainder of the report. Section 2 defines the variables that impact the design requirements. These data form the baseline to create a preliminary conceptual design that is technically sound, economically viable, and capitalizes on economies of scale. Priorities governing the design activities are: (1) minimizing worker exposure to radionuclide hazards, (2) maximizing worker safety, (3) minimizing environmental contamination, (4) minimizing secondary wastes, and (5) establishing engineering controls to insure that the plant will be granted a license in the state selected for operation. Section 3 provides details of the preliminary conceptual design that was selected. The cost of project construction is estimated and the personnel needed to support the steel-making operation and radiological and environmental control are identified. Section 4 identifies the operational costs and supports the economic feasibility analysis. A detailed discussion of the resulting conclusions and recommendations is included in this section.

752 (DOE/ID/12915–4) **Assessment for development of an industrial wet oxidation system for burning waste and low-grade fuels. Final report, October 18, 1989–February 28, 1995.** Sundback, C. Modell Environmental Corp., Waltham, MA (United States). May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC07-90ID12915. Order Number DE96013300. Source: OSTI; NTIS; INIS; GPO Dep.

The ultimate goal of this program was to demonstrate safe, reliable, and effective operation of the supercritical water oxidation process (SCWO) at a pilot plant-level throughput. This program was a three phase program. Phase 1 of the program preceded MODEC's participation in the program. MODEC did participate in Phases 2 and 3 of the program. In Phase 2, the target waste and industry were pulp mill sludges from the pulp and paper industry. In Phase 3, the target was modified to be DOE-generated mixed low level waste; wastes containing RCRA hazardous constituents and radionuclide surrogates were used as model wastes. The paper describes the research unit planning and design; bench-scale development of SCWO; research and development of wet oxidation of fuels; and the design of a super-critical water pilot plant.

753 (DOE/LLW–114A-1) **Greater-than-Class C low-level radioactive waste characterization. Appendix A-1: Nuclear utility data outputs from the GNUPS database.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002383. Source: OSTI; NTIS; INIS; GPO Dep.

The Greater-Than-Class C Nuclear Utility Projections System (GNUPS) was developed as a database for the GTCC LLW Program to estimate future volumes and radionuclide activities of nuclear utility GTCC LLW. Detailed printouts from the GNUPS database are presented in this appendix. The GNUPS projects nuclear utility volumes and activities for three cases: low, base, and high. In addition, the projections can be adjusted to account for the effects of packaging, concentration averaging, and plant operating lifetime. A brief description of how the GNUPS performs calculations of volumes and activities is given.

754 (DOE/LLW–114A-2) **Greater-than-Class C low-level radioactive waste characterization. Appendix A-2: Timing of greater-than-Class C low-level radioactive waste from nuclear power plants.** Steinke, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002384. Source: OSTI; NTIS; INIS; GPO Dep.

Planning for the storage or disposal of greater-than-Class C low-level radioactive waste (GTCC LLW) requires characterization of that waste. Timing, or the date the waste will require storage or disposal, is an integral aspect of that planning. The majority of GTCC LLW is generated by nuclear power plants, and the length of time a reactor remains operational directly affects the amount of GTCC waste expected from that reactor. This report uses data from existing literature to develop high, base, and low case estimates for the number of plants expected to experience (a) early shutdown, (b) 40-year operation, or (c) life extension to 60-year operation. The discussion includes possible effects of advanced light water reactor technology on future GTCC LLW generation. However, the main focus of this study is timing for shutdown of current technology reactors that are under construction or operating.

755 (DOE/LLW–114A-3) **Greater-than-Class C low-level radioactive waste characterization. Appendix A-3: Basis for greater-than-Class C low-level radioactive waste light water reactor projections.** Mancini, A.; Tuite, P.; Tuite, K.; Woodberry, S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002385. Source: OSTI; NTIS; INIS; GPO Dep.

This study characterizes low-level radioactive waste types that may exceed Class C limits at light water reactors, estimates the amounts of waste generated, and estimates radionuclide content and distribution within the waste. Waste types that may exceed Class C limits include metal components that become activated during operations, process wastes such as cartridge filters and decontamination resins, and activated metals from decommissioning activities. Operating parameters and current management practices at operating plants are reviewed and used to estimate the amounts of low-level waste exceeding Class C limits that is generated per fuel cycle, including amounts of routinely generated activated metal components and process waste. Radionuclide content is calculated for specific activated metals components. Empirical data from actual low-level radioactive waste are used to estimate radionuclide content for process wastes. Volumes and activities are also estimated for decommissioning activated metals that exceed Class C limits. To estimate activation levels of decommissioning waste, six typical light water reactors are modeled and analyzed. This study does not consider concentration averaging.

756 (DOE/LLW–114D-3) **Greater-than-Class C low-level radioactive waste characterization. Appendix D-3: Characterization of greater-than-Class C low-level radioactive waste from other generators.** Fish, L.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002386. Source: OSTI; NTIS; INIS; GPO Dep.

The Other Generators category includes all greater-than-Class C low-level radioactive waste (GTCC LLW) that is not generated or held by nuclear utilities or sealed sources licensees or that is not stored at Department of Energy facilities. To determine the amount of waste within this category, 90 LLW generators were contacted; 13 fit the Other Generators category. Based on information received from the 13 identified Other Generators, the GTCC LLW Management Program was able to (a) characterize the nature of industries in this category, (b) estimate the 1993 inventory of Other Generator waste for high, base, and low cases, and (c) project inventories to the year 2035 for high, base, and low cases. Assumptions were applied to each of the case estimates to account for generators who may not have been identified in this study.

757 (DOE/LLW–114E-1) **Greater-than-Class C low-level radioactive waste characterization. Appendix E-1: Historical development of GTCC LLW characterization.** EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002387. Source: OSTI; NTIS; INIS; GPO Dep.

By the late 1980s, it was apparent that there was little support for any of the volume projections of greater-than-Class C low-level radioactive waste (GTCC LLW) thus far predicted. It had also become clear that the amount of GTCC LLW to be generated in the future was highly dependent on a number of specific technical and policy issues unrelated to past generation rates. In 1990, DOE's EM-35 organization requested that the GTCC LLW Management Program at the INEL conduct a systematic exercise designed to achieve a degree of consensus around a narrower range of volume projections. Following the series of workshops, the INEL and subcontractors conducted technical studies to associate specific waste volume projections with the various scenarios developed by the panels. The results of these studies were reported in Greater-Than-Class C Low-Level Radioactive Waste Characterization: Estimated Volumes, Radionuclide Activities, and Other Characteristics (DOE/LLW-114, August 1991). This appendix briefly describes the historical development of the GTCC LLW project.

758 (DOE/LLW–114E-2) **Greater-than-Class C low-level radioactive waste characterization. Appendix E-2:**

Mixed GTCC LLW assessment. Kirner, N.P. (Ebasco Environmental, Idaho Falls, ID (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States); Ebasco Environmental, Idaho Falls, ID (United States). Sep 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002388. Source: OSTI; NTIS; INIS; GPO Dep.

Mixed greater-than-Class C low-level radioactive waste (mixed GTCC LLW) is waste that combines two characteristics: it is radioactive, and it is hazardous. This report uses information compiled from Greater-Than-Class C Low-Level Radioactive Waste Characterization: Estimated Volumes, Radionuclide Activities, and Other Characteristics (DOE/LLW 1 14, Revision 1), and applies it to the question of how much and what types of mixed GTCC LLW are generated and are likely to require disposal in facilities jointly regulated by the DOE and the NRC. The report describes how to classify a RCRA hazardous waste, and then applies that classification process to the 41 GTCC LLW waste types identified in the DOE/LLW-114 (Revision 1). Of the 41 GTCC LLW categories identified, only six were identified in this study as potentially requiring regulation as hazardous waste under RCRA. These wastes can be combined into the following three groups: fuel-in decontamination resins, organic liquids, and process waste consisting of lead scrap/ shielding from a sealed source manufacturer. For the base case, no mixed GTCC LLW is expected from nuclear utilities or sealed source licensees, whereas only 177 ml of mixed GTCC LLW are expected to be produced by other generators through the year 2035. This relatively small volume represents approximately 40% of the base case estimate for GTCC wastes from other generators. For these other generators, volume estimates for mixed GTCC LLW ranged from less than 1 m^3 to 187 m^3, depending on assumptions and treatments applied to the wastes.

759 (DOE/LLW–114E-3) **Greater-than-Class C low-level radioactive waste characterization. Appendix E-3: GTCC LLW assumptions matrix.** EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002389. Source: OSTI; NTIS; INIS; GPO Dep.

This study identifies four categories of GTCC LLW: nuclear utility; sealed sources; DOE-held; and other generators. Within each category, inventory and projection data are modeled in three scenarios: (1) Unpackaged volume–this is the unpackaged volume of waste that would exceed Class C limits if the waste calculation methods in 10 CFR 61.55 were applied to the discrete items before concentration averaging methods were applied to the volume; (2) Not-concentration-averaged (NCA) packaged volume–this is the packaged volume of GTCC LLW assuming that no concentration averaging is allowed; and (3) After-concentration-averaging (ACA) packaged volume–this is the packaged volume of GTCC LLW, which, for regulatory or practical reasons, cannot be disposed of in a LLW disposal facility using allowable concentration averaging practices. Three cases are calculated for each of the volumes described above. These values are defined as the low, base, and high cases. The following tables explain the assumptions used to determine low, base, and high case estimates for each scenario, within each generator category. The appendices referred to in these tables are appendices to Greater-Than-Class C Low-Level Radioactive Waste Characterization: Estimated Volumes, Radionuclide Activities, and Other Characteristics (DOE/LLW-114, Revision 1).

760 (DOE/LLW–114E-4) **Greater-than-Class C low-level radioactive waste characterization. Appendix E-4: Packaging factors for greater-than-Class C low-level radioactive waste.** Quinn, G.; Grant, P.; Winberg, M.; Williams, K. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002390. Source: OSTI; NTIS; INIS; GPO Dep.

This report estimates packaging factors for several waste types that are potential greater-than-Class C (GTCC) low-level radioactive waste (LLW). The packaging factor is defined as the volume of a GTCC LLW disposal container divided by the as-generated or "unpackaged" volume of the waste loaded into the disposal container. Packaging factors reflect any processes that reduce or increase an original unpackaged volume of GTCC LLW, the volume inside a waste container not occupied by the waste, and the volume of the waste container itself. Three values are developed that represent (a) the base case or most likely value for a packaging factor, (b) a high case packaging factor that corresponds to the largest anticipated disposal volume of waste, and (c) a low case packaging factor for the smallest volume expected. GTCC LLW is placed in three categories for evaluation in this report: activated metals, sealed sources, and all other waste.

761 (DOE/LLW–114E-5) **Greater-than-Class C low-level radioactive waste characterization. Appendix E-5: Impact of the 1993 NRC draft Branch Technical Position on concentration averaging of greater-than-Class C low-level radioactive waste.** Tuite, P. (Waste Management Group, Inc., Peekskill, NY (United States)); Tuite, K.; Harris, G. EG and G Idaho, Inc., Idaho Falls, ID (United States); Waste Management Group, Peekskill, NY (United States). Sep 1994. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002391. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the effects of concentration averaging practices on the disposal of greater-than-Class C low-level radioactive waste (GTCC LLW) generated by the nuclear utility industry and sealed sources. Using estimates of the number of waste components that individually exceed Class C limits, this report calculates the proportion that would be classified as GTCC LLW after applying concentration averaging; this proportion is called the concentration averaging factor. The report uses the guidance outlined in the 1993 Nuclear Regulatory Commission (NRC) draft Branch Technical Position on concentration averaging, as well as waste disposal experience at nuclear utilities, to calculate the concentration averaging factors for nuclear utility wastes. The report uses the 1993 NRC draft Branch Technical Position and the criteria from the Barnwell, South Carolina, LLW disposal site to calculate concentration averaging factors for sealed sources. The report addresses three waste groups: activated metals from light water reactors, process wastes from light-water reactors, and sealed sources. For each waste group, three concentration averaging cases are considered: high, base, and low. The base case, which is the most likely case to occur, assumes using the specific guidance given in the 1993 NRC draft Branch Technical Position on concentration averaging. To project future GTCC LLW generation, each waste category is assigned a concentration averaging factor for the high, base, and low cases.

762 (DOE/LLW–114F) **Greater-than-Class C low-level waste characterization. Appendix F: Greater-than-Class C low-level radioactive waste light water reactor projections.** Tuite, P.; Tuite, K.; Levin, A.; O'Kelley, M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1991. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002307. Source: OSTI; NTIS; INIS; GPO Dep.

This study characterizes potential greater-than-Class C low-level radioactive waste streams, estimates the amounts of waste generated, and estimates their radionuclide content and distribution. Several types of low-level radioactive wastes produced by light water reactors were identified in an earlier study as being potential greater-than-Class C low-level waste, including specific activated metal components and certain process wastes in the form of cartridge filters and decontamination resins. Light water reactor operating parameters and current management practices at operating plants were reviewed and used to estimate the amounts of potential greater-than-Class C low-level waste generated per fuel cycle. The amounts of routinely generated activated metal components and process waste were estimated as a function of fuel cycle. Component-specific radionuclide content and distribution was calculated for activated metals components. Empirical data from actual low-level radioactive waste streams were used to estimate radionuclide content and distribution for process wastes. The greater-than-Class C low-level waste volumes that could be generated through plant closure were also estimated, along with volumes and activities for potential greater-than-Class C activated metals generated at decommissioning.

763 (DOE/LLW–114G) **Greater-than-Class C low-level waste characterization. Appendix G: Evaluation of potential for greater-than-Class C classification of irradiated hardware generated by utility-operated reactors.** Cline, J.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1991. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002308. Source: OSTI; NTIS; INIS; GPO Dep.

This study compiles and evaluates data from many sources to expand a base of data from which to estimate the activity concentrations and volumes of greater-than-Class C low-level waste that the Department of Energy will receive from the commercial power industry. Sources of these data include measurements of irradiated hardware made by or for the utilities that was classified for disposal in commercial burial sites, measurements of neutron flux in the appropriate regions of the reactor pressure vessel, analyses of elemental constituents of the particular structural material used for the components, and the activation analysis calculations done for hardware. Evaluations include results and assumptions in the activation analyses. Sections of this report and the appendices present interpretation of data and the classification definitions and requirements.

764 (DOE/LLW–114H) **Greater-than-Class C low-level radioactive waste characterization. Appendix H: Packaging factors for greater-than-Class C low-level radioactive waste.** Quinn, G.; Grant, P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1991. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002381. Source: OSTI; NTIS; INIS; GPO Dep.

This report develops and presents estimates for a set of three values that represent a reasonable range for the packaging factors for several waste streams that are potential greater-than-Class C low-level radioactive waste. The packaging factor is defined as the volume of a greater-than-Class C low-level waste disposal container divided by the original, as-generated or "unpackaged," volume of the wastes loaded into the disposal container. Packaging factors take into account any processes that reduce or increase an original unpackaged volume of a greater-than-Class C low-level radioactive waste, the volume inside a waste container not occupied by the waste, and the volume of the waste container itself. The three values developed represent (a) the base case or most likely value for a packaging factor, (b) a high case packaging factor that corresponds to the largest anticipated volume of waste for disposal, and (c) a low case packaging factor for the smallest volume expected. Three categories of greater-than-Class C low-level waste are evaluated in this report: activated metals, sealed sources, and all other wastes. Estimates of reasonable packaging factors for the low, base, and high cases for the specific waste streams in each category are shown in Table H-1.

765 (DOE/LLW–114I) **Greater-than-Class C low-level waste characterization. Appendix I: Impact of concentration averaging low-level radioactive waste volume projections.** Tuite, P.; Tuite, K.; O'Kelley, M.; Ely, P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1991. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002382. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides a quantitative framework for bounding unpackaged greater-than-Class C low-level radioactive waste types as a function of concentration averaging. The study defines the three concentration averaging scenarios that lead to base, high, and low volumetric projections; identifies those waste types that could be greater-than-Class C under the high volume, or worst case, concentration averaging scenario; and quantifies the impact of these scenarios on identified waste types relative to the base case scenario. The base volume scenario was assumed to reflect current requirements at the disposal sites as well as the regulatory views. The high volume scenario was assumed to reflect the most conservative criteria as incorporated in some compact host state requirements. The low volume scenario was assumed to reflect the 10 CFR Part 61 criteria as applicable to both shallow land burial facilities and to practices that could be employed to reduce the generation of Class C waste types.

766 (DOE/LLW–127) **National Low-Level Waste Management Program radionuclide report series. Volume 2, Niobium-94.** Adams, J.P.; Carboneau, M.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002298. Source: OSTI; NTIS; INIS; GPO Dep.

The Purpose of the National Low-Level Waste Management Program Radionuclide Report Series is to provide information to, state representatives and developers of low-level radioactive waste disposal facilities about the radiological chemical, and physical characteristics of selected radionuclides and their behavior in the low-level radioactive waste disposal facility environment. Extensive surveys of available literature provided information used to produce this series of reports and an introductory report. This report is Volume 11 of the series. It outlines the basic radiological, chemical, and physical characteristics of niobium-94, waste types and forms that contain it, and its behavior in environmental media such as soils, plants, groundwater, air, animals and the human body.

767 (DOE/LLW–128) **National Low-Level Waste Management Program Radionuclide Report Series: Volume 12, Cobalt-60.** Adams, J.P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95017655. Source: OSTI; NTIS; INIS; GPO Dep.

This report outlines the basic radiological and chemical characteristics of cobalt-60 (^{60}Co) and examines how these characteristics affect the behavior of ^{60}Co in various environmental media, such as soils, groundwater, plants, animals, the atmosphere, and the human body. Discussions also include methods of ^{60}Co production, waste types, and waste forms that contain ^{60}Co. All cobalt atoms contain 27 protons ($Z = 27$) and various numbers of neutrons (typically $N = 27$ to 37 neutrons) within the atom's nucleus. There is only one stable isotope of cobalt, namely ^{59}Co. All other cobalt isotopes, including ^{60}Co, are radioactive. The radioactive isotopes of cobalt have half-lives ranging from less than a second (^{54}Co-0.19 s) to 5.2 years (^{60}Co). The radioactive isotopes of cobalt are not a normal constituent of the natural environment and are generated as a result of human activities. The primary source of ^{60}Co in the environment has been low-level radioactive waste material generated as a result of neutron activation of stable ^{59}Co that is present in the structural components of nuclear reactor vessels. This isotope is also intentionally produced, usually in reactors but also to some degree in accelerators for industrial and medical uses, such as for radiation sources for cancer treatment and nondestructive testing of metals and welds. ^{60}Co may enter the environment as a result of the activities associated with nuclear reactor operations and decommissioning and when industrial and medical sources are being used, manufactured, or disposed.

768 (DOE/LLW–129-Vol.13) **National Low-Level Waste Management Program radionuclide report series. Volume 13, Curium-242.** Adams, J.P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001323. Source: OSTI; NTIS; INIS; GPO Dep.

This report, Volume 13 of the National Low-Level Waste Management Program Radionuclide Report Series, discusses the radiological and chemical characteristics of curium-242 (^{242}Cm). This report also includes discussions about waste types and forms in which ^{242}Cm can be found and ^{242}Cm behavior in the environment and in the human body.

769 (DOE/LLW–130) **National low-level waste management program radionuclide report series, Volume 14: Americium-241.** Winberg, M.R.; Garcia, R.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002366. Source: OSTI; NTIS; INIS; GPO Dep.

This report, Volume 14 of the National Low-Level Waste Management Program Radionuclide Report Series, discusses the radiological and chemical characteristics of americium-241 (^{241}Am). This report also includes discussions about waste types and forms in which ^{241}Am can be found and ^{241}Am behavior in the environment and in the human body.

770 (DOE/LLW–131) **National low-level waste management program radionuclide report series, Volume 15: Uranium-238.** Adams, J.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002365. Source: OSTI; NTIS; INIS; GPO Dep.

This report, Volume 15 of the National Low-Level Waste Management Program Radionuclide Report Series, discusses the radiological and chemical characteristics of uranium-238 (^{238}U). The purpose of the National Low-Level Waste Management Program Radionuclide Report Series is to provide information to state representatives and developers of low-level radioactive waste disposal facilities about the radiological, chemical, and physical characteristics of selected radionuclides and their behavior in the waste disposal facility environment. This report also includes discussions about waste types and forms in which ^{238}U can be found, and ^{238}U behavior in the environment and in the human body.

771 (DOE/LLW–147-Rev.1) **Evaluation of Department of Energy-Held Potential Greater-Than-Class C Low-Level Radioactive Waste. Revision 1.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1994. 464p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002370. Source: OSTI; NTIS; INIS; GPO Dep.

A number of commercial facilities have generated potential greater-than-Class C low-level radioactive waste (GTCC LLW), and, through contractual arrangements with the US Department of Energy (DOE) or for health and safety reasons, DOE is storing the waste. This report presents the results of an assessment conducted by the GTCC LLW Management Program to consider specific circumstances under which DOE accepted the waste, and to determine whether disposal in a facility licensed by the US Nuclear Regulatory Commission, or by DOE in a nonlicensed facility, is appropriate. Input from EG&G Idaho, Inc., and DOE Idaho Operations Office legal departments concerning the disposal requirements of this waste were the basis for the decision process used in this report.

772 (DOE/LLW–153) **Commercial low-level radioactive waste transportation liability and radiological risk.** Quinn, G.J.; Brown, O.F. II; Garcia, R.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1992. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96005883. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared for States, compact regions, and other interested parties to address two subjects related to transporting low-level radioactive waste to disposal facilities. One is the potential liabilities associated with low-level radioactive waste transportation from the perspective of States as hosts to low-level radioactive waste disposal facilities. The other is the radiological risks of low-level radioactive waste transportation for drivers, the public, and disposal facility workers.

773 (DOE/LLW–160-Rev.1) **Savannah River Site off-site hazardous waste shipment data validation report. Revision 1.** Casey, C.; Kudera, D.E.; Page, L.A.; Rohe, M.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1995. 200p. Sponsored by USDOE,

Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001157. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this data validation is to verify that waste shipments reported in response to the US Department of Energy Headquarters data request are properly categorized according to DOE-HQ definitions. This report documents all findings and actions resulting from the independent review of the Savannah River Site data submittal, and provides a summary of the SRS data submittal and data validation strategy. The overall hazardous waste management and offsite release process from 1987–1991 is documented, along with an identification and description of the hazardous waste generation facilities. SRS did not ship any hazardous waste offsite before 1987. Sampling and analysis and surface surveying procedures and techniques used in determining offsite releasability of the shipments are also described in this report. SRS reported 150 manifested waste shipments from 1984 to 1991 that included 4,755 drums or lab packs and 13 tankers. Of these waste items, this report categorizes 4,251 as clean (including 12 tankers), 326 as likely clean, 138 as likely radioactive, and 55 as radioactive (including one tanker). Although outside the original scope of this report, 14 manifests from 1992 and 1993 are included, covering 393 drums or lab packs and seven tankers. From the 1992–1993 shipments, 58 drums or lab packs are categorized as radioactive and 16 drums are categorized as likely radioactive. The remainder are categorized as clean.

774 (DOE/LLW–179) **Transportation and disposal configuration for DOE-managed low-level and mixed low-level waste.** Johnsen, T. EG and G Idaho, Inc., Idaho Falls, ID (United States). Idaho National Engineering Lab. Jun 1993. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96008980. Source: OSTI; NTIS; INIS; GPO Dep.

This report briefly examines the current U.S. Department of Energy complex-wide configuration for transportation and disposal of low-level and mixed low-level waste, and also retraces the historical sequence of events and rationale that has guided its development. The study determined that Nevada Test Site and the Hanford Site are the only two sites that currently provide substantial disposal services for offsite low-level waste generators. It was also determined that mixed low-level waste shipments are infrequent and are generally limited to shipments to offsite commercial treatment facilities or other Department of Energy sites for storage. The current alignment of generator to disposal site for low-level waste shipments is generally consistent with the programmatic mission of the generator; that is, defense-generated waste is shipped to the Nevada Test Site and research-generated waste is transported to the Hanford Site. The historical development of the current configuration was resurrected by retrieving Department of Energy documentation and interviewing both current and former department and contractor personnel. According to several accounts, the basic framework of the system was developed during the late 1970s, and was reportedly based on the ability of the disposal site to manage a given waste form. Documented evidence to support this reasoning, however, could not be uncovered.

775 (DOE/LLW–185) **Methods for verifying compliance with low-level radioactive waste acceptance criteria.** USDOE Idaho Operations Office, Idaho Falls, ID (United States); Dames and Moore, Denver, CO (United States). Sep 1993. 309p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002302. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the methods that are currently employed and those that can be used to verify compliance with low-level radioactive waste (LLW) disposal facility waste acceptance criteria (WAC). This report presents the applicable regulations representing the Federal, State, and site-specific criteria for accepting LLW. Typical LLW generators are summarized, along with descriptions of their waste streams and final waste forms. General procedures and methods used by the LLW generators to verify compliance with the disposal facility WAC are presented. The report was written to provide an understanding of how a regulator could verify compliance with a LLW disposal facility's WAC. A comprehensive study of the methodology used to verify waste generator compliance with the disposal facility WAC is presented in this report. The study involved compiling the relevant regulations to define the WAC, reviewing regulatory agency inspection programs, and summarizing waste verification technology and equipment. The results of the study indicate that waste generators conduct verification programs that include packaging, classification, characterization, and stabilization elements. The current LLW disposal facilities perform waste verification steps on incoming shipments. A model inspection and verification program, which includes an emphasis on the generator's waste application documentation of their waste verification program, is recommended. The disposal facility verification procedures primarily involve the use of portable radiological survey instrumentation. The actual verification of generator compliance to the LLW disposal facility WAC is performed through a combination of incoming shipment checks and generator site audits.

776 (DOE/LLW–186) **Social and institutional evaluation report for Greater-Than-Class C Low-Level Radioactive Waste Disposal.** Anderson, T.L. (Dames and Moore, Denver, CO (United States)); Lewis, B.E.; Turner, K.H.; Rozelle, M.A. EG and G Idaho, Inc., Idaho Falls, ID (United States); Dames and Moore, Denver, CO (United States). Oct 1993. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95017654. Source: OSTI; NTIS; INIS; GPO Dep.

This report identifies and characterizes social and institutional issues that would be relevant to the siting, licensing, construction, closure, and postclosure of a Greater-Than-Class-C low-level radioactive waste (GTCC LLW) disposal facility. A historical perspective of high-level radioactive waste (HLW) and LLW disposal programs is provided as an overview of radioactive waste disposal and to support the recommendations and conclusions in the report. A characterization of each issue is provided to establish the basis for further evaluations. Where applicable, the regulatory requirements of 10 CFR 60 and 61 are incorporated in the issue characterizations. The issues are used to compare surface, intermediate depth, and deep geologic disposal alternatives. The evaluation establishes that social and institutional issues do not significantly discriminate among the disposal alternatives. Recommendations are provided for methods by which the issues could be considered throughout the lifecycle of a GTCC LLW disposal program.

777 (DOE/LLW–187) **Introduction to radiological performance assessment.** Moss, G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1995. 28p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC07-94ID13223. Order Number DE96001326. Source: OSTI; NTIS; INIS; GPO Dep.

A radiological performance assessment is conducted to provide reasonable assurance that performance objectives for low-level radioactive waste (LLW) disposal will be met. Beginning in the early stages of development, a radiological performance assessment continues through the operational phase, and is instrumental in the postclosure of the facility. Fundamental differences exist in the regulation of commercial and defense LLW, but the radiological performance assessment process is essentially the same for both. The purpose of this document is to describe that process in a concise and straightforward manner. This document focuses on radiological performance assessment as it pertains to commercial LLW disposal, but is applicable to US Department of Energy sites as well. Included are discussions on performance objectives, site characterization, and how a performance assessment is conducted. A case study is used to illustrate how the process works as a whole. A bibliography is provided to assist in locating additional information.

778 (DOE/LLW–189) **Developing operating procedures for a low-level radioactive waste disposal facility.** Sutherland, A.A. (Rogers and Associates Engineering Corp., Salt Lake City, UT (United States)); Miner, G.L.; Grahn, K.F.; Pollard, C.G. EG and G Idaho, Inc., Idaho Falls, ID (United States); Rogers and Associates Engineering Corp., Salt Lake City, UT (United States). Oct 1993. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (RAE–9304/1-1). Order Number DE96001576. Source: OSTI; NTIS; INIS; GPO Dep.

This document is intended to assist persons who are developing operating and emergency procedures for a low-level radioactive waste disposal facility. It provides 25 procedures that are considered to be relatively independent of the characteristics of a disposal facility site, the facility design, and operations at the facility. These generic procedures should form a good starting point for final procedures on their subjects for the disposal facility. In addition, this document provides 55 annotated outlines of other procedures that are common to disposal facilities. The annotated outlines are meant as checklists to assist the developer of new procedures.

779 (DOE/LLW–192) **Greater-Than-Class C Low-Level Radioactive Waste Transportation Strategy report and institutional plan.** Schmitt, R.C.; Tyacke, M.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95017651. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains two parts. Part I, Greater-Than-Class-C Low-Level Radioactive Waste Transportation Strategy, addresses the requirements, responsibilities, and strategy to transport and receive these wastes. The strategy covers (a) transportation packaging, which includes shipping casks and waste containers; (b) transportation operations relating to the five facilities involved in transportation, i.e., waste originator, interim storage, dedicated storage, treatment, and disposal; (c) system safety and risk analysis; (d) routes; (e) emergency preparedness and response; and (o safeguards and security. A summary of strategic actions is provided at the conclusion of Part 1. Part II, Institutional Plan for Greater-Than-Class C Low-Level Radioactive Waste Packaging and Transportation, addresses the assumptions, requirements, and institutional plan elements and actions. As documented in the Strategy and Institutional Plan, the most challenging issues facing the GTCC LLW Program shipping campaign are institutional issues closely related to the strategy. How the Program addresses those issues and demonstrates to the states, local governments, and private citizens that the shipments can and will be made safely will strongly affect the success or failure of the campaign.

780 (DOE/LLW–199) **Comparative approaches to siting low-level radioactive waste disposal facilities.** Newberry, W.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1994. 119p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96001577. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes activities in nine States to select site locations for new disposal facilities for low-level radioactive waste. These nine States have completed processes leading to identification of specific site locations for onsite investigations. For each State, the status, legal and regulatory framework, site criteria, and site selection process are described. In most cases, States and compact regions decided to assign responsibility for site selection to agencies of government and to use top-down mapping methods for site selection. The report discusses quantitative and qualitative techniques used in applying top-down screenings, various approaches for delineating units of land for comparison, issues involved in excluding land from further consideration, and different positions taken by the siting organizations in considering public acceptance, land use, and land availability as factors in site selection.

781 (DOE/LLW–208) **National Institutes of Health: Mixed waste stream analysis.** Kirner, N.P.; Faison, G.P.; Johnson, D.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE95017656. Source: OSTI; NTIS; INIS; GPO Dep.

The Low-Level Radioactive Waste Policy Amendments Act of 1985 requires that the US Department of Energy (DOE) provide technical assistance to host States, compact regions, and unaffiliated States to fulfill their responsibilities under the Act. The National Low-Level Waste Management Program (NLLWMP) operated for DOE by EG&G Idaho, Inc. provides technical assistance in the development of new commercial low-level radioactive waste disposal capacity. The NLLWMP has been requested by the Appalachian Compact to help the biomedical community become better acquainted with its mixed waste streams, to help minimize the mixed waste streams generated by the biomedical community, and to provide applicable treatment technologies to those particular mixed waste streams. Mixed waste is waste that satisfies the definition of low-level radioactive waste (LLW) in the Low-Level Radioactive Waste Policy Act of 1980 (LLRWPA) and contains hazardous waste that either (a) is listed as a hazardous waste in Subpart D of 40 CFR 261, or (b) causes the LLW to exhibit any of the hazardous waste characteristics identified in 40 CFR 261. The purpose of this report is to clearly define and characterize the mixed waste streams generated by the biomedical community so that an identification can be made of the waste streams that can and cannot be minimized and treated by current options. An understanding of the processes and complexities of generation of mixed waste in the biomedical community may encourage more treatment and storage options to become available.

782 (DOE/LLW–210) **Vitrification treatment options for disposal of greater-than-Class-C low-level waste in a deep geologic repository.** Fullmer, K.S.; Fish, L.W.; Fischer, D.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1994. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009673. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE), in keeping with their responsibility under Public Law 99-240, the Low-Level Radioactive Waste Policy Amendments Act of 1985, is investigating several disposal options for greater-than-Class C low-level waste (GTCC LLW), including emplacement in a deep geologic repository. At the present time vitrification, namely borosilicate glass, is the standard waste form assumed for high-level waste accepted into the Civilian Radioactive Waste Management System. This report supports DOE's investigation of the deep geologic disposal option by comparing the vitrification treatments that are able to convert those GTCC LLWs that are inherently migratory into stable waste forms acceptable for disposal in a deep geologic repository. Eight vitrification treatments that utilize glass, glass ceramic, or basalt waste form matrices are identified. Six of these are discussed in detail, stating the advantages and limitations of each relative to their ability to immobilize GTCC LLW. The report concludes that the waste form most likely to provide the best composite of performance characteristics for GTCC process waste is Iron Enriched Basalt 4 (IEB4).

783 (DOE/LLW–213) **Potential co-disposal of greater-than-class C low-level radioactive waste with Department of Energy special case waste - greater-than-class C low-level waste management program.** Allred, W.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96002367. Source: OSTI; NTIS; INIS; GPO Dep.

This document evaluates the feasibility of co-disposing of greater-than-Class C low-level radioactive waste (GTCC LLW) with U.S. Department of Energy (DOE) special case waste (SCW). This document: (1) Discusses and evaluates key issues concerning co-disposal of GTCC LLW with SCW. This includes examining these issues in terms of regulatory concerns, technical feasibility, and economics; (2) Examines advantages and disadvantages of such co-disposal; and (3) Makes recommendations. Research and analysis of the issues presented in this report indicate that it would be technically and economically feasible to co-dispose of GTCC LLW with DOE SCW. However, a dilemma will likely arise in the current division of regulatory responsibilities between the U.S. Nuclear Regulatory Commission and DOE (i.e., current requirement for disposal of GTCC LLW in a facility licensed by the Nuclear Regulatory Commission). DOE SCW is currently not subject to this licensing requirement.

784 (DOE/LLW–218) **National Institutes of Health: Mixed waste minimization and treatment.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002288. Source: OSTI; NTIS; INIS; GPO Dep.

The Appalachian States Low-Level Radioactive Waste Commission requested the US Department of Energy's National Low-Level Waste Management Program (NLLWMP) to assist the biomedical community in becoming more knowledgeable about its mixed waste streams, to help minimize the mixed waste stream generated by the biomedical community, and to identify applicable treatment technologies for these mixed waste streams. As the first step in the waste minimization process, liquid low-level radioactive mixed waste (LLMW) streams generated at the National Institutes of Health (NIH) were characterized and combined into similar process categories. This report identifies possible waste minimization and treatment approaches for the LLMW generated by the biomedical community identified in DOE/LLW-208. In development of the report, on site meetings were conducted with NIH personnel responsible for generating each category of waste identified as lacking disposal options. Based on the meetings and general waste minimization guidelines, potential waste minimization options were identified.

785 (DOE/LLW–220) **Model training curriculum for Low-Level Radioactive Waste Disposal Facility Operations.** Tyner, C.J.; Birk, S.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1995. 494p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002369. Source: OSTI; NTIS; INIS; GPO Dep.

This document is to assist in the development of the training programs required to be in place for the operating license for a low-level radioactive waste disposal facility. It consists of an introductory document and four additional appendixes of individual training program curricula. This information will provide the starting point for the more detailed facility-specific training programs that will be developed as the facility hires and trains new personnel and begins operation. This document is comprehensive and is intended as a guide for the development of a company- or facility-specific program. The individual licensee does not need to use this model training curriculum as written. Instead, this document can be used as a menu for the development, modification, or verification of customized training programs.

786 (DOE/LLW–221) **Impact assessment of draft DOE Order 5820.2B. Radioactive Waste Technical Support Program.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95017657. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has prepared a revision to DOE Order 5820.2A, entitled "Radioactive Waste Management." DOE issued DOE Order 5820.2A in September 1988 and, as the title implies, it covered only radioactive waste forms. The proposed draft order, entitled "Waste Management," addresses the management of both radioactive and nonradioactive waste forms. It also includes spent nuclear fuel, which DOE does not consider a waste. Waste forms covered include hazardous waste, high-level waste, transuranic (TRU) waste, low-level radioactive waste, uranium and thorium mill tailings, mixed waste, and sanitary waste. The Radioactive Waste Technical Support Program (TSP) of Leached Idaho Technologies Company (LITCO) is facilitating the revision of this order. The EM Regulatory Compliance Division (EM-331) has requested that TSP estimate the impacts and costs of compliance with the revised order. TSP requested Dames & Moore to aid in this assessment by comparing requirements in Draft Order 5820.2B to ones in DOE Order 5820.2A and other DOE orders and Federal regulations. The assessment started with a draft version of 5820.2B dated January 14, 1994. DOE has released three updated versions of the draft order since then (dated May

20, 1994; August 26, 1994; and January 23, 1995). Each time DOE revised the order, Dames and Moore updated the assessment work to reflect the text changes. This report reflects the January 23, 1995 version of the draft order.

787 (DOE/LLW-222) **Summary of treatment, storage, and disposal facility usage data collected from U.S. Department of Energy sites.** Jacobs, A. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Oswald, K.; Trump, C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009663. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an analysis for the US Department of Energy (DOE) to determine the level and extent of treatment, storage, and disposal facility (TSDF) assessment duplication. Commercial TSDFs are used as an integral part of the hazardous waste management process for those DOE sites that generate hazardous waste. Data regarding the DOE sites' usage have been extracted from three sets of data and analyzed in this report. The data are presented both qualitatively and quantitatively, as appropriate. This information provides the basis for further analysis of assessment duplication to be documented in issue papers as appropriate. Once the issues have been identified and adequately defined, corrective measures will be proposed and subsequently implemented.

788 (DOE/LLW-224) **1994 state-by-state assessment of low-level radioactive wastes received at commercial disposal sites.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002357. Source: OSTI; NTIS; INIS; GPO Dep.

Each year the National Low-Level Waste Management Program publishes a state-by-state assessment report. This report provides both national and state-specific disposal data on low-level radioactive waste commercially disposed in the United States. Data in this report are categorized according to disposal site, generator category, waste class, volumes, and radionuclide activity. Included in this report are tables showing the distribution of waste by state for 1994 and a comparison of waste volumes and radioactivity by state for 1990 through 1994; also included is a list of all commercial nuclear power reactors in the United States as of December 31, 1994. This report distinguishes between low-level radioactive waste shipped directly for disposal by generators and waste that was handled by an intermediary, a reporting change introduced in the 1988 state-by-state report.

789 (DOE/LLW-225) **Comparison of selected DOE and non-DOE requirements, standards, and practices for Low-Level Radioactive Waste Disposal.** Cole, L. (Cole and Associates (United States)); Kudera, D.; Newberry, W. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007520. Source: OSTI; NTIS; INIS; GPO Dep.

This document results from the Secretary of Energy's response to Defense Nuclear Facilities Safety Board Recommendation 94-2. The Secretary stated that the US Department of Energy (DOE) would "address such issues as...the need for additional requirements, standards, and guidance on low-level radioactive waste management. " The authors gathered information and compared DOE requirements and standards for the safety aspects Of low-level disposal with similar requirements and standards of non-DOE entities.

790 (DOE/LLW-227) **Lawrence Livermore National Laboratory offsite hazardous waste shipment data validation report.** EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002364. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy Headquarters requested this report to verify that Lawrence Livermore National Laboratory (LLNL) properly categorized hazardous waste shipped offsite from 1984 to 1991. LLNL categorized the waste shipments by the new guidelines provided on the definition of radioactive waste. For this validation, waste that has had no radioactivity added by DOE operations is nonradioactive. Waste to which DOE operations has added or concentrated any radioactivity is radioactive. This report documents findings from the review of available LLNL hazardous waste shipment information and summarizes the data validation strategy. The report discusses administrative and radiological control procedures in place at LLNL during the data validation period. It also describes sampling and analysis and surface survey procedures used in determining radionuclide concentrations for offsite release of hazardous waste shipments. The evaluation team reviewed individual items on offsite hazardous waste shipments and classified them, using the DOE-HQ waste category definitions. LLNL relied primarily on generator knowledge to classify wastes. Very little radioanalytical information exists on hazardous wastes shipped from LLNL. Slightly greater than one-half of those hazardous waste items for which the documentation included radioanalytical data showed concentrations of radioactivity higher than the LLNL release criteria used from 1989 to 1991. Based on this small amount of available radioanalytical data, very little (less than one percent) of the hazardous waste generated at the LLNL main site can be shown to contain DOE added radioactivity. LLNL based the criteria on the limit of analytical sensitivity for gross alpha and gross beta measurements and the background levels of tritium. Findings in this report are based on information and documentation on the waste handling procedures in place before the start of the hazardous waste shipping moratorium in May 1991.

791 (DOE/LLW-228) **Argonne National Laboratory, east hazardous waste shipment data validation.** Casey, C.; Graden, C.; Coveleskie, A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002189. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of EM-331, the Radioactive Waste Technical Support Program (TSP) is conducting an evaluation of data regarding past hazardous waste shipments from DOE sites to commercial TSDFs. The intent of the evaluation is to find out if, from 1984 to 1991, DOE sites could have shipped hazardous waste contaminated with DOE-added radioactivity to commercial TSDFs not licensed to receive radioactive material. A team visited Argonne National Laboratory, East (ANL-E) to find out if any data existed that would help to make such a determination at ANL-E. The team was unable to find any relevant data. The team interviewed personnel who worked in waste management at the time. All stated that ANL-E did not sample and analyze hazardous waste shipments for radioactivity. Waste generators at ANL-E relied on process knowledge to decide that their waste was not radioactive. Also, any item leaving a building where radioisotopes were used was surveyed using hand-held instrumentation. If radioactivity above the criteria in DOE Order 5400.5 was found, the item was considered radioactive. The only documentation still available is the paperwork filled out by the waste generator and initialed by a health physics technician to show no contamination was found. The team concludes that, since all waste shipped offsite was subjected at least once to health physics instrumentation scans, the waste shipped from ANL-E from 1984 to 1991 may be considered clean.

792 (DOE/LLW–233) **MWIR-1995 DOE national mixed and TRU waste database users guide.** Idaho National Engineering Lab., Idaho Falls, ID (United States). Nov 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004071. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) National 1995 Mixed Waste Inventory Report (MWIR-1995) Database Users Guide provides information on computer system requirements and describes installation, operation, and navigation through the database. The MWIR-1995 database contains a detailed, nationwide compilation of information on DOE mixed waste streams and treatment systems. In addition, the 1995 version includes data on non- mixed, transuranic (TRU) waste streams. These were added to the data set as a result of coordination of the 1995 update with the National Transuranic Program Office's (NTPO's) data needs to support the Waste Isolation Pilot Plant (WIPP) TRU Waste Baseline Inventory Report (WTWBIR). However, the information on the TRU waste streams is limited to that associated with the core mixed waste data requirements. The additional, non-core data on TRU streams collected specifically to support the WTWBIR is not included in the MWIR-1995 database. With respect to both the mixed and TRU waste stream data, the data set addresses "stored" streams. In this instance, "stored" streams are defined as (a) streams currently in storage at both EM-30 and EM-40 sites and (b) streams that have yet to be generated but are anticipated within the next five years from sources other than environmental restoration and decontamination and decommissioning (ER/D&D) activities. Information on future ER/D&D streams is maintained in the EM-40 core database. The MWIR-1995 database also contains limited information for both waste streams and treatment systems that have been removed or deleted since the 1994 MWIR. Data on these is maintained only through Section 2, Waste Stream Identification/Tracking/Source, to document the reason for removal from the data set.

793 (DOE/LLW–235) **Analysis of the suitability of DOE facilities for treatment of commercial low-level radioactive mixed waste.** Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1996. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96008981. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the capabilities of the United States Department of Energy's (DOE's) existing and proposed facilities to treat 52 commercially generated low-level radioactive mixed (LLMW) waste streams that were previously identified as being difficult-to-treat using commercial treatment capabilities. The evaluation was performed by comparing the waste matrix and hazardous waste codes for the commercial LLMW streams with the waste acceptance criteria of the treatment facilities, as identified in the following DOE databases: Mixed Waste Inventory Report, Site Treatment Plan, and Waste Stream and Technology Data System. DOE facility personnel also reviewed the list of 52 commercially generated LLMW streams and provided their opinion on whether the wastes were technically acceptable at their facilities, setting aside possible administrative barriers. The evaluation tentatively concludes that the DOE is likely to have at least one treatment facility (either existing or planned) that is technically compatible for most of these difficult-to-treat commercially generated LLMW streams. This conclusion is tempered, however, by the limited amount of data available on the commercially generated LLMW streams, by the preliminary stage of planning for some of the proposed DOE treatment facilities, and by the need to comply with environmental statutes such as the Clean Air Act.

794 (DOE/LLW–236) **Comparison of low-level waste disposal programs of DOE and selected international countries.** Meagher, B.G. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Cole, L.T. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1996. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013299. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to examine and compare the approaches and practices of selected countries for disposal of low-level radioactive waste (LLW) with those of the US Department of Energy (DOE). The report addresses the programs for disposing of wastes into engineered LLW disposal facilities and is not intended to address in-situ options and practices associated with environmental restoration activities or the management of mill tailings and mixed LLW. The countries chosen for comparison are France, Sweden, Canada, and the United Kingdom. The countries were selected as typical examples of the LLW programs which have evolved under differing technical constraints, regulatory requirements, and political/social systems. France was the first country to demonstrate use of engineered structure-type disposal facilities. The UK has been actively disposing of LLW since 1959. Sweden has been disposing of LLW since 1983 in an intermediate-depth disposal facility rather than a near-surface disposal facility. To date, Canada has been storing its LLW but will soon begin operation of Canada's first demonstration LLW disposal facility.

795 (DOE/LLW–8843-91-1) **Managing commercial low-level radioactive waste beyond 1992: Issues and potential problems of temporary storage.** Kerr, T.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1991. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96005884. Source: OSTI; NTIS; INIS; GPO Dep.

In accordance with the Low-Level Radioactive Waste Policy Amendments Act of 1985, States will become responsible for managing low-level radioactive waste, including mixed waste, generated within their borders as of January 1, 1993. In response to this mandate, many States and compact regions have made substantial progress toward establishing new disposal capacity for these wastes. While this progress is noteworthy, many circumstances can adversely affect States' abilities to meet the 1993 deadline, and many States have indicated that they are considering other waste management options in order to fulfill their responsibilities beyond 1992. Among the options that States are considering for the interim management of low- level radioactive waste is temporary storage. Temporary storage may be either short term or long term and may be at a centralized temporary storage facility provided by the State or a contractor, or may be at the point of generation or collection. Whether States choose to establish a centralized temporary storage facility or choose to rely on generators or brokers to provide additional and problem areas that must be addressed and resolved. Areas with many potential issues associated with the temporary storage of waste include: regulations, legislation, and policy and implementation guidance; economics; public participation; siting, design, and construction; operations; and closure and decommissioning.

796 (DOE/LLW–11026-94-1) **Low-level radioactive waste disposal technologies used outside the United States.** Templeton, K.J.; Mitchell, S.J.; Molton, P.M.; Leigh, I.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1994. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007406. Source: OSTI; NTIS; INIS; GPO Dep.

Low-level radioactive waste (LLW) disposal technologies are an integral part of the waste management process. In the United States, commercial LLW disposal is the responsibility of the State or groups of States (compact regions). The United States defines LLW as all radioactive waste that is not classified as spent nuclear fuel, high- level radioactive waste, transuranic waste, or by-product material as defined in Section II(e)(2) of the Atomic Energy Act. LLW may contain some long-lived components in very low concentrations. Countries outside the United States, however, may define LLW differently and may use different disposal technologies. This paper outlines the LLW disposal technologies that are planned or being used in Canada, China, Finland, France, Germany, Japan, Sweden, Taiwan, and the United Kingdom (UK).

797 (DOE/LLW–96007139) **LLW Notes: Volume 10, Number 3.** USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United States). Apr 1995. 32p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007139. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

798 (DOE/LLW–96007140) **LLW Notes: Volume 10, Number 4.** USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United States). Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007140. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

799 (DOE/LLW–96007141) **LLW notes: Volume 10, Number 5.** USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United States). Jul 1995. 24p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007141. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

800 (DOE/LLW–96007142) **LLW notes: Volume 10, Number 6.** Norris, C. (ed.) (Afton Associates, Inc., Washington, DC (United States)). USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United States). Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007142. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

801 (DOE/LLW–96007143) **LLW Notes: Volume 10, Number 7.** Norris, C. (ed.) (Afton Associates, Inc., Washington, DC (United States)). USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United States). Oct 1995. 40p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007143. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

802 (DOE/LLW–96007144) **LLW Notes: Volume 10, Number 8.** Norris, C. (ed.) (Afton Associates, Inc., Washington, DC (United States)). USDOE, Washington, DC (United States); Afton Associates, Inc., Washington, DC (United

States). 6 Dec 1995. 24p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96007144. Source: OSTI; NTIS; INIS.

The Low-Level Radioactive Waste Forum is an association of state and compact representatives, appointed by governors and compact commissions, established to facilitate state and compact implementation of the Low-Level Radioactive Waste Policy Act of 1980 and the Low-Level Radioactive Waste Policy Amendments Act of 1985 and to promote the objectives of low-level radioactive waste regional compacts. The LLW Forum provides an opportunity for state and compact officials to share information with one another and to exchange views with officials of federal agencies and other interested parties.

803 (DOE/LLW–96013498) **Low-Level Waste Forum notes and summary reports for 1994. Volume 9, Number 2, April 1994.** Afton Associates, Inc., Washington, DC (United States). Apr 1994. 35p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013498. Source: OSTI; INIS; NTIS; GPO Dep.

This is a publication of the Low-Level Radioactive Waste Forum Participants. The topics of the publication include DOE policy, state concerns and activities, court hearings and decisions, federal agency activities, US NRC waste management function reorganization, low-level radioactive waste storage and compaction, and US NRC rulemaking and hearings.

804 (DOE/LLW–96013499) **Low-Level Waste Forum notes and summary reports for 1994. Volume 9, Number 3, May-June 1994.** Afton Associates, Inc., Washington, DC (United States). Jun 1994. 41p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013499. Source: OSTI; NTIS; INIS; GPO Dep.

This issue includes the following articles: Vermont ratifies Texas compact; Pennsylvania study on rates of decay for classes of low-level radioactive waste; South Carolina legislature adjourns without extending access to Barnwell for out-of-region generators; Southeast Compact Commission authorizes payments for facility development, also votes on petitions, access contracts; storage of low-level radioactive waste at Rancho Seco removed from consideration; plutonium estimates for Ward Valley, California; judgment issued in Ward Valley lawsuits; Central Midwest Commission questions court's jurisdiction over surcharge rebates litigation; Supreme Court decides commerce clause case involving solid waste; parties voluntarily dismiss Envirocare case; appellate court affirms dismissal of suit against Central Commission; LLW Forum mixed waste working group meets; US EPA Office of Radiation and Indoor Air rulemakings; EPA issues draft radiation site cleanup regulation; EPA extends mixed waste enforcement moratorium; and NRC denies petition to amend low-level radioactive waste classification regulations.

805 (DOE/LLW–96013500) **Low-Level Waste Forum notes and summary reports for 1994. Volume 9, Number 4, July 1994.** Afton Associates, Inc., Washington, DC (United States). Jul 1994. 37p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013500. Source: OSTI; NTIS; INIS; GPO Dep.

This issue includes the following articles: Federal Facility Compliance Act Task Force forms mixed waste workgroup; Illinois Department of Nuclear Safety considers construction of centralized storage facility; Midwest Commission agrees on capacity limit, advisory committee; EPA responds to California site developer's queries regarding application of air pollutant standards; county-level disqualification site screening of Pennsylvania complete; Texas Compact legislation introduced in US Senate; Generators ask court to rule in their favor on surcharge rebates lawsuit; Vermont authority and Battelle settle wetlands dispute; Eighth Circuit affirms decision in Nebraska community consent lawsuit; Nebraska court dismisses action filed by Boyd County local monitoring committee; NC authority, Chem-Nuclear, and Stowe exonerated; Senator Johnson introduces legislation to transfer Ward Valley site; Representative Dingell writes to Clinton regarding disposal of low-level radioactive waste; NAS committee on California site convenes; NRC to improve public petition process; NRC releases draft proposed rule on criteria for decontamination and closure of NRC-licensed facilities; and EPA names first environmental justice federal advisory council.

806 (DOE/MC/27346–5099) **Analysis of international efforts in energy research and development.** Rezaiyan, A.J.; Gill, R.T. K and M Engineering and Consulting Corp., Washington, DC (United States). Sep 1995. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-90MC27346. Order Number DE96000630. Source: OSTI; NTIS; INIS; GPO Dep.

Research and experimental development comprise innovative and creative work undertaken systematically to increase the stock of knowledge of science, engineering, and society. This knowledge reserve is used to improve living conditions and standards, including economic growth. Research and development (R&D) expenditures are useful measures of the scale and direction of technological innovation within a country, industry, or scientific field. Administrators concerned with economic growth and performance rely on R&D statistics as one possible type of indicator of technological change. R&D statistics are an essential tool in many government programs and evaluations (OECD 1993). The objective of the analysis was to identify and evaluate R&D funding sources, levels, and trends in the energy sectors of selected industrialized countries (Australia, Belgium, Canada, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Sweden, Switzerland, United Kingdom, United States) and the European Union (EU). Fossil fuel technologies, particularly fuel cells and advanced gas turbines, were the focus of the analysis, whose results are presented in this report.

807 (DOE/MC/28245–5043) **Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants. Quarterly report, January–March 1995.** Atomic Energy of Canada Ltd., Chalk River, ON (Canada). May 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28245. Order Number DE96000574. Source: OSTI; NTIS; GPO Dep.

The objective of this project is to design and develop a physico- chemical treatment process for the removal of uranium and heavy metals from contaminated soil to achieve target contamination levels below 35 pCi/g of soil and a target for non-radioactive heavy metals below concentration levels permissible for release of the soil. Ex- situ pilot-scale soil decontamination and leachate treatment test using Chalk River Chemical Pit soil are nearing completion. Soil decontamination tests using Fernald Incinerator Area soil originally scheduled for February 1995 was postponed to

May 1995 as result of unexpected delays in the preparation of two drums of soils.

808 (DOE/MC/29105-96/CO563) **VAC*TRAX - Thermal desorption for mixed wastes.** McElwee, M.J.; Palmer, C.R. Rust Federal Services, Inc., Anderson, SC (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29105. (CONF-9510108-12: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003462. Source: OSTI; NTIS; INIS; GPO Dep.

The patented VAC*TRAX process was designed in response to the need to remove organic constituents from mixed waste, waste that contains both a hazardous (RCRA or TSCA regulated) component and a radioactive component. Separation of the mixed waste into its hazardous and radioactive components allows for ultimate disposal of the material at existing, permitted facilities. The VAC*TRAX technology consists of a jacketed vacuum dryer followed by a condensing train. Solids are placed in the dryer and indirectly heated to temperatures as high as 260°C, while a strong vacuum (down to 50 mm Hg absolute pressure) is applied to the system and the dryer is purged with a nitrogen carrier gas. The organic contaminants in the solids are thermally desorbed, swept up in the carrier gas and into the condensing train where they are cooled and recovered. The dryer is fitted with a filtration system that keeps the radioactive constituents from migrating to the condensate. As such, the waste is separated into hazardous liquid and radioactive solid components, allowing for disposal of these streams at a permitted incinerator or a radioactive materials landfill, respectively. The VAC*TRAX system is designed to be highly mobile, while minimizing the operational costs with a simple, robust process. These factors allow for treatment of small waste streams at a reasonable cost. This paper describes the VAC*TRAX thermal desorption process, as well as results from the pilot testing program. Also, the design and application of the full-scale treatment system is presented. Materials tested to date include spiked soil and debris, power plant trash and sludge contaminated with solvents, PCB contaminated soil, solvent-contaminated uranium mill-tailings, and solvent and PCB-contaminated sludge and trash. Over 70 test runs have been performed using the pilot VAC*TRAX system, with more than 80% of the tests using mixed waste as the feed material.

809 (DOE/MC/29107-96/CO567) **Development studies of a novel wet oxidation process.** Rogers, T.W.; Dhooge, P.M. Delphi Research, Inc., Albuquerque, NM (United States). 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29107. (CONF-9510108-11: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003459. Source: OSTI; NTIS; INIS; GPO Dep.

Many DOE waste streams and remediates contain complex and variable mixtures of organic compounds, toxic metals, and radionuclides. These materials are often dispersed in organic or inorganic matrices, such as personal protective equipment, various sludges, soils, and water. Incineration and similar combustive processes do not appear to be viable options for treatment of these waste streams due to various considerations. There is a need for non-combustion processes with a wide application range to treat the large majority of these waste forms. The non-combustion process should also be safe, effective, cost-competitive, permit-able, and preferrably mobile. This paper describes the DETOX process of organic waste oxidation.

810 (DOE/MC/29107-5046) **Development studies for a novel wet oxidation process. Phase 2.** Delphi Research, Inc., Albuquerque, NM (United States). Jul 1994. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29107. Order Number DE96000587. Source: OSTI; NTIS; INIS; GPO Dep.

DETOX^{SM} is a catalyzed wet oxidation process which destroys organic materials in an acidic water solution of iron at 373 to 473 K. The solution can be used repeatedly to destroy great amounts of organic materials. Since the process is conducted in a contained vessel, air emissions from the process can be well controlled. The solution is also capable of dissolving and concentrating many heavy and radioactive metals for eventual stabilization and disposal. The Phase 2 effort for this project is site selection and engineering design for a DETOX demonstration unit. Site selection was made using a set of site selection criteria and evaluation factors. A survey of mixed wastes at DOE sites was conducted using the Interim Mixed Waste Inventory Report. Sites with likely suitable waste types were identified. Potential demonstration sites were ranked based on waste types, interest, regulatory needs, scheduling, ability to provide support, and available facilities. Engineering design for the demonstration unit is in progress and is being performed by Jacobs Applied Technology. The engineering design proceeded through preliminary process flow diagrams (PFDs), calculation of mass and energy balances for representative waste types, process and instrumentation diagrams (P and IDs), preparation of component specifications, and a firm cost estimate for fabrication of the demonstration unit.

811 (DOE/MC/29249-96/CO574) **Electromagnetic mixed waste processing system for asbestos decontamination.** Kasevich, R.S.; Vaux, W.G.; Nocito, T. KAI Technologies, Inc., Portsmouth, NH (United States). 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC29249. (CONF-9510108-15: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003464. Source: OSTI; NTIS; INIS; GPO Dep.

DOE sites contain a broad spectrum of asbestos materials (cloth, pipe lagging, sprayed insulation and other substances) which are contaminated with a combination of hazardous and radioactive wastes due to its use during the development of the U.S. nuclear weapons complex. These wastes consist of cutting oils, lubricants, solvents, PCB's, heavy metals and radioactive contaminants. The radioactive contaminants are the activation, decay and fission products of DOE operations. The asbestos must be converted by removing and separating the hazardous and radioactive materials to prevent the formation of mixed wastes and to allow for both sanitary disposal and effective decontamination. Currently, no technology exists that can meet these sanitary and other objectives.

812 (DOE/MC/29249-4074) **Electromagnetic mixed-waste processing system for asbestos decontamination.** KAI Technologies, Inc., Woburn, MA (United States). Apr 1995. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-94MC29249. Order Number DE95009720. Source: OSTI; NTIS; INIS; GPO Dep.

The first phase of a program to develop and demonstrate a cost-effective, integrated process for remediation of asbestos-containing material that is contaminated with organics, heavy metals, and radioactive compounds was successfully completed. Laboratory scale tests were performed to demonstrate initial process viability for asbestos conversion, organics removal, and radionuclide and heavy metal removal. All success criteria for the laboratory tests were met. (1) Ohio DSI demonstrated greater than 99% asbestos conversion to amorphous solids using their commercial process. (2) KAI demonstrated 90% removal of organics from the asbestos suspension. (3) Westinghouse STC achieved the required metals removal criteria on a laboratory scale (e.g., 92% removal of uranium from solution, resin loadings of 0.6 equivalents per liter, and greater than 50% regeneration of resin in a batch test.) Using the information gained in the laboratory tests, the process was reconfigured to provide the basis for the mixed waste remediation system. An integrated process is conceptually developed, and a Phase 2 program plan is proposed to provide the bench-scale development needed in order to refine the design basis for a pilot processing system.

813 (DOE/MC/30171–96/CO581) **Catalytic extraction processing of contaminated scrap metal.** Griffin, T.P.; Johnston, J.E.; Payea, B.M.; Zeitoon, B.M. Molten Metal Technology, Inc., Waltham, MA (United States). 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30171. (CONF-9510108–3: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003452. Source: OSTI; NTIS; INIS; GPO Dep.

Molten Metal Technology was awarded a contract to demonstrate the applicability of the Catalytic Extraction Process, a proprietary process that could be applied to US DOE's inventory of low level mixed waste. This paper is a description of that technology, and included within this document are discussions of: (1) Program objectives, (2) Overall technology review, (3) Organic feed conversion to synthetic gas, (4) Metal, halogen, and transuranic recovery, (5) Demonstrations, (6) Design of the prototype facility, and (7) Results.

814 (DOE/MC/30173–96/CO584) **Waste Inspection Tomography (WIT).** Bernardi, R.T. Bio-Imaging Research, Inc., Lincolnshire, IL (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30173. (CONF-9510108–9: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003455. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Inspection Tomography (WIT) provides mobile semi-trailer mounted nondestructive examination (NDE) and assay (NDA) for nuclear waste drum characterization. WIT uses various computed tomography (CT) methods for both NDE and NDA of nuclear waste drums. Low level waste (LLW), transuranic (TRU), and mixed radioactive waste can be inspected and characterized without opening the drums. With externally transmitted x-ray NDE techniques, WIT has the ability to identify high density waste materials like heavy metals, define drum contents in two- and three-dimensional space, quantify free liquid volumes through density and x-ray attenuation coefficient discrimination, and measure drum wall thickness. With waste emitting gamma-ray NDA techniques, WIT can locate gamma emitting radioactive sources in two- and three-dimensional space, identify gamma emitting isotopic species, identify the external activity levels of emitting gamma-ray sources, correct for waste matrix attenuation, provide internal activity approximations, and provide the data needed for waste classification as LLW or TRU. The mobile feature of WIT allows inspection technologies to be brought to the nuclear waste drum storage site without the need to relocate drums for safe, rapid, and cost-effective characterization of regulated nuclear waste. The combination of these WIT characterization modalities provides the inspector with an unprecedented ability to non-invasively characterize the regulated contents of waste drums as large as 110 gallons, weighing up to 1,600 pounds. Any objects that fit within these size and weight restrictions can also be inspected on WIT, such as smaller waste bags and drums that are five and thirty-five gallons.

815 (DOE/MC/30361–95/C0498) **Development of components for waste management systems using aerospace technology.** Rousar, D. (Aerojet-General Corp., Sacramento, CA (United States)); Young, M.; Sieger, A. Aerojet-General Corp., Sacramento, CA (United States); Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30361 ; AC04-94AL85000. (CONF-9510219–1: 46. international astronautical congress, Oslo (Norway), 2-6 Oct 1995). Order Number DE95017866. Source: OSTI; NTIS; GPO Dep.

An aerospace fluid management technology called "platelets" has been applied to components that are critical to the economic operation of waste management systems. Platelet devices are made by diffusion bonding thin metal plates which have been etched with precise flow passage circuitry to control and meter fluid to desired locations. Supercritical water oxidation (SCWO) is a promising waste treatment technology for safe and environmentally acceptable destruction of hazardous wastes. Performance and economics of current SCWO systems are limited by severe salt deposition on and corrosion of the reactor walls. A platelet transpiring-wall reactor has been developed that provides a protective layer of water adjacent to the reactor walls which prevents salt deposition and corrosion. Plasma arc processing is being considered as a method for stabilizing mixed radioactive wastes. Plasma arc torch systems currently require frequent shutdown to replace failed electrodes and this increases operating costs. A platelet electrode design was developed that has more than 10 times the life of conventional electrodes. It has water cooling channels internal to the electrode wall and slots through the wall for injecting gas into the arc.

816 (DOE/MC/30361–4087) **Platelet-cooled plasma arc torch. Final report.** Aerojet-General Corp., Sacramento, CA (United States). Oct 1995. 210p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30361. Order Number DE95009734. Source: OSTI; NTIS; INIS; GPO Dep.

In this 12-month program sponsored by the DOE Morgantown Energy Technology Center, Aerojet designed, fabricated, and tested six platelet cooled electrodes for a Retech 75T (90 MW) plasma arc torch capable of processing mixed radioactive waste. Two of the electrodes with gas injection through the electrode wall demonstrated between eight and forty times the life of conventional water cooled electrodes. If a similar life increase can be produced in a 1 Mw size electrode, then electrodes possessing thousands, rather than hundreds, of hours of life will be available to

DOE for potential application to mixed radioactive waste processing.

817 (DOE/MC/31188–96/CO629) **Mixed waste treatment using the ChemChar thermolytic detoxification technique.** Kuchynka, D. Mirage Systems, Sunnyvale, CA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC31188. (CONF-9510108–43: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003735. Source: OSTI; NTIS; INIS; GPO Dep.

The diversity of mixed waste matrices contained at Department of Energy sites that require treatment preclude a single, universal treatment technology capable of handling sludges, solids, heterogeneous debris, aqueous and organic liquids and soils. Versatility of the treatment technology, volume reduction and containment of the radioactive component of the mixed waste streams are three criteria to be considered when evaluating potential treatment technologies. The ChemChar thermolytic detoxification process being developed under this R and D contract is a thermal, chemically reductive technology that converts the organic portion of a mixed waste stream to an energy-rich synthesis gas while simultaneously absorbing volatile inorganic species (metals and acid gases) on a macroporous, carbon-based char. The latter is mixed with the waste stream prior to entering the reactor. Substoichiometric amounts of oxidant are fed into the top portion of the cylindrical reactor generating a thin, radial thermochemical reaction zone. This zone generates all the necessary heat to promote the highly endothermic reduction of the organic components in the waste in the lower portion of the reactor, producing, principally, hydrogen and carbon monoxide. The solid by-product is a regenerated carbon char that, depending on the inorganic loading, is capable for reuse. The in situ scrubbing of contaminants by the char within the reactor coupled with a char filter for final polishing produce an exceptionally clean synthesis gas effluent suitable for on-site generation of heat, steam or electricity. Despite the elevated temperatures in the thermochemical reaction zone, the reductive nature of the process precludes formation of nitrogen oxides and halogenated organic compound by-products.

818 (DOE/MC/31189–5035) **Recovery and removal of mercury from mixed wastes. Final report, September 1994–June 1995.** Sutton, W.F.; Weyand, T.E.; Koshinski, C.J. Mercury Recovery Services, New Brighton, PA (United States). Jun 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31189. Order Number DE96000557. Source: OSTI; NTIS; INIS; GPO Dep.

In recognition of the major environmental problem created by mercury contamination of wastes and soils at an estimated 200,000 sites along US natural gas and oil pipelines and at a number of government facilities, including Oak Ridge, Savannah River, Hanford, and Rocky Flats, the US Department of Energy (DOE) is seeking an effective and economical process for removing mercury from various DOE waste streams in order to allow the base waste streams to be treated by means of conventional technologies. In response to the need for Unproved mercury decontamination technology, Mercury Recovery Services (MRS) has developed and commercialized a thermal treatment process for the recovery of mercury from contaminated soils and industrial wastes. The objectives of this program were to: demonstrate the technical and economic feasibility of the MRS process to successfully remove and recover mercury from low-level mixed waste containing mercury compounds (HgO, HgS, $HgCl_2$) and selected heavy metal compounds (PbO, CdO); determine optimum processing conditions required to consistently reduce the residual total mercury content to 1 mg/kg while rendering the treated product non-toxic as determined by TCLP methods; and provide an accurate estimate of the capital and operating costs for a commercial processing facility designed specifically to remove and recovery mercury from various waste streams of interest at DOE facilities. These objectives were achieved in a four-stage demonstration program described within with results.

819 (DOE/MC/31388–5030) **Environmental management technology demonstration and commercialization: Tasks 2, 3, 4, and 8. Semiannual report, October 1994–March 1995.** Hawthorne, S.B.; Ness, R.O. Jr.; Nowok, J.W.; Pflughoeft-Hassett, D.; Hurley, J.P.; Steadman, E.N. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. May 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE96000567. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the Environmental Management program at the Energy and Environmental Research Center (EERC) is to develop, demonstrate, and commercialize technologies that address the environmental management needs of contaminated sites, including characterization, sensors, and monitoring; low-level mixed waste processing; material disposition technology; improved waste forms; in situ containment and remediation; and efficient separation technologies for radioactive wastes. Task 2 is the extraction and analysis of pollutant organics from contaminated solids using off-line supercritical fluid extraction (SFE) and on-line SFE-infrared spectroscopy. Task 3, pyrolysis of plastics, has as its objectives to develop a commercial process to significantly reduce the volume of mixed-plastics-paper-resin waste contaminated with low-level radioactive material; concentrate contaminants in a collectible form; and determine the distribution and form of contaminants after pyrolysis of the mixed waste. Task 4, stabilization of vitrified wastes, has as its objectives to (1) demonstrate a waste vitrification procedure for enhanced stabilization of waste materials and (2) develop a testing protocol to understand the long-term leaching behavior of the stabilized waste form. The primary objective of Task 8, Management and reporting, is coordination of this project with other programs and opportunities. In addition, management oversight will be maintained to ensure that tasks are completed and coordinated as planned and that deliverables are submitted in a timely manner. Accomplishments to date is each task are described. 62 refs.

820 (DOE/METC–96/1021-Vol.1) **Proceedings of the environmental technology through industry partnership conference. Volume 1.** Kothari, V.P. USDOE Morgantown Energy Technology Center, WV (United States). Oct 1995. 312p. Sponsored by USDOE, Washington, DC (United States). (CONF-9510108–Vol.1: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96000551. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of this conference was to review the latest environmental and waste management technologies being developed under the sponsorship of METC. The focus of this conference was also to address the accomplishments and barriers affecting private sector, and lay the groundwork for future technology development initiatives and opportunities. 26 presentations were presented in: Mixed waste characterization, treatment, and disposal; Contaminant plume containment and remediation; and Decontamination and decommissioning. In addition there were 10 Focus Area presentations, 31 Poster papers covering all Focus Areas, and two panel discussions on: Mixed waste characterization, treatment, and disposal issues; and the application, evaluation, and acceptance of in-situ and ex-situ plume remediation technologies. Volume 1 contains the keynote address, 15 poster papers, 5 papers on mixed waste characterization, treatment, and disposal, and 13 papers on decontamination and decommissioning. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

821 (DOE/METC-96/1021-Vol.2) **Proceedings of the environmental technology through industry partnership conference. Volume 2.** Kothari, V.P. USDOE Morgantown Energy Technology Center, WV (United States). Oct 1995. 266p. Sponsored by USDOE, Washington, DC (United States). (CONF-9510108-Vol.2: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96000552. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of this conference was to review the latest environmental and waste management technologies being developed under the sponsorship of METC. The focus of this conference was also to address the accomplishments and barriers affecting private sector, and lay the groundwork for future technology development initiatives and opportunities. 26 presentations were presented in: Mixed waste characterization, treatment, and disposal; Contaminant plume containment and remediation; and Decontamination and decommissioning. In addition there were 10 Focus Area presentations, 31 Poster papers covering all Focus Areas, and two panel discussions on: Mixed waste characterization, treatment, and disposal issues; and the Application, evaluation, and acceptance of in-situ and ex-situ plume remediation technologies. Volume 2 contains 16 papers in a poster session and 8 papers in the contaminant plume containment and remediation and landfill stabilization Focus Areas. Selected papers are indexed separately for inclusion in the Energy Science and Technology Database.

822 (DOE/MWIP-26) **Alternatives to incineration. Technical area status report.** Schwinkendorf, W.E. (BDM Federal, Inc., Albuquerque, NM (United States)); McFee, J.; Devarakonda, M.; Nenninger, L.L.; Fadullon, F.S.; Donaldson, T.L.; Dickerson, K. Oak Ridge National Lab., TN (United States). Apr 1995. 474p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95015684. Source: OSTI; NTIS; INIS; GPO Dep.

Recently, the DOE's Mixed Waste Integrated Program (MWIP) (superseded by the Mixed Waste Focus Area) initiated an evaluation of alternatives to incineration to identify technologies capable of treating DOE organically contaminated mixed wastes and which may be more easily permitted. These technologies have the potential of alleviating stakeholder concerns by decreasing off-gas volurties and the associated emissions of particulates, volatilized metals and radionuclides, PICs, NO_x, SO_x, and recombination products (dioxins and furans). Ideally, the alternate technology would be easily permitted, relatively omnivorous and effective in treating a variety of wastes with varying constituents, require minimal pretreatment or characterization, and be easy to implement. In addition, it would produce secondary waste stream volumes significantly smaller than the original waste stream, and would minimize the environmental health and safety effects on workers and the public. The purpose of this report is to provide an up-to-date (as of early 1995) compendium of iternative technologies for designers of mixed waste treatment facilities, and to identify lternate technologies that may merit funding for further development. Various categories of non-thermal and thermal technologies have been evaluated and are summarized in Table ES-1. Brief descriptions of these technologies are provided in Section 1.7 of the Introduction. This report provides a detailed description of approximately 30 alternative technologies in these categories. Included in the report are descriptions of each technology; applicable input waste streams and the characteristics of the secondary, or output, waste streams; the current status of each technology relative to its availability for implementation; performance data; and costs. This information was gleaned from the open literature, governments reports, and discussions with principal investigators and developers.

823 (DOE/OR/21548-584) **Engineering evaluation/cost analysis for the proposed removal action at the Southeast Drainage near the Weldon Spring Site, Weldon Spring, Missouri.** MK-Ferguson Co., St. Charles, MO (United States); Argonne National Lab., IL (United States). Aug 1996. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21548 ; W-31109-ENG-38. Order Number DE96014288. Source: OSTI; NTIS; INIS; GPO Dep.

The engineering evaluation/cost analysis (EE/CA) has been prepared to support the proposed removal of contaminated sediment from selected portions of the Southeast Drainage as part of cleanup activities being conducted at the Weldon Spring site in St. Charles County, Missouri, by the U.S. Department of Energy (DOE). The cleanup activities are conducted in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, incorporating the values of the National Environmental Policy Act (NEPA). The Weldon Spring site is located near the town of Weldon Spring, about 48 km (30 mi) west of St. Louis. It consists of two noncontiguous areas: the chemical plant area and a limestone quarry about 6.4 km (4 mi) south-southwest of the chemical plant area. The Southeast Drainage is a natural 2.4-km (1.5-mi) channel that carries surface runoff to the Missouri River from the southern portion of the chemical plant area and a small portion of the ordnance works area (part of the Weldon Spring Training Area) south of the groundwater divide. The drainage became contaminated as a result of past activities of the U.S. Army and the DOE (and its predecessors).

824 (DOE/RF/00467-T1) **U.S. Army Engineer Waterways Experiment Station (WES) support to Department of Energy Rocky Flats Facility (DOE RF) saltcrete processing. Progress report, October 1-December 31, 1993.** Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). 24 Jan 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00467. Order Number DE96013635. Source: OSTI; NTIS; GPO Dep.

Accomplishments during this report period for waste cementation/processing operations are summarized. The principal effort of this report period was a review of two documents. These were (1) Sampling and Analysis Plan for Saltcrete Process Inputs and (2) Waste Treatment Spray

Dryer and Saltcrete Process. The WES review report for the latter of these two documents comprises the bulk of this paper.

825 (DOE/RF/00467–T3) **U.S. Army Engineer Waterways Experiment Station (WES) support to Department of Energy Rocky Flats Facility (DOE RF) saltcrete processing. Progress report, April 1–June 30, 1994.** Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). 26 Jul 1994. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00467. Order Number DE96013637. Source: OSTI; NTIS; GPO Dep.

Accomplishments during this report period for waste cementation/processing operations are summarized. During this report period, the team completed an important site visit to the Rocky Flats Facility (RF). This visit focused on extensive interaction with DOE contract personnel about microstructural and phase characterization of saltcrete. A copy of the trip report prepared by the WES team is enclosed. The team prepared a document detailing procedures for sample preparation and analysis to enhance the usefulness of results of the forensic work underway at RF. A copy of this document is enclosed. A proposal was prepared for additional short-term tasks to contribute significantly to gaining the most benefit from data gathered during forensic analyses of saltcrete, and waste-treatment studies, by EG and G. A copy of this proposal was forwarded to RF at the end of May, and it is included.

826 (DOE/RF/00467–T5) **U.S. Army Engineer Waterways Experiment Station (WES) support to Department of Energy Rocky Flats Facility (DOE RF) saltcrete processing. Progress report, October 1–December 31, 1994.** Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). 27 Jan 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00467. Order Number DE96013639. Source: OSTI; NTIS; GPO Dep.

This report summarizes work authorized for technical and scientific support to waste cementation and saltcrete processing operations. During this report period, tasks described in amendment M003 were initiated, some were completed, and an additional task not listed in M003 also was completed at the request of DOE RF. Summaries of task-specific activities are in four enclosures to this progress report. Other activities during this quarter included negotiation and initiation of amendment M004, to extend the period of performance and continue WES assistance to DOE RF. The four enclosures are: continuing support to waste cementation and saltcrete operations at DOE Rocky Flats Facility; review of "Analyses of saltcrete"; review of Connell, et al "Saltcrete evaluation" report dated August 16, 1993; and scoping study of simulated saltcrete.

827 (DOE/RF/00467–T9) **U.S. Army Engineer Waterways Experiment Station (WES) support to Department of Energy Rocky Flats Facility (DOE RFO) saltcrete processing. Progress report, April 15–September 30, 1995.** Army Engineer Waterways Experiment Station, Vicksburg, MS (United States). 29 Apr 1996. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00467. Order Number DE96013643. Source: OSTI; NTIS; GPO Dep.

This report summarizes work authorized for technical and scientific support to waste cementation and saltcrete processing operations. During this report period, the remaining tasks described in the agreement were completed and the project was closed. Accomplishments are summarized. The bulk of this report is a paper entitled "Salt related expansion reactions in portland-cement-based waste forms."

828 (DOE/RL–93-64-Rev.2) **Sodium Dichromate expedited response action assessment. Revision 2.** USDOE, Washington, DC (United States). May 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95012047. Source: OSTI; NTIS; INIS; GPO Dep.

The Washington State Department of Ecology (lead agency) and the US Environmental Protection Agency (support agency) recommended that the US Department of Energy perform an expedited response action (ERA) for the Sodium Dichromate Barrel Disposal Landfill. The ERA goal is to reduce the potential for any contaminant migration from the landfill to the soil column, groundwater, and the Columbia River. Because the Sodium Dichromate Barrel Disposal Landfill is the only waste site within the operable unit, this removal action is the final remediation of the 100-IU-4 Operable Unit. A total of 144 anomalies and 11 subsurface zones were inspected and excavated. various homestead debris (wire fencing, wooden posts, and other miscellaneous debris) and about 5,000 crushed barrels were removed and transported to the Hanford Central Landfill. Besides containing crushed drums, four zones included some loose asbestos, one crushed drum full of asbestos, two 5-gal roofing tar cans, a 12-volt vehicle battery, one empty paint can, and used oil and grease containers (about 0.5 gal total). These materials were placed in three 55-gal drums and sent to an offsite hazardous waste disposal facility permitted to receive hazardous materials. Because the cleanup activities removed all hazardous substances, the site is clean and available for unrestricted land use.

829 (DOE/RL–95-15) **1995 Report on Hanford site land disposal restrictions for mixed waste.** Black, D.G. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 252p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011574. Source: OSTI; NTIS; INIS; GPO Dep.

This report was submitted to meet the requirements of Hanford Federal Facility Agreement and Consent Order Milestone M-26-01E. This milestone requires the preparation of an annual report that covers characterization, treatment, storage, minimization, and other aspects of land disposal restricted mixed waste at the Hanford Site. The U.S. Department of Energy, its predecessors, and contractors at the Hanford Site were involved in the production and purification of nuclear defense materials from the early 1940s to the late 1980s. These production activities have generated large quantities of liquid and solid radioactive mixed waste. This waste is subject to regulation under authority of both the Resource Conservation and Recovery Act of 1976 and Atomic Energy Act of 1954. This report covers mixed waste only. The Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy have entered into an agreement, the Hanford Federal Facility Agreement and Consent Order (commonly referred to as the Tri-Party Agreement) to bring the Hanford Site operations into compliance with dangerous waste regulations. The Tri-Party Agreement required development of the original land disposal restrictions (LDRs) plan and its annual updates to comply with LDR requirements for radioactive mixed waste. This report is the fifth update of the plan first issued in 1990. Tri-Party Agreement negotiations completed in 1993 and approved in January 1994 changed and added many new milestones. Most of the changes were related to the Tank Waste Remediation System and these changes are incorporated into this report.

830 (DOE/RL–95-17-VOL.2) **Hanford Site annual dangerous waste report: Volume 2, Generator dangerous waste report, radioactive mixed waste.** USDOE Richland Operations Office, WA (United States). 1994. 331p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012348. Source: OSTI; NT.IS; INIS; GPO Dep.

This report contains information on radioactive mixed wastes at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, waste number, waste designation, weight, and waste designation.

831 (DOE/RL–95-17-Vol.3) **Hanford Site annual dangerous waste report: Volume 3, Part 2, Waste Management Facility report, dangerous waste.** USDOE Richland Operations Office, WA (United States). 1944. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012350. Source: OSTI; NTIS; GPO Dep.

This report contains information on hazardous wastes at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, handling and containment vessel, waste number, waste designation and amount of waste.

832 (DOE/RL–95-17-Vol.3-Pt.1) **Hanford Site annual dangerous waste report: Volume 3, Part 1, Waste Management Facility report, dangerous waste.** USDOE Richland Operations Office, WA (United States). 1994. 225p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012349. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information on hazardous wastes at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, handling method and containment vessel, waste number, waste designation, and amount of waste.

833 (DOE/RL–95-17-Vol.4) **Hanford Site annual dangerous waste report: Volume 4, Waste Management Facility report, Radioactive mixed waste.** USDOE Richland Operations Office, WA (United States). 1994. 445p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012451. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains information on radioactive mixed wastes at the Hanford Site. Information consists of shipment date, physical state, chemical nature, waste description, handling method and containment vessel, waste number, waste designation and amount of waste.

834 (DOE/RL–95-38) **Approach and plan for cleanup actions in the 100-FR-2 operable unit of the Hanford Site, Revision 0.** USDOE Richland Operations Office, WA (United States). Jun 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017514. Source: OSTI; NTIS; INIS; GPO Dep.

A new administrative approach is being used to reach a cleanup decision for the 100-FR-2 Operable Unit. The unit, located at the 100-F Area, contains solid waste sites and is one of the remaining operable units scheduled for characterization and cleanup in the 100 Area. This Focus Package (1) describes the new approach and activities needed to reach a decision on cleanup actions for the 100-FR-2 Operable Unit and (2) invites public participation into the planning process. The previous approach included the production of a Work Plan, a Limited Field Investigation Report, a Qualitative Risk Assessment, a Focused Feasibility Study, and a Proposed Plan, all culminating in an interim action Record of Decision. Information gathered to date on other operable units allows the analgous site approach to be used on the 100-FR-2 Operable Unit, and therefore, a reduction in documentation preparation. The U.S. Environmental Protection Agency, Washington State Department of Ecology, and the U.S. Department of Energy (Tri-Party Agreement) believe that the new approach will save time and funding. In the new approach, the Work Plan has been condensed into this 12 page Focus Package. The Focus Package includes a summary of 100-F Area information, a list of waste sites in the 100-FR-2 Operable Unit, a summary of proposed work, and a schedule. The new approach will also combine the Limited Field Investigation and Qualitative Risk Assessment reports into the Focused Feasibility Study. The Focused Feasibility Study will analyze methods and costs to clean up waste sites. Consolidating the documents should reduce the time to complete the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process by 16 months, compared to the previous approach.

835 (DOE/RL–95-46) **Soil washing pilot plant treatability test for the 100-DR-1 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96000281. Source: OSTI; NTIS; INIS; GPO Dep.

Large volumes of radionuclide contaminated soils remain as a result of past waste disposal practices at the Hanford Site. The amount of contaminated soils requiring remediation in the 100 Area could reach upwards of 10 million yd^3. The proposed plans for the first three source operable units (HR-1, BC-1, DR-1) describe the preferred remediation alternative as remove, treat "as appropriate" and dispose. Soil washing is an alternative that offers an appropriate treatment at a cost comparable to direct disposal. It is an alternative that reduces the problem through treatment, not just moves it to another location. This remediation approach is consistent with the mandate set forth by Congress to treat when possible. Based on results of this and other studies and current knowledge of the soils, soil washing could be applicable to as much as 50% of the contaminated soils in the 100 Area. In addition, one of the recommendations of this report is to continue investigating evolving technologies that could result in further volume reductions and possible recovery of radionuclides for resale.

836 (DOE/RL–96-18) **1995 Tier Two emergency and hazardous chemical inventory. Emergency Planning and Community Right-To-Know Act, Section 312.** USDOE Richland Operations Office, WA (United States). Mar 1996. 115p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009667. Source: OSTI; NTIS; INIS; GPO Dep.

Tier Two reports are required as part of the Superfund compliance. The purpose is to provide state and local officials and the public with specific information on hazardous chemicals present at a facility during the past year. The facility is required to provide specific information on description, hazards, amounts, and locations of all hazardous materials. This report compiled such information for the Hanford Reservation.

837 (DOE/RL–96-19) **Mitigation action plan for liquid waste sites in the 100-BC-1, 100-DR-1, and 100-HR-1 units.** Weiss, S.G. USDOE Richland Operations Office, WA (United States). May 1996. 22p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013563. Source: OSTI; NTIS; INIS; GPO Dep.

A Record of Decision (ROD) was issued for remediation of waste sites in the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units in the 100 Area of the Hanford Site. This Mitigation Action Plan (MAP) explains how mitigation measures for these remedial activities will be planned and implemented. The new activities planned in the ROD are not anticipated to result in releases of hazardous substances and will minimize disturbance of currently undisturbed areas. However, certain actions required by the ROD may result in the redisturbance of areas of recovering vegetation. This MAP presents a strategy for limiting disturbances and identifies an opportunity for revegetating a previously disturbed site; the knowledge gained from this demonstration project can be applied to final revegetation of the rest of the remediated sites and sites disturbed during cleanup when remediation of an area is completed. This work will be conducted in coordination with the Natural Resource Trustees Council and Native American Tribes to help minimize impacts to natural resources and cultural resources from project activities and to restore the remediated sites to an appropriate level of habitat.

838 (DOE/RL–364162-1-Vol.1) **Solid waste operations complex W-113: Preliminary design report. Volume I.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Subcontract MJJ-SVV-364162. Order Number DE95010983. Source: OSTI; NTIS; INIS; GPO Dep.

This document is Volume I of a Preliminary Design Report (Title I) for the Solid Waste Retrieval Facilities-Phase I (Project W-113) at Hanford. It was prepared by Raytheon and BNFL Inc. and submitted to Westinghouse Hanford Company in January 1995. This volume provides a project overview and a discussion of the waste handling systems, the data acquisition and control systems, the building systems, and the site/building structure.

839 (DOE/RL–364162-1-Vol.3) **Solid waste operations complex W-113: Specifications. Preliminary design report. Volume III.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 403p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Subcontract MJJ-SVV-364162. Order Number DE95010980. Source: OSTI; NTIS; INIS; GPO Dep.

This document is Volume III of the Preliminary Design report for the Solid Waste Retrieval Facility at Hanford. The report was prepared by Raytheon and BNFL Inc. and submitted to Westinghouse Hanford Company in January 1995. This volume is a complete listing of the specifications for construction and the required material and equipment.

840 (DOE/RL–364162-1-Vol.4) **Solid Waste Operations Complex W-113: Project cost estimate. Preliminary design report. Volume IV.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Subcontract MJJ-SVV-364162. Order Number DE95010981. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Volume IV of the Preliminary Design Report for the Solid Waste Operations Complex W-113 which is the Project Cost Estimate and construction schedule. The estimate was developed based upon Title 1 material take-offs, budgetary equipment quotes and Raytheon historical in-house data. The W-113 project cost estimate and project construction schedule were integrated together to provide a resource loaded project network.

841 (DOE/RL–364162-1-Vol.5) **Solid waste operations complex W-113: Engineering assessments and lists. Preliminary design report. Volume V.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 270p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Subcontract MJJ-SVV-364162. Order Number DE95010982. Source: OSTI; NTIS; INIS; GPO Dep.

This document is Volume V of the Preliminary Design Report for the Solid Waste Retrieval Facility at Hanford. It was prepared by Raytheon and BNFL Inc. and submitted to Westinghouse Hanford Company in January 1995. This volume contains the engineering assessments and lists (load list, instrument list, master equipment lists, et al).

842 (DOE/S–0118) **Pollution prevention program plan 1996.** USDOE Office of the Secretary, Washington, DC (United States). 1996. 72p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011033. Source: OSTI; NTIS; INIS; GPO Dep.

This plan serves as the principal crosscutting guidance to Department of Energy (DOE) Headquarters, Operations Office, laboratory, and contractor management to fully implement pollution prevention programs within the DOE complex between now and 2000. To firmly demonstrate DOE's commitment to pollution prevention, the Secretary of Energy has established goals, to be achieved by December 31, 1999, that will aggressively reduce DOE's routine generation of radioactive, mixed, and hazardous wastes, and total releases and offsite transfers of toxic chemicals. The Secretary also has established sanitary waste reduction, recycling, and affirmative procurement goals. Site progress in meeting these goals will be reported annually to the Secretary in the Annual Report on Waste Generation and Waste Minimization Progress, using 1993 as the baseline year. Implementation of this plan will represent a major step toward reducing the environmental risks and costs associated with DOE operations.

843 (EGG-LLW–8843-91-2) **Performance assessments for near-surface low-level radioactive waste disposal facilities.** Kostelnik, K.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1991. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007404. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of a performance assessment for a low-level radioactive waste (LLW) disposal facility is to determine the proposed facility's projected compliance with regulatory limits in terms of doses to the general public and to protect inadvertent intruders. A set of exposure scenarios must be evaluated for each of the various institutional phases of the facility; a quantitative evaluation must be performed for the most probable scenarios. Evaluation of the final conceptual model of the facility and site should involve the use of appropriate computer code and site-specific data. Code selection for a performance assessment should be based on code capabilities as well as on site-specific needs and characteristics. Generally, a single code will not be capable of simulating all relevant scenarios. A review of performance assessments for confirmation of regulatory compliance will be conducted by the NRC or the appropriate Agreement State regulatory agency. Performance assessment codes are tools for evaluating a proposed LLW disposal facility's regulatory compliance. This evaluation should objectively assess the physical properties of the facility and its environment. Calculations in support of this evaluation must be conservative yet realistic and they must also be technically defensible and supported by adequate data.

844 (EGG-LLW-8843-91-3) **Portland cement: A solidification agent for low-level radioactive waste.** McConnell, J.W. Jr. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1991. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007405. Source: OSTI; NTIS; INIS; GPO Dep.

This bulletin discusses the solidification of waste streams using portland-type cement to provide the structural stability required by 10 CFR 61. Portland cement has been used in this role since early in the commercial nuclear program as a simple and inexpensive solidification medium for immobilization of radioactive wastes. Through the use of additives, most waste streams can be satisfactorily immobilized with portland cement. However, some problem waste streams can not be solidified with portland cement at this time, and those are discussed in this document.

845 (EGG-LLW-10135-92-1) **Managing commercial low-level radioactive waste beyond 1992: Transportation planning for a LLW disposal facility.** Quinn, G.J. (Wastren, Inc. (United States)). EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1992. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007407. Source: OSTI; NTIS; INIS; GPO Dep.

This technical bulletin presents information on the many activities and issues related to transportation of low-level radioactive waste (LLW) to allow interested States to investigate further those subjects for which proactive preparation will facilitate the development and operation of a LLW disposal facility. The activities related to transportation for a LLW disposal facility are discussed under the following headings: safety; legislation, regulations, and implementation guidance; operations-related transport (LLW and non-LLW traffic); construction traffic; economics; and public involvement.

846 (EGG-LLW-10135-92-2) **Commercial low-level radioactive waste transportation safety history.** Garcia, R.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1992. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007408. Source: OSTI; NTIS; INIS; GPO Dep.

An excellent safety record has been established for the transport of commercial low-level radioactive waste. By using the Radioactive Material Incident Report data base to evaluate transportation accidents involving commercial low-level radioactive waste, it was found that there have been only four transportation accidents involving the release of commercial low-level radioactive waste in the last 20 years. The accidents were minor, and the released materials were quickly repackaged. There has never been a radiologically related injury or death associated with a transportation accident involving commercial low-level radioactive waste.

847 (EGG-LLW-10135-92-3) **Impact of revised 10 CFR 20 on existing performance assessment computer codes used for LLW disposal facilities.** Leonard, P.R.; Seitz, R.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1992. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96007409. Source: OSTI; NTIS; INIS; GPO Dep.

The US Nuclear Regulatory Commission (NRC) recently announced a revision to Chapter 10 of the Code of Federal Regulations, Part 20 (10 CFR 20) "Standards for Protection Against Radiation," which incorporates recommendations contained in Publications 26 and 30 of the International Commission on Radiological Protection (ICRP), issued in 1977 and 1979, respectively. The revision to 10 CFR 20 was also developed in parallel with Presidential Guidance on occupational radiation protection published in the Federal Register. Thus, this study concludes that the issuance of the revised 10 CFR 20 will not affect calculations using the computer codes considered in this report. In general, the computer codes and EPA and DOE guidance on which computer codes are based were developed in a manner consistent with the guidance provided in ICRP 26/30, well before the revision of 10 CFR 20.

848 (EGG-WM-11118) **Preliminary siting activities for new waste handling facilities at the Idaho National Engineering Laboratory.** Taylor, D.D.; Hoskinson, R.L.; Kingsford, C.O.; Ball, L.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96003832. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Waste Processing Facility, the Mixed and Low-Level Waste Treatment Facility, and the Mixed and Low-Level Waste Disposal Facility are new waste treatment, storage, and disposal facilities that have been proposed at the Idaho National Engineering Laboratory (INEL). A prime consideration in planning for such facilities is the selection of a site. Since spring of 1992, waste management personnel at the INEL have been involved in activities directed to this end. These activities have resulted in the (a) identification of generic siting criteria, considered applicable to either treatment or disposal facilities for the purpose of preliminary site evaluations and comparisons, (b) selection of six candidate locations for siting,and (c) site-specific characterization of candidate sites relative to selected siting criteria. This report describes the information gathered in the above three categories for the six candidate sites. However, a single, preferred site has not yet been identified. Such a determination requires an overall, composite ranking of the candidate sites, which accounts for the fact that the sites under consideration have different advantages and disadvantages, that no single site is superior to all the others in all the siting criteria, and that the criteria should be assigned different weighing factors depending on whether a site is to host a treatment or a disposal facility. Stakeholder input should now be solicited to help guide the final selection. This input will include (a) siting issues not already identified in the siting, work to date, and (b) relative importances of the individual siting criteria. Final site selection will not be completed until stakeholder input (from the State of Idaho, regulatory agencies, the public, etc.) in the above areas has been obtained and a strategy has been developed to make a composite ranking of all candidate sites that accounts for all the siting criteria.

849 (ES/WM–47) **Facility design, construction, and operation.** Oak Ridge National Lab., TN (United States); Numatec, Inc., Bethesda, MD (United States). Apr 1995. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. 1AK-EGJ68V. (ORNL/M–4614). Order Number DE95017170. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Management Program.

France has been disposing of low-level radioactive waste (LLW) at the Centre de Stockage de la Manche (CSM) since 1969 and now at the Centre de Stockage de l'Aube (CSA) since 1992. In France, several agencies and companies are involved in the development and implementation of LLW technology. The Commissariat a l'Energie Atomic (CEA), is responsible for research and development of new technologies. The Agence National pour la Gestion des Dechets Radioactifs is the agency responsible for the construction and operation of disposal facilities and for wastes acceptance for these facilities. Compagnie Generale des Matieres Nucleaires provides fuel services, including uranium enrichment, fuel fabrication, and fuel reprocessing, and is thus one generator of LLW. Societe pour les Techniques Nouvelles is an engineering company responsible for commercializing CEA waste management technology and for engineering and design support for the facilities. Numatec, Inc. is a US company representing these French companies and agencies in the US. In Task 1.1 of Numatec's contract with Martin Marietta Energy Systems, Numatec provides details on the design, construction and operation of the LLW disposal facilities at CSM and CSA. Lessons learned from operation of CSM and incorporated into the design, construction and operating procedures at CSA are identified and discussed. The process used by the French for identification, selection, and evaluation of disposal technologies is provided. Specifically, the decisionmaking process resulting in the change in disposal facility design for the CSA versus the CSM is discussed. This report provides' all of the basic information in these areas and reflects actual experience to date.

850 (ES/WM–80) **Life cycle benefit-cost analysis of alternatives for deployment of the transportable vitrification system.** Sexton, J.L.; Dole, L.R. Oak Ridge National Lab., TN (United States). Jul 1996. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011783. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's (DOE) Oak Ridge Reservation (ORR) occupies almost 37,000 acres in and around the city of Oak Ridge, Tennessee. In the rapid effort to produce a working atomic bomb, three plants were constructed: Oak Ridge Gaseous Diffusion Plant (K-25), now the Oak Ridge K-25 Site and the Center for Environmental Technology and Waste Management; Clinton Laboratories (now the Oak Ridge National Laboratory [ORNL]); and the Oak Ridge Y-12 Plant. Following the end of the Cold War and the resulting reduction in nuclear weapons production, the DOE faced an unprecedented task of safely managing, storing, and treating legacy waste while, at the same time, cleaning up the contaminated areas within its sites in 33 states in a manner that uses the most cost-effective methods in conjunction with its responsibility to protect human health and the environment. The Transportable Vitrification system (TVS), an alternative waste treatment technology, has been developed by the DOE Office of Technology Development (EM-50). EM-50, or OTD, is the DOE program concerned with developing, demonstrating, and deploying new methods for environmental restoration and waste management and, as such, has provided the majority of the funding for the development of the TVS. This study reports the results of life cycle benefit-cost-risk analyses of the TVS for a series of use-scenarios proposed for treating mixed low-level waste (MLLW) streams on the ORR in accordance with the Office of Management and Budget (OMB) guidelines contained in OMB Circular 94. The system is designed to produce about 300 lb of glass per hour at its maximum capacity and is capable of processing wet, dry, or slurried waste. When formed into glass by the TVS, MLLW streams meet the Resource Conservation and Recovery Act (RCRA) land disposal requirements (LDR) and can potentially be disposed of as low-level wastes (LLW).

851 (FEMP–2388) **Radium bearing waste disposal.** Tope, W.G. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Nixon, D.A.; Smith, M.L.; Stone, T.J.; Vogel, R.A.; Schofield, W.D. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950401–11: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013793. Source: OSTI; NTIS; INIS; GPO Dep.

Fernald radium bearing ore residue waste, stored within Silos 1 and 2 (K-65) and Silo 3, will be vitrified for disposal at the Nevada Test Site (NTS). A comprehensive, parametric evaluation of waste form, packaging, and transportation alternatives was completed to identify the most cost-effective approach. The impacts of waste loading, waste form, regulatory requirements, NTS waste acceptance criteria, as-low-as-reasonably-achievable principles, and material handling costs were factored into the recommended approach.

852 (FEMP–2445) **Chemical treatment of mixed waste can be done.....Today!.** Honigford, L. (Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)); Dilday, D.; Cook, D.; Sattler, J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-960212–13: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007278. Source: OSTI; NTIS; INIS; GPO Dep.

The Chemical Treatment Project is one in a series of projects implemented by the FEMP to treat mixed waste. The projects were initiated to address concerns regarding treatment capacity for mixed waste and to comply with requirements established by the Federal Facility Compliance Act. The Chemical Treatment Project is designed to utilize commercially available mobile technologies to perform treatment at the FEMP site. The waste in the Project consists of a variety of waste types with a wide range of hazards and physical characteristics. The treatment processes to be established for the waste types will be developed by a systematic approach including waste streams evaluation, projectization of the waste streams, and categorization of the stream. This information is utilized to determine the proper train of treatment which will be required to lead the waste to its final destination (i.e., disposal). This approach allows flexibility to manage a wide variety of waste in a cheaper, faster manner than designing a single treatment technology diverse enough to manage all the waste streams.

853 (FEMP/SUB–102) **Natural phenomena hazards evaluation of concrete silos 1, 2, 3 and 4 at Fernald, Ohio.** Char, C.V. (PARSONS Environmental Remedial Action Project, Fairfield, OH (United States)); Shiner, T.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Aug 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-9511128–1: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96000320. Source: OSTI; NTIS; INIS; GPO Dep.

Fernald Environmental Management Project (FEMP) is a United States Department of Energy (DOE) site located near Cincinnati, Ohio. FEMP was formerly established as the Feed Materials Production Center (FMPC) in 1951 under the Atomic Energy Commission. FEMP is currently undergoing site wide environmental remediation. This paper addresses four concrete silos built during the 1950s and located in Operable Unit 4 (OU-4). Silos 1 and 2 known as K-65 Silos contain residues from Uranium Ore processing. Silo 3 contains metal oxides in powder form. Silo 4 is empty. The Silos are categorized as low hazard facilities and the Natural Phenomena Hazards (NPH) performance category is PC-2, based on a recently completed safety analysis report. This paper describes the structural evaluation of concrete Silos 1, 2, 3 and 4 for NPH. Non Destructive Tests (NDT) were conducted to establish the current conditions of the silos. Analytical and computer methods were used to evaluate the stresses and displacements for different silo configurations and different loading combinations. Finite element models were developed to uniquely represent each silo, and analyzed using SAP90 computer program. The SAPLOT post processor was used for rapid determination of critical areas of concern for critical loading combinations and for varying silo configurations.

854 (INEL–94/00063) **Macroencapsulation of lead and steel SWARF.** Zirker, L.; Thiesen, T.; Tyson, D.; Beitel, G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950877–24: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96003507. Source: OSTI; NTIS; INIS; GPO Dep.

The treatability study to macroencapsulate radioactively contaminated lead and steel swarf (cuttings and/or chips)and chunks, a low level mixed waste, from the dismantlement of excess surplus uranium fuel handling and transfer casks was successful. Macroencapsulation is the land disposal restriction treatment standard for this waste form per 40 CFR 268.42 Table 3. An epoxy-based thermoset system was employed due to cracking failures of other types of thermoset systems. Bench scale tests were performed with a two-part epoxy (resin and hardener) using cast iron chips as a surrogate waste media. A two stage encapsulation process was employed in treating the swarf. Two liters of epoxy were added to a 2.8ℓ (3 qt) container of swarf under 51K Pa vacuum (-15-inch of Hg) during the first stage of the process. In this stage each individual particle or chip was wetted by epoxy and allowed to harden into an initial monolith. The second stage encapsulated the initial monolith with a secondary layer of epoxy forming a larger final monolith. By evacuating the air from the swarf and epoxy during the initial monolith encapsulation, a higher density (higher swarf to epoxy ratio) was achieved. Tensile and compressive strength tests were performed on samples and without any media (cast iron chips). The coupons were prepared from a series of monoliths featuring various mixtures ratios and vacuum levels. The tensile strength of epoxy without chips averaged 41M Pa (6000 psi) and 1.4M Pa (2000 psi) with cast iron chips. Compression strengths averaged 140M Pa (20,000 psi) without chips and 66.2M Pa (9600 psi) with cast iron chips.

855 (INEL–94/0095) **Modeling of thermal plasma arc technology FY 1994 report.** Hawkes, G.L.; Nguyen, H.D.; Paik, S.; McKellar, M.G. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1995. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001325. Source: OSTI; NTIS; INIS; GPO Dep.

The thermal plasma arc process is under consideration to thermally treat hazardous and radioactive waste. A computer model for the thermal plasma arc technology was designed as a tool to aid in the development and use of the plasma arc-Joule beating process. The value of this computer model is to: (a) aid in understanding the plasma arc-Joule beating process as applied to buried waste or exhumed buried waste, (b) help design melter geometry and electrode configuration, (c) calculate the process capability of vitrifying waste (i.e., tons/hour), (d) develop efficient plasma and melter operating conditions to optimize the process and/or reduce safety hazards, (e) calculate chemical reactions during treatment of waste to track chemical composition of off-gas products, and composition of final vitrified waste form and (f) help compare the designs of different plasma-arc facilities. A steady-state model of a two-dimensional axisymmetric transferred plasma arc has been developed and validated. A parametric analysis was performed that studied the effects of arc length, plasma gas composition, and input power on the temperatures and velocity profiles of the slag and plasma gas. A two-dimensional transient thermo-fluid model of the US Bureau of Mines plasma arc melter has been developed. This model includes the growth of a slag pool. The thermo-fluid model is used to predict the temperature and pressure fields within a plasma arc furnace. An analysis was performed to determine the effects of a molten metal pool on the temperature, velocity, and voltage fields within the slag. A robust and accurate model for the chemical equilibrium calculations has been selected to determine chemical composition of final waste form and off-gas based on the temperatures and pressures within the plasma-arc furnace. A chemical database has been selected. The database is based on the materials to be processed in the plasma arc furnaces.

856 (INEL–94/0211-Rev.2) **Waste Management facilities cost information: System Cost Model Software Quality Assurance Plan. Revision 2.** Peterson, B.L.; Lundeen, A.S. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1996. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009906. Source: OSTI; NTIS; INIS; GPO Dep.

In May of 1994, Lockheed Idaho Technologies Company (LITCO) in Idaho Falls, Idaho and subcontractors developed the System Cost Model (SCM) application. The SCM estimates life-cycle costs of the entire US Department of Energy (DOE) complex for designing; constructing; operating; and decommissioning treatment, storage, and disposal (TSD) facilities for mixed low-level, low-level, transuranic, and mixed transuranic waste. The SCM uses parametric cost functions to estimate life-cycle costs for various treatment, storage, and disposal modules which reflect planned and existing facilities at DOE installations. In addition, SCM can model new facilities based on capacity needs over the program life cycle. The SCM also provides transportation costs for truck and rail, which include transport of contact-handled, remote-handled, and alpha (transuranic) wastes. The user can provide input data (default data is included in the SCM) including the volume and nature of waste to be managed, the time period over which the waste is to be managed, and the configuration of the waste management complex (i.e., where each installation's generated waste will be treated, stored, and disposed). Then the SCM uses parametric cost equations to estimate the costs of pre-operations (designing), construction costs, operation management, and decommissioning these waste management facilities. For the product to be effective and useful the SCM users must have a high level of confidence in the data generated by the software model. The SCM Software Quality Assurance Plan is part of the overall SCM project management effort to ensure that the SCM is maintained as a quality product and can be relied on to produce viable planning data. This document defines tasks and deliverables to ensure continued product integrity, provide increased confidence in the accuracy of the data generated, and meet the LITCO's quality standards during the software maintenance phase. 8 refs., 1 tab.

857 (INEL–94/0237) **Clean Lead Facility Inventory System user's manual.** Garcia, J.F. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Source: OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS.

The purpose of this user's manual is to provide instruction and guidance needed to enter and maintain inventory information for the Clean Lead Facility (CLF), PER-612. Individuals responsible for maintaining and using the system should study and understand the information provided. The user's manual describes how to properly use and maintain the CLF Inventory System. Annual, quarterly, monthly, and current inventory reports may be printed from the Inventory System for reporting purposes. Profile reports of each shipment of lead may also be printed for verification and documentation of lead transactions. The CLF Inventory System was designed on Microsoft Access version 2.0. Similar inventory systems are in use at the Idaho National Engineering Laboratory (INEL) to facilitate site-wide compilations of mixed waste data. The CLF Inventory System was designed for inventorying the clean or non-radioactive contaminated lead stored at the CLF. This data, along with the mixed waste data, will be compiled into the Idaho Mixed Waste Information (IMWI) system for reporting to the Department of Energy Idaho Office, Department of Energy Headquarters, and/or the State of Idaho.

858 (INEL–94/0252-Rev.1) **Characterization of void volume VOC concentration in vented TRU waste drums. Final report.** Liekhus, K.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001190. Source: OSTI; NTIS; INIS; GPO Dep.

A test program has been conducted at the Idaho National Engineering Laboratory to demonstrate that the concentration of volatile organic compounds within the innermost layer of confinement in a vented waste drum can be estimated using a model incorporating diffusion and permeation transport principles and limited waste drum sampling data. This final report summarizes the experimental measurements and model predictions for transuranic waste drums containing solidified sludges and solid waste.

859 (INEL–95/0013) **Waste Management Facilities cost information for low-level waste.** Shropshire, D.; Sherick, M.; Biadgi, C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001353. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for managing low-level waste. The report's information on treatment, storage, and disposal modules can be integrated to develop total life-cycle costs for various waste management options. A procedure to guide the US Department of Energy and its contractor personnel in the use of cost estimation data is also summarized in this report.

860 (INEL–95/0014-Rev.1) **Waste Management Facilities cost information for mixed low-level waste. Revision 1.** Shropshire, D.; Sherick, M.; Biadgi, C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001352. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for managing mixed low-level waste. The report's information on treatment, storage, and disposal modules can be integrated to develop total life-cycle costs for various waste management options. A procedure to guide the US Department of Energy and its contractor personnel in the use of cost estimation data is also summarized in this report.

861 (INEL–95/0016-Rev.1) **Waste management facilities cost information for hazardous waste. Revision 1.** Shropshire, D.; Sherick, M.; Biagi, C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001351. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for managing hazardous waste. The report's information on treatment, storage, and disposal modules can be integrated to develop total life-cycle costs for various waste management options. A procedure to guide the US Department of Energy and its contractor personnel in the use of cost estimation data is also summarized in this report.

862 (INEL–95/0020-Rev.1) **Review of private sector treatment, storage, and disposal capacity for radioactive waste. Revision 1.** Smith, M.; Harris, J.G.; Moore-Mayne, S.; Mayes, R.; Naretto, C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 14 Apr 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001555. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an update of a report that summarized the current and near-term commercial and disposal of radioactive and mixed waste. This report was capacity for the treatment, storage, dating and written for the Idaho National Engineering Laboratory (INEL) with the objective of updating and expanding the report entitled "Review of Private Sector Treatment, Storage, and Disposal Capacity for Radioactive Waste", (INEL-95/0020, January 1995). The capacity to process radioactively-contaminated protective clothing and/or respirators was added to the list of private sector capabilities to be assessed. Of the 20 companies surveyed in the previous report, 14 responded to the request for additional information, five did not respond, and one asked to be deleted from the survey. One additional company was identified as being capable of performing LLMW treatability studies and six were identified as providers of laundering services for radioactively-contaminated protective clothing and/or respirators.

863 (INEL–95/0054) **Advanced Mixed Waste Treatment Project melter system preliminary design technical review meeting.** Eddy, T.L.; Raivo, B.D.; Soelberg, N.R.; Wiersholm, O. Fermi National Accelerator Lab., Batavia, IL (United States). Feb 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001189. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory Advanced Mixed Waste Treatment Project sponsored a plasma are melter technical design review meeting to evaluate high-temperature melter system configurations for processing heterogeneous alpha-contaminated low-level radioactive waste (ALLW). Thermal processing experts representing Department of Energy contractors, the Environmental Protection Agency, and private sector companies participated in the review. The participants discussed issues and evaluated alternative configurations for three areas of the melter system design: plasma torch melters and graphite arc melters, offgas treatment options, and overall system configuration considerations. The Technical Advisory Committee for the review concluded that graphite arc melters are preferred over plasma torch melters for processing ALLW. Initiating involvement of stakeholders was considered essential at this stage of the design. For the offgas treatment system, the advisory committee raised the question whether to a use wet-dry or a dry-wet system. The committee recommended that the waste stream characterization, feed preparation, and the control system are essential design tasks for the high-temperature melter treatment system. The participants strongly recommended that a complete melter treatment system be assembled to conduct tests with nonradioactive surrogate waste material. A nonradioactive test bed would allow for inexpensive design and operational changes prior to assembling a system for radioactive waste treatment operations.

864 (INEL–95/0055) **Calculations of protective action distance for toxic chemical spills using nomographs.** Lee, L.G.; Vail, J.A.; Gibeault, G.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Apr 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001140. Source: OSTI; NTIS; INIS; GPO Dep.

This document was produced for emergency use following a spill of liquid gas or finely divided solid (<100 micron) toxic chemicals. The information on the next few pages was kept deliberately terse and is limited to data and graphic aids needed for calculation of plume distance (protective action distance). All supporting material is provided as Appendices.

865 (INEL–95/00095) **Comparison of the radiological and chemical toxicity of lead.** Beitel, G.A.; Mott, S. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9504207–1: Hazardous waste and materials conference, Pocatello, ID (United States), 17-19 Apr 1995). Order Number DE96001623. Source: OSTI; NTIS; INIS; GPO Dep.

This report estimates the worst-case radiological dose to an individual from ingested lead containing picocurie levels of radionuclides and then compares the calculated radiological health effects to the chemical toxic effects from that same lead. This comparison provides an estimate of the consequences of inadvertently recycling, in the commercial market, lead containing nominally undetectable concentrations of radionuclides. Quantitative expressions for the radiological and chemical toxicities of lead are based on concentrations of lead in the blood stream. The result shows that the chemical toxicity of lead is a greater health hazard, by orders of magnitude, than any probable companion radiation dose.

866 (INEL–95/0095-Rev.1) **Preliminary parametric performance assessment of potential final waste forms for alpha low-level waste at the Idaho National Engineering Laboratory. Revision 1.** Smith, T.H. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Sussman, M.E.; Myers, J.; Djordjevic, S.M.; DeBiase, T.A.; Goodrich, M.T.; DeWitt, D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002303. Source: OSTI; NTIS; INIS; GPO Dep.

Formerly EGG-WM-11415.

This report presents a preliminary parametric performance assessment (PA) of potential waste disposal systems for alpha-contaminated, mixed, low-level waste (ALLW) currently stored at the Transuranic Storage Area of INEL. The ALLW, which contains from 10 to 100 nCi/g of transuranic (TRU) radionuclides, is awaiting treatment and disposal. The purpose of this study was to examine the effects of several parameters on the radiological-confinement performance of potential disposal systems for the ALLW. The principal emphasis was on the performance of final waste forms (FWFs). Three categories of FWF (cement, glass, and ceramic) were addressed by evaluating the performance of two limiting FWFs for each category. Performance at five conceptual disposal sites was evaluated to illustrate the effects of site characteristics on the performance of the total disposal system. Other parameters investigated for effects on receptor dose included inventory assumptions, TRU radionuclide concentration, FWF fracture, disposal depth, water infiltration rates, subsurface-transport modeling assumptions, receptor well location, intrusion scenario assumptions, and the absence of waste immobilization. These and other factors were varied singly and in some combinations. The results indicate that compliance of the treated and disposed ALLW with the performance objectives depends on the assumptions made, as well as on the FWF and the disposal site. Some combinations result in compliance, while others do not. The implications of these results for decision making relative to treatment and disposal of the INEL ALLW are discussed. The report compares the degree of conservatism in this preliminary parametric PA against that in four other PAs and one risk assessment. All of the assessments addressed the same disposal site, but different wastes. The report also presents a qualitative evaluation of the uncertainties in the PA and makes recommendations for further study.

867 (INEL–95/0098) **Dissolution of two NWCF calcines: Extent of dissolution and characterization of undissolved solids.** Brewer, K.N. (and others); Herbst, R.S.; Tranter, T.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004069. Source: OSTI; NTIS; INIS; GPO Dep.

A study was undertaken to determine the dissolution characteristics of two NWCF calcine types. A two-way blended calcine made from 4 parts nonradioactive aluminum nitrate and one part WM-102 was studied to determine the extent of dissolution for aluminum-type calcines. A two-way blend of 3.5 parts fluorinel waste from WM-187 and 1 part sodium waste from WM-185 was used to determine the extent of dissolution for zirconium-type calcines. This study was necessary to develop suitable aqueous separation flowsheets for the partitioning of actinides and fission products from ICPP calcines and to determine the disposition of the resulting undissolved solids (UDS). The dissolution flowsheet developed by Herbst was used to dissolve these two NWCF calcine types. Results show that greater than 95 wt% of aluminum and zirconium calcine types were dissolved after a single batch contact with 5 M HNO_3. A characterization of the UDS indicates that the weight percent of TRU elements in the UDS resulting from both calcine type dissolutions increases by approximately an order of magnitude from their concentrations prior to dissolution. Substantial activities of cesium and strontium are also present in the UDS resulting from the dissolution of both calcine types. Multiple TRU, Cs, and Sr analyses of both UDS types show that these solids are relatively homogeneous. From this study, it is estimated that between 63.5 and 635 cubic meters of UDS will be generated from the dissolution of 3800 M_3 of calcine. The significant actinide and fission product activities in these UDS will preclude their disposal as low-level waste. If the actinide and fission activity resulting from the UDS is the only considered source in the dissolved calcine solutions, an estimated 99.9 to 99.99 percent of the solids must be removed from this solution for it to meet non-TRU Class A low-level waste.

868 (INEL–95/0109-Rev.1) **Position for determining gas phase volatile organic compound concentrations in transuranic waste containers. Revision 1.** Connolly, M.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Liekhus, K.J.; Djordjevic, S.M.; Loehr, C.A.; Spangler, L.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Benchmark Environmental Corp., Albuquerque, NM (United States). Aug 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001196. Source: OSTI; NTIS; INIS; GPO Dep.

In the conditional no-migration determination (NMD) for the test phase of the Waste Isolation Pilot Plant (WIPP), the US Environmental Protection Agency (EPA) imposed certain conditions on the US Department of Energy (DOE) regarding gas phase volatile organic compound (VOC) concentrations in the void space of transuranic (TRU) waste containers. Specifically, the EPA required the DOE to ensure that each waste container has no layer of confinement that contains flammable mixtures of gases or mixtures of gases that could become flammable when mixed with air. The EPA also required that sampling of the headspace of waste containers outside inner layers of confinement be representative of the entire void space of the container. The EPA stated that all layers of confinement in a container would have to be sampled until DOE can demonstrate to the EPA that sampling of all layers is either unnecessary or can be safely reduced. A test program was conducted at the Idaho National Engineering Laboratory (INEL) to demonstrate that the gas phase VOC concentration in the void space of each layer of confinement in vented drums can be estimated from measured drum headspace using a theoretical transport model and that sampling of each layer of confinement is unnecessary. This report summarizes the studies performed in the INEL test program and extends them for the purpose of developing a methodology for determining gas phase VOC concentrations in both vented and unvented TRU waste containers. The methodology specifies conditions under which waste drum headspace gases can be said to be representative of drum gases as a whole and describes a method for predicting drum concentrations in situations where the headspace concentration is not representative. The methodology addresses the approach for determining the drum VOC gas content for two purposes: operational period drum handling and operational period no-migration calculations.

869 (INEL–95/0112) **Lessons learned from the EG&G consolidated hazardous waste subcontract and ESH&Q liability assessment process.** Fix, N.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Mar 1995. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001178. Source: OSTI; NTIS; INIS; GPO Dep.

Hazardous waste transportation, treatment, recycling, and disposal contracts were first consolidated at the Idaho National Engineering Laboratory in 1992 by EG&G Idaho, Inc. At that time, disposition of Resource, Conservation and Recovery Act hazardous waste, Toxic Substance Control Act waste, Comprehensive Environmental Response, Compensation, and Liability Act hazardous substances and contaminated media, and recyclable hazardous materials was consolidated under five subcontracts. The wastes were generated by five different INEL M&O contractors, under the direction of three different Department of Energy field offices. The consolidated contract reduced the number of facilities handling INEL waste from 27 to 8 qualified treatment, storage, and disposal facilities, with brokers specifically prohibited. This reduced associated transportation costs, amount and cost of contractual paperwork, and environmental liability exposure. EG&G reviewed this approach and proposed a consolidated hazardous waste subcontract be formed for the major EG&G managed DOE sites: INEL, Mound, Rocky Flats, Nevada Test Site, and 10 satellite facilities. After obtaining concurrence from DOE Headquarters, this effort began in March 1992 and was completed with the award of two master task subcontracts in October and November 1993. In addition, the effort included a team to evaluate the apparent awardee's facilities for environment, safety, health, and quality (ESH&Q) and financial liability status. This report documents the evaluation of the process used to prepare, bid, and award the EG&G consolidated hazardous waste transportation, treatment, recycling, and/or disposal subcontracts and associated ESH&Q and financial liability assessments; document the strengths and weaknesses of the process; and propose improvements that would expedite and enhance the process for other DOE installations that used the process and for the re-bid of the consolidated subcontract, scheduled for 1997.

870 (INEL–95/0114) **Catalog of documents produced by the Greater-Than-Class C Low-Level Waste Management Program.** Winberg, M.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001356. Source: OSTI; NTIS; INIS; GPO Dep.

This catalog provides a ready reference for documents prepared by the Greater-Than-Class C Low-Level Waste (GTCC LLW) Management Program. The GTCC LLW Management Program is part of the National Low-Level Waste Management Program (NLLWMP). The NLLWMP is sponsored by the US Department of Energy (DOE) and is responsible for assisting the DOE in meeting its obligations under Public Law 99-240, The Low-Level Radioactive Waste Policy Amendments Act of 1985. This law assigns DOE the responsibility of ensuring the safe disposal of GTCC LLW in a facility licensed by the Nuclear Regulatory Commission (NRC). The NLLWMP is managed at the Idaho National Engineering Laboratory (INEL).

871 (INEL–95/0129) **Integrated thermal treatment system sudy: Phase 2, Results.** Feizollahi, F.; Quapp, W.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Aug 1995. 405p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96000981. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the second phase of a study on thermal treatment technologies. The study consists of a systematic assessment of nineteen thermal treatment alternatives for the contact-handled mixed low-level waste (MLLW) currently stored in the US Department of Energy complex. The treatment alternatives consist of widely varying technologies for safely destroying the hazardous organic components, reducing the volume, and preparing for final disposal of the MLLW. The alternatives considered in Phase 2 were innovative thermal treatments with nine types of primary processing units. Other variations in the study examined the effect of combustion gas, air pollution control system design, and stabilization technology for the treatment residues. The Phase 1 study, the results of which have been published as an interim report, examined ten initial thermal treatment alternatives. The Phase 2 systems were evaluated in essentially the same manner as the Phase 2 systems. The assumptions and methods were the same as for the Phase 1 study. The quantities, and physical and chemical compositions, of the input waste used in he Phase 2 systems differ from those in the Phase 1 systems, which were based on a preliminary waste input database developed at the onset of the Integrated Thermal Treatment System study. The inventory database used in the Phase 2 study incorporates the latest US Department of Energy information. All systems, both primary treatment systems and subsystem inputs, have now been evaluated using the same waste input (2,927 lb/hr).

872 (INEL–95/0129-Rev.1) **Integrated thermal treatment system study – Phase 2 results. Revision 1.** Feizollahi, F.; Quapp, W.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1996. 410p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96008968. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the second phase of a study on thermal treatment technologies. The study consists of a systematic assessment of nineteen thermal treatment alternatives for the contact-handled mixed low-level waste (MLLW) currently stored in the US Department of Energy complex. The treatment alternatives consist of widely varying technologies for safely destroying the hazardous organic components, reducing the volume, and preparing for final disposal of the MLLW. The alternatives considered in Phase 2 were innovative thermal treatments with nine types of primary processing units. Other variations in the study examined the effect of combustion gas, air pollution control system design, and stabilization technology for the treatment residues. The Phase 1 study examined ten initial thermal treatment alternatives. The Phase 2 systems were evaluated in essentially the same manner as the Phase 1 systems. The alternatives evaluated were: rotary kiln, slagging kiln, plasma furnace, plasma gasification, molten salt oxidation, molten metal waste destruction, steam gasification, Joule-heated vitrification, thermal desorption and mediated electrochemical oxidation, and thermal desorption and supercritical water oxidation. The quantities, and physical and chemical compositions, of the input waste used in the Phase 2 systems differ from those in the Phase 1 systems, which were based on a preliminary waste input database developed at the onset of the Integrated Thermal Treatment System study. The inventory database used in the Phase 2 study incorporates the latest US Department of Energy information. All systems, both primary treatment systems and subsystem inputs, have now been evaluated using the same waste input (2,927 lb/hr). 28 refs., 88 figs., 41 tabs.

873 (INEL–95/0135-Vol.1) **A comprehensive inventory of radiological and nonradiological contaminants in waste buried or projected to be buried in the subsurface disposal area of the INEL RWMC during the years 1984-2003, Volume 1.** EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001162. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a comprehensive inventory of the radiological and nonradiological contaminants in waste buried or projected to be buried from 1984 through 2003 in the Subsurface Disposal Area (SDA) at the Radioactive Waste Management Complex (RWMC) of the Idaho National Engineering Laboratory. The project to compile the inventory is referred to as the recent and projected data task. The inventory was compiled primarily for use in a baseline risk assessment under the Comprehensive Environmental Response, Compensation, and Liability Act. The compiled information may also be useful for environmental remediation activities that might be necessary at the RWMC. The information that was compiled has been entered into a database termed CIDRA-the Contaminant Inventory Database for Risk Assessment. The inventory information was organized according to waste generator and divided into waste streams for each generator. The inventory is based on waste information that was available in facility operating records, technical and programmatic reports, shipping records, and waste generator forecasts. Additional information was obtained by reviewing the plant operations that originally generated the waste, by interviewing personnel formerly employed as operators, and by performing nuclear physics and engineering calculations. In addition to contaminant inventories, information was compiled on the physical and chemical characteristics and the packaging of the 99 waste streams. The inventory information for waste projected to be buried at the SDA in the future was obtained from waste generator forecasts. The completeness of the contaminant inventories was confirmed by comparing them against inventories in previous reports and in other databases, and against the list of contaminants detected in environmental monitoring performed at the RWMC.

874 (INEL–95/0135-Vol.2) **A comprehensive inventory of radiological and nonradiological contaminants in waste buried or projected to be buried in the subsurface disposal area of the INEL RWMC during the years 1984-2003, Volume 2.** EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001163. Source: OSTI; NTIS; INIS; GPO Dep.

This is the second volume of this comprehensive report of the inventory of radiological and nonradiological contaminants in waste buried or projected to be buried in the subsurface disposal area of the Idaho National Engineering Laboratory. Appendix B contains a complete printout of contaminant inventory and other information from the CIDRA Database and is presented in volumes 2 and 3 of the report.

875 (INEL–95/0135-Vol.3) **A comprehensive inventory of radiological and nonradiological contaminants in waste buried or projected to be buried in the subsurface disposal area of the INEL RWMC during the years 1984-2003, Volume 3.** EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001164. Source: OSTI; NTIS; INIS; GPO Dep.

This is the third volume of this comprehensive report of the inventory of radiological and nonradiological contaminants in waste buried or projected to be buried in the subsurface disposal area of the Idaho National Engineering Laboratory. Appendix B contains a complete printout of contaminant inventory and other information from the CIDRA Database and is presented in volumes 2 and 3 of the report.

876 (INEL–95/00137) **Life cycle cost estimation and systems analysis of Waste Management Facilities.** Shropshire, D. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Feizollahi, F. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950917–14: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96001615. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents general conclusions from application of a system cost analysis method developed by the United States Department of Energy (DOE), Waste Management Division (WM), Waste Management Facilities Costs Information (WMFCI) program. The WMFCI method has been used to assess the DOE complex-wide management of radioactive, hazardous, and mixed wastes. The Idaho Engineering Laboratory, along with its subcontractor Morrison Knudsen Corporation, has been responsible for developing and applying the WMFCI cost analysis method. The cost analyses are based on system planning level life-cycle costs. The costs for life-cycle waste management activities estimated by WMFCI range from bench-scale testing and developmental work needed to design and construct a facility, facility permitting and startup, operation and maintenance, to the final decontamination, decommissioning, and closure of the facility. For DOE complex-wide assessments, cost estimates have been developed at the treatment, storage, and disposal module level and rolled up for each DOE installation. Discussions include conclusions reached by studies covering complex-wide consolidation of treatment, storage, and disposal facilities, system cost modeling, system costs sensitivity, system cost optimization, and the integration of WM waste with the environmental restoration and decontamination and decommissioning secondary wastes.

877 (INEL–95/0146) **Separation of non-hazardous, non-radioactive components from ICPP calcine via chlorination.** Nelson, L.O. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001554. Source: OSTI; NTIS; INIS; GPO Dep.

A pyrochemical treatment method for separating non-radioactive from radioactive components in solid granular waste accumulated at the Idaho Chemical Processing Plant was investigated. The goal of this study was to obtain kinetic and chemical separation data on the reaction products of the chlorination of the solid waste, known as calcine. Thermodynamic equilibrium calculations were completed to verify that a separation of radioactive and non-radioactive calcine components was possible. Bench-scale chlorination experiments were completed subsequently in a variety of reactor configurations including: a fixed-bed reactor (reactive gases flowed around and not through the particle bed), a packed/fluidized-bed reactor, and a packed-bed reactor (reactive gases flowed through the particle bed). Chemical analysis of the reaction products generated during the chlorination experiments verified the predictions made by the equilibrium calculations. An empirical first-order kinetic rate expression was developed for each of the reactor configurations. 20 refs., 16 figs., 21 tabs.

878 (INEL–95/0164) **Measurement of VOC permeability of polymer bags and VOC solubility in polyethylene drum liner.** Liekhus, K.J.; Peterson, E.S. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001180. Source: OSTI; NTIS; INIS; GPO Dep.

A test program conducted at the Idaho National Engineering Laboratory (INEL) investigated the use of a transport model to estimate the volatile organic compound (VOC) concentration in the void volume of a waste drum. Unsteady-state VOC transport model equations account for VOC permeation of polymer bags, VOC diffusion across openings in layers of confinement, and VOC solubility in a polyethylene drum liner. In support of this program, the VOC permeability of polymer bags and VOC equilibrium concentration in a polyethylene drum liner were measured for nine VOCs. The VOCs used in experiments were dichloromethane, carbon tetrachloride, cyclohexane, toluene, 1,1,1-trichloroethane, methanol, 1,1,2-trichloro-1,2,2-trifluoroethane (Freon-113), trichloroethylene, and p-xylene. The experimental results of these measurements as well as a method of estimating both parameters in the absence of experimental data are described in this report.

879 (INEL–95/0182) **HEPA filter leaching concept validation trials at the Idaho Chemical Processing Plant.** Chakravartty, A.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95017629. Source: OSTI; NTIS; INIS; GPO Dep.

The enclosed report documents six New Waste Calcining Facility (NWCF) HEPA filter leaching trials conducted at the Idaho Chemical Processing Plant using a filter leaching system to validate the filter leaching treatment concept. The test results show that a modified filter leaching system will be able to successfully remove both hazardous and radiological constituents to RCRA disposal levels. Based on the success of the filter leach trials, the existing leaching system will be modified to provide a safe, simple, effective, and operationally flexible filter leaching system.

880 (INEL–95/00184) **Compliance agreements at the INEL: A success story.** McBath, W.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950863–23: 4. IEEE international symposium on high performance distributed computing, Pentagon City, VA (United States), 1-4 Aug 1995). Order Number DE96001926. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Waste Management Complex (RWMC), located at the Idaho National Engineering Laboratory (INEL), is the storage facility for approximately 135,000 containers of radioactive mixed waste that must be stored in accordance with Resource Conservation and Recovery Act (RCRA) requirements. Collectively, the compliance and safety basis documents governing the operation of the storage facility contain approximately 2,500 specific, identifiable requirements. Critical to the compliance with these 2,500 requirements was the development of a process which converted these requirements to a form and format that allowed implementation at the operator level. Additionally, to ensure continued compliance, a method of identifying and controlling implementing documents is imperative. This paper discusses the methods employed to identify, implement, and control these requirements.

881 (INEL–95/00202) **Radiologically contaminated lead shot reuse at the Idaho National Engineering Laboratory (INEL).** Heileson, W.M.; Grant, R.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9505111–5: 11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress, Knoxville, TN (United States), 16-18 May 1995). Order Number DE96001710. Source: OSTI; NTIS; INIS; GPO Dep.

This project involved the utilization of radioactively contaminated lead shot located at the Radioactive Waste Management Complex (RWMC) for radiation shielding on a radioactive liquid process tank located at Argonne National Laboratory-West (ANL-W). The use of previously contaminated shot precludes the radioactive contamination of clean shot. With limited treatment and disposal options for contaminated lead shot, the reuse of lead for shielding is significant due to the inherent characteristic of becoming a mixed waste when radiologically contaminated. The INEL conducted a lead cleanup campaign in 1990. This was designed to ensure control of potential Resource Conservation and Recovery Act (RCRA) regulated waste. Contaminated lead from throughout the INEL, was containerized per the lead Waste Acceptance Criteria at the generator sites. Limited areas at the INEL are designated for mixed waste storage. As a result, some of the lead was stored at the RWMC in the air support weather shield (ASWS). This lead was contaminated with small amounts of fission product contamination. The lead was in the form of shot, brick, sheet, casks, and other various sized pieces. In 1993, ANL-W identified a need for lead shot to be used as shielding in a radioactive liquid waste storage and processing tank at the Fuel Cycle Facility (FCF). The contaminated lead used on this project had been in storage as mixed waste at the RWMC. This paper will focus on the processes and problems encountered to utilize the contaminated lead shot.

882 (INEL–95/00233) **Management of Pit 9 - highlights of accomplishments and lessons learned to date.** Schwartz, F.G. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–24: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96001931. Source: OSTI; NTIS; INIS; GPO Dep.

The Pit 9 project is a U.S. Department of Energy prototype full scale demonstration to retrieve and treat buried mixed transuranic waste. The project is being managed by the DOE-Idaho Environmental Restoration Program, in conjunction with the Environmental Protection Agency Region 10 and the state of Idaho, under the Idaho National Engineering Laboratory Federal Facility Agreement and Consent Order. Pit 9 is located in the northeast corner of the Subsurface Disposal Area (SDA) of the Radioactive Waste Management Complex (RWMC) at the Idaho National Engineering Laboratory (INEL). The Pit 9 project was conceived out of the need to determine capabilities to cost effectively retrieve and treat buried radioactive and radioactive mixed waste, and obtain characterization and contaminant migration data for buried waste at the INEL. Waste was disposed in Pit 9 from November 1967 to June 1969. Pit 9, at about 380 feet by 125 feet, represents approximately one acre of surface area of the 88 acre SDA. The pit contains approximately 350,000 ft^3 of soil beneath and between the buried waste and about 250,000 ft^3 of overburden soil. The average depth of the pit from soil surface to bedrock is approximately 17.5 feet. Approximately 110,000 ft^3 of transuranic (TRU) contaminated mixed wastes from Rocky Flats and approximately 40,000 ft^3 of low level and mixed wastes from the INEL were buried in Pit 9 during this period. Pit 9 is estimated to contain over 30,000 gallons of organics (over 30% of the total organic inventory in the SDA) and approximately 66 pounds of TRU radionuclides (between 3% and 4% of the total TRU inventory in the SDA). Pit 9 was selected as a demonstration site because it was one of the last disposal pits at the INEL to receive Rocky Flats waste, disposal records are better for Pit 9 than for disposal pits and trenches from earlier points in time, and the wastes in Pit 9 are representative of the wastes disposed in the SDA.

883 (INEL–95/00256) **Use of a sensitivity study to identify risk assessment modeling data gaps at the Idaho National Engineering Laboratory's subsurface disposal area.** Burns, D.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–28: ER '95: environmental remediation conference: committed to results, Denver, CO

(United States), 13-18 Aug 1995). Order Number DE96004004. Source: OSTI; NTIS; INIS; GPO Dep.

A common question in the CERCLA remedial investigation (RI) process is, "What are the data gaps that must be filled in order to perform a risk assessment for a given site?" Often a method that can be used to identify and rank data gaps is needed to help allocate scarce remedial investigation funds, and to help prepare for a CERCLA site's baseline risk assessment (BRA). A CERCLA Remedial Investigation/Feasibility Study (RI/FS) is underway at the Idaho National Engineering Laboratory's (INEL) Subsurface Disposal Area (SDA). The SDA is a radioactive waste disposal site where transuranic (TRU) waste, mixed waste (MW), and low-level waste (LLW) has been buried in pits, trenches, and soil vaults since 1952. The procedures described in this paper have been developed for the identification of risk assessment data gaps at the SDA. In preparation for the SDA RI/FS, three major investigations have been performed over the past two years. The first of these investigations identified all of the waste streams that were buried in the SDA from 1952 through 1983. The second investigation identified all of the SDA waste streams that were buried from 1984 through the present, and made predictions of the waste volumes that will be buried through the year 2003. The third investigation was the Preliminary Scoping Risk Assessment (PSRA) for the SDA. The PSRA was an initial evaluation of the human health risk associated with the SDA's buried waste, and it was developed with the intent of identifying risk assessment data gaps for the SDA. The following paragraphs give a brief description of the PSRA, and of the sensitivity study within the PSRA that was used to idenitfy data gaps.

884 (INEL–95/0258) **Cyclone reduction of taconite. Final report.** Taylor, P.R. (College of Mines and Earth Resources, University of Idaho, Idaho Falls, ID (United States)); Bartlett, R.W.; Abdel-latif, M.A.; Hou, X.; Kumar, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1995. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003556. Source: OSTI; NTIS; INIS; GPO Dep.

A cyclone reactor system for the partial reduction and melting of taconite concentrate fines has been engineered, designed and operated. A non-transferred arc plasma torch was employed as a heat source. Taconite fines, carbon monoxide, and carbon dioxide were fed axially into the reactor, while the plasma gas was introduced tangentially into the cyclone. The average reactor temperature was maintained at above 1400°C, and reduction experiments were performed under various conditions. The influence of the following parameters on the reduction of taconite was investigated experimentally; carbon monoxide to carbon dioxide inlet feed ratio, carbon monoxide inlet partial pressure, and average reactor temperature. The interactions of the graphite lining with carbon dioxide and taconite were also studied. An attempt was made to characterize the flow behavior of the molten product within the cyclone. The results suggest that the system may approach a plug flow reactor, with little back mixing. Finally, a fundamental mathematical model was developed. The model describes the flow dynamics of gases and solid particles in a cyclone reactor, energy exchange, mass transfer, and the chemical kinetics associated with cyclone smelting of taconite concentrate fines. The influence of the various parameters on the reduction and melting of taconite particles was evaluated theoretically.

885 (INEL–95/0272) **Lead use and recycling at the INEL.** Losinski, S.J.; Thurmond, S.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001336. Source: OSTI; NTIS; INIS; GPO Dep.

As part of DOE's efforts to develop a Department-wide management strategy for the use, reuse, and recycle of lead, DOE has requested that each site provide site-specific management and use practices for lead, specifically management and use information that responds to four specific questions of interest. This report provides the Idaho National Engineering Laboratory's response to those areas of interest.

886 (INEL–95/0315) **Development of DU-AGG (Depleted Uranium Aggregate).** Lessing, P.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009937. Source: OSTI; NTIS; INIS; GPO Dep.

Depleted uranium oxide (UO_2 or $U0_3$) powder was mixed with fine mineral additives, pressed, and heated to about 1,250°C. The additives were chemically constituted to result in an iron-enriched basalt (IEB). Melting and wetting of the IEB phase caused the urania powder compact to densify (sinter) via a liquid phase sintering mechanism. An inorganic lubricant was found to aid in green-forming of the body. Sintering was successful in oxidizing (air), inert (argon), or reducing (dry hydrogen containing) atmospheres. The use of ground $U0_3$ powders (93 vol %) followed by sintering in a dry hydrogen-containing atmosphere significantly increased the density of samples (bulk density of 8.40 g/cm^3 and apparent density of 9.48 g/cm^3, open porosity of 11.43%). An improvement in the microstructure (reduction in open porosity) was achieved when the vol % of $U0_3$ was decreased to 80%. The bulk density increased to 8.59 g/cm^3, the apparent density decreased slightly to 8.82 g/cm^3 (due to increase of low density IEB content), while the open porosity decreased to an excellent number of 2.78%. A representative sample derived from 80 vol % $U0_3$ showed that most pores were closed pores and that, overall, the sample achieved the excellent relative density value of 94.1% of the estimated theoretical density (composite of $U0_2$ and IEB). It is expected that ground powders of $U0_3$ could be successfully used to mass produce lowcost aggregate using the green-forming technique of briquetting.

887 (INEL–95/00320) **Commercial low-level radioactive waste disposal in the US.** Smith, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950787–86: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE96001612. Source: OSTI; NTIS; INIS; GPO Dep.

Why are 11 states attempting to develop new low-level radioactive waste disposal facilities? Why is only on disposal facility accepting waste nationally? What is the future of waste disposal? These questions are representative of those being asked throughout the country. This paper attempts to answer these questions in terms of where we are, how we got there, and where we might be going.

888 (INEL–95/00321) **Plasma Hearth Process vitrification of DOE low-level mixed waste.** Gillins, R.L.

(Science Applications International Corp., Idaho Falls, ID (United States)); Geimer, R.M. Science Applications International Corp., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13266. (CONF-950718-2: Electric Power Research Institute low-level waste conference, Orlando, FL (United States), 10-12 Jul 1995). Order Number DE96002044. Source: OSTI; NTIS; INIS; GPO Dep.

The Plasma Hearth Process (PHP) demonstration project is one of the key technology projects in the Department of Energy (DOE) Office of Technology Development Mixed Waste Focus Area. The PHP is recognized as one of the more promising solutions to DOE's mixed waste treatment needs, with potential application in the treatment of a wide variety of DOE mixed wastes. The PHP is a high temperature vitrification process using a plasma arc torch in a stationary, refractory lined chamber that destroys organics and stabilizes the residuals in a nonleaching, vitrified waste form. This technology will be equally applicable to low-level mixed wastes generated by nuclear utilities. The final waste form will be volume reduced to the maximum extent practical, because all organics will have been destroyed and the inorganics will be in a high-density, low void-space form and little or no volume-increasing glass makers will have been added. Low volume and high integrity waste forms result in low disposal costs. This project is structured to ensure that the plasma technology can be successfully employed in radioactive service. The PHP technology will be developed into a production system through a sequence of tests on several test units, both non-radioactive and radioactive. As the final step, a prototype PHP system will be constructed for full-scale radioactive waste treatment demonstration.

889 (INEL-95/0381) **Radiological, physical, and chemical characterization of additional alpha contaminated and mixed low-level waste for treatment at the advanced mixed waste treatment project.** Hutchinson, D.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jul 1995. 950p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001177. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides physical, chemical, and radiological descriptive information for a portion of mixed waste that is potentially available for private sector treatment. The format and contents are designed to provide treatment vendors with preliminary information on the characteristics and properties for additional candidate portions of the Idaho National Engineering Laboratory (INEL) and offsite mixed wastes not covered in the two previous characterization reports for the INEL-stored low-level alpha-contaminated and transuranic wastes. This report defines the waste, provides background information, briefly reviews the requirements of the Federal Facility Compliance Act (P.L. 102-386), and relates the Site Treatment Plans developed under the Federal Facility Compliance Act to the waste streams described herein. Each waste is summarized in a Waste Profile Sheet with text, charts, and tables of waste descriptive information for a particular waste stream. A discussion of the availability and uncertainty of data for these waste streams precedes the characterization descriptions.

890 (INEL-95/00393) **Arc melter vitrification of organic and chloride containing materials.** Soelberg, N.R. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Chambers, A.G.; Anderson, G.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 20p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9510125-2: International symposium on environmental technologies: plasma systems and applications, Atlanta, GA (United States), 8-11 Oct 1995). Order Number DE96001551. Source: OSTI; NTIS; INIS; GPO Dep.

Demonstration tests for vitrifying mixed wastes and contaminated soils have been conducted using a small (800 kVA), industrial-scale, three-phase AC, graphite electrode furnace located at the Albany Research Center of the United States Bureau of Mines (USBM). The feed mixtures were non-radioactive surrogates of mixed (radioactive and hazardous), transuranic (TRU)-contaminated wastes stored and buried at the Idaho National Engineering Laboratory (INEL). The different feed mixtures included up to (a) 80 weight % combustibles, (b) 60% chlorinated and nonchlorinated hydrocarbons, (c) 27% metals, (d) 2% nitrates, and (e) 3 % metal hydroxides. Cerium was added as a nonradioactive surrogate for plutonium, a TRU element. Over 9,200 kg (20,200 lb) of the feed mixtures were vitrified at feedrates of up to 500 kg/hr (1,100 lb/hr). The furnace products including the glass, metal, offgas, and offgas solids have been analyzed to determine the fate and partitioning of metals, organics, and the TRU surrogate. Offgas emissions were efficiently controlled using an air pollution control system that included a thermal oxidizer, water-spray and air dilution cooling, cyclone and baghouse particulate removal, packed bed acid gas scrubbing, charcoal absorption, and High Efficiency Particulate-Air (HEPA) filtration.

891 (INEL-95/0460) **Commercial disposal options for Idaho National Engineering Laboratory low-level radioactive waste.** Porter, C.L.; Widmayer, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002190. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is a Department of Energy (DOE)-owned, contractor-operated site. Significant quantities of low-level radioactive waste (LLW) have been generated and disposed of onsite at the Radioactive Waste Management Complex (RWMC). The INEL expects to continue generating LLW while performing its mission and as aging facilities are decommissioned. An on-going Performance Assessment process for the RWMC underscores the potential for reduced or limited LLW disposal capacity at the existing onsite facility. In order to properly manage the anticipated amount of LLW, the INEL is investigating various disposal options. These options include building a new facility, disposing the LLW at other DOE sites, using commercial disposal facilities, or seeking a combination of options. This evaluation reports on the feasibility of using commercial disposal facilities.

892 (INEL-95/0502) **Graphite electrode arc melter demonstration Phase 2 test results.** Soelberg, N.R.; Chambers, A.G.; Anderson, G.L.; O'Connor, W.K.; Oden, L.L.; Turner, P.C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1996. 283p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014153. Source: OSTI; NTIS; INIS; GPO Dep.

Several U.S. Department of Energy organizations and the U.S. Bureau of Mines have been collaboratively conducting mixed waste treatment process demonstration testing on the near full-scale graphite electrode submerged arc melter system at the Bureau's Albany (Oregon) Research Center. An initial test series successfully demonstrated arc melter capability for treating surrogate incinerator ash of buried mixed wastes with soil. The conceptual treatment process for that test series assumed that buried waste would be retrieved and incinerated, and that the incinerator ash would be vitrified in an arc melter. This report presents results from a recently completed second series of tests, undertaken to determine the ability of the arc melter system to stably process a wide range of "as-received" heterogeneous solid mixed wastes containing high levels of organics, representative of the wastes buried and stored at the Idaho National Engineering Laboratory (INEL). The Phase 2 demonstration test results indicate that an arc melter system is capable of directly processing these wastes and could enable elimination of an up-front incineration step in the conceptual treatment process.

893 (INEL–95/00502) **Alternative disposal options for alpha-mixed low-level waste.** Loomis, G.G.; Sherick, M.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951209–1: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96002775. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents several disposal options for the Department of Energy alpha-mixed low-level waste. The mixed nature of the waste favors thermally treating the waste to either an iron-enriched basalt or glass waste form, at which point a multitude of reasonable disposal options, including in-state disposal, are a possibility. Most notably, these waste forms will meet the land-ban restrictions. However, the thermal treatment of this waste involves considerable waste handling and complicated/expensive offgas systems with secondary waste management problems. In the United States, public perception of offgas systems in the radioactive incinerator area is unfavorable. The alternatives presented here are nonthermal in nature and involve homogenizing the waste with cryogenic techniques followed by complete encapsulation with a variety of chemical/grouting agents into retrievable waste forms. Once encapsulated, the waste forms are suitable for transport out of the state or for actual in-state disposal. This paper investigates variances that would have to be obtained and contrasts the alternative encapsulation idea with the thermal treatment option.

894 (INEL–95/0517) **Alternatives to reduce corrosion of carbon steel storage drums.** Zirker, L.R.; Beitel, G.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004070. Source: OSTI; NTIS; INIS; GPO Dep.

The major tasks of this research were (a) pollution prevention opportunity assessments on the overpacking operations for failed or corroded drums, (b) research on existing container corrosion data, (c) investigation of the storage environment of the new Resource Conservation and Recovery Act Type II storage modules, (d) identification of waste streams that demonstrate deleterious corrosion affects on drum storage life, and (e) corrosion test cell program development. Twenty-one waste streams from five US Department of Energy (DOE) sites within the DOE Complex were identified to demonstrate a deleterious effect to steel storage drums. The major components of these waste streams include acids, salts, and solvent liquids, sludges, and still bottoms. The solvent-based waste streams typically had the shortest time to failure: 0.5 to 2 years. The results of this research support the position that pollution prevention evaluations at the front end of a project or process will reduce pollution on the back end.

895 (INEL–95/0519) **Geologic processes in the RWMC area, Idaho National Engineering Laboratory: Implications for long term stability and soil erosion at the radioactive waste management complex.** Hackett, W.R. (and others); Tullis, J.A.; Smith, R.P. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002205. Source: OSTI; NTIS; INIS; GPO Dep.

The Radioactive Waste Management Complex (RWMC) is the disposal and storage facility for low-level radioactive waste at the Idaho National Engineering Laboratory (INEL). Transuranic waste and mixed wastes were also disposed at the RWMC until 1970. It is located in the southwestern part of the INEL about 80 km west of Idaho Falls, Idaho. The INEL occupies a portion of the Eastern Snake River Plain (ESRP), a low-relief, basalt, and sediment-floored basin within the northern Rocky Mountains and northeastern Basin and Range Province. It is a cool and semiarid, sagebrush steppe desert characterized by irregular, rolling terrain. The RWMC began disposal of INEL-generated wastes in 1952, and since 1954, wastes have been accepted from other Federal facilities. Much of the waste is buried in shallow trenches, pits, and soil vaults. Until about 1970, trenches and pits were excavated to the basalt surface, leaving no sediments between the waste and the top of the basalt. Since 1970, a layer of sediment (about 1 m) has been left between the waste and the basalt. The United States Department of Energy (DOE) has developed regulations specific to radioactive-waste disposal, including environmental standards and performance objectives. The regulation applicable to all DOE facilities is DOE Order 5820.2A (Radioactive Waste Management). An important consideration for the performance assessment of the RWMC is the long-term geomorphic stability of the site. Several investigators have identified geologic processes and events that could disrupt a radioactive waste disposal facility. Examples of these "geomorphic hazards" include changes in stream discharge, sediment load, and base level, which may result from climate change, tectonic processes, or magmatic processes. In the performance assessment, these hazards are incorporated into scenarios that may affect the future performance of the RWMC.

896 (INEL–95/0537) **Routine organic air emissions at the Radioactive Waste Management Complex Waste Storage Facilities fiscal year 1995 report.** Galloway, K.J.; Jolley, J.G. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003834. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the data and results of the routine organic air emissions monitoring performed in the Radioactive Waste Management Complex Waste Storage Facility, WMF-628, from January 4, 1995 to September 3, 1995. The task objectives were to systematically identify and measure volatile organic compound (VOC) concentrations within WMF-628 that could be emitted into the environment. These routine measurements implemented a dual method approach using Open-Path Fourier Transform Infrared Spectroscopy (OP-FTIR) monitoring and the Environmental Protection Agency (EPA) analytical method TO-14, Summa® Canister sampling. The data collected from the routine monitoring of WNF-628 will assist in estimating the total VOC emissions from WMF-628.

897 (INEL–95/00549) **Facility status and progress of the INEL's WERF MLLW and LLW incinerator.** Conley, D.; Corrigan, S. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-960804–27: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010442. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory's (INEL) Waste Experimental Reduction Facility (WERF) incinerator began processing beta/gamma- emitting low-level waste (LLW) in September 1984. A Resource Conservation and Recovery Act (RCRA) trial burn for the WERF incinerator was conducted in 1986, and in 1989 WERF began processing (hazardous and low-level radioactive) waste known as mixed low-level waste (MLLW). On February 14, 1991 WERF operations were suspended to improve operating procedures and configuration management. On July 12, 1995, WERF initiated incineration of LLW; and on September 20, 1995 WERF resumed its primary mission of incinerating MLLW. MLLW incineration is proceeding under RCRA interim status. State of Idaho issuance of the Part B permit is one of the State's highest permitting priorities. The State of Idaho's Division of Environmental Quality is reviewing the permit application along with a revised trial burn plan that was also submitted with the application. The trial burn has been proposed to be performed in 1996 to demonstrate compliance with the current incinerator guidance. This paper describes the experiences and problems associated with WERF's operations, incineration of MLLW, and the RCRA Part B Permit Application. Some of the challenges that have been overcome include waste characterization, waste repackaging, repackaged waste storage, and implementation of RCRA interim status requirements. A number of challenges remain. They include revision of the RCRA Part B Permit Application and the Trial Burn Plan in response to comments from the state permit application reviewers as well as facility and equipment upgrades required to meet RCRA Permitted Status.

898 (INEL–95/0555) **Mixed Waste Focus Area: Department of Energy complex needs report.** Roach, J.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 16 Nov 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003831. Source: OSTI; NTIS; INIS; GPO Dep.

The Assistant Secretary for the Office of Environmental Management (EM) at the US Department of Energy (DOE) initiated a new approach in August of 1993 to environmental research and technology development. A key feature of this new approach included establishment of the Mixed Waste Characterization, Treatment, and Disposal Focus Area (MWFA). The mission of the MWFA is to identify, develop, and implement needed technologies such that the major environmental management problems related to meeting DOE's commitments for treatment of mixed wastes under the Federal Facility Compliance Act (FFCA), and in accordance with the Land Disposal Restrictions (LDR) of the Resource Conservation and Recovery Act (RCRA), can be addressed, while cost-effectively expending the funding resources. To define the deficiencies or needs of the EM customers, the MWFA analyzed Proposed Site Treatment Plans (PSTPs), as well as other applicable documents, and conducted site visits throughout the summer of 1995. Representatives from the Office of Waste Management (EM-30), the Office of Environmental Restoration (EM-40), and the Office of Facility Transition and Management (EM-60) at each site visited were requested to consult with the Focus Area to collaboratively define their technology needs. This report documents the needs, deficiencies, technology gaps, and opportunities for expedited treatment activities that were identified during the site visit process. The defined deficiencies and needs are categorized by waste type, namely Wastewaters, Combustible Organics, Sludges/Soils, Debris/Solids, and Unique Wastes, and will be prioritized based on the relative affect the deficiency has on the DOE Complex.

899 (INEL–95/00616) **Mixed waste focus area Department of Energy technology development needs identification and prioritization.** Roach, J.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960246–1: Waste management '96 symposium and spectrum '96, Seattle, WA (United States), 25-29 Feb 1996). Order Number DE96004553. Source: OSTI; NTIS; INIS; GPO Dep.

The Assistant Secretary for the Office of Environmental Management (EM) at the US DOE initiated a new approach in August, 1993 to environmental research and technology development. The key features of this new approach included establishment of five focus areas and three crosscutting technology programs, which overlap the boundaries of the focus areas. The five focus areas include the Contaminant Plumes Containment and Remediation; Mixed Waste Characterization, Treatment, and Disposal; High-Level Waste Tank Remediation, Landfill Stabilization, and Decontamination and Decommissioning Focus Areas. The three crosscutting technologies programs include Characterization, Monitoring, and Sensor Technology; Efficient Separations and Processing; and Robotics. The DOE created the Mixed Waste Characterization, Treatment, and Disposal Focus Area (MWFA) to develop and facilitate implementation of technologies required to meet its commitments for treatment of mixed wastes. To accomplish this goal, the technology deficiencies must be identified and categorized, the deficiencies and needs must be prioritized, and a technical baseline must be established that integrates the requirements associated with these needs into the planned and ongoing environmental research and technology development activities supported by the MWFA. These steps are described.

900 (INEL–95/0647) **National Low-Level Waste Management Program final summary report of key activities and accomplishments for fiscal year 1995.** Forman, S. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007529. Source: OSTI; NTIS; INIS; GPO Dep.

To assist the Department of Energy (DOE) in fulfilling its responsibilities under the Low-Level Radioactive Waste Policy Amendments Act of 1985, the National Low-Level Waste Management Program (NLLWMP) outlines the key activities that the NLLWMP will accomplish in the following fiscal year. Additional activities are added during the fiscal year as necessary to accomplish programmatic goals. This report summarizes the activities and accomplishments of the NLLWMP during fiscal year 1995.

901 (INEL–96/00041) **A comparison of the costs of treating wastes from a radio analytical laboratory.** Moore, R. (Dept. of Energy, Idaho Falls, ID (United States). Idaho Field Office); Pole, S.B. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9604123–1: Conference on hazardous wastes and materials, Idaho Falls, ID (United States), 3-4 Apr 1996). Order Number DE96009117. Source: OSTI; NTIS; INIS; GPO Dep.

The Radiological and Environmental Sciences Laboratory (RESL) is a government-owned, government-operated facility at the Idaho National Engineering Laboratory (INEL). RESL's traditional strengths are in precise radionuclide analysis and dosimetry measurements. RESL generates small quantities of various types of waste. This study identified potential waste management options for a solvent extraction process waste stream and the cost differences resulting from either process changes, improved technology usage, or material substitutions or changes at RESL. Where possible, this report identifies changes that have resulted or may result in waste reduction and cost savings. DOE P2 directs the lab to review processes, evaluate waste practices, and estimate potential reductions in waste volumes and waste management costs. This study focused on selected processes, but the processes are illustrative of potential waste volume reductions and cost minimizations that may be achieved elsewhere at the INEL and throughout the DOE complex. In analyzing a waste disposal process, the authors allocated component costs to functional categories. These categories included the following: (1) operational costs, included waste generation and collection into a storage area; (2) administrative costs, including worker training, routine inspections, and reporting; and (3) disposal costs, including preparing the waste for shipment and disposing of it.

902 (INEL–96/00047) **Survey of commercial firms with mixed-waste treatability study capability.** McFee, J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); McNeel, K.; Eaton, D.; Kimmel, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–78: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009016. Source: OSTI; NTIS; INIS; GPO Dep.

According to the data developed for the Proposed Site Treatment Plans, the US Department of Energy (DOE) mixed low-level and mixed transuranic waste inventory was estimated at 230,000 m^3 and embodied in approximately 2,000 waste streams. Many of these streams are unique and may require new technologies to facilitate compliance with Resource Conservation and Recovery Act disposal requirements. Because most waste streams are unique, a demonstration of the selected technologies is justified. Evaluation of commercially available or innovative technologies in a treatability study is a cost-effective method of providing a demonstration of the technology and supporting decisions on technology selection. This paper summarizes a document being prepared by the Mixed Waste Focus Area of the DOE Office of Science and Technology (EM-50). The document will provide DOE waste managers with a list of commercial firms (and universities) that have mixed-waste treatability study capabilities and with the specifics regarding the technologies available at those facilities. In addition, the document will provide a short summary of key points of the relevant regulations affecting treatability studies and will compile recommendations for successfully conducting an off-site treatability study. Interim results of the supplier survey are tabulated in this paper. The tabulation demonstrates that treatment technologies in 17 of the US Environmental Protection Agency's technology categories are available at commercial facilities. These technologies include straightforward application of standard technologies, such as pyrolysis, as well as proprietary technologies developed specifically for mixed waste. The paper also discusses the key points of the management of commercial mixed-waste treatability studies.

903 (INEL–96/00055) **Life cycle cost and risk estimation of environmental management options.** Shropshire, D.; Sherick, M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–77: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009014. Source: OSTI; NTIS; INIS; GPO Dep.

The evaluation process is demonstrated in this paper through comparative analysis of two alternative scenarios identified for the management of the alpha-contaminated fixed low-level waste currently stored at INEL. These two scenarios, the Base Case and the Delay Case, are realistic and based on actual data, but are not intended to exactly match actual plans currently being developed at INEL. Life cycle cost estimates were developed for both scenarios using the System Cost Model; resulting costs are presented and compared. Life cycle costs are shown as a function of time and also aggregated by pretreatment, treatment, storage, and disposal activities. Although there are some short-term cost savings for the Delay Case, cumulative life cycle costs eventually become much higher than costs for the Base Case over the same period of time, due mainly to the storage and repackaging necessary to accommodate the longer Delay Case schedule. Life cycle risk estimates were prepared using a new risk analysis method adapted to the System Cost Model architecture for automated, systematic cost/risk applications. Relative risk summaries are presented for both scenarios as a function of time and also aggregated by pretreatment, treatment, storage, and disposal activities. Relative risk of the Delay Case is shown to be higher than that of the Base Case. Finally, risk and cost results are combined to show how the collective information can be used to help identify opportunities for risk or cost reduction and highlight areas where risk reduction can be achieved most economically.

904 (INEL–96/00056) **The System Cost Model: A tool for life cycle cost and risk analysis.** Hsu, K.; Lundeen, A.; Shropshire, D.; Sherick, M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–75: Waste management '96: HLW, LLW, mixed wastes and

environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009013. Source: OSTI; NTIS; INIS; GPO Dep.

In May of 1994, Lockheed Idaho Technologies Company (LITCO) in Idaho Falls, Idaho and subcontractors began development of the System Cost Model (SCM) application. The SCM estimates life cycle costs of the entire US Department of Energy (DOE) complex for designing; constructing; operating; and decommissioning treatment, storage, and disposal (TSD) facilities for mixed low-level, low-level, and transuranic waste. The SCM uses parametric cost functions to estimate life cycle costs for various treatment, storage, and disposal modules which reflect planned and existing waste management facilities at DOE installations. In addition, SCM can model new TSD facilities based on capacity needs over the program life cycle. The user can provide input data (default data is included in the SCM) including the volume and nature of waste to be managed, the time period over which the waste is to be managed, and the configuration of the waste management complex (i.e., where each installation's generated waste will be treated, stored, and disposed). Then the SCM uses parametric cost equations to estimate the costs of pre-operations (designing), construction, operations and maintenance, and decommissioning these waste management facilities. The SCM also provides transportation costs for DOE wastes. Transportation costs are provided for truck and rail and include transport of contact-handled, remote-handled, and alpha (transuranic) wastes. A complement to the SCM is the System Cost Model-Risk (SCM-R) model, which provides relative Environmental, Safety, and Health (ES and H) risk information. A relative ES and H risk basis has been developed and applied by LITCO at the INEL. The risk basis is now being automated in the SCM-R to facilitate rapid risk analysis of system alternatives. The added risk functionality will allow combined cost and risk evaluation of EM alternatives.

905 (INEL–96/0060) **Tribal and public involvement in the U.S. Department of Energy Mixed Waste Focus Area – First quarter status report for the period ending December 31, 1995.** Owens, K.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013292. Source: OSTI; NTIS; GPO Dep.

The US Department of Energy (DOE) Mixed Waste Focus Area (MWFA) began operations in February 1995 to provide technologies for the design, construction, and operation of implementable mixed waste treatment systems as identified in DOE Site Treatment Plans of the Federal Facilities Compliance Act. Implementable mixed waste treatment systems means that they meet the MWFA success criteria and that potential barriers to implementing those treatment systems have been identified and eliminated through effective communications and meaningful involvement with regulators, stakeholders, and tribal governments. The Regulatory and External Liaison Product Area of the MWFA is responsible for ensuring that possible teaming arrangements are considered and integrated into the MWFA technology development and decision-making processes. The Tribal and Public Involvement Team of the MWFA Regulatory and External Liaison Product Area has initiated a variety of activities to facilitate tribal and stakeholder involvement within the MWFA. This document discusses the status of those activities as of the end of the first quarter of the 1996 fiscal year and describes applicable lessons learned and process improvements.

906 (INEL–96/0073) **Review of private sector and Department of Energy treatment, storage, and disposal capabilities for low-level and mixed low-level waste.** Willson, R.A.; Ball, L.W.; Mousseau, J.D.; Piper, R.B. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1996. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010319. Source: OSTI; NTIS; INIS; GPO Dep.

Private sector capacity for treatment, storage, and disposal (TSD) of various categories of radioactive waste has been researched and reviewed for the Idaho National Engineering Laboratory (INEL) by Lockheed Idaho Technologies Company, the primary contractor for the INEL. The purpose of this document is to provide assistance to the INEL and other US Department of Energy (DOE) sites in determining if private sector capabilities exist for those waste streams that currently cannot be handled either on site or within the DOE complex. The survey of private sector vendors was limited to vendors currently capable of, or expected within the next five years to be able to perform one or more of the following services: low-level waste (LLW) volume reduction, storage, or disposal; mixed LLW treatment, storage, or disposal; alpha-contaminated mixed LLW treatment; LLW decontamination for recycling, reclamation, or reuse; laundering of radioactively-contaminated laundry and/or respirators; mixed LLW treatability studies; mixed LLW treatment technology development. Section 2.0 of this report will identify the approach used to modify vendor information from previous revisions of this report. It will also illustrate the methodology used to identify any additional companies. Section 3.0 will identify, by service, specific vendor capabilities and capacities. Because this document will be used to identify private sector vendors that may be able to handle DOE LLW and mixed LLW streams, it was decided that current DOE capabilities should also be identified. This would encourage cooperation between DOE sites and the various states and, in some instances, may result in a more cost-effective alternative to privatization. The DOE complex has approximately 35 sites that generate the majority of both LLW and mixed LLW. Section 4.0 will identify these sites by Operations Office, and their associated LLW and mixed LLW TSD units.

907 (INEL–96/00151) **Technology transfer: A cooperative agreement and success story.** Reno, H.W. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); McNeel, K.; Armstrong, A.T.; Vance, J.K. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960804–52: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96014121. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the cooperative agreement between the U.S. Department of Energy and Envirocare of Utah, Inc., wherein the former transferred macroencapsulative technology to the latter for purposes of demonstrating commercialization of treatment and disposal of 225, 000 Kg of radioactive lead stored at departmental installations.

908 (INEL–96/0155) **Mixed waste focus area integrated master schedule (current as of May 6, 1996).** Idaho National Engineering Lab., Idaho Falls, ID (United States). 1996. 84p. Sponsored by USDOE, Washington, DC

(United States). DOE Contract AC07-94ID13223. Order Number DE96010270. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Mixed Waste Characterization, Treatment, and Disposal Focus Area (MWFA) is to provide acceptable treatment systems, developed in partnership with users and with the participation of stakeholders, tribal governments, and regulators, that are capable of treating the Department of Energy's (DOE's) mixed wastes. In support of this mission, the MWTA produced the Mixed Waste Focus Area Integrated Technical Baseline Report, Phase I Volume 1, January 16, 1996, which identified a prioritized list of 30 national mixed waste technology deficiencies. The MWFA is targeting funding toward technology development projects that address the current list of deficiencies. A clear connection between the technology development projects and the EM-30 and EM-40 treatment systems that they support is essential for optimizing the MWFA efforts. The purpose of the Integrated Master Schedule (IMS) is to establish and document these connections and to ensure that all technology development activities performed by the MWFA are developed for timely use in those treatment systems. The IMS is a list of treatment systems from the Site Treatment Plans (STPs)/Consent Orders that have been assigned technology development needs with associated time-driven schedules, Technology deficiencies and associated technology development (TD) needs have been identified for each treatment system based on the physical, chemical, and radiological characteristics of the waste targeted for the treatment system. The schedule, the technology development activities, and the treatment system have been verified through the operations contact from the EM-30 organization at the site.

909 (INEL–96/00188) **Packaged low-level waste verification system.** Tuite, K.T. (Waste Management Group, Peekskill, NY (United States)); Winberg, M.; Flores, A.Y.; Killian, E.W.; McIsaac, C.V. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960804–54: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96014106. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, states and low-level radioactive waste (LLW) disposal site operators have no method of independently verifying the radionuclide content of packaged LLW that arrive at disposal sites for disposal. At this time, disposal sites rely on LLW generator shipping manifests and accompanying records to insure that LLW received meets the waste acceptance criteria. An independent verification system would provide a method of checking generator LLW characterization methods and help ensure that LLW disposed of at disposal facilities meets requirements. The Mobile Low-Level Waste Verification System (MLLWVS) provides the equipment, software, and methods to enable the independent verification of LLW shipping records to insure that disposal site waste acceptance criteria are being met. The MLLWVS system was developed under a cost share subcontract between WMG, Inc., and Lockheed Martin Idaho Technologies through the Department of Energy's National Low-Level Waste Management Program at the Idaho National Engineering Laboratory (INEL).

910 (INEL–96/0249) **Commercial treatability study capabilities for application to the US Department of Energy's anticipated mixed waste streams.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Jul 1996. 169p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014151. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) has established the Mixed Waste Focus Area (MWFA), which represents a national effort to develop and coordinate treatment solutions for mixed waste among all DOE facilities. The hazardous waste component of mixed waste is regulated under the Resource Conservation and Recovery Act (RCRA), while the radioactive component is regulated under the Atomic Energy Act, as implemented by the DOE, making mixed waste one of the most complex types of waste for the DOE to manage. The MWFA has the mission to support technologies that meet the needs of the DOE's waste management efforts to characterize, treat, and dispose of mixed waste being generated and stored throughout the DOE complex. The technologies to be supported must meet all regulatory requirements, provide cost and risk improvements over available technologies, and be acceptable to the public. The most notable features of the DOE's mixed-waste streams are the wide diversity of waste matrices, volumes, radioactivity levels, and RCRA-regulated hazardous contaminants. Table 1-1 is constructed from data from the proposed site treatment plans developed by each DOE site and submitted to DOE Headquarters. The table shows the number of mixed-waste streams and their corresponding volumes. This table illustrates that the DOE has a relatively small number of large-volume mixed-waste streams and a large number of small-volume mixed-waste streams. There are 1,033 mixed-waste streams with volumes less than 1 cubic meter; 1,112 mixed-waste streams with volumes between 1 and 1,000 cubic meters; and only 61 mixed-waste streams with volumes exceeding 1,000 cubic meters.

911 (K/TSO–7A) **Waste form development for use with ORNL waste treatment facility sludge.** Abotsi, G.M.K. (Clark Atlanta Univ., GA (United States)); Bostick, W.D. Oak Ridge K-25 Site, TN (United States); Clark Atlanta Univ., GA (United States). May 1996. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011091. Source: OSTI; NTIS; INIS; GPO Dep.

A sludge that simulates Water Softening Sludge number 5 (WSS number 5 filtercake) at Oak Ridge National Laboratory was prepared and evaluated for its thermal behavior, volume reduction, stabilization, surface area and compressive strength properties. Compaction of the surrogate waste and the calcium oxide (produced by calcination) in the presence of paraffin resulted in cylindrical molds with various degrees of stability. This work has demonstrated that surrogate WSS number 5 at ORNL can be successfully stabilized by blending it with about 35 percent paraffin and compacting the mixture at 8000 psi. This compressive strength of the waste form is sufficient for temporary storage of the waste while long-term storage waste forms are developed. Considering the remarkable similarity between the surrogate and the actual filtercake, the findings of this project should be useful for treating the sludge generated by the waste treatment facility at ORNL.

912 (LA–12967-MS) **Ecological surveys of the proposed high explosives wastewater treatment facility region.** Haarmann, T. Los Alamos National Lab., NM (United States). Jul 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95015053. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (LANL) proposes to improve its treatment of wastewater from high explosives (HE) research and development activities. The proposed project would focus on a concerted waste minimization effort to greatly reduce the amount of wastewater needing treatment. The result would be a 99% decrease in the HE wastewater volume, from the current level of 6,760,000 L/mo (1,786,000 gal./mo) to 41,200 L/mo (11,000 gal./mo). This reduction would entail closure of HE wastewater outfalls, affecting some wetland areas that depend on HE wastewater effluents. The outfalls also provide drinking water for many wildlife species. Terminating the flow of effluents at outfalls would represent an improvement in water quality in the LANL region but locally could have a negative effect on some wetlands and wildlife species. None of the affected species are protected by any state or federal endangered species laws. The purpose of this report is to briefly discuss the different biological studies that have been done in the region of the project area. This report is written to give biological information and baseline data and the biota of the project area.

913 (LA–13041-MS) **Mixed waste treatment model: Basis and analysis.** Palmer, B.A. Los Alamos National Lab., NM (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96000887. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy's Programmatic Environmental Impact Statement (PEIS) required treatment system capacities for risk and cost calculation. Los Alamos was tasked with providing these capacities to the PEIS team. This involved understanding the Department of Energy (DOE) Complex waste, making the necessary changes to correct for problems, categorizing the waste for treatment, and determining the treatment system requirements. The treatment system requirements depended on the incoming waste, which varied for each PEIS case. The treatment system requirements also depended on the type of treatment that was desired. Because different groups contributing to the PEIS needed specific types of results, we provided the treatment system requirements in a variety of forms. In total, some 40 data files were created for the TRU cases, and for the MLLW case, there were 105 separate data files. Each data file represents one treatment case consisting of the selected waste from various sites, a selected treatment system, and the reporting requirements for such a case. The treatment system requirements in their most basic form are the treatment process rates for unit operations in the desired treatment system, based on a 10-year working life and 20-year accumulation of the waste. These results were reported in cubic meters and for the MLLW case, in kilograms as well. The treatment system model consisted of unit operations that are linked together. Each unit operation's function depended on the input waste streams, waste matrix, and contaminants. Each unit operation outputs one or more waste streams whose matrix, contaminants, and volume/mass may have changed as a result of the treatment. These output streams are then routed to the appropriate unit operation for additional treatment until the output waste stream meets the treatment requirements for disposal. The total waste for each unit operation was calculated as well as the waste for each matrix treated by the unit.

914 (LA–13042-MS) **Gas-solid alkali destruction of volatile chlorocarbons.** Foropoulos, J. Jr. Los Alamos National Lab., NM (United States). Dec 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003988. Source: OSTI; NTIS; INIS; GPO Dep.

Many chlorocarbons are environmental dangers and health hazards. The simplest perchlorinated hydrocarbon, carbon tetrachloride, is near the top of the list of hazardous compounds. Carbon tetrachloride was used as a cleaning fluid, solvent, and fire-extinguishing agent. The nuclear and defense complexes also employed great quantities of carbon tetrachloride and other chlorocarbons as cleaning and degreasing agents. Many sites nationwide have underground chlorocarbon contamination plumes. Bulk chlorocarbon inventories at many locations await treatment and disposal. Often the problem is compounded by the chlorocarbon being radioactively contaminated. Waste inventory and groundwater contamination problems exist for many other chlorocarbons, especially methylene chloride, chloroform, and tri- and tetrachloroethylene. In this work solid soda lime (a fused mixture of approximately 95% CaO and 5% NaOH in a coarse, granulated form) at 350 C to 400 C acts as the hydrolyzing degradation, and off-gas scrubbing medium. Within soda lime CO_2 and HCl from hydrolysis and degradation convert immediately to calcium and sodium chlorides and carbonates, with water vapor as a volatile byproduct.

915 (LA–13089-MS) **Geological site characterization for the proposed Mixed Waste Disposal Facility, Los Alamos National Laboratory.** Reneau, S.L.; Raymond, R. Jr. (eds.). Los Alamos National Lab., NM (United States). Dec 1995. 136p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96012968. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of geological site characterization studies conducted from 1992 to 1994 on Pajarito Mesa for a proposed Los Alamos National Laboratory Mixed Waste Disposal Facility (MWDF). The MWDF is being designed to receive mixed waste (waste containing both hazardous and radioactive components) generated during Environmental Restoration Project cleanup activities at Los Alamos. As of 1995, there is no Resource Conservation and Recovery Act (RCRA) permitted disposal site for mixed waste at the Laboratory, and construction of the MWDF would provide an alternative to transport of this material to an off-site location. A 2.5 km long part of Pajarito Mesa was originally considered for the MWDF, extending from an elevation of about 2150 to 2225 m (7060 to 7300 ft) in Technical Areas (TAs) 15, 36, and 67 in the central part of the Laboratory, and planning was later concentrated on the western area in TA-67. The mesa top lies about 60 to 75 m (200 to 250 ft) above the floor of Pajarito Canyon on the north, and about 30 m (100 ft) above the floor of Threemile Canyon on the south. The main aquifer used as a water supply for the Laboratory and for Los Alamos County lies at an estimated depth of about 335 m (1100 ft) below the mesa. The chapters of this report focus on surface and near-surface geological studies that provide a basic framework for siting of the MWDF and for conducting future performance assessments, including fulfillment of specific regulatory requirements. This work includes detailed studies of the stratigraphy, mineralogy, and chemistry of the bedrock at Pajarito Mesa by Broxton and others, studies of the geological structure and of mesa-top soils and surficial deposits by Reneau and others, geologic mapping and studies of fracture characteristics by Vaniman and Chipera, and studies of potential landsliding and rockfall along the mesa-edge by Reneau.

916 (LA–13114-MS) **Deflagration in stainless steel storage containers containing plutonium dioxide.** Kleinschmidt, P.D. Los Alamos National Lab., NM (United States). Feb 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96007457. Source: OSTI; NTIS; INIS; GPO Dep.

Detonation of hydrogen and oxygen in stainless steel storage containers produces maximum pressures of 68.5 psia and 426.7 psia. The cylinders contain 3,000 g of PuO_2 with 0.05 wt% and 0.5 wt% water respectively. The hydrogen and oxygen are produced by the alpha decomposition of the water. Work was performed for the Savannah River Site.

917 (LA–13175) **Application of cryogenic grinding to achieve homogenization of transuranic wastes.** Atkins, W.H. (and others); Hill, D.D.; Lucero, M.E.; Jaramillo, L.; Martinez, H.E. Los Alamos National Lab., NM (United States). Aug 1996. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013912. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes work done at Los Alamos National Laboratory (LANL) in collaboration with the Department of Energy Rocky Flats Field Office (DOE/RFFO) and with the National Institute of Standards and Technology (NIST), Boulder, Colorado. Researchers on this project have developed a method for cryogenic grinding of mixed wastes to homogenize and, thereby, to acquire a representative sample of the materials. There are approximately 220,000 waste drums owned by the Rocky Flats Environmental Technology Site (RFETS)-50,000 at RFETS and 170,000 at the Idaho National Engineering Laboratory. The cost of sampling the heterogeneous distribution of waste in each drum is prohibitive. In an attempt to produce a homogeneous mixture of waste that would reduce greatly the cost of sampling, researchers at NIST and RFETS are developing a cryogenic grinder. The Los Alamos work herein described addresses the implementation issues of the task. The first issue was to ascertain whether samples of the "small particle" mixtures of materials present in the waste drums at RFETS were representative of actual drum contents. Second, it was necessary to determine at what temperature the grinding operation must be performed in order to minimize or to eliminate the release of volatile organic compounds present in the waste. Last, it was essential to evaluate any effect the liquid cryogen might have on the structural integrity and ventilation capacity of the glovebox system. Results of this study showed that representative samples could be and had been obtained, that some release of organics occurred below freezing because of sublimation, and that operation of the cryogenic grinding equipment inside the glovebox was feasible.

918 (LA-SUB–95-166) **Project Management Support and Services for the Environmental Restoration and Waste Management. Final report.** Los Alamos National Lab., NM (United States); Project Time and Cost, Washington, DC (United States). 10 Apr 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003108. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Environmental Restoration Technical Support Office (ERTSO) contracted Project Time & Cost, Inc. (PT&C) on 16 November 1992 to provide support services to the US Department of Energy (DOE). ERTSO had traditionally supported the DOE Albuquerque office in the Environmental Restoration and Waste Management Programs and had also supported the Office of Waste Management (EM-30) at DOE Headquarters in Germantown, Maryland. PT&C was requested to provide project management and support services for the DOE as well as liaison and coordination of responses and efforts between various agencies. The primary objective of this work was to continue LANL's technical support role to EM-30 and assist in the development of the COE Cost and Schedule Estimating (CASE) Guide for EM-30. PT&C's objectives, as specified in Section B of the contract, were well met during the duration of the project through the review and comment of various draft documents, trips to DOE sites providing program management support and participating in the training for the EM-30 Cost and Schedule Estimating Guide, drafting memos and scheduling future projects, attending numerous meetings with LANL, DOE and other subcontractors, and providing written observations and recommendations.he results obtained were determined to be satisfactory by both the LANL ERTSO and DOE EM-30 organizations. The objective to further the support from LANL and their associated subcontractor (PT&C) was met. The contract concluded with no outstanding issues.

919 (LA-SUB–95-196-Vol.1) **[Inspection of gas cylinders in storage at TA-54, Area L]. Volume 1, Final report.** Los Alamos National Lab., NM (United States); Earth Resources Corp., Ocoee, FL (United States). 23 Jun 1994. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003373. Source: OSTI; NTIS; GPO Dep.

ERC sampled, analyzed, and recontainerized when necessary gas cylinders containing various chemicals in storage at Los Alamos TA-54 Area L. A vapor containment structure was erected. A total of 179 cylinders was processed; 39 were repackaged; and 55 were decommissioned. This report summarizes the operation; this is Volume 1 of five volumes.

920 (LA-SUB–95-196-Vol.2) **[Inspection of gas cylinders in storage at TA-54, Area L]. Volume 2, Final report.** Los Alamos National Lab., NM (United States); Earth Resources Corp., Ocoee, FL (United States). 23 Jun 1994. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003374. Source: OSTI; NTIS; GPO Dep.

ERC sampled, analyzed, and rcontainerized when necessary gas cylinders containing various chemicals in storage at LANL TA-54 Area L. This report summarizes the operation. This is Volume 2 of five volumes.

921 (LA-SUB–95-196-Vol.3) **Cylinder inspection logs and analytical data LCRU-001 through LCRU-063. Volume 3, Final report.** Los Alamos National Lab., NM (United States); Earth Resources Corp., Ocoee, FL (United States). 23 Jun 1994. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003375. Source: OSTI; NTIS; GPO Dep.

ERC sampled, analyzed, and recontainerized when necessary gas cylinders of various chemicals in storage at LANL TA-54 Area L. This report summarizes the operation. This is Volume 3 of five volumes.

922 (LA-SUB–95-196-Vol.4) **Cylinder inspection logs and analytical data LCRU-066 through LCRU-131. Volume 4, Final report.** Los Alamos National Lab., NM (United States); Earth Resources Corp., Ocoee, FL (United States). 23 Jun 1994. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36.

Order Number DE96003376. Source: OSTI; NTIS; GPO Dep.

ERC sampled, analyzed, and recontainerized when necessary gas cylinders of various chemicals in storage at LANL TA-54 Area L. This report summarizes the operation. This is Volume 4 of five volumes.

923 (LA-SUB-95-196-Vol.5) **Cylinder inspection logs and analytical data LCRU-133 through LCRU-199. Volume 5, Final report.** Los Alamos National Lab., NM (United States); Earth Resources Corp., Ocoee, FL (United States). 23 Jun 1994. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003377. Source: OSTI; NTIS; GPO Dep.

ERC sampled, analyzed, and recontainerized when necessary 179 gas cylinders containing various chemicals in storage at LANL TA-54 Area L. This report summarizes the operation. This is Volume 5 of five volumes.

924 (LA-SUB-95-208) **Bioreduction amenability testing of actinide contaminated soils. The systems: Am^{241}-Pu^{238}, Am^{241}-$Pu^{239/40}$, U.** Korich, D.G. (MBX Systems, Inc., Tucson, AZ (United States)); Sharp, J.E. Los Alamos National Lab., NM (United States); MBX Systems, Inc., Tucson, AZ (United States). Jan 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96006790. Source: OSTI; NTIS; INIS; GPO Dep.

Bioreductive processing of actinide contaminated soils can achieve extraction levels in excess of 97% for both plutonium and uranium contaminants. Reasonable reaction rates of 4 to 6 day resident times for Pu-Am have been demonstrated on 4 gram sample charges. Longer reaction times of 17 days required for uranium extraction can be improved by soil sample preconditioning and/or an increase in process reagent concentrations. The environmentally benign treatment process operates at pH 6–7, preserves the original soil matrix, and utilizes standard processing equipment. The process reagent component (inoculum SD-1 and biological growth medium PX100™) are available for utilization in an integrated system. Process techniques developed by MBX, involving graduated volume bioreactors have been proven to alleviate biological toxicity problems in treatment leachates. Bioreduction processing of actinide contaminated soils, preconditioning of soil charges, and recycling or vegetation of unacceptable tailings can be combined to provide an effective and environmentally attractive method of remediation. The soil test program was designed to determine the applicability of the MBX bioreductive technology to solubilize Pu and Am from RFP, Mound and LANL soils and uranium from Hanford and Fernald soils.

925 (LA-SUB-95-223) **Waste management and technologies analytical database project for Los Alamos National Laboratory/Department of Energy. Final report, June 7, 1993–June 15, 1994.** Los Alamos National Lab., NM (United States); Summitec Corp., Oak Ridge, TN (United States). 17 Apr 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96006842. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Management and Technologies Analytical Database System (WMTADS) supported by the Department of Energy's (DOE) Office of Environmental Management (EM), Office of Technology Development (EM-50), was developed and based at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico, to collect, identify, organize, track, update, and maintain information related to existing/available/developing and planned technologies to characterize, treat, and handle mixed, hazardous and radioactive waste for storage and disposal in support of EM strategies and goals and to focus area projects. WMTADS was developed as a centralized source of on-line information regarding technologies for environmental management processes that can be accessed by a computer, modem, phone line, and communications software through a Local Area Network (LAN), and server connectivity on the Internet, the world's largest computer network, and with file transfer protocol (FTP) can also be used to globally transfer files from the server to the user's computer through Internet and World Wide Web (WWW) using Mosaic.

926 (LA-SUB-96-99-Pt.1) **Ambient monitoring of volatile organic compounds at Los Alamos National Laboratory in technical area 54, areas G and L. Final report.** Mischler, S. (Radian Corp., Austin, TX (United States)); Anderson, E.; Vold, E.L. Radian Corp., Austin, TX (United States); Los Alamos National Lab., NM (United States). 15 Mar 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013264. Source: OSTI; NTIS; INIS; GPO Dep.

Ambient air monitoring for volatile organic compounds (VOCs) was conducted at TA-54 to characterize non-radioactive air emissions to determine if the Laboratory's waste operations are releasing significant amounts of VOCs to the ambient environment. Samples were collected at four locations along the northern fenceline (dominant downwind side) of Areas G & L and at a background site located in Bandelier National Monument. Eight-hour integrated samples were collected in evacuated canisters during daylight hours on each of eight days during the summer of 1994, for a total of 40 samples. The samples were analyzed by gas chromatography following EPA Method TO-14 for a target list of 68 analytes. In general, about two dozen volatile organic compounds (VOCs) were identified in each sample, including those collected at the background site, but the concentration levels were very low (e.g.; < 1 to 10 ppbv). The average total non-methane hydrocarbon (TNMHC) concentration ranged from 4.3 to 22.8 ppbv at the Area G and L sites as compared with an average of 4.2 ppbv at the background site. The measured concentrations were compared with action levels developed by the New Mexico Environment Department and were well below the action levels in all cases. Methanol and benzene were the only compounds that ever exceeded 1 % of the action level. The measured VOC concentrations were collected during the warmest months of the year and therefore should represent worst-case air impacts. Based on the results of this study, VOC emissions from Areas G and L have an insignificant impact on local air quality and pose no health risk to workers or nearby populations.

927 (LA-SUB-96-99-Pt.3) **Measurement of emission fluxes from Technical Area 54, Area G and L. Final report.** Eklund, B. (Radian Corp., Austin, TX (United States)). Los Alamos National Lab., NM (United States). 15 Mar 1995. 265p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013367. Source: OSTI; NTIS; INIS; GPO Dep.

The emission flux (mass/time-area) of tritiated water from TA-54 was measured to support the characterization of radioactive air emissions from waste sites for the Radioactive

Air Emissions Management (RAEM) program and for the Area G Performance Assessment. Measurements were made at over 180 locations during the summers of 1993 and 1994, including randomly selected locations across Area G, three suspected areas of contamination at Area G, and the property surrounding TA-54. The emission fluxes of radon were measured at six locations and volatile organic compounds (VOCs) at 30 locations. Monitoring was performed at each location over a several-hour period using the U.S. EPA flux chamber approach. Separate samples for tritiated water, radon, and VOCs were collected and analyzed in off-site laboratories. The measured tritiated water emission fluxes varied over several orders of magnitude, from background levels of about 3 pCi/m^2-min to 9.69 x 10^6 pCi/m^2-min near a disposal shaft. Low levels of tritiated water were found to have migrated into Pajarito Canyon, directly south of Area G. The tritium flux data were used to generate an estimated annual emission rate of 14 Curies/yr for all of Area G, with the majority of this activity being emitted from relatively small areas adjacent to several disposal shafts. The estimated total annual release is less than 1% of the total tritium release from all LANL in 1992 and results in a negligible off-site dose. Based on the limited data available, the average emission flux of radon from Area G is estimated to be 8.1 pCi/m^2-min. The measured emission fluxes of VOCs were < 100 μg/m^2-min, which is small compared with fluxes typically measured at hazardous waste landfills. The air quality impacts of these releases were evaluated in a separate report.

928 (LA-UR–95-252) **A process for treating uranium chips and turnings.** Dziewinska, K. (Los Alamos National Lab., NM (United States)); Lussiez, G.; Munger, D. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950917–5: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95006270. Source: OSTI; NTIS; INIS; GPO Dep.

Depleted uranium (DU) chips and turnings are generated during machining of uranium metal. Because high surface area uranium is pyrophoric, the turnings are subject to spontaneous ignition in air. The oxidation of uranium to UO_2 and U_3O_8 is highly exothermic and therefore the reaction may be self-sustaining. A uranium fire or even rapid oxidation and thermal convection currents will cause emission of radioactive uranium oxides. In the presence of water as liquid or vapor, uranium may also oxidize into UO_2 and U_3O_8-with generation of hydrogen, a flammable and explosive gas. The heat generated the water reaction may ignite the uranium or hydrogen producing a fire, explosion, or convection current resulting in some uranium oxide becoming airborne. Because the high surface area uranium has the hazardous characteristic of reactivity, it is stored immersed in diesel oil preventing contact with water or air. Los Alamos National Laboratory (LANL) has developed and constructed a process to remove the reactivity characteristic by oxidizing uranium metal to an inert product. This inert form can then be landfilled as a low-level waste. The treatment process consists of draining the packing oils, treating with sodium hypochlorite to wet-oxidize the DU to uranyl hydroxide ($UO_2(OH)_2$), using sodium thiosulfate to reduce the (UO_2(OH)2) to UO_2, neutralizing with sodium hydroxide, and stabilizing the settled slurry in a cement matrix. The neutralized waste water is consumed at a radioactive waste water treatment facility. Studies done at LANL describe a manageable oxidation rate well within safe bounds.

929 (LA-UR–95-254) **A process for treating radioactive water-reactive wastes.** Dziewinski, J. (Los Alamos National Lab., NM (United States)); Lussiez, G.; Munger, D. Los Alamos National Lab., NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950917–4: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95006269. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory and other locations in the complex of experimental and production facilities operated by the United States Department of Energy (DOE) have generated an appreciable quantity of hazardous and radioactive wastes. The Resource Conservation and Recovery Act (RCRA) enacted by the United States Congress in 1976 and subsequently amended in 1984, 1986, and 1988 requires that every hazardous waste must be rendered nonhazardous before disposal. Many of the wastes generated by the DOE complex are both hazardous and radioactive. These wastes, called mixed wastes, require applying appropriate regulations for radioactive waste disposal and the regulations under RCRA. Mixed wastes must be treated to remove the hazardous waste component before they are disposed as radioactive waste. This paper discusses the development of a treatment process for mixed wastes that exhibit the reactive hazardous characteristic. Specifically, these wastes react readily and violently with water. Wastes such as lithium hydride (LiH), sodium metal, and potassium metal are the primary wastes in this category.

930 (LA-UR–95-255) **A process for treatment of mixed waste containing chemical plating wastes.** Anast, K.R.; Dziewinski, J.; Lussiez, G. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950917–3: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95006267. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Treatment and Minimization Group at Los Alamos National Laboratory has designed and will be constructing a transportable treatment system to treat low-level radioactive mixed waste generated during plating operations. The chemical and plating waste treatment system is composed of two modules with six submodules, which can be trucked to user sites to treat a wide variety of aqueous waste solutions. The process is designed to remove the hazardous components from the waste stream, generating chemically benign, disposable liquids and solids with low level radioactivity. The chemical and plating waste treatment system is designed as a multifunctional process capable of treating several different types of wastes. At this time, the unit has been the designated treatment process for these wastes: Destruction of free cyanide and metal-cyanide complexes from spent plating solutions; destruction of ammonia in solution from spent plating solutions; reduction of Cr^{VI} to Cr^{III} from spent plating solutions, precipitation, solids separation, and immobilization; heavy metal precipitation from spent plating solutions, solids separation, and immobilization, and acid or base neutralization from unspecified solutions.

931 (LA-UR–95-256) **Electrochemical treatment of mixed (hazardous and radioactive) wastes.** Dziewinski,

J.; Zawodzinski, C.; Smith, W.H. Los Alamos National Lab., NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950917–2: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95006268. Source: OSTI; NTIS; INIS; GPO Dep.

Electrochemical treatment technologies for mixed hazardous waste are currently under development at Los Alamos National Laboratory. For a mixed waste containing toxic components such as heavy metals and cyanides in addition to a radioactive component, the toxic components can be removed or destroyed by electrochemical technologies allowing for recovery of the radioactive component prior to disposal of the solution. Mixed wastes with an organic component can be treated by oxidizing the organic compound to carbon dioxide and then recovering the radioactive component. The oxidation can be done directly at the anode or indirectly using an electron transfer mediator. This work describes the destruction of isopropanol, acetone and acetic acid at greater than 90% current efficiency using cobalt +3 or silver +2 as the electron transfer mediator. Also described is the destruction of cellulose based cheesecloth rags with electrochemically generated cobalt +3, at an overall efficiency of approximately 20%.

932 (LA-UR–95-586) **Considerations relating to mixed waste treatment technologies.** Reader, G.E. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950877–1: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95007887. Source: OSTI; NTIS; INIS; GPO Dep.

In order to select the most appropriate mixed waste treatment technology, many factors need to be evaluated. Depending upon individual circumstances, different factors will carry greater weight. Some of these factors must be addressed early on in the selection process. Various factors may also be used as screening criteria thus streamlining the selection process. New and innovative technologies should also be addressing key, critical factors during the conceptual development phase in order to guide efforts through the construction of production units. This will aid in the development of technologies which are attractive for technology transfer. This paper discusses considerations relating to the selection of mixed waste treatment technologies. Covered by this paper are applicability, cost, availability/maturity, capacity, safety/reliability, secondary waste generation, liability, regulatory considerations, treatment requirements, and public interactions. Basing selection processes on these factors will help assure that all technologies are evaluated fairly and that the appropriate waste treatment technology is selected for a given situation. Suggestions for selection processes are also covered as well as other important information required for selecting a mixed waste treatment technology.

933 (LA-UR–95-1136) **Air modelling as an alternative to sampling for low-level radioactive airborne releases.** Morgenstern, M.Y. (ERM Program Management Co., Los Alamos, NM (United States)); Hueske, K. Los Alamos National Lab., NM (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9505206–1: 50. Purdue industrial waste conference, W. Lafayette, IN (United States), 8-10 May 1995). Order Number DE95010884. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes our efforts to assess the effect of airborne releases at one DOE laboratory using air modelling based on historical data. Among the facilities affected by these developments is Los Alamos National Laboratory (LANL) in New Mexico. RCRA, as amended by the Hazardous and Solid Waste Amendments (HSWA) in 1984, requires all facilities which involve the treatment, storage, and disposal of hazardous waste obtain a RCRA/HSWA waste facility permit. LANL complied with CEARP by initiating a process of identifying potential release sites associated with LANL operations prior to filing a RCRA/HSWA permit application. In the process of preparing the RCRA/HSWA waste facility permit application to the U.S. Environmental Protection Agency (EPA), a total of 603 Solid Waste Management Units (SWMUs) were identified as part of the requirements of the HSWA Module VIH permit requirements. The HSWA Module VIII permit requires LANL to determine whether there have been any releases of hazardous waste or hazardous constituents from SWMUs at the facility dating from the 1940's by performing a RCRA Facility Investigation to address known or suspected releases from specified SWMUs to affected media (i.e. soil, groundwater, surface water, and air). Among the most troublesome of the potential releases sites are those associated with airborne radioactive releases. In order to assess health risks associated with radioactive contaminants in a manner consistent with exposure standards currently in place, the DOE and LANL have established Screening Action Levels (SALs) for radioactive soil contamination. The SALs for each radionuclide in soil are derived from calculations based on a residential scenario in which individuals are exposed to contaminated soil via inhalation and ingestion as well as external exposure to gamma emitters in the soil. The applicable SALs are shown.

934 (LA-UR–95-1838) **Mixed waste focus area alternative technologies workshop.** Borduin, L.C. (Los Alamos National Lab., NM (United States). Technology Analysis Group); Palmer, B.A.; Pendergrass, J.A. Los Alamos National Lab., NM (United States). 24 May 1995. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9501100–Summ: Mixed waste focus area alternative technologies workshop, Salt Lake City, UT (United States), 24-27 Jan 1995). Order Number DE95015256. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the Mixed Waste Focus Area (MWFA)-sponsored Alternative Technology Workshop held in Salt Lake City, Utah, from January 24–27, 1995. The primary workshop goal was identifying potential applications for emerging technologies within the Options Analysis Team (OAT) "wise" configuration. Consistent with the scope of the OAT analysis, the review was limited to the Mixed Low-Level Waste (MLLW) fraction of DOE's mixed waste inventory. The Los Alamos team prepared workshop materials (databases and compilations) to be used as bases for participant review and recommendations. These materials derived from the Mixed Waste Inventory Report (MWIR) data base (May 1994), the Draft Site Treatment Plan (DSTP) data base, and the OAT treatment facility configuration of December 7, 1994. In reviewing workshop results, the reader should note several caveats regarding data limitations. Link-up of the MWIR and DSTP data bases, while representing the most comprehensive array of mixed waste information available at the time of the workshop, requires additional data to completely characterize all waste streams.

A number of changes in waste identification (new and redefined streams) occurred during the interval from compilation of the data base to compilation of the DSTP data base with the end result that precise identification of radiological and contaminant characteristics was not possible for these streams. To a degree, these shortcomings compromise the workshop results; however, the preponderance of waste data was linked adequately, and therefore, these analyses should provide useful insight into potential applications of alternative technologies to DOE MLLW treatment facilities.

935 (LA-UR–95-2343) **A high temperature pulsed corona plasma reactor.** Korzekwa, R.A.; Rosocha, L.A. Los Alamos National Lab., NM (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950750–17: 10. Institute of Electrical and Electronics Engineers (IEEE) pulsed power conference, Albuquerque, NM (United States), 10-13 Jul 1995). Order Number DE95016780. Source: OSTI; NTIS; GPO Dep.

Non-thermal plasma reactors have recently been used for the treatment of gaseous pollutants. High energy electrons (several eV) are produced in the plasma while the gas remains near ambient temperatures. Pollutant molecules are decomposed by highly reactive chemical radicals created through electron collisions. The focus of this work is the treatment of pollutants from the exhaust of electric arc incinerators. A pulsed corona reactor capable of operation at exhaust temperatures of hundreds of degrees C has been constructed. This design can be used as a conventional pulsed corona reactor (wire-metal tube geometry) and has the potential for use as a hybrid reactor which incorporates a wire-tube geometry with a ceramic dielectric barrier on the inside surface of the metal tube. Pulse widths of a few 10's of ns and risetimes of less than 10 ns have been obtained. Specifically, the reactor performance as a function of temperature is investigated. The preliminary results of the destruction of gaseous pollutants from this prototype are presented along with electrical and chemical efficiencies of the device.

936 (LA-UR–95-3004) **Preliminary results from the Los Alamos TA54 complex terrain Atmospheric Transport Study (ATS).** Vold, E.; Chan, M.; Sanders, L. Los Alamos National Lab., NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960127–2: 9. joint American Meteorological Society/Air and Waste Management Association conference on applications of air pollution meteorology, Atlanta, GA (United States), 28 Jan - 2 Feb 1996). Order Number DE96000027. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Low-Level Radioactive Waste (LLRW) disposal site at TA54, Area G la located on a mesa top amidst a complex terrain of finger like mesas typically 30 motors or more In height above canyons of widths varying from 100 to 300 motors. Atmospheric dispersion from this site is of concern for routine operations and for potential Incidents during waste retrieval operations. Indian lands are located In the dominant downwind direction within 500 m from the site and provide further incentive to understand the potential and actual impacts of waste disposal operations. The permanent network of meteorological towers at LANL have been located primarily at mesa-top locations to coincide with most laboratory facilities and as such do not resolve the effects of channeling in the canyons and the influence this has on potential surface releases. An Atmospheric Transport Study (ATS) was initiated to better understand the wind flow fields and dispersion from the LANL Waste Storage and Disposal facilities at TA-54, Area G. As part of this effort, a series of six portable meteorological towers were sited in the vicinity of Area G, two at mesa top locations, one just east of the site where the mesas have dissipated to mild ridges, and three in the canyons adjacent to the disposal site mesa as indicated on the topographic representation of the local terrain. Since 1994, the towers have collected horizontal wind velocities, pressure, temperature, relative humidity and a radiation gamma reading every fifteen minutes. The data bass is being analyzed for trends and to provide a basis for comparison to computational modeling efforts to predict the flow fields.

937 (LA-UR–95-3523) **Integration of computational modeling for the Los Alamos National Laboratory low level radioactive waste disposal performance assessment.** Vold, E.L. (Lawrence Livermore National Lab., CA (United States)); Birdsell, K.H.; Springer, E.P.; Hollis, D.K.; Shuman, R. Lawrence Livermore National Lab., CA (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-951209–3: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96002597. Source: OSTI; NTIS; INIS; GPO Dep.

The preliminary Performance Assessment for the Los Alamos National Laboratory Low Level Radioactive Waste Disposal Facility at Area G is drawing to completion. The disposal site is located on the top of a finger mesa in the complex terrain of a semi-arid region which leads to considerable complications in the atmospheric and subsurface transport and in the requisite modeling. Infiltration and run-off are evaluated for the proposed disposal unit closure configuration. A new analytic source release model characterizes the disposal unit performance utilizing detailed source term characterization from the inventory data base. This analysis provides input to the subsurface modeling done by the sophisticated finite element transport code, FEHM, using realistic 2-D cross-sections of the geologic units stratigraphies and the disposal units. Subsurface transport via lateral flow to intermittent alluvial waters in adjacent canyons is evaluated in addition to the usual deep aquifer. Vapor phase flow has been treated separately and calibrated to field data for tritium migration. Atmospheric transport is based on Gaussian dispersion with a correction for complex canyon terrain evaluated from on-going 3-D atmospheric transport studies. Indications to date are that the Performance Assessment objectives are met for all migration pathways.

938 (LA-UR–95-3690) **A source release model with application to the LANL LLRW disposal site performance assessment.** Vold, E.L. Los Alamos National Lab., NM (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-951155–4: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96002586. Source: OSTI; NTIS; INIS; GPO Dep.

A source release model was developed to quantify time dependent liquid phase releases of radioactive material to the vadose zone from a disposal site. The model has been implemented to evaluate the source terms in the Performance Assessment for the Los Alamos National Laboratory (LANL) Low Level Radioactive Waste (LLRW) Disposal Facility at Area G, an analysis of the long term post-closure impact of disposal operations required by the USDOE orders. Analytic solutions describe transport through the model compartments: the solid phase waste package, the liquid phase within each waste package and the liquid phase within the disposal unit. The model accounts for elemental solubility limits and retardation coefficients (Rf) separately in the waste package and in the disposal unit. Several parameters define the site specific aspects of the disposal unit. In our case for example, the disposal unit is waste buried with crushed volcanic tuff, and a small net infiltration rate is determined from independent numerical studies. The analytic solution allows efficient explorations of the sensitivity to the input parameters. Numerical solutions extend the model to account for decay product ingrowth which may have different transport properties than the parent nuclides. Results show source release rates verses package or disposal unit Kd, and effects of solubility limits. At the LANL LLRW disposal site, only thorium, uranium and some low-level nuclides are solubility limited. Otherwise, a 'rapid rinse' waste package category dominates the peak disposal unit efflux which occurs for the LANL disposal site at about 100 years for nuclides with Kd=0 (Rf=1) and for proportionately longer times as Kd or Rf increases. Additional simple analytic models or detailed numerical codes can be coupled to these results to predict groundwater concentrations.

939 (LA-UR–95-3691) **Low-impact sampling under an active solid low-level radioactive waste disposal unit using horizontal drilling technology.** Puglisi, C.V.; Vold, E.L. Los Alamos National Lab., NM (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-951155–5: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96002585. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this project was to determine the performance of the solid low-level radioactive waste (LLRW) disposal units located on a mesa top at TA-54, Area G, Los Alamos National Laboratory (LANL), Los Alamos, NM, and to provide in-situ (vadose zone) site characterization information to Area G's Performance Assessment. The vadose zone beneath an active disposal unit (DU 37), was accessed by utilizing low-impact, air-rotary horizontal drilling technology. Core samples were pulled, via wire-line core method, in 3 horizontal holes fanning out below DU 37 at approximately 5 foot intervals depending on recovery percentage. Samples were surveyed and prepared in-field following Environmental Restoration (ER) guidelines. Samples were transferred from the field to the CST-9 Radvan for initial radiological screening. Following screening, samples were delivered to CST-3 analytical lab for analyses including moisture content, 23 inorganics, 60 volatile organic compounds (VOC's), 68 semivolatile organic compounds (SVOC's), tritium, lead 210, radium 226 & 228, cesium 137, isotopic plutonium, americium 241, strontium 90, isotopic uranium, and isotopic thorium. Other analyses included matric potential, alpha spectroscopy, gamma spectroscopy, and gross alpha/beta. The overall results of the analysis identified only tritium as having migrated from the DU. Am-241, Eu-152, and Pu-238 were possibly identified above background but the results are not definitive. Of all organics analysed for, only ethyl acetate was tentatively identified slightly above background. All inorganics were found to be well below regulatory limits. Based on the results of the above mentioned analyses, it was determined that Area G's disposal units are performing well and no significant liquid phase migration of contaminants has occurred.

940 (LA-UR–95-3707) **Los Alamos National Laboratory's mobile PAN (Passive/Active Neutron) system for assay of TRU waste in 55 gallon drums.** Taggart, D.P. (and others); Betts, S.E.; Martinez, E.F. Los Alamos National Lab., NM (United States). 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-951091–6: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96002583. Source: OSTI; NTIS; INIS; GPO Dep.

We describe the refurbishment, reactivation and rough calibration of a mobile second generation Passive/Active Neutron (PAN) assay system previously owned by the Carlsbad Area Office (CAO) and stored at the Idaho National Engineering Laboratory - Lockheed Idaho Technology Center (INEL-LITC). This system was transferred to LANL a little over one year ago. After substantial refurbishment for operations, including installation of operating software developed at INEL-LITC, we have completed a rough calibration of the system in preparation for the Performance Demonstration Program (PDP) expected to begin in the near future. We discuss compensation for the waste matrix neutron moderating and absorbing characteristics and present some data acquired during the calibration process which points out the possible waste matrix effects on the results of an assay. Future plans are also discussed.

941 (LA-UR–95-4244) **Solid low-level radioactive waste volume projections at Los Alamos National Laboratory.** Art, K. (Benchmark Environmental Corp., White Rock, NM (United States)); Minton-Hughes, J.; Peper, C. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–9: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96005607. Source: OSTI; NTIS; INIS; GPO Dep.

In response to regulatory requirements, the current economic environment, and diminishing on-site low-level radioactive waste (LLW) disposal capacity, LANL needed to develop a system to collect data on future LLW generation that would comply with DOE Order 5820. 2A and be an effective facility planning tool. The LANL Volume Projections Project (VPP) was created to meet these needs. This paper describes objectives, scope, and components of the VPP that will provide information essential to future facility planning and development.

942 (LA-UR–95-4245) **Characterization of mixed waste for shipment to TSD Facilities Program.** Chandler, K. (Benchmark Environmental Corp., Albuquerque, NM (United States)); Goyal, K. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–8: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96005606. Source: OSTI; NTIS; INIS; GPO Dep.

In compliance with the Federal Facilities Compliance Agreement, Los Alamos National Laboratory (LANL) is striving to ship its low-level mixed waste (LLMW) off-site for treatment and disposal. In order to ship LLMW off site to a commercial facility, LANL must request exemption from the DOE Order 5820.2A requirement that LLMW be shipped only to Department of Energy facilities. Because the process of obtaining the required information and approvals for a mixed waste shipment campaign can be very expensive, time consuming, and frustrating, a well-planned program is necessary to ensure that the elements for the exemption request package are completed successfully the first time. LANL has developed such a program, which is cost- effective, quality-driven, and compliance-based. This program encompasses selecting a qualified analytical laboratory, developing a quality project-specific sampling plan, properly sampling liquid and solid wastes, validating analytical data, documenting the waste characterization and decision processes, and maintaining quality records. The products of the program are containers of waste that meet the off-site facility's waste acceptance criteria, a quality exemption request package, documentation supporting waste characterization, and overall quality assurance for the process. The primary goal of the program is to provide an avenue for documenting decisions, procedures, and data pertinent to characterizing waste and preparing it for off-site treatment or disposal.

943 (LA-UR–96-368) **The role of a detailed aqueous phase source release model in the LANL Area G performance assessment.** Vold, E.L. (Los Alamos National Lab., NM (United States)); Hollis, D.; Longmire, P.; Springer, E.; Birdsell, K.; Shuman, R. Los Alamos National Lab., NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–69: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008122. Source: OSTI; NTIS; INIS; GPO Dep.

The Performance Assessment for the LANL Low-Level Radioactive Waste (LLRW) Disposal Facility, Area G, is ongoing. A detailed review of the inventory data base records and the existing models for source release led to the development of a new modeling capability to describe the liquid phase aqueous transport from the waste package volumes. Inventory is sorted into four release form categories and screened in a comparison of leachate concentrations to the drinking water limit. Percolation through the disposal unit is prescribed in an independent surface water balance model incorporating site rainfall statistics. Waste package types and the disposal unit matrix have independently specified solubility limits and solid-liquid phase partition coefficients, or Kd values. Analytic solutions for inventory limited release of each nuclide in each of the four different waste package release forms are computed. Isotopic contributions are summed over elements to limit the waste package liquid phase concentrations to the elemental solubility limits. Time dependent releases from the waste packages for each nuclide which may be inventory or solubility limited are specified as model output which is provided as the source term to the unsaturated transport model. The waste package efflux is distributed over the 2-D unsaturated zone model grid points corresponding to the cross-sections for 5 representative disposal units within the mesa top. Results show the Area G release is dominated by the inventory in the rapid release waste form (Kd = 0), which percolates from the waste packages over 5–100 years and from the disposal unit over 50–1,000 years. Nuclides in waste package categories with larger Kd values are released proportionately slower. U and Th are the main nuclides of concern released as solubility limited nuclides from the historical inventory at Area G.

944 (LA-UR–96-0595) **Non-Thermal Plasma (NTP) session overview: Second International Symposium on Environmental Applications of Advanced Oxidation Technologies (AOTs).** Rosocha, L.A. Los Alamos National Lab., NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960252–1: 2. international symposium on environmental applications of advanced oxidation technologies, San Francisco, CA (United States), 28 Feb - 1 Mar 1996). Order Number DE96006969. Source: OSTI; NTIS; INIS; GPO Dep.

Advanced Oxidation Technologies (used in pollution control and treating hazardous wastes) has expanded from using hydroxyl radicals to treat organic compounds in water, to using reductive free radicals as well, and to application to pollutants in both gases and aqueous media. Non-Thermal Plasma (NTP) is created in a gas by an electrical discharge or energetic electron injection. Highly reactive species (O atoms, OH, N radicals, plasma electrons) react with entrained hazardous organic chemicals in the gas, converting them to CO2, H2O, etc. NTP can be used to simultaneously remove different kinds of pollutants (eg, VOCs, SOx, NOx in flue gases). This paper presents an overview of NTP technology for pollution control and hazardous waste treatment; it is intended as an introduction to the NTP session of the symposium.

945 (LA-UR–96-1102) **Ready, set,...quit! A review of the controlled-air incinerator.** Reader, G.E. California Univ., Irvine, CA (United States). 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960535–1: 15. international conference on incineration and thermal treatment technologies, Savannah, GA (United States), 6-10 May 1996). Order Number DE96009034. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Controlled-Air Incinerator (CAI) has had a long and productive past as a research and development tool. It now appears that use of the CAI to treat LANL legacy and other wastes under the Federal Facilities Compliance Act is no longer viable due to numerous programmatic problems. This paper will review the history of the CAI. Various aspects associated with the CAI and how those aspects resulted in the loss of this Department of Energy asset as a viable waste treatment option will also be discussed. Included are past missions and tests-CAI capabilities, emissions, and permits; Federal Facility Compliance Act and associated Agreement; National Environmental Policy Act coverage; cost; budget impacts; public perception; the U.S. Environmental Protection Agency Combustion Strategy; Independent Technical Review "Red" Team review; waste treatment alternative technologies; the New Mexico Environment Department; and future options and issues.

946 (LA-UR–96-1103) **Evaluation of pressure response in the Los Alamos controlled air incinerator during three incident scenarios.** Vavruska, J.S. (Equinox, Ltd., Santa Fe, NM (United States)); Elsberry, K.; Thompson, T.K.; Pendergrass, J.A. Los Alamos National Lab., NM (United States). 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960535–3: 15. international conference on incineration and thermal treatment technologies, Savannah, GA (United States), 6-10 May 1996). Order Number DE96009035. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos Controlled Air Incinerator (CAI) is a system designed to accept radioactive mixed waste containing alpha-emitting radionuclides. A mathematical model was developed to predict the pressure response throughout the offgas treatment system of the CAI during three hypothetical incident scenarios. The scenarios examined included: (1) loss of burner flame and failure of the flame safeguard system with subsequent reignition of fuel gas in the primary chamber, (2) pyrolytic gas buildup from a waste package due to loss of induced draft and subsequent restoration of induced draft, and (3) accidental charging of propellant spray cans in a solid waste package to the primary chamber during a normal feed cycle. For each of the three scenarios, the finite element computer model was able to determine the transient pressure surge and decay response throughout the system. Of particular interest were the maximum absolute pressures attainable at critical points in the system as well as maximum differential pressures across the high efficiency particulate air (HEPA) filters. Modeling results indicated that all three of the scenarios resulted in maximum HEPA filter differential pressures well below the maximum allowable levels.

947 (LA-UR-96-1287) **Experiences with treatment of mixed waste.** Dziewinski, J. (Los Alamos National Lab., NM (United States)); Marczak, S.; Smith, W.H.; Nuttall, E. Los Alamos National Lab., NM (United States). 10 Apr 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960804–17: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96009230. Source: OSTI; NTIS; INIS; GPO Dep.

During its many years of research activities involving toxic chemicals and radioactive materials, Los Alamos National Laboratory (Los Alamos) has generated considerable amounts of waste. Much of this waste includes chemically hazardous components and radioisotopes. Los Alamos chose to use an electrochemical process for the treatment of many mixed waste components. The electro-chemical process, which the authors are developing, can treat a great variety of waste using one type of equipment built at a moderate expense. Such a process can extract heavy metals, destroy cyanides, dissolve contamination from surfaces, oxidize toxic organic compounds, separate salts into acids and bases, and reduce the nitrates. All this can be accomplished using the equipment and one crew of trained operating personnel. Results of a treatability study of chosen mixed wastes from Los Alamos Mixed Waste Inventory are presented. Using electrochemical methods cyanide and heavy metals bearing wastes were treated to below disposal limits.

948 (LA-UR–962050) **Los Alamos Waste Management FY96 and FY97 Tactical Plan, March 1, 1996.** Los Alamos National Lab., NM (United States). 1 Mar 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96012850. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Waste Management Program (WMP) began a transition to become a "best of class" waste management program during fiscal year 1995 (FY95). A best of class waste management program means that LANL will provide cost-effective and compliant management of the minimum amount of waste. In FY94, the WMP could be characterized as a level of effort program requiring several new facilities and new LANL-developed technologies to carry out its waste management responsibilities. By the end of FY95, significant progress had been made in the transition to best of class. The FY96 WMP is realigned and reorganized. Its budget and scope of work are built upon discrete work packages. It is committed to achieving improved cost-effectiveness, providing significant tangible technical results, and to having its performance measured. During FY95, over $11,000,000 in facility and operational costs were avoided. The need for three new major facilities was reexamined and lower cost solutions, not requiring the development of new facilities, were agreed to. Technology development activities were terminated and replaced with the use of commercial facilities to achieve aggressive reductions in the Low-Level Mixed Waste legacy inventory. In addition, over $14,000,000 in improved cost-effectiveness has been included in the FY96 Baseline. An overall WMP vision, specific milestones, performance measures, and commitments are in place for FY96 to ensure that LANL continues the transition to a best of class waste management program. The following table identifies the overall vision and success indicators for FY96.

949 (NBL–332) **Evaluation on the use of cerium in the NBL Titrimetric Method.** Zebrowski, J.P.; Orlowicz, G.J.; Johnson, K.D.; Smith, M.M.; Soriano, M.D. USDOE New Brunswick Lab., Argonne, IL (United States). Mar 1995. 50p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011952. Source: OSTI; NTIS; INIS; GPO Dep.

An alternative to potassium dichromate as titrant in the New Brunswick Laboratory Titrimetric Method for uranium analysis was sought since chromium in the waste makes disposal difficult. Substitution of a ceric-based titrant was statistically evaluated. Analysis of the data indicated statistically equivalent precisions for the two methods, but a significant overall bias of +0.035% for the ceric titrant procedure. The cause of the bias was investigated, alterations to the procedure were made, and a second statistical study was performed. This second study revealed no statistically significant bias, nor any analyst-to-analyst variation in the ceric titration procedure. A statistically significant day-to-day variation was detected, but this was physically small (0.01 5%) and was only detected because of the within-day precision of the method. The added mean and standard deviation of the %RD for a single measurement was found to be 0.031%. A comparison with quality control blind dichromate titration data again indicated similar overall precision. Effects of ten elements on the ceric titration's performance was determined. Co, Ti, Cu, Ni, Na, Mg, Gd, Zn, Cd, and Cr in previous work at NBL these impurities did not interfere with the potassium dichromate titrant. This study indicated similar results for the ceric titrant, with the exception of Ti. All the elements (excluding Ti and Cr), caused no statistically significant bias in uranium measurements at levels of 10 mg impurity per 20-40 mg uranium. The presence of Ti was found to cause a bias of −0.05%; this is attributed to the presence of sulfate ions, resulting in precipitation of titanium sulfate and occlusion of uranium. A negative bias of 0.012% was also statistically observed in the samples containing chromium impurities.

950 (NCRP–95-22246) **Radioactive and mixed waste - risk as a basis for waste classification. Symposium proceedings No. 2.** Oak Ridge National Lab., TN (United States). 21 Jun 1995. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (CONF-941192–: Symposium on radioactive and mixed waste: risk as a basis for waste classification, Las Vegas, NV (United States), 9 Nov 1994). Order Number

DE95016101. Source: OSTI; NTIS; INIS; NCRP Publications, 7910 Woodmont Avenue, Suite 800, Bethesda, MD 20814-3095; GPO Dep.

The management of risks from radioactive and chemical materials has been a major environmental concern in the United states for the past two or three decades. Risk management of these materials encompasses the remediation of past disposal practices as well as development of appropriate strategies and controls for current and future operations. This symposium is concerned primarily with low-level radioactive wastes and mixed wastes. Individual reports were processed separately for the Department of Energy databases.

951 (ORNL/ER–297) **Inactive Tanks Remediation Program strategy and plans for Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program.** H and R Technical Associates, Inc., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States). Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017059. Source: OSTI; NTIS; INIS; GPO Dep.

The overall objective of the Inactive Tank Remediation Program is to remediate all LLLW tanks that have been removed fimn service to the extent practicable in accordance with the FFA and CERCLA requirements. Applicable or relevant and appropriate requirements (ARARs) will be addressed in choosing a remediation alternative. Preference will be given to remedies that are highly reliable and provide long-term protection. Efforts will be directed toward permanently and significantly reducing the volume, toxicity, or mobility of hazardous substances, pollutants, and contaminants associated with the tank systems. Where indicated by operational or other restraints, interim measures short of full and complete remediation may be taken to maintain human health and ecological risks at acceptable levels until full remediation can be accomplished.

952 (ORNL/ER–298) **Waste Area Grouping 4 Site Investigation Data Management Plan, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Mar 1995. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014996. Source: OSTI; NTIS; GPO Dep.

Environmental Restoration Program.

The purpose of this Data and Records Management Plan (DRMP) is to ensure that the ER environmental measurements data management process, from planning through measurement, recording, evaluation, analysis, use, reporting, and archival of data, is controlled in an efficient, comprehensive, and standardized manner. Proper organization will ensure that data and documentation are adequate to describe the procedures, events,and results of the Waste Area Grouping (WAG) 4 project. The data management process manages the life cycle of environmental measurements data from the planning of data for characterization and remediation decisions through the collection, review, and actual usage of the data for decision-making purposes to the long-term storage of the data. The nature of the decision-making process for an Environmental Restoration (ER) project is inherently repetitive. Existing data are gathered and evaluated to establish what is known about a site. Decisions regarding the nature of the contamination and potential remedial actions are formulated. Based upon the potential risk to human health and the environment, an acceptable level of uncertainty is defined for each remediation decision. WAG 4 is a shallow-waste burial site consisting of three separate areas: (1) Solid Waste Storage Area (SWSA) 4, a shallow-land burial ground containing radioactive and potentially hazardous wastes; (2) an experimental Pilot Pit Area, including a pilot-scale testing pit; and (3) sections of two abandoned underground pipelines formerly used for transporting liquid, low-level radioactive waste.

953 (ORNL/ER–304) **Waste management plan for inactive LLLW tanks 3001-B, 3004-B, 3013, and T-30 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program.** H and R Technical Associates, Inc., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States). Jul 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016172. Source: OSTI; NTIS; INIS; GPO Dep.

This Project Waste Management Plan identifies the waste that is expected to be generated in connection with the removal and disposition of inactive liquid low-level radioactive waste tanks 3001-B, 3004-B, and T-30, and grouting of tank 3013 at the Oak Ridge National Laboratory and the isolation of these tanks' associated piping systems. The plan also identifies the organization, responsibilities, and administrative controls that will be followed to ensure proper handling of the waste.

954 (ORNL/ER–306) **Inactive Tanks Remediation Program Batch I, Series I tanks 3001-B, 3004-B, 3013, and T-30 technical memorandum. Environmental Restoration Program.** H and R Technical Associates, Inc., Oak Ridge, TN (United States); Oak Ridge National Lab., TN (United States). May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017049. Source: OSTI; NTIS; INIS; GPO Dep.

This technical memorandum provides information that can be used to make decisions concerning the disposition of four inactive tank systems that have been designated Batch 1, Series 1, by the Inactive Tanks Remediation Program team. The Batch I, Series 1, tanks are 3001-B, 3004-B, 3013, and T-30. The report offers viable alternatives for tank system disposition. The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Federal Facility Agreement (FFA) for federal facilities placed on the National Priorities List. The Oak Ridge Reservation was placed on that list on December 21, 1989, and the agreement was signed in November 1991 by DOE's Oak Ridge Operations Office, the US Environmental Protection Agency-Region IV, and the Tennessee Department of Environment and Conservation. The effective date of the FFA is January 1, 1992. One objective of the FFA is to ensure that inactive liquid low-level radioactive waste tank systems are evaluated and, if appropriate, remediated through the CERCLA process. The Inactive Tanks Remediation Program and the Gunite and Associated Tanks Project (GAAT) are the two efforts that will meet this FFA objective. This memorandum addresses tank systems within the Inactive Tanks Remediation Program. Separate CERCLA documentation addresses the tank systems within the GAAT Project.

955 (ORNL/ER–312) **Project management plan for inactive tanks 3001-B, 3004-B, 3013, and T-30 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program.** Oak Ridge National Lab.,

TN (United States). Jul 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016167. Source: OSTI; NTIS; INIS; GPO Dep.

*This document identifies the roles and responsibilities of the project team members and identifies the project scope, schedule, and cost reporting activities for a maintenance activity to remove and dispose of three inactive liquid low-level radioactive waste (LLLW) system tanks and to isolate and fill one LLLW tank with grout. Tanks 3001-B, 3004-B, and T-30 are located in concrete vaults and tank 3013 is buried directly in the soil. The maintenance project consists of cutting the existing pipes attached to the tanks; capping the piping to be left in place; removing the tanks and filling the vaults with grout for tanks 3001-B, 3004-B, and T-30; and filling tank 3013 with grout. Because the LLLW line serving tank 3001-B will be needed for discharging the 3001 canal demineralizer back flush and regeneration waste to tank WC-19, tank 3001-B will be replaced with a section of piping.

956 (ORNL/ER–318) **Maintenance Action Readiness Assessment Plan for Waste Area Grouping 1 inactive Tanks 3001-B, 3004-B, T-30, and 3013 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Jul 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016169. Source: OSTI; NTIS; INIS; GPO Dep.

This Readiness Assessment Plan has been prepared to document operational readiness for the maintenance action consisting of remediation of four inactive liquid low-level radioactive tanks in Waste Area Grouping 1 at Oak Ridge National Laboratory. The four tanks to be remediated are Tanks 3001-B, 3004-B, T-30, and 3013. Tanks 3001-B, 3004-B, and T-30 will be removed from the ground. Because of logistical issues associated with excavation and site access, Tank 3013 will be grouted in place and permanently closed. This project is being performed as a maintenance action rather than an action under the Comprehensive Environmental Response, Compensation, and Liability Act, because the risk to human health and environment is well below the US Environmental Protection Agency's level of concern. The decision to proceed as a maintenance action was documented by an interim action proposed plan, which is included in the administrative record. A Readiness Assessment Team has been assembled to review the criteria deemed necessary to conduct the remediation tasks. These criteria include approval of all plans, acquisition of needed equipment, completion of personnel training, and coordination with plant health and safety personnel. Once the criteria have been met and documented, the task will begin. The readiness assessment is expected to be completed by late July 1995, and the task will begin thereafter.

957 (ORNL/ER–319) **Maintenance Action Work Plan for Waste Area Grouping 1 inactive tanks 3001-B, 3004-B, T-30, and 3013 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Environmental Restoration Program.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Jul 1995. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016170. Source: OSTI; NTIS; INIS; GPO Dep.

This Maintenance Action Work Plan has been prepared to document the activities and procedures for the remediation of four inactive, low-level radioactive tanks at Waste Area Grouping 1, from the Category D list of tanks in the Federal Facility Agreement for the Oak Ridge Reservation (EPA et al. 1994). The four tanks to remediated are tanks 3001-B, 3004-B, T-30, and 3013. Three of the tanks (3001-B, 3004-B, and T-30) will be physically removed from the ground. Because of logistical issues associted with excavation and site access, the fourth tank (3013) will be grouted in place and permanently closed.

958 (ORNL/ER–349) **Preliminary evaluation of liquid integrity monitoring methods for gunite and associated tanks at the Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Vista Research, Inc., Oak Ridge, TN (United States). Feb 1996. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006685. Source: OSTI; NTIS; INIS; GPO Dep.

The Gunite and Associated Tanks (GAAT) are inactive, liquid low-level waste (LLLW) tanks located in and around the North and South Tank Farms (NTF and STF) at Oak Ridge National Laboratory (ORNL). These tanks, which contain a supernatant over a layer of radioactive sludge, are the subject of an ongoing treatability study that will determine the best way to remove the sludge and remediate the tanks. As part of this study, a preliminary assessment of liquid integrity (or "tightness") monitoring methods for the Gunite tanks has been conducted. Both an external and an internal liquid integrity monitoring method were evaluated, and a preliminary assessment of the liquid integrity of eight Gunite tanks was made with the internal method. The work presented in this report shows that six of the eight GAAT considered here are liquid tight and that, in the case of the other two, data quality was too poor to allow a conclusive decision. The analysis indicates that when the release detection approach described in this report is used during the upcoming treatability study, it will function as a sensitive and robust integrity monitoring system. Integrity assessments based on both the internal and external methods can be used as a means of documenting the integrity of the tanks before the initiation of in-tank operations. Assessments based on the external method can be used during these operations as a means of providing a nearly immediate indication of a release, should one occur. The external method of release detection measures the electrical conductivity of the water found in the dry wells associated with each of the tanks. This method is based on the fact that the conductivity of the liquid in the GAAT is very high, while the conductivity of the groundwater in the dry wells and the underdrain system for the GAAT is very low.

959 (ORNL/ER–359) **Root cause analysis for waste area grouping 1, Batch I, Series 1 Tank T-30 project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Aug 1996. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96013408. Source: OSTI; NTIS; INIS; GPO Dep.

Four inactive liquid low-level waste (LLLW) tanks were scheduled for remedial actions as the Batch L Series I Tank Project during fiscal year (FY) 1995. These tanks are 3001-B, 3004-B, T-30, and 3013. The initial tank remediation project was conducted as a maintenance action. One project objective was to gain experience in remediation efforts (under maintenance actions) to assist in conducting remedial action projects for the 33 remaining inactive LLLW tanks. Batch I, Series 1 project activities resulted in the successful remediation of tanks 3001-B, 3004-B, and 3013.

Tank T-30 remedial actions were halted as a result of information obtained during waste characterization activities. The conditions discovered on tank T-30 would not allow completion of tank removal and smelting as originally planned. A decision was made to conduct a root cause analysis of Tank T-30 events to identify and, where possible, correct weaknesses that, if uncorrected, could result in similar delays for completion of future inactive tank remediation projects. The objective of the analysis was to determine why a portion of expected project end results for Tank T-30 were not fully achieved. The root cause analysis evaluates project events and recommends beneficial improvements for application to future projects. This report presents the results of the Batch I, Series root cause analysis results and makes recommendations based on that analysis.

960 (ORNL/ER–372) **Preliminary engineering report waste area grouping 5, Old Hydrofracture Facility Tanks content removal project, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Jun 1996. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96014280. Source: OSTI; NTIS; INIS; GPO Dep.

The Superfund Amendments and Reauthorization Act of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires a Federal Facilities Agreement (FFA) for federal facilities placed on the National Priorities List. The Oak Ridge Reservation was placed on that list on December 21, 1989, and the agreement was signed in November 1991 by the U.S. Department of Energy (DOE) Oak Ridge Operations Office, the U.S. Environmental Protection Agency (EPA) Region IV, and the Tennessee Department of Environment and Conservation (TDEC). The effective date of the FFA is January 1, 1992. One objective of the FFA is to ensure that liquid low-level waste (LLLW) tanks that are removed from service are evaluated and remediated through the CERCLA process. Five inactive LLLW tanks, designated T-1, T-2, T-3, T-4, and T-9, located at the Old Hydrofracture (OHF) Facility in the Melton Valley area of Oak Ridge National Laboratory (ORNL) have been evaluated and are now entering the remediation phase. As a precursor to final remediation, this project will remove the current liquid and sludge contents of each of the five tanks (System Requirements Document, Appendix A). It was concluded in the Engineering Evaluation/Cost Analysis [EE/CA] for the Old Hydrofracture Facility Tanks (DOE 1996) that sluicing and pumping the contaminated liquid and sludge from the five OHF tanks was the preferred removal action. Evaluation indicated that this alternative meets the removal action objective and can be effective, implementable, and cost-effective. Sluicing and removing the tank contents was selected because this action uses (1) applicable experience, (2) the latest information about technologies and techniques for removing the wastes from the tanks, and (3) activities that are currently acceptable for storage of transuranic (TRU) mixed waste.

961 (ORNL/ER–375) **Project management plan for Waste Area Grouping 5 Old Hydrofracture Facility tanks content removal at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Jul 1996. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012158. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Old Hydrofracture Facility (OHF) tanks content removal project is to transfer inventory from the five OHF tanks located in Waste Area Grouping (WAG) 5 at Oak Ridge National Laboratory (ORNL) to the Melton Valley Storage Tanks (MVST) liquid low-level (radioactive) waste (LLLW) storage facility, and remediate the remaining OHF tank shells. The major activities involved are identified in this document along with the organizations that will perform the required actions and their roles and responsibilities for managing the project.

962 (ORNL/GWPO–0024) **Variable-density flow and transport modeling to evaluate anomalous nitrate concentrations and pressures in GW-134.** Jones, T.L.; Toran, L.E.; Watson, D.B. Oak Ridge National Lab., TN (United States). Jun 1996. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96013673. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy operates the Oak Ridge Reservation near Oak Ridge, Tennessee. Four waste disposal ponds, referred to as the S-3 ponds, were located within this reservation near the western edge of the Y-12 Plant. The S-3 ponds were constructed in 1951 and received liquid waste until 1983. The main component of the waste received by the ponds was nitric acid. In 1988, the ponds were structurally stabilized and capped and the area above the ponds was converted into an asphalt parking lot. Coreholes were drilled in 1985 to characterize the geology of the region. These coreholes have since been equipped with monitoring equipment capable of performing pressure measurements and collecting fluid samples. A modeling study was also conducted to evaluate scenarios potentially capable of producing anomalous pressure and concentration data observed in GW-134. Results are described.

963 (ORNL/TM–12105) **Update of the management strategy for Oak Ridge National Laboratory Liquid Low-Level Waste.** Robinson, S.M.; Abraham, T.J.; DePaoli, S.M.; Walker, A.B. Oak Ridge National Lab., TN (United States). Apr 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95011626. Source: OSTI; NTIS; INIS; GPO Dep.

The strategy for management of the Oak Ridge National Laboratory's (ORNL) radioactively contaminated liquid waste was reviewed in 1991. The latest information available through the end of 1990 on waste characterization, regulations, US Department of Energy (DOE) budget guidance, and research and development programs was evaluated to determine how the strategy should be revised. Few changes are needed to update the strategy to reflect new waste characterization, research, and regulatory information. However, recent budget guidance from DOE indicates that minimum funding will not be sufficient to accomplish original objectives to upgrade the liquid low-level waste (LLLW) system to comply with the Federal Facilities Agreement, provide long-term LLLW treatment capability, and minimize environmental, safety, and health risks. Options are presented that might allow the ORNL LLLW system to continue operations temporarily, but they would significantly reduce its capabilities to handle emergency situations, provide treatment for new waste streams, and accommodate waste from the Environmental Restoration Program and from decontamination and decommissioning of surplus facilities. These options are also likely to increase worker radiation exposure, risk of environmental insult, and generation of solid waste for on-site and off-site disposal/storage beyond existing facility capacities. The strategy will be fully developed after receipt of additional guidance. The proposed budget limitations are too severe to allow ORNL to meet regulatory requirements or continue operations long term.

964 (ORNL/TM-12299) **Status of the ORNL liquid low-level waste management upgrades.** Robinson, S.M.; Kent, T.E.; DePaoli, S.M. Oak Ridge National Lab., TN (United States). Aug 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000849. Source: OSTI; NTIS; INIS; GPO Dep.

The strategy for management of the Oak Ridge National Laboratory's (ORNL's) radioactively contaminated liquid waste was reviewed. The latest information on waste characterization, regulations, US Department of Energy (DOE) budget guidance, and research and development programs was evaluated to determine how the strategy should be revised. Few changes are needed to update the strategy to reflect new waste characterization, research, and regulatory information. However, recent budget guidance from DOE indicates that minimum funding will not be sufficient to accomplish original objectives to upgrade the liquid low-level waste (LLLW) system to be in compliance with the Federal Facilities Agreement compliance, provide long-term LLLW treatment capability, and minimize Environmental Safety & Health risks. Options are presented that might allow the ORNL LLLW system to continue operations temporarily but significantly reduce its capabilities to handle emergency situations, provide treatment for new waste streams, and accommodate waste from the Environmental Restoration Program and from decontamination and decommissioning of surplus facilities. These options are also likely to increase worker radiation exposure, risk of environmental insult, and generation of solid waste for on-site and off-site disposal/storage beyond existing facility capacities. The strategy will be fully developed after receiving additional guidance. The proposed budget limitations are too severe to allow ORNL to meet regulatory requirements or continue operations long term.

965 (ORNL/TM-12887) **The removal of mercury from solid mixed waste using chemical leaching processes.** Gates, D.D.; Chao, K.K.; Cameron, P.A. Oak Ridge National Lab., TN (United States). Jul 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017139. Source: OSTI; NTIS; INIS; GPO Dep.

The focus of this research was to evaluate chemical leaching as a technique to treat soils, sediments, and glass contaminated with either elemental mercury or a combination of several mercury species. Potassium iodide/iodine solutions were investigated as chemical leaching agents for contaminated soils and sediments. Clean, synthetic soil material and surrogate storm sewer sediments contaminated with mercury were treated with KI/I_2 solutions. It was observed that these leaching solutions could reduce the mercury concentration in soil and sediments by 99.8%. Evaluation of selected posttreatment sediment samples revealed that leachable mercury levels in the treated solids exceeded RCRA requirements. The results of these studies suggest that KI/I_2 leaching is a treatment process that can be used to remove large quantities of mercury from contaminated soils and sediments and may be the only treatment required if treatment goals are established on Hg residual concentrations in solid matrices. Fluorescent bulbs were used to simulate mercury contaminated glass mixed waste. To achieve mercury contamination levels similar to those found in larger bulbs such as those used in DOE facilities a small amount of Hg was added to the crushed bulbs. The most effective agents for leaching mercury from the crushed fluorescent bulbs were KI/I_2, NaOCl, and NaBr + acid. Radionuclide surrogates were added to both the EPA synthetic soil material and the crushed fluorescent bulbs to determine the fate of radionuclides following chemical leaching with the leaching agents determined to be the most promising. These experiments revealed that although over 98% of the dosed mercury solubilized and was found in the leaching solution, no Cerium was measured in the posttreatment leaching solution. This finding suggest that Uranium, for which Ce was used as a surrogate, would not solubilize during leaching of mercury contaminated soil or glass.

966 (ORNL/TM-12913) **Liquid and Gaseous Waste Operations Department annual operating report CY 1994.** Maddox, J.J.; Scott, C.B. Oak Ridge National Lab., TN (United States). Mar 1995. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014460. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents details about the operation of the liquid and gaseous waste department of Oak Ridge National Laboratory for the calendar year 1994. Topics discussed include; process waste system, upgrade activities, low-level liquid radioactive waste solidification project, maintenance activities, and other activities such as training, audits, and tours.

967 (ORNL/TM-12939) **Design alternatives report for the cesium removal demonstration.** Walker, J.F. Jr.; Youngblood, E.L. Oak Ridge National Lab., TN (United States). Sep 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96002293. Source: OSTI; NTIS; INIS; GPO Dep.

The Cesium Removal Demonstration (CRD) project will use liquid low-level waste (LLLW) stored in the Oak Ridge National Laboratory Melton Valley Storage Tanks to demonstrate cesium removal from sodium nitrate-based supernates. This report presents the results of a conceptual design study to scope the alternatives for conducting the demonstration at ORNL. Factors considered included (1) sorbent alternatives, (2) facility alternatives, (3) process alternatives, (4) process disposal alternatives, and (5) relative cost comparisons. Recommendations included (1) that design of the CRD system move forward based on information obtained to date from tests with Savannah River Resin, (2) that the CRD system be designed so it could use crystalline silicotitanates (CST) if an engineered form of CST becomes available prior to the CRD, (3) that the system be designed without the capability for resin regeneration, (4) that the LLLW solidification facility be used for the demonstration (5) that vitrification of the loaded resins from the CRD be demonstrated at the Savannah River Site, and (6) that permanent disposal of the loaded and/or vitrified resin at the Nevada Test Site be pursued.

968 (ORNL/TM-12974) **Investigation of the liquid low-level waste evaporator steam coil failure and supporting laboratory studies.** Pawel, S.J.; Keiser, J.R.; Longmire, H.F. Oak Ridge National Lab., TN (United States). May 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95015662. Source: OSTI; NTIS; INIS; GPO Dep.

Using a remote video camera, the internals of a low-level waste evaporator tank (termed 2A2, type 304L stainless steel construction, known to have failed steam coils) were inspected. This inspection revealed at least three rather substantial holes as opposed to crack- or pit-like leak sites near the nominal solution level position on one particular steam coil. This section was removed from the evaporator vessel, and subsequent hot cell examination revealed extensive general corrosion on the process side of the coil with little or no attack on the steam side. Hot cell metallography confirmed intense general corrosion on the process side and, in addition, revealed shallow intergranular attack at the leading edge of corrosion. No pits or cracks were detected in this section of the steam coil. Laboratory corrosion tests with coupons of 304L (and other high-alloy materials) isothermally exposed in a range of solutions similar to those expected in the evaporator reveal only very low corrosion rates below 40% sodium hydroxide and the solution boiling point. However, "dried film" experiments revealed that much more dilute solutions became aggressive to stainless steel due to concentrating effects (evaporation and periodic wetting) at the air/solution interface. The high general corrosion rates observed on the failed coil section occurred at or near the air/solution interface and were attributed to such "splash zone" activity.

969 (ORNL/TM–13012) **Prediction of external corrosion for UF_6 cylinders: Results of an empirical method.** Lyon, B.F. Oak Ridge National Lab., TN (United States). Jun 1995. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014488. Source: OSTI; NTIS; INIS; GPO Dep.

Wall thickness data for depleted LTF, (DU) cylinders in above-ground storage at three Department of Energy (DOE) sites (Oak Ridge, TN; Paducah, KY; Portsmouth, OH) were analyzed in order to address the following questions: How many cylinders may have breaches now? and, What will the conditions be like in 2020? This report summarizes preliminary results of the analyses conducted. These results are to be used as input into models for estimating risks and hazards associated with the cylinders in the various conditions. These models will then be used as a basis for implementing engineering fixes where possible and for management decisions on corrective actions. This is part of the overall assessment of the risks and hazards within the DU management program.

970 (ORNL/TM–13028) **Evaluation of interim and final waste forms for the newly generated liquid low-level waste flowsheet.** Abotsi, G.M.K. (Clark Atlanta Univ., GA (United States)); Bostick, D.T.; Beck, D.E. Oak Ridge National Lab., TN (United States). May 1996. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011591. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this review is to evaluate the final forms that have been proposed for radioactive-containing solid wastes and to determine their application to the solid wastes that will result from the treatment of newly generated liquid low-level waste (NGLLLW) and Melton Valley Storage Tank (MVST) supernate at the Oak Ridge National Laboratory (ORNL). Since cesium and strontium are the predominant radionuclides in NGLLLW and MVST supernate, this review is focused on the stabilization and solidification of solid wastes containing these radionuclides in cement, glass, and polymeric materials-the principal waste forms that have been tested with these types of wastes. Several studies have shown that both cesium and strontium are leached by distilled water from solidified cement, although the leachabilities of cesium are generally higher than those of strontium under similar conditions. The situation is exacerbated by the presence of sulfates in the solution, as manifested by cracking of the grout. Additives such as bentonite, blast-furnace slag, fly ash, montmorillonite, pottery clay, silica, and zeolites generally decrease the cesium and strontium release rates. Longer cement curing times (>28 d) and high ionic strengths of the leachates, such as those that occur in seawater, also decrease the leach rates of these radionuclides. Lower cesium leach rates are observed from vitrified wastes than from grout waste forms. However, significant quantities of cesium are volatilized due to the elevated temperatures required to vitrify the waste. Hence, vitrification will generally require the use of cleanup systems for the off-gases to prevent their release into the atmosphere.

971 (ORNL/TM–13036) **Sludge mobilization with submerged nozzles in horizontal cylindrical tanks.** Hylton, T.D.; Cummins, R.L.; Youngblood, E.L.; Perona, J.J. Oak Ridge National Lab., TN (United States). Oct 1995. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003185. Source: OSTI; NTIS; INIS; GPO Dep.

The Melton Valley Storage Tanks (MVSTs) and the evaporator service tanks at the Oak Ridge National Laboratory (ORNL) are used for the collection and storage of liquid low-level waste (LLLW). Wastes collected in these tanks are typically acidic when generated and are neutralized with sodium hydroxide to protect the tanks from corrosion; however, the high pH of the solution causes the formation of insoluble compounds that precipitate. These precipitates formed a sludge layer approximately 0.6 to 1.2 m (2 to 4 ft) deep in the bottom of the tanks. The sludge in the MVSTs and the evaporator service tanks will eventually need to be removed from the tanks and treated for final disposal or transferred to another storage facility. The primary options for removing the sludge include single-point sluicing, use of a floating pump, robotic sluicing, and submerged-nozzle sluicing. The objectives of this study were to (1) evaluate the feasibility of submerged-nozzle sluicing in horizontal cylindrical tanks and (2) obtain experimental data to validate the TEMPEST (time-dependent, energy, momentun, pressure, equation solution in three dimensions) computer code.

972 (ORNL/TM–13078) **PCB extraction from ORNL tank WC-14 using a unique solvent.** Bloom, G.A.; Lucero, A.J.; Koran, L.J.; Turner, E.N. Oak Ridge National Lab., TN (United States). Sep 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000834. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the development work of the Engineering Development Section of the Chemical Technology Division at Oak Ridge National Laboratory (ORNL) for an organic extraction method for removing polychlorinated biphenyls (PCBs) from tank WC-14. Tank WC-14 is part of the ORNL liquid low-level radioactive tank waste system and does not meet new secondary containment and leak detection regulations. These regulations require the tank to be taken out of service, and remediated before tank removal. To remediate the tank, the PCBs must be removed; the tank contents can then be transferred to the Melton Valley Storage Tanks before final disposal. The solvent being used for the PCB extraction experiments is triethylamine, an aliphatic amine that is soluble in water below 60°F but insoluble in water above 90°F. This property will allow the extraction to be carried out under fully miscible conditions within the tank; then, after tank conditions have been changed, the solvent will not be miscible with water and phase separation will occur. Phase separation between sludge, water, and solvent will allow solvent (loaded with PCBs) to be removed from the tank for disposal. After removing the PCBs from the sludge and removing the sludge from the tank, administrative control of the tank can be transferred to ORNL's Environmental Restoration Program, where priorities will be set for tank removal. Experiments with WC-14 sludge show that greater than 90% extraction efficiencies can be achieved with one extraction stage and that PCB concentration in the sludge can be reduced to below 2 ppm in three extractions. It is anticipated that three extractions will be necessary to reduce the PCB concentration to below 2 ppm during field applications. The experiments conducted with tank WC-14 sludge transferred less than 0.03% of the original alpha contamination and less than 0.002% of the original beta contamination.

973 (ORNL/TM-13101) **FY 1995 separation studies for liquid low-level waste treatment at Oak Ridge National Laboratory.** Bostick, D.T. (and others); Arnold, W.D.; Burgess, M.W. Oak Ridge National Lab., TN (United States). Jan 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006025. Source: OSTI; NTIS; INIS; GPO Dep.

During FY 1995, studies were continued to develop improved methods for centralized treatment of liquid low-level waste (LLLW) at Oak Ridge National Laboratory (ORNL). Focus in this reporting period was on (1) identifying the parameters that affect the selective removal of ^{90}Sr and ^{137}Cs, two of the principal radioactive contaminants expected in the waste; (2) validating the effectiveness of the treatment methods by testing an ac Melton Valley Storage Tank (MVST) supernate; (3) evaluating the optimum solid/liquid separation techniques for the waste; (4) identifying potential treatment methods for removal of technetium from LLLW; and (5) identifying potential methods for stabilizing the high-activity secondary solid wastes generated by the treatment.

974 (ORNL/TM-13131) **Current and projected liquid low-level waste generation at ORNL.** DePaoli, S.M.; West, G.D. Oak Ridge National Lab., TN (United States). Apr 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96010623. Source: OSTI; NTIS; INIS; GPO Dep.

Liquid low-level waste (LLLW) is generated by various programs and projects throughout Oak Ridge National Laboratory (ORNL). This waste is collected in bottles, by trucks, or in underground collection tanks; it is then neutralized with sodium hydroxide and reduced in volume at the ORNL LLLW evaporator. This report presents historical and projected data concerning the volume and the characterization of LLLW, both prior to and after evaporation. Storage space for projected waste generation is also discussed.

975 (ORNL/TM-13164) **Liquid and Gaseous Waste Operations Department annual operating report, CY 1995.** Maddox, J.J.; Scott, C.B. Oak Ridge National Lab., TN (United States). Mar 1996. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96009374. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the operating activities, upgrade activities, maintenance, and other activities regarding liquid and gaseous low level radioactive waste management at the Oak Ridge National Laboratory. Miscellaneous activities include training, audits, tours, and environmental restoration support.

976 (ORNL/TM-13189) **Oak Ridge National Laboratory program plan for certification of nonradioactive hazardous waste.** Oak Ridge National Lab., TN (United States). May 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012271. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes Oak Ridge National Laboratory's (ORNL) Program for Certification of Nonradioactive Hazardous Waste (Program). The Program establishes the criteria that will be used by all ORNL divisions, offices, and programs for unrestricted release of hazardous waste to off-site commercial facilities. The certification process meets the requirements given in the Performance Objective for Certification of Non-Radioactive Hazardous Waste. The Program Plan has two main elements: (A) Establishing Radioactive Materials Management Areas (RMMAs). At ORNL, RMMAs are (1) Contamination Areas, High Contamination Areas, and Airborne Radioactivity Areas, (2) Radiological Buffer Areas established for contamination control, and (3) areas posted to prevent loss of control of activated items. (B) Certifying that hazardous waste originating in an RMMA is suitable for commercial treatment, storage, or disposal by process knowledge, surface contamination surveys, sampling and analysis, or a combination of these techniques. If process knowledge is insufficient, the hazardous waste must undergo sampling and analysis in addition to surface contamination surveys. This Program will reduce the impact to current ORNL operations by using current radiological area boundaries and existing plans and procedures to the greatest extent possible. New or revised procedures will be developed as necessary to implement this Program.

977 (ORNL/TM-13192) **Prediction of external corrosion for steel cylinders at the Paducah Gaseous Diffusion Plant: Application of an empirical method.** Lyon, B.F. Oak Ridge National Lab., TN (United States). Feb 1996. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96008763. Source: OSTI; NTIS; INIS; GPO Dep.

During the summer of 1995, ultrasonic wall thickness data were collected for 100 steel cylinders containing depleted uranium (DU) hexafluoride located at Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky. The cylinders were selected for measurement to assess the condition of the more vulnerable portion of the cylinder inventory at PGDP. The purpose of this report is to apply the method used in Lyon to estimate the effects of corrosion for larger unsampled populations as a function of time. The scope of this report is limited and is not intended to represent the final analyses of available data. Future efforts will include continuing analyses of available data to investigate defensible deviations from the conservative assumptions made to date. For each cylinder population considered, two basic types of analyses were conducted: (1) estimates were made of the number of cylinders as a function of time that will have a minimum wall thickness of either 0 mils (1 mil = 0.00 1 in.) or 250 mils and (2) the current minimum wall thickness distributions across cylinders were estimated for each cylinder population considered. Additional analyses were also performed investigating comparisons of the results for F and G yards with the results presented in Lyon (1995).

978 (ORNL/TM–13236) **Comparison of SW-846 method 3051 and SW-846 method 7471A for the preparation of solid waste samples for mercury determination.** Giaquinto, J.M.; Essling, A.M.; Keller, J.M. Oak Ridge National Lab., TN (United States). [1996]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96014278. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes experimental studies to evaluate the use of EPA SW-846 method 3051 for preparation and dissolution of solid samples for Hg analysis. The study showed that the method is effective in dissolution of four sample types without significant loss of Hg. Based on results of this study, method 3051 was used for analysis of high radioactive waste samples to obtain results for a number of RCRA regulated metals without the need to utilize a separate sample preparation method (EPA SW-846 method 7471A) specific only for Hg.

979 (PNL–10068) **300 Area dangerous waste tank management system: Compliance plan approach. Final report.** Pacific Northwest National Lab., Richland, WA (United States); Ebasco Environmental, Richland, WA (United States); Hart Crowser, Inc., Richland, WA (United States). Mar 1996. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008343. Source: OSTI; NTIS; INIS; GPO Dep.

In its Dec. 5, 1989 letter to DOE-Richland (DOE-RL) Operations, the Washington State Dept. of Ecology requested that DOE-RL prepare "a plant evaluating alternatives for storage and/or treatment of hazardous waste in the 300 Area...". This document, prepared in response to that letter, presents the proposed approach to compliance of the 300 Area with the federal Resource Conservation and Recovery Act and Washington State's Chapter 173-303 WAC, Dangerous Waste Regulations. It also contains 10 appendices which were developed as bases for preparing the compliance plan approach. It refers to the Radioactive Liquid Waste System facilities and to the radioactive mixed waste.

980 (PNL–10524) **Arid sites stakeholder participation in evaluating innovative technologies: VOC-Arid Site Integrated Demonstration.** Peterson, T.S. (and others); McCabe, G.H.; Brockbank, B.R. Pacific Northwest Lab., Richland, WA (United States). May 1995. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012395. Source: OSTI; NTIS; GPO Dep.

Developing and deploying innovative environmental cleanup technologies is an important goal for the U.S. Department of Energy (DOE), which faces challenging remediation problems at contaminated sites throughout the United States. Achieving meaningful, constructive stakeholder involvement in cleanup programs, with the aim of ultimate acceptance of remediation decisions, is critical to meeting those challenges. DOE's Office of Technology Development sponsors research and demonstration of new technologies, including, in the past, the Volatile Organic Compounds Arid Site Integrated Demonstration (VOC-Arid ID), hosted at the Hanford Site in Washington State. The purpose of the VOC-Arid ID has been to develop and demonstrate new technologies for remediating carbon tetrachloride and other VOC contamination in soils and ground water. In October 1994 the VOC-Arid ID became a part of the Contaminant Plume Containment and Remediation Focus Area (Plume Focus Area). The VOC Arid ID's purpose of involving stakeholders in evaluating innovative technologies will now be carried on in the Plume Focus Area in cooperation with Site Technology Coordination Groups and Site Specific Advisory Boards. DOE's goal is to demonstrate promising technologies once and deploy those that are successful across the DOE complex. Achieving that goal requires that the technologies be acceptable to the groups and individuals with a stake in DOE facility cleanup. Such stakeholders include groups and individuals with an interest in cleanup, including regulatory agencies, Native American tribes, environmental and civic interest groups, public officials, environmental technology users, and private citizens. This report documents the results of the stakeholder involvement program, which is an integral part of the VOC-Arid ID.

981 (PNL–10623) **324 Building Compliance Project: Selection and evaluation of alternatives for the removal of solid remote-handled mixed wastes from the 324 Building.** Ross, W.A. (and others); Bierschbach, M.C.; Dukelow, J.S. Jr. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016115. Source: OSTI; NTIS; INIS; GPO Dep.

Six alternatives for the interim storage of remote-handled mixed wastes from the 324 Building on the Hanford Site have been identified and evaluated. The alternatives focus on the interim storage facility and include use of existing facilities in the 200 Area, the construction of new facilities, and the vitrification of the wastes within the 324 Building to remove the majority of the wastes from under RCRA regulations. The six alternatives are summarized in Table S.1, which identifies the primary facilities to be utilized, the anticipated schedule for removal of the wastes, the costs of the transfer from 324 Building to the interim storage facility (including any capital costs), and an initial risk comparison of the alternatives. A recently negotiated Tri-Party Agreement (TPA) change requires the last of the mixed wastes to be removed by May 1999. The ability to use an existing facility reduces the costs since it eliminates the need for new capital construction. The basic regulatory approvals for the storage of mixed wastes are in place for the PUREX facility, but the Form HI permit will need some minor modifications since the 324 Building wastes have some additional characteristic waste codes and the current permit limits storage of wastes to those from the facility itself. Regulatory reviews have indicated that it will be best to use the tunnels to store the wastes. The PUREX alternatives will only provide storage for about 65% of the wastes. This results from the current schedule of the B-Cell Clean Out Project, which projects that dispersible debris will continue to be collected in small quantities until the year 2000. The remaining fraction of the wastes will then be stored in another facility. Central Waste Complex (CWC) is currently proposed for that residual waste storage; however, other options may also be available.

982 (PNL–10666) **Literature review of arc/plasma, combustion, and joule-heated melter vitrification systems.** Freeman, C.J.; Abrigo, G.P.; Shafer, P.J.; Merrill, R.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017598. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides reviews of papers and reports for three basic categories of melters: arc/plasma-heated melters, combustion-heated melters, and joule-heated melters. The literature reviewed here represents those publications which may lend insight to phase I testing of low-level waste vitrification being performed at the Hanford Site in FY 1995. For each melter category, information from those papers and reports containing enough information to determine steady-state mass balance data is tabulated at the end of each section. The tables show the composition of the feed processed, the off-gas measured via decontamination factors, gross energy consumptions, and processing rates, among other data.

983 (PNL–10743) **1995 Baseline solid waste management system description.** Anderson, G.S.; Konynenbelt, H.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000203. Source: OSTI; NTIS; INIS; GPO Dep.

This provides a detailed solid waste system description that documents the treatment, storage, and disposal (TSD) strategy for managing Hanford's solid low-level waste, low-level mixed waste, transuranic and transuranic mixed waste, and greater-than-Class III waste. This system description is intended for use by managers of the solid waste program, facility and system planners, as well as system modelers. The system description identifies the TSD facilities that constitute the solid waste system and defines these facilities' interfaces, schedules, and capacities. It also provides the strategy for treating each of the waste streams generated or received by the Hanford Site from generation or receipt through final destination.

984 (PNL–10746) **Evaluation of the single-pass flow-through test to support a low-activity waste specification.** McGrail, B.P. (Pacific Northwest Lab., Richland, WA (United States)); Peeler, D.K. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000197. Source: OSTI; NTIS; INIS; GPO Dep.

A series of single-pass flow-through (SPFT) tests was performed on five reference low-activity waste glasses and a reference glass from the National Institute of Standards and Technology to support a product specification for low-activity waste (LAW) forms. The results showed that the SPFT test provides a means to quantitatively distinguish among LAW glass forms in terms of their forward reaction rate at a given temperature and solution pH. Two of the test glasses were also subjected to SPFT testing at Argonne National Laboratory (ANL). Forward reaction rate constants calculated from the ANL test data were 100 to over 1,000 times larger than the values obtained from the SPFT tests conducted at PNL. An analysis of the ANL results showed that they were inconsistent with independent measurements done on glasses of similar composition, the known pH-dependence of the forward rate, and with the results from low surface-area-to-volume, short duration product consistency tests. Because the data set obtained from the SPFT tests done at PNL was consistent with each of these same factors, a detailed examination of the test procedures used at both laboratories was performed to determine the cause(s) of the discrepancy. The omission of background subtraction in the data analysis procedure and the short-duration (on the order of hours) of the ANL tests are factors that may have significantly affected the calculated rates.

985 (PNL–10779) **Alternative comparison, analysis, and evaluation of solid waste and materials system alternatives.** Brothers, A.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003602. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents a comprehensive analysis of the impact of solid waste technical options on values and objectives that are important to the public. It is written in support of the Solid Waste and Materials Systems Alternatives Study (WHC, 1995). Described are the values that were identified, the major programmatic risks, how the impacts were measured, the performance of alternatives, the methodology used for the analysis, and the implications of the results. Decision analysis was used to guide the collection and analysis of data and the logic of the evaluation. Decision analysis is a structured process for the analysis and evaluation of alternatives. It is theoretically grounded in a set of axioms that capture the basic principles of decision making (von Neuman and Morgenstern 1947). Decision analysis objectively specifies what factors are to be considered, how they are to be measured and evaluated, and heir relative importance. The result is an analysis in which the underlying rationale or logic upon which the decision is based is made explicit. This makes possible open discussion of the decision basis in which facts and values are clearly distinguished, resulting in a well- documented decision that can be clearly explained and justified. The strategy of decision analysis is to analyze the various components relevant to the decision separately and then integrate the individual judgments to arrive at an overall decision. This assures that all the relevant factors are identified and their relative importance is considered. The procedure for obtaining the individual judgments, and the decision rules, for combining them and evaluating alternatives, have both theoretical and empirical foundation in mathematics, economics, and psychology.

986 (PNL–10788) **The role of plants and animals in isolation barriers at Hanford, Washington.** Link, S.O.; Cadwell, L.L.; Petersen, K.L.; Sackschewsky, M.R.; Landeen, D.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000814. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Surface Barrier Development Program was organized in 1985 to test the effectiveness of various barrier designs in minimizing the effects of water infiltration; plant, animal, and human intrusion; and wind and water erosion on buried wastes, and in minimizing the emanation of noxious gases. Plants will serve to minimize drainage and erosion, but present,the potential for growing roots into wastes. Animals burrow holes into the soil, and the burrow holes could allow water to preferentially drain into the waste. They also bring soil to the surface which, if wastes are incorporated, could present a risk for the dispersion of wastes into the environment. This report reviews work done to assess the role of plants and animals in isolation barriers at Hanford. It also reviews work done to understand the potential effects from climate change on the plants and animals that may inhabit barriers in the future.

987 (PNL–10830) **Selection of a computer code for Hanford low-level waste engineered-system performance assessment.** McGrail, B.P.; Mahoney, L.A. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 30p. Sponsored by USDOE, Washington,. DC (United

States). DOE Contract AC06-76RL01830. Order Number DE96001363. Source: OSTI; NTIS; INIS; GPO Dep.

Planned performance assessments for the proposed disposal of low-level waste (LLW) glass produced from remediation of wastes stored in underground tanks at Hanford, Washington will require calculations of radionuclide release rates from the subsurface disposal facility. These calculations will be done with the aid of computer codes. Currently available computer codes were ranked in terms of the feature sets implemented in the code that match a set of physical, chemical, numerical, and functional capabilities needed to assess release rates from the engineered system. The needed capabilities were identified from an analysis of the important physical and chemical process expected to affect LLW glass corrosion and the mobility of radionuclides. The highest ranked computer code was found to be the ARES-CT code developed at PNL for the US Department of Energy for evaluation of and land disposal sites.

988 (PNL–10872) **Hanford prototype-barrier status report: FY 1995.** Gee, G.W.; Ward, A.L.; Gilmore, B.G.; Ligotke, M.W.; Link, S.O. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003908. Source: OSTI; NTIS; INIS; GPO Dep.

Surface barriers (or covers) have been proposed for use at the Hanford Site as a means to isolate certain waste sites that, for reasons of cost or worker safety or both, may not be exhumed. Surface barriers are intende to isolated the wastes from the accessible environment and to provide long-term protection to future populations that might use the Hanford Site. Currently, no "proven" long-term barrier system is available. For this reason, the Hanford Site Permanent Isolation Surface-Barrier Development Program (BDP) was organized to develop the technology needed to provide long-term surface barrier capability for the Hanford Site for the US Department of Energy (DOE). Designs have been proposed to meet the most stringent needs for long-term waste disposal. The objective of the current barrier design is to use natural materials to develop a protective barrier system that isolates wastes for at least 1000 years by limiting water, plant, animal, and human intrusion; and minimizing erosion. The design criteria for water drainage has been set at 0.5 mm/yr. While other design criteria are more qualitative, it is clear that waste isolation for an extended time is the prime objective of the design. Constructibility and performance. are issues that can be tested and dealt with by evaluating prototype designs prior to extensive construction and deployment of covers for waste sites at Hanford.

989 (PNL-SA–24939) **Applying waste logistics modeling to regional planning.** Holter, G.M.; Khawaja, A.; Shaver, S.R.; Peterson, K.L. Pacific Northwest Lab., Richland, WA (United States). May 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9505208–3: Pacific basin conference on hazardous waste, Alberta (Canada), 7-12 May 1995). Order Number DE95014179. Source: OSTI; NTIS; GPO Dep.

Waste logistics modeling is a powerful analytical technique that can be used for effective planning of future solid waste storage, treatment, and disposal activities. Proper waste management is essential for preventing unacceptable environmental degradation from ongoing operations, and is also a critical part of any environmental remediation activity. Logistics modeling allows for analysis of alternate scenarios for future waste flowrates and routings, facility schedules, and processing or handling capacities. Such analyses provide an increased understanding of the critical needs for waste storage, treatment, transport, and disposal while there is still adequate lead time to plan accordingly. They also provide a basis for determining the sensitivity of these critical needs to the various system parameters. This paper discusses the application of waste logistics modeling concepts to regional planning. In addition to ongoing efforts to aid in planning for a large industrial complex, the Pacific Northwest Laboratory (PNL) is currently involved in implementing waste logistics modeling as part of the planning process for material recovery and recycling within a multi-city region in the western US.

990 (PNL-SA–25207) **The comparison of element partitioning in two types of thermal treatment facilities and the effects on potential radiation dose.** Aaberg, R.L. (Pacific Northwest Lab., Richland, WA (United States)); Burger, L.L.; Baker, D.A.; Wallo, A. III; Vazquez, G.A.; Beck, W.L. Pacific Northwest Lab., Richland, WA (United States). May 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950542–4: 14. international symposium on thermal treatment technologies: incineration conference, Seattle, WA (United States), 8-12 May 1995). Order Number DE95014175. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is performing a technical analysis to support the potential development of risk-based, numerical radiological control criteria (RCC) for mixed waste from DOE operations. As part of the technical analysis, potential future radiation doses are being calculated for workers at thermal treatment facilities and members of the public residing near such facilities. This study compared two types of thermal treatment systems: a conventional combustion chamber with excess air, represented by a rotary kiln with afterburner, and an oxygen-deficient pyrolysis unit, represented by a plasma arc furnace. The purpose of the first part of this study is to estimate the partitioning for significant radionuclides and elements in the two types of thermal treatment systems. Excess-air systems are generally found to produce heavy-metal chlorides, oxides, and sulfates; plasma-arc systems tend to produce more volatile free metals. This difference causes a change in source term dominance from halide volatility to free metal volatility. Chemical thermodynamic methodology is used to estimate partitioning in the two treatment systems. The second part of the study examines how the potential radiation dose to workers handling residue materials is affected by partitioning of radionuclides at the different types of facilities.

991 (PNL-SA–25640) **Effect of temperature on perchloroethylene dechlorination by a methanogenic consortium.** Gao, J.; Skeen, R.S.; Hooker, B.S. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950483–3: 3. international in situ and on-site bioreclamation symposium, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE95014168. Source: OSTI; NTIS; GPO Dep.

The effect of temperature on the kinetics of growth, substrate metabolism, and perchloroethylene (PCE) dechlorination by a methanogenic consortium is reported. In all cases, a simple kinetic model accurately reflected experimental data. Values for the substrate and methane yield coefficients, and the maximum specific growth rate are fairly consistent at each temperature. Also, the substrate and methane yield coefficients show little temperature sensitivity. In contrast, both the maximum specific growth rate and the PCE dechlorination yield coefficient (Y_{PCE}) are temperature dependent.

992 (PNL-SA-25753) **A PC-based software package for modeling DOE mixed-waste management options.** Abashian, M.S. (IT Corp., Albuquerque, NM (United States)); Carney, C.; Schum, K. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-153: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95014171. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Headquarters and associated contractors have developed an IBM PC-based software package that estimates costs, schedules, and public and occupational health risks for a range of mixed-waste management options. A key application of the software package is the comparison of various waste-treatment options documented in the draft Site Treatment Plans prepared in accordance with the requirements of the Federal Facility Compliance Act of 1992. This automated Systems Analysis Methodology consists of a user interface for configuring complexwide or site-specific waste-management options; calculational algorithms for cost, schedule and risk; and user-selected graphical or tabular output of results. The mixed-waste management activities modeled in the automated Systems Analysis Methodology include waste storage, characterization, handling, transportation, treatment, and disposal. Analyses of treatment options identified in the draft Site Treatment Plans suggest potential cost and schedule savings from consolidation of proposed treatment facilities. This paper presents an overview of the automated Systems Analysis Methodology.

993 (PNL-SA-25764) **Vitrification development for mixed wastes.** Merrill, R.; Whittington, K.; Peters, R. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-154: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95014190. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification is a promising approach to waste-form immobilization. It destroys hazardous organic compounds and produces a durable and highly stable glass. Vitrification tests were performed on three surrogate wastes during fiscal year 1994; 183-H Solar Evaporation Basin waste from Hanford, bottom ash from the Oak Ridge TSCA incinerator, and saltcrete from Rocky Flats. Preliminary glass development involved melting trials followed by visual homogeneity examination, short-duration leach tests on glass specimens, and long-term leach tests on selected glasses. Viscosity and electrical conductivity measurements were taken for the most durable glass formulations. Results for the saltcrete are presented in this paper and demonstrate the applicability of vitrification technology to this mixed waste.

994 (PNL-SA-25844) **Nonthermal plasma technology for organic destruction.** Heath, W.O.; Birmingham, J.G. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950601-17: Annual meeting of the American Nuclear Society (ANS), Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95014188. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) is investigating the use of nonthermal, electrically driven plasmas for destroying organic contaminants near ambient temperatures and pressures. Three different plasma systems have been developed to treat organics in air, water, and soil. These systems are the Gas-Phase Corona Reactor (GPCR)III for treating air, the Liquid-Phase Corona Reactor for treating water, and In Situ Corona for treating soils. This presentation focuses on recent technical developments, commercial status, and project costs of OPCR as a cost-effective alternative to other air-purification technologies that are now in use to treat off-gases from site-remediation efforts as well as industrial emissions.

995 (PNL-SA-26015) **Vitrification of NAC process residue.** Merrill, R.A.; Whittington, K.F.; Peters, R.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950917-16: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96002717. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification tests have been performed with simulated waste compositions formulated to represent the residue which would be obtained from the treatment of low-level, nitrate wastes from Hanford and Oak Ridge by the nitrate to ammonia and ceramic (NAC) process. The tests were designed to demonstrate the feasibility of vitrifying NAC residue and to quantify the impact of the NAC process on the volume of vitrified waste. The residue from NAC treatment of low-level nitrate wastes consists primarily of oxides of aluminum and sodium. High alumina glasses were formulated to maximize the waste loading of the NAC product. Transparent glasses with up to 35 wt% alumina, and even higher contents in opaque glasses, were obtained at melting temperatures of 1200°C to 1400°C. A modified TCLP leach test showed the high alumina glasses to have good chemical durability, leaching significantly less than either the ARM-1 or the DWPF-EA high-level waste reference glasses. A significant increase in the final waste volume would be a major result of the NAC process on LLW vitrification. For Hanford wastes, NAC-treatment of nitrate wastes followed by vitrification of the residue will increase the final volume of vitrified waste by 50% to 90%; for Melton Valley waste from Oak Ridge, the increase in final glass volume will be 260% to 280%. The increase in volume is relative to direct vitrification of the waste in a 20 wt% Na_2O glass formulation. The increase in waste volume directly affects not only disposal costs, but also operating and/or capital costs. Larger plant size, longer operating time, and additional energy and additive costs are direct results of increases in waste volume. Such increases may be balanced by beneficial impacts on the vitrification process; however, those effects are outside the scope of this report.

996 (PNL-SA-26066) **Demonstrating and implementing innovative technologies: Case studies from the USDOE Office of Technology Development.** Brouns, T.M. (Pacific Northwest Lab., Richland, WA (United States)); Koegler, K.J.; Mamiya, L.S. Pacific Northwest Lab., Richland, WA (United States). Feb 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950216-136: Waste management '95,

Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95011492. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes elements of success for demonstration, evaluation, and transfer for deployment of innovative technologies for environmental restoration. They have been compiled from lessons learned through the US Department of Energy (DOE) Office of Technology Development's Volatile Organic Compounds in Arid Soil Integrated Demonstration (VOC-Arid ID). The success of the VOC-Arid ID program was determined by the rapid development demonstration, and transfer for deployment of technologies to operational sites that improve on safety, cost, and/or schedule of performance over baseline technologies. The VOC-Arid ID successfully fielded more than 25 innovative technology field demonstrations; several of the technologies demonstrated have been successfully transferred for deployment Field demonstration is a critical element in the successful transfer of innovative technologies into environmental restoration operations. The measures of success for technology demonstrations include conducting the demonstration in a safe and controlled environment and generating the appropriate information by which to evaluate the technology. However, field demonstrations alone do not guarantee successful transfer for deployment There are many key elements throughout the development and demonstration process that have a significant impact on the success of a technology. This paper presents key elements for a successful technology demonstration and transfer for deployment identified through the experiences of the VOC-Arid ID. Also, several case studies are provided as examples.

997 (PNL-SA-26147) **Application of macro material flow modeling to the decision making process for integrated waste management systems.** Vigil, S.A. (California Polytechnic State Univ., San Luis Obispo, CA (United States)); Holter, G.M. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9504119-1: Air & Waste Management Association international speciality conference on thermal treatment and waste-to-energy technologies for solid waste management, Washington, DC (United States), 18-21 Apr 1995). Order Number DE95014635. Source: OSTI; NTIS; INIS; GPO Dep.

Computer models have been used for almost a decade to model and analyze various aspects of solid waste management Commercially available models exist for estimating the capital and operating costs of landfills, waste-to-energy facilities and compost systems and for optimizing system performance along a single dimension (e.g. cost or transportation distance). An alternative to the use of currently available models is the more flexible macro material flow modeling approach in which a macro scale or regional level approach is taken. Waste materials are tracked through the complete integrated waste management cycle from generation through recycling and reuse, and finally to ultimate disposal. Such an approach has been applied by the authors to two different applications. The STELLA simulation language (for Macintosh computers) was used to model the solid waste management system of Puerto Rico. The model incorporated population projections for all 78 municipalities in Puerto Rico from 1990 to 2010, solid waste generation factors, remaining life for the existing landfills, and projected startup time for new facilities. The Pacific Northwest Laboratory has used the SimScript simulation language (for Windows computers) to model the management of solid and hazardous wastes produced during cleanup and remediation activities at the Hanford Nuclear Site.

998 (PNL-SA-26246) **Liquid Effluent Monitoring Program at the Pacific Northwest Laboratory.** Ballinger, M.Y. Pacific Northwest Lab., Richland, WA (United States). May 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9505101-9: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE95015826. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) is conducting a program to monitor the waste water from PNL-operated research and development facilities on the Hanford Site. The purpose of the program is to collect data to assess administrative controls and to determine whether discharges to the process sewer meet sewer criteria. Samples have been collected on a regular basis from the major PNL facilities on the Hanford Site since March 1994. A broad range of analyses has been performed to determine the primary constituents in the liquid effluent. The sampling program is briefly summarized in the paper. Continuous monitoring of pH, conductivity, and flow also provides data on the liquid effluent streams. In addition to sampling and monitoring, the program is evaluating the dynamics of the waste stream with dye studies and is evaluating the use of newer technologies for potential deployment in future sampling/monitoring efforts. Information collected to date has been valuable in determining sources of constituents that may be higher than the Waste Acceptance Criteria (WAC) for the Treated Effluent Disposal Facility (TEDF). This facility treats the waste streams before discharge to the Columbia River.

999 (PNL-SA-26455) **Large-scale multimedia modeling applications.** Droppo, J.G. Jr.; Buck, J.W.; Whelan, G.; Strenge, D.L.; Castleton, K.J.; Gelston, G.M. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9507119-7: Summer national meeting of the American Institute of Chemical Engineers, Boston, MA (United States), 30 Jul - 2 Aug 1995). Order Number DE96002615. Source: OSTI; NTIS; INIS; GPO Dep.

Over the past decade, the US Department of Energy (DOE) and other agencies have faced increasing scrutiny for a wide range of environmental issues related to past and current practices. A number of large-scale applications have been undertaken that required analysis of large numbers of potential environmental issues over a wide range of environmental conditions and contaminants. Several of these applications, referred to here as large-scale applications, have addressed long-term public health risks using a holistic approach for assessing impacts from potential waterborne and airborne transport pathways. Multimedia models such as the Multimedia Environmental Pollutant Assessment System (MEPAS) were designed for use in such applications. MEPAS integrates radioactive and hazardous contaminants impact computations for major exposure routes via air, surface water, ground water, and overland flow transport. A number of large-scale applications of MEPAS have been conducted to assess various endpoints for environmental and human health impacts. These applications are described in terms of lessons learned in the development of an effective approach for large-scale applications.

1000 (PNNL–10913) **Stakeholder acceptance analysis: Tunable hybrid plasma.** Peterson, T. Battelle Seattle Research Center, WA (United States). Dec 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (BSRC–800/95/020). Order Number DE96005842. Source: OSTI; NTIS; INIS; GPO Dep.

This report resents evaluations, recommendations, and requirements concerning Tunable Hybrid Plasma (THP) derived from a three-year program of stake holder involvement. THP destroys volatile organic compounds by directing a moderate energy electron beam into a flow of air containing organic contaminants. This report is for technology developers and for those responsible for making decisions about the use of technology to remediate contamination by volatile organic compounds. Stakeholders' perspectives help those responsible for technology deployment make good decisions concerning the acceptability and applicability of THP to the remediation problems the face. In addition, this report presents data requirements for the technology's field demonstration defined by stakeholders associated with the Hanford site in Washington State, as well as detailed comments on THP from stakeholders from four other sites throughout the western United States.

1001 (PNNL–10947) **Sulfur polymer cement as a low-level waste glass matrix encapsulant.** Sliva, P. (and others); Peng, Y.B.; Peeler, D.K. Pacific Northwest Lab., Richland, WA (United States). Jan 1996. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96006587. Source: OSTI; NTIS; INIS; GPO Dep.

Sulfur polymer cement (SPC) is being considered as a matrix encapsulant for the Hanford low-level (activity) waste glass. SPC is an elemental sulfur polymer-stabilized thermoplastic that is fluid at 120 °C to 140°C. The candidate process would encapsulate the waste glass by mixing the glass cullet with the SPC and casting it into the container. As the primary barrier to groundwater and a key factor in controlling the local environment of the disposal system after it has been compromised, SPC plays a key role in the waste form's long-term performance assessment. Work in fiscal year 1995 targeted several technical areas of matrix encapsulation involving SPC. A literature review was performed to evaluate potential matrix-encapsulant materials. The dissolution and corrosion behavior of SPC under static conditions was determined as a function of temperature, pH, and sample surface area/solution volume. Preliminary dynamic flow-through testing was performed. SPC formulation and properties were investigated, including controlled crystallization, phase formation, modifying polymer effects on crystallization, and SPC processibility. The interface between SPC and simulated LLW glass was examined. Interfacial chemistry and stability, the effect of water on the glass/SPC interface, and the effect of molten sulfur on the glass surface chemistry were established. Preliminary scoping experiments, involving SPC's Tc gettering capabilities were performed. Compressive strengths of SPC and SPC/glass composites, both before and after lifetime radiation dose exposure, were determined.

1002 (PNNL–11052) **Volatility literature of chlorine, iodine, cesium, strontium, technetium, and rhenium; technetium and rhenium volatility testing.** Langowski, M.H.; Darab, J.G.; Smith, P.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-03G). Order Number DE96008860. Source: OSTI; NTIS; INIS; GPO Dep.

A literature review pertaining to the volatilization of Sr, Cs, Tc (and its surrogate Re), Cl, I and other related species during the vitrification of Hanford Low Level Waste (LLW) streams has been performed and the relevant information summarized. For many of these species, the chemistry which occurs in solution prior to the waste stream entering the melter is important in dictating their loss at higher temperatures. In addition, the interactive effects between the species being lost was found to be important. A review of the chemistries of Tc and Re was also performed. It was suggested that Re would indeed act as an excellent surrogate for Tc in non-radioactive materials testing. Experimental results on Tc and Re loss from sodium aluminoborosilicate melts of temperatures ranging from 900–1350°C performed at PNL are reported and confirm that Re behaves in a nearly identical manner to that of technetium.

1003 (PNNL–11053) **Letter report: Minor component study for low-level radioactive waste glasses.** Li, H. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-01B). Order Number DE96008814. Source: OSTI; NTIS; INIS; GPO Dep.

During the waste vitrification process, troublesome minor components in low-level radioactive waste streams could adversely affect either waste vitrification rate or melter life-time. Knowing the solubility limits for these minor components is important to determine pretreatment options for waste streams and glass formulation to prevent or to minimize these problems during the waste vitrification. A joint study between Pacific Northwest Laboratory and Rensselaer Polytechnic Institute has been conducted to determine minor component impacts in low-level nuclear waste glass.

1004 (PNNL–11055) **Low-level waste vitrification pilot-scale system need report.** Morrissey, M.F.; Whitney, L.D. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C94-22-02D). Order Number DE96008429. Source: OSTI; NTIS; INIS; GPO Dep.

This report examines the need for pilot-scale testing in support of the low-level vitrification facility at Hanford. In addition, the report examines the availability of on-site facilities to contain a pilot-plant. It is recommended that a non-radioactive pilot-plant be operated for extended periods. In addition, it is recommended that two small-scale systems, one processing radioactive waste feed and one processing a simulated waste feed be used for validation of waste simulants. The actual scale of the pilot-plant will be determined from the technologies included in conceptual design of the plant. However, for the purposes of this review, a plant of 5 to 10 metric ton/day of glass production was assumed. It is recommended that a detailed data needs package and integrated flowsheet be developed in FY95 to clearly identify data requirements and identify relationships with other TWRS elements. A pilot-plant will contribute to the reduction of uncertainty in the design and initial operation of the vitrification facility to an acceptable level. Prior to pilot-scale testing, the components will not have been operated as an integrated system and will not have been tested for extended operating periods. Testing for extended periods at pilot-scale will allow verification of the flowsheet including the effects of recycle streams. In addition, extended testing will allow evaluation of wear, corrosion and mechanical reality of individual components, potential accumulations within the components, and the sensitivity of the process to operating conditions. Also, the pilot facility will provide evidence that the facility will meet radioactive and nonradioactive environmental release limits, and increase the confidence in scale-up. The pilot-scale testing data and resulting improvements in the vitrification facility design will reduce the time required for cold chemical testing in the vitrification facility.

1005 (PNNL–11056) **Process system evaluation-consolidated letters. Volume 1. Alternatives for the off-gas treatment system for the low-level waste vitrification process.** Peurrung, L.M.; Deforest, T.J; Richards, J.R. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008184. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides an evaluation of alternatives for treating off-gas from the low-level waste (LLW) melter. The study used expertise obtained from the commercial nonradioactive off-gas treatment industry. It was assumed that contact maintenance is possible, although the subsequent risk to maintenance personnel was qualitatively considered in selecting equipment. Some adaptations to the alternatives described may be required, depending on the extent of contact maintenance that can be achieved. This evaluation identified key issues for the off-gas system design. To provide background information, technology reviews were assembled for various classifications of off-gas treatment equipment, including off-gas cooling, particulate control, acid gas control, mist elimination, NO_x reduction, and SO_2 removal. An order-of-magnitude cost estimate for one of the off-gas systems considered is provided using both the off-gas characteristics associated with the Joule-heated and combustion-fired melters. The key issues identified and a description of the preferred off-gas system options are provided below. Five candidate treatment systems were evaluated. All of the systems are appropriate for the different melting/feed preparations currently being considered. The lowest technical risk is achieved using option 1, which is similar to designs for high-level waste (HLW) vitrification in the Hanford Waste Vitrification Project (HWVP) and the West Valley. Demonstration Project. Option 1 uses a film cooler, submerged bed scrubber (SBS), and high-efficiency mist eliminator (HEME) prior to NO_x reduction and high-efficiency particulate air (HEPA) filtration. However, several advantages were identified for option 2, which uses high-temperature filtration. Based on the evaluation, option 2 was identified as the preferred alternative. The characteristics of this option are described below.

1006 (PNNL–11057) **Letter report: Pre-conceptual design study for a pilot-scale Non-Radioactive Low-Level Waste Vitrification Facility.** Thompson, R.A.; Morrissey, M.F. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 164p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–T3B-95-212). Order Number DE96008338. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a pre-conceptual design study for a Non-Radioactive Low-Level Waste, Pilot-Scale Vitrification System. This pilot plant would support the development of a full-scale LLW Vitrification Facility and would ensure that the full-scale facility can meet its programmatic objectives. Use of the pilot facility will allow verification of process flowsheets, provide data for ensuring product quality, assist in scaling to full scale, and support full-scale start-up. The facility will vitrify simulated non-radioactive LLW in a manner functionally prototypic to the full-scale facility. This pre-conceptual design study does not fully define the LLW Pilot-Scale Vitrification System; rather, it estimates the funding required to build such a facility. This study includes identifying all equipment necessary. to prepare feed, deliver it into the melter, convert the feed to glass, prepare emissions for atmospheric release, and discharge and handle the glass. The conceived pilot facility includes support services and a structure to contain process equipment.

1007 (PNNL–11116) **Low-level tank waste simulant data base.** Lokken, R.O. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011464. Source: OSTI; NTIS; INIS; GPO Dep.

The majority of defense wastes generated from reprocessing spent N- Reactor fuel at Hanford are stored in underground Double-shell Tanks (DST) and in older Single-Shell Tanks (SST) in the form of liquids, slurries, sludges, and salt cakes. The tank waste remediation System (TWRS) Program has the responsibility of safely managing and immobilizing these tank wastes for disposal. This report discusses three principle topics: the need for and basis for selecting target or reference LLW simulants, tanks waste analyses and simulants that have been defined, developed, and used for the GDP and activities in support of preparing and characterizing simulants for the current LLW vitrification project. The procedures and the data that were generated to characterized the LLW vitrification simulants were reported and are presented in this report. The final section of this report addresses the applicability of the data to the current program and presents recommendations for additional data needs including characterization and simulant compositional variability studies.

1008 (SAND–94-1639) **TOUGH2 simulations of the TEVES Project including the behavior of a single-component NAPL.** Webb, S.W. (Sandia National Labs., Albuquerque, NM (United States). Geohydrology Dept.). Sandia National Labs., Albuquerque, NM (United States). May 1996. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96013676. Source: OSTI; NTIS; INIS; GPO Dep.

The TEVES (Thermal Enhanced Vapor Extraction System) Project is a demonstration of a process designed to extract solvents and chemicals contained in the Chemical Waste Landfill at Sandia National Laboratories. In this process, the ground is electrically heated, and borehole(s) within the heated zone are maintained at a vacuum to draw air and evaporated contaminants into the borehole and a subsequent treatment facility. TOUGH2 simulations have been performed to evaluate the fluid flow and heat transfer behavior of the system. The TOUGH2 version used in this study includes air, water, and a single-component non-aqueous phase liquid (NAPL). In the present simulations, an initial o-xylene inventory is assumed in the heated zone for illustration purposes. Variation in borehole (vapor extraction) vacuum, borehole location, and soil permeability were investigated. Simulations indicate that the temperatures in the soil are relatively insensitive to the magnitude of the borehole vacuum or the borehole locations. In contrast, however, the NAPL and liquid water saturation distributions are sensitive to these borehole parameters. As the borehole vacuum and air flow rate through the soil decrease, the possibility of contaminant (NAPL) migration from the heated zone into the surrounding unheated soil increases. The borehole location can also affect the likelihood of contaminant movement into the unheated soil.

1009 (SAND–94-2340) **Off site demonstrations for MWLID technologies.** Williams, C. (Sandia National Labs., Albuquerque, NM (United States)); Gruebel, R. Sandia National Labs., Albuquerque, NM (United States). Apr 1995. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95011835. Source: OSTI; NTIS; INIS; GPO Dep.

Open demonstrations of technologies developed by the Office of Technology Development's (QTD's) Mixed Waste Landfill Integrated Demonstration (MWLID) should facilitate regulatory acceptance and speed the transfer and commercialization of these technologies. The purpose of the present project is to identify the environmental restoration needs of hazardous waste and/or mixed waste landfill owners within a 25-mile radius of Sandia National Laboratories (SNL). Most municipal landfills that operated prior to the mid-1980s accepted household/commercial hazardous waste and medical waste that included low-level radioactive waste. The locations of hazardous and/or mixed waste landfills within the State of New Mexico were. identified using federal, state, municipal and Native American tribal environmental records. The records reviewed included the US Environmental Protection Agency (EPA) Superfund Program CERCLIS Event/Site listing (which includes tribal records), the New Mexico Environment Department (NMED), Solid Waste Bureau mixed waste landfill database, and the City of Albuquerque Environmental Health Department landfill database. Tribal envirorunental records are controlled by each tribal government, so each tribal environmental officer and governor was contacted to obtain release of specific site data beyond what is available in the CERCLIS listings.

1010 (SAND–94-2643C) **Characterization of indoor and outdoor pool fires with active calorimetry.** Koski, J.A. (Sandia National Labs., Albuquerque, NM (United States)); Gill, W.; Gritzo, L.A.; Kent, L.A.; Wix, S.D. Sandia National Labs., Albuquerque, NM (United States). [1994]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950828–3: 1995 National heat transfer conference, Portland, OR (United States), 5-9 Aug 1995). Order Number DE95006315. Source: OSTI; NTIS; INIS; GPO Dep.

A water cooled, 1 m × 1 m, vertical calorimeter panel has been used in conjunction with other fire diagnostics to characterize a 6 m × 6 m outdoor and three 3 m × 3 m indoor JP-4 pool fires. Measurements reported include calorimeter surface heat flux and surface temperatures, flame temperatures, and gas flow velocities in the fire. From the data, effective radiative absorption coefficients for various zones in the fires have been estimated. The outdoor test was conducted at Sandia's Coyote Canyon test facility, while indoor tests were conducted at the indoor SMokE Reduction Facility (SMERF) at the same location. The measurements provide data useful in calibrating simple analytic fire models intended for the analysis of packages containing hazardous materials.

1011 (SAND–94-2728) **Framework for DOE mixed low-level waste disposal: Site fact sheets.** Gruebel, M.M.; Waters, R.D.; Hospelhorn, M.B.; Chu, M.S.Y. (eds.). Sandia National Labs., Albuquerque, NM (United States). Nov 1994. 315p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95008800. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is required to prepare and submit Site Treatment Plans (STPS) pursuant to the Federal Facility Compliance Act (FFCAct). Although the FFCAct does not require that disposal be addressed in the STPS, the DOE and the States recognize that treatment of mixed low-level waste will result in residues that will require disposal in either low-level waste or mixed low-level waste disposal facilities. As a result, the DOE is working with the States to define and develop a process for evaluating disposal-site suitability in concert with the FFCAct and development of the STPS. Forty-nine potential disposal sites were screened; preliminary screening criteria reduced the number of sites for consideration to twenty-six. The DOE then prepared fact sheets for the remaining sites. These fact sheets provided additional site-specific information for understanding the strengths and weaknesses of the twenty-six sites as potential disposal sites. The information also provided the basis for discussion among affected States and the DOE in recommending sites for more detailed evaluation.

1012 (SAND–94-3188C) **Successful remediation of four uranium calibration pits at Technical Area II, Sandia National Laboratories, Albuquerque, New Mexico, USA.** Conway, R. (Sandia National Labs., Albuquerque, NM (United States)); Wade, M.; Tharp, T.; Copland, J. Sandia National Labs., Albuquerque, NM (United States). [1994]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950917–1: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE95006308. Source: OSTI; NTIS; INIS; GPO Dep.

The first remediation of an Environmental Restoration (ER) Project site at Sandia National Laboratories (SNL) was successfully conducted in May and June 1994 at Technical Area II. The removal action involved four Uranium Calibration Pits (UCPs) filled with radioactive or hazardous materials. The concrete culvert pits were used to test and calibrate borehole radiometric logging tools for uranium exploration. The removal action consisted of excavating and containerizing the pit contents and contaminated soil beneath the culverts, removing the four culverts, and backfilling the excavation. Each UCP removal had unique complexities. Sixty 208-L drums of solid radioactive waste and eight 208-L drums of liquid hazardous waste were generated during the VCM. Two of the concrete culverts will be disposed as radioactive waste and two as solid waste. Uranium-238 was detected in UCP-2 ore material at 746 pci/g, and at 59 pci/g in UCP-1 silica sand. UCP-4 was empty; sludge from UCP-3 contained 122 mg/L (ppm) chromium.

1013 (SAND–95-0188C) **Mixed waste chemical compatibility: A testing program for plastic packaging components.** Nigrey, P.J. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–6: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003097. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of hazardous and radioactive materials packaging is to enable these materials to be transported without posing a threat to the health or property of the general public. To achieve this aim, regulations in the United States have been written establishing general design requirements for such packagings. While no regulations have been written specifically for mixed waste packaging, regulations for the constituents of mixed wastes, i.e., hazardous and radioactive substances, have been codified by the US Department of Transportation (DOT, 49 CFR 173) and the US Nuclear Regulatory Commission (NRC, 10 CFR 71). The design requirements for both hazardous [49 CFR 173.24 (e)(1)] and radioactive [49 CFR 173.412 (g)] materials packaging specify packaging compatibility, i.e., that the materials of the packaging @d any contents be chemically compatible with each other. Furthermore, Type A [49 CFR 173.412 (g)] and Type B (10 CFR 71.43) packaging design requirements stipulate that there be no significant chemical, galvanic, or other reaction between the materials and contents of the package. Based on these requirements, a Chemical Compatibility Testing Program was developed in the Transportation Systems Department at Sandia National Laboratories (SNL). The program attempts to assure any regulatory body that the issue of packaging material compatibility towards hazardous and radioactive materials has been addressed. This program has been described in considerable detail in an internal SNL document, the Chemical Compatibility Test Plan & Procedure Report (Nigrey 1993).

1014 (SAND–95-0208C) **Corrosion resistance of candidate transportation container materials.** Maestas, L.M.; Sorensen, N.R.; McAllaster, M.E. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–24: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003658. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy is currently remediating several sites that have been contaminated over the years with hazardous, mixed waste and radioactive materials. Regulatory guidelines require strict compliance demonstrating public safety during remediation and the transport of these hazardous, mixed waste and radioactive materials. The compatibility of the metallic transportation containers with the contents they are designed to transport is an ultimate concern that must be satisfied to ensure public safety. The transportation issue is inherently complicated due to the complex, varied, and unknown composition of the hazardous, mixed and radioactive waste that is being, considered for transport by the DOE facilities. Never before have the interactions between the waste being transported and the materials that comprise the transportation packages been more important. Therefore, evaluation of material performance when subjected to a simulated waste will ensure that all regulatory issues and requirements for transportation of hazardous, mixed, and radioactive wastes are satisfied. The tasks encompassed by this study include defining criteria for candidate material selection, defining a test matrix that will provide pertinent information on the material compatibility with the waste stimulant, and evaluation of material performance when subjected to a stimulant waste. Our goal is to provide package design engineers with a choice of materials which exhibit enhanced performance upon exposure to hazardous, mixed, and radioactive waste that is similar in composition to the waste stimulant used in this study. Due to the fact that there are many other possible waste compositions, additional work needs to be done to broaden our materials compatibility/waste stream data base.

1015 (SAND–95-0789C) **DOE's Innovative Treatment Remediation Demonstration Program accelerating the implementation of innovative technologies.** Hightower, M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950868–5: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95015853. Source: OSTI; NTIS; INIS; GPO Dep.

A program to help accelerate the adoption and implementation of new and innovative remediation technologies has been initiated by the Department of Energy's (DOE) Environmental Restoration Program Office (EM40). Developed as a Public-Private Partnership program in cooperation with the US Environmental Protection Agency's (EPA) Technology Innovation Office (TIO) and coordinated by Sandia National Laboratories, the Innovative Treatment Remediation Demonstration (ITRD) Program attempts to reduce many of the classic barriers to the use of new technologies by involving government, industry, and regulatory agencies in the assessment, implementation, and validation of innovative technologies. In this program, DOE facilities work cooperatively with EPA, industry, national laboratories, and state and federal regulatory agencies to establish remediation demonstrations using applicable innovative technologies at their sites. Selected innovative technologies are used to remediate small, one to two acre, sites to generate the full-scale and real-world operating, treatment performance, and cost data needed to validate these technologies and gain acceptance by industry and regulatory agencies, thus accelerating their use nationwide. Each ITRD project developed at a DOE site is designed to address a typical soil or groundwater contamination issue facing both DOE and industry. This includes sites with volatile organic compound (VOC), semi-VOC, heavy metal, explosive residue, and complex or multiple constituent contamination. Projects are presently underway at three DOE facilities, while additional projects are under consideration for initiation in FY96 at several additional DOE sites. A brief overview of the ITRD Program, program plans, and the status and progress of existing ITRD projects are reviewed in this paper.

1016 (SAND–95-1084C) **Modeling of capillary barriers and comparison to data.** Webb, S.W.; Stormont, J.C. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9503116–11: 1995 TOUGH workshop, Berkeley, CA (United States), 20-22 Mar 1995). Order Number DE95013027. Source: OSTI; NTIS; GPO Dep.

Measurements of capillary barrier performance have been conducted in above-grade wooden structures (boxes) configured to measure the water balance. The capillary-barrier portion of the boxes is 6.0 m long, 2.0 m wide, and 1.2 m high with a slope of 5%. A coarse-grained material was placed in the bottom 25-cm of the box with a 90-cm deep fine-grained material (local soil) on top. A region for laterally diverted water to accumulate and drain was created in the last 1.0 m of the box. The soil at the top is terraced into five, 1.4 m long, level intervals to prevent runoff when adding water. Water is added uniformly to the entire top of the box at a rate of about 66 l/day, or an infiltration rate of 1.7 m/year.

The top of the box is covered with fiber-reinforced plastic to minimize evaporation of water, discourage plant growth, and prevent rainfall from contacting the soil. Five drains are spaced along the bottom of the coarse layer. These drains discretize the coarse layer into five collection regions to provide a means of identifying the breakthrough location into the coarse layer. A drain is also located in the downdip collection region of the box. Soil moisture changes were measured in the fine-grained material with a frequency-domain reflectometry (FDR) probe, which was calibrated using soil from the field site at a known moisture content and density.

1017 (SAND-95-1356) **Passive and active soil gas sampling at the Mixed Waste Landfill, Technical Area III, Sandia National Laboratories/New Mexico.** McVey, M.D. (GRAM, Inc., Albuquerque, NM (United States)); Goering, T.J.; Peace, J.L. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96008036. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Project at Sandia National Laboratories, New Mexico is tasked with assessing and remediating the Mixed Waste Landfill in Technical Area III. The Mixed Waste Landfill is a 2.6 acre, inactive radioactive and mixed waste disposal site. In 1993 and 1994, an extensive passive and active soil gas sampling program was undertaken to identify and quantify volatile organic compounds in the subsurface at the landfill. Passive soil gas surveys identified levels of PCE, TCE, 1,1, 1-TCA, toluene, 1,1,2-trichlorotrifluoroethane, dichloroethyne, and acetone above background. Verification by active soil gas sampling confirmed concentrations of PCE, TCE, 1,1,1-TCA, and 1,1,2-trichloro-1,2,2-trifluoroethane at depths of 10 and 30 feet below ground surface. In addition, dichlorodifluoroethane and trichlorofluoromethane were detected during active soil gas sampling. All of the volatile organic compounds detected during the active soil gas survey were present in the low ppb range.

1018 (SAND-95-1609) **Application of non-intrusive geophysical techniques at the Mixed Waste Landfill, Technical Area 3, Sandia National Laboratories, New Mexico.** Peace, J.L. (Sandia National Labs., Albuquerque, NM (United States). Environmental Restoration Project); Hyndman, D.A.; Goering, T.J. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010900. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Project at Sandia National Laboratories, New Mexico is tasked with assessment and remediation of the Mixed Waste Landfill in Technical Area 3. The Mixed Waste Landfill is an inactive radioactive and mixed waste disposal site. The landfill contains disposal pits and trenches of questionable location and dimension. Non-intrusive geophysical techniques were utilized to provide an effective means of determining the location and dimension of suspected waste disposal trenches before Resource Conservation and Recovery Act intrusive assessment activities were initiated. Geophysical instruments selected for this investigation included a Geonics EM-31 ground conductivity meter, the new Geonics EM-61 high precision, time-domain metal detector, and a Geometrics 856 total field magnetometer. The results of these non-intrusive geophysical techniques were evaluated to enhance the efficiency and cost-effectiveness of future waste-site investigations at Environmental Restoration Project sites.

1019 (SAND-95-1611) **Tritium in surface soils at the Mixed Waste Landfill, Technical Area 3, Sandia National Laboratories, New Mexico.** Peace, J.L. (Sandia National Labs., Albuquerque, NM (United States). Environmental Restoration Project); Goering, T.J.; McVey, M.D. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96009071. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Project at Sandia National Laboratories, New Mexico is tasked with assessment and remediation of the Mixed Waste Landfill in Technical Area 3. The Mixed Waste Landfill is an inactive, low-level radioactive and mixed waste disposal site. The Mixed Waste Landfill was subject to an extensive surface soil sampling program for tritium in July 1993. Results indicate that surface soils at the landfill contain significant levels of tritium. The classified area of the landfill contains the highest levels of tritium. Results also indicate that tritium has migrated beyond the fenced boundary of the classified area of the landfill.

1020 (SAND-95-1637) **Analysis of instantaneous profile test data from soils near the Mixed Waste Landfill, Technical Area 3, Sandia National Laboratories/New Mexico.** Goering, T.J. (GRAM, Inc., Albuquerque, NM (United States)); McVey, M.D.; Strong, W.R.; Peace, J.L. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96008037. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the results of an instantaneous profile test conducted near the Mixed Waste Landfill at Sandia National Laboratories/New Mexico. The purpose of the test was to measure the unsaturated hydraulic properties of soils near the Mixed Waste Landfill, including the relations between hydraulic conductivity, moisture content, and soil water tension. A 4.7 meter by 4.7 meter plot was saturated with water to a depth of 2 meters, and the wetting and drying responses of the vertical profile were observed. These data were analyzed to obtain in situ measurements of the unsaturated hydraulic properties.

1021 (SAND-95-2060) **SEAMIST™ in-situ instrumentation and vapor sampling system applications in the Sandia Mixed Waste Landfill Integrated Demonstration program: Final report.** Williams, C. (Sandia National Labs., Albuquerque, NM (United States). Environmental Restoration Technologies); Lowry, W.; Cremer, D.; Dunn, S.D. Sandia National Labs., Albuquerque, NM (United States). Sep 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96001760. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Landfill Integrated Demonstration was tasked with demonstrating innovative technologies for the cleanup of chemical and mixed waste landfills that are representive of sites occurring throughout the DOE complex and the nation. The SEAMIST™ inverting membrane deployment system has been used successfully at the Mixed Waste Landfill Integrated Demonstration (MWLID) for multipoint vapor sampling, pressure measurement, permeability measurement, sensor integration demonstrations, and borehole lining. Several instruments were deployed inside the SEAMIST™-lined boreholes to detect metals, radionuclides, moisture, and geologic variations. The liner protected the instruments from contamination, maintained support of the uncased borehole wall, and sealed the total borehole from air circulation. Recent activities included the installation of three multipoint vapor sampling systems and sensor integration systems in 100-foot-deep vertical boreholes. A long term pressure monitoring program has recorded barometric pressure effects at depth with relatively high spatial resolution. The SEAMIST™ system has been integrated with a variety of hydrologic and chemical sensors for in-situ measurements, demonstrating its versatility as an instrument deployment system that allows easy emplacement and removal. Standard SEAMIST™ vapor sampling systems were also integrated with state-of-the-art volatile organic compound analysis technologies. The results and status of these demonstration tests are presented.

1022 (SAND–95-2216C) **A proposed alternative approach for protection of inadvertent human intruders from buried Department of Energy low level radioactive wastes.** Cochran, J.R. Sandia National Labs., Albuquerque, NM (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–45: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006398. Source: OSTI; NTIS; INIS; GPO Dep.

The burial of radioactive wastes creates a legacy. To limit the impact of this legacy on future generations, we establish and comply with performance objectives. This paper reviews performance objectives for the long-term isolation of buried radioactive wastes; identifies regulatorly-defined performance objectives for protecting the inadvertent human intruder (IHI) from buried low-level radioactive waste (LLW); (3) discusses a shortcoming of the current approach; and (4) offers an alternative approach for protecting the IHI. This alternative approach is written specifically for the burial of US Department of Energy (DOE) wastes at the Nevada Test Site (NTS), although the approach might be applied at other DOE burial sites.

1023 (SAND–95-2583C) **Scoping evaluation of the technical capabilities of DOE sites for disposal of mixed low-level waste. Examples: Sandia National Laboratories and Los Alamos National Laboratory.** Gruebel, M.R. (Tech Reps, Inc., Albuquerque, NM (United States)); Parsons, A.M.; Waters, R.D. Sandia National Labs., Albuquerque, NM (United States). 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9603129–1: 1996 New Mexico conference on the environment, Albuquerque, NM (United States), 12-14 Mar 1996). Order Number DE96007059. Source: OSTI; NTIS; INIS; GPO Dep.

The disposal of mixed low-level waste has become an issue for the U.S. Department of Energy and the States since the inception of the Federal Facilities Compliance Act in 1992. Fifteen sites, including Sandia National Laboratories (SNL) and Los Alamos National Laboratory (LANL), have been evaluated to estimate their technical capabilities for disposal of this type of waste after it has been subjected to treatment processes. The analyses were designed to quantify the maximum permissible concentrations of radioactive and hazardous constituents in mixed low-level waste that could potentially be disposed of in a facility at one of the fifteen sites and meet regulatory requirements. The evaluations provided several major insights about the disposal of mixed low-level waste. All of the fifteen sites have the technical capability for disposal of some waste. Maximum permissible concentrations for the radioactive component of the waste at and sites such as SNL and LANL are almost exclusively determined by pathways other than through groundwater. In general, for the hazardous component of the waste, travel times through groundwater to a point 100 meters from the disposal facility are on the order of thousands of years. The results of the evaluations will be compared to actual treated waste that may be disposed of in a facility at one of these fifteen evaluated sites. These comparisons will indicate which waste streams may exceed the disposal limitations of a site and which component of the waste limits the technical acceptability for disposal. The technical analyses provide only partial input to the decision-making process for determining the disposal sites for mixed low-level waste. Other, less quantitative factors such as social and political issues will also be considered.

1024 (SAND–95-2934C) **Update on the Federal Facilities Compliance Act disposal workgroup disposal site evaluation - what has worked and what has not.** Case, J.T.; Waters, R.D. Sandia National Labs., Albuquerque, NM (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951209–8: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96004302. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has been developing a planning process for mixed low-level waste (MLLW) disposal in conjunction with the affected states for over two years and has screened the potential disposal sites from 49 to 15. A radiological performance evaluation was conducted on these fifteen sites to further identify their strengths and weaknesses for disposal of MLLW. Technical analyses are on-going. The disposal evaluation process has sufficiently satisfied the affected states' concerns to the point that disposal has not been a major issue in the consent order process for site treatment plans. Additionally, a large amount of technical and institutional information on several DOE sites has been summarized. The relative technical capabilities of the remaining fifteen sites have been demonstrated, and the benefits of waste form and disposal facility performance have been quantified. However, the final disposal configuration has not yet been determined. Additionally, the MLLW disposal planning efforts will need to integrate more closely with the low-level waste disposal activities before a final MLLW disposal configuration can be determined. Recent Environmental Protection Agency efforts related to the definition of hazardous wastes may also affect the process.

1025 (SAND–96-0113) **Report on the treatability study for inerting small quantities of radioactive explosives and explosive components.** Loyola, V.M.; Reber, S.D. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96006197. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of Sandia's radiation hardening testing on a variety of its explosive components, radioactive waste streams were generated and have to be disposed of as radioactive waste. Due to the combined hazards of explosives and radioactivity, Sandia's Radioactive and Mixed Waste Management organization did not have a mechanism for disposal of these waste streams. This report documents the study done to provide a method for the removal of the explosive hazard from those waste streams. The report includes the design of the equipment used, procedures followed, results from waste stream analog tests and the results from the actual explosive inerting tests on radioactive samples. As a result of the inerting treatment, the waste streams were rendered non-explosive and, thus, manageable through normal radioactive waste disposal channels.

1026 (SAND–96-0294C) **On-site vs off-site management of environmental restoration waste: A cost effectiveness analysis.** Morse, M.A. (Terradigm, Inc., Albuquerque, NM (United States)); Aamodt, P.L.; Cox, W.B. Sandia National Labs., Albuquerque, NM (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–57: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007341. Source: OSTI; NTIS; INIS; GPO Dep.

The Sandia National Laboratories Environmental Restoration Project is expected to generate relatively large volumes of hazardous waste as a result of cleanup operations. These volumes will exceed the Laboratories existing waste management capacity. This paper presents four options for managing remediation wastes, including three alternatives for on-site waste management utilizing a corrective action management unit (CAMU). Costs are estimated for each of the four options based on current volumetric estimates of hazardous waste. Cost equations are derived for each of the options with the variables being waste volumes, the major unknowns in the analysis. These equations provide a means to update cost estimates as volume estimates change. This approach may be helpful to others facing similar waste management decisions.

1027 (SAND–96-0297C) **Stabilization of liquid low-level and mixed wastes: a treatability study.** Carson, S.; Cheng, Yu-Cheng; Yellowhorse, L.; Peterson, P. Sandia National Labs., Livermore, CA (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–11: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007428. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study has been conducted on liquid low-level and mixed wastes using the stabilization agents Aquaset, Aquaset II, Aquaset II-H, Petroset, Petroset-H, and Petroset and Petroset II. A total of 40 different waste types with activities ranging from 10^{-14} to 10^{-4} curies/ml have been stabilized. Reported data for each waste include its chemical and radiological composition and the optimum composition or range of compositions (weight of agent/volume of waste) for each stabilization agent used. All wastes were successfully stabilized with one or more of the stabilization agents and all final waste forms passed the Paint Filter Liquids Test (EPA Method 9095).

1028 (SAND–96-0377C) **Scoping analysis of toxic metal performance in DOE low-level waste disposal facilities.** Waters, R.D; Bougai, D.A.; Pohl, P.I. Sandia National Labs., Albuquerque, NM (United States). [1996]. 13p. Sponsored by USDOE, Washington, DC (United States);National Academy of Sciences, Washington, DC (United States);National Research Council, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–46: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006479. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides a scoping safety assessment for disposal of toxic metals contained in Department of Energy (DOE) mixed low-level waste (MLLW) at six DOE sites that currently have low-level waste (LLW) disposal facilities–Savannah River Site, Oak Ridge Reservation, Los Alamos National Laboratory, Hanford Reservation, Nevada Test Site, and Idaho National Engineering Laboratory. The study has focused on the groundwater contaminant pathway, which is considered to be the dominant human exposure pathway from shallow land MLLW disposal. A simple and conservative transport analysis has been performed using site hydrological data to calculate site-specific "permissible" concentrations of toxic metals in grout-immobilized waste. These concentrations are calculated such that, when toxic metals are leached from the disposal facility by infiltrating water and attenuated in local ground-water system the toxic metal concentrations in groundwater below the disposal facility do not exceed the Maximum Contaminant Levels as stated in the National Primary Drinking Water Regulation. The analysis shows that and sites allow about l00 times higher toxic metal concentrations in stabilized waste leachate than humid sites. From the limited available data on toxic metal concentrations in DOE MLLW, a margin of protection appears to exist in most cases when stabilized wastes containing toxic metals are disposed of at the DOE sites under analysis. Possible exceptions to this conclusion are arsenic, chromium selenium, and mercury when disposed of at some humid sites such as the Oak Ridge Reservation. This analysis also demonstrates that the US Environmental Protection Agency's prescriptive regulatory approach that defines rigid waste treatment standards does not inherently account for the variety of disposal environments encountered nationwide and may result in either underprotection of groundwater resources (at humid sites) or an excessive margin of protection (at and sites).

1029 (SAND–96-0378C) **Disposal of mixed waste: Technical, institutional, and policy factors.** Waters, R.D. (Sandia National Labs., Albuquerque, NM (United States)); Gruebel, M.M.; Letourneau, M.J.; Case, J.T. Sandia National Labs., Albuquerque, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–47: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006474. Source: OSTI; NTIS; INIS; GPO Dep.

In conjunction with the affected States as part of their interactions required by the Federal Facilities Compliance Act, the Department of Energy has been developing a process for a disposal configuration for its mixed low-level waste (MLLW). This effort, spanning more than two years, has reduced the potential disposal sites from 49 to 15. The remaining 15 sites have been subjected to a performance evaluation to determine their strengths and weaknesses for disposal of MLLW. The process has included institutional and policy factors as well as strictly technical analyses, and technical analyses must be supported by technical analyses, and technical analyses must be performed within a framework which includes some institutional considerations, with the institutional considerations selected for inclusion largely a matter of policy. While the disposal configuration process is yet to be completed, the experience to date offers a viable approach for solving some of these issues. Additionally, several factors remain to be addressed before an MLLW disposal configuration can be developed.

1030 (SAND–96-0692C) **A general method for the efficient selection of sampling locations for problems in environmental restoration.** Rutherford, B.M. Sandia National Labs., Albuquerque, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9605103–1: 2. international symposium on spatial accuracy assessment in natural resources and environmental sciences, St. Collins, CO (United States), 21-23 May 1996). Order Number DE96006981. Source: OSTI; NTIS; INIS; GPO Dep.

Problems in environmental restoration that involve detecting or monitoring contamination or site characterization often benefit from procedures that help select sampling or drilling locations for obtaining meaningful data that support the analysis. One example of this type of procedure is a spatial sampling program that will "automatically" (based on the implementation of a computer algorithm) guide an iterative investigation through the process of site characterization at a minimal cost to determine appropriate remediation activities. In order to be effective, such a procedure should translate site and modeling uncertainties into terms that facilitate comparison with regulations and should also provide a methodology that will lead to an efficient sampling plan over the course of the analysis. In this paper, a general framework is given that can accomplish these objectives and can be applied to a wide range of environmental restoration applications. The methodology is illustrated using an example where soil samples support the characterization of a chemical waste landfill area.

1031 (SAND–96-0749C) **Probabilistic risk assessment for the Sandia National Laboratories Technical Area V Liquid Waste Disposal System surface impoundments.** Dawson, L.A. (Sandia National Labs., Albuquerque, NM (United States)); Eidson, A.F. Sandia National Labs., Albuquerque, NM (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–4: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96008252. Source: OSTI; NTIS; INIS; GPO Dep.

A probabilistic risk assessment was completed for a former radioactive waste disposal site. The site, two unlined surface impoundment, was designed as part of the Liquid Waste Disposal System (LWDS) to receive radioactive effluent from nuclear reactors in Technical Area-V (TA-V) at Sandia National Laboratories/New Mexico (SNL/NM). First, a statistical comparison of site sampling results to natural background, using EPA methods, and a spatial distribution analysis were performed. Risk assessment was conducted with SNL/NM's Probabilistic Risk Evaluation and Characterization Investigation System model. The risk assessment indicated that contamination from several constituents might have been high enough to require remediation. However, further analysis based on expected site closure activities and recent EPA guidance indicated that No Further Action was acceptable.

1032 (SAND–96-0813) **Preliminary data from an instantaneous profile test conducted near the Mixed Waste Landfill, Technical Area 3, Sandia National Laboratories/New Mexico.** Bayliss, S.C. (DanShar, Inc., Bosque Farms, NM (United States)); Goering, T.J.; McVey, M.D.; Strong, W.R.; Peace, J.L. Sandia National Labs., Albuquerque, NM (United States). Apr 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010914. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents data from an instantaneous profile test conducted near the Sandia National Laboratories/New Mexico Mixed Waste Landfill in Technical Area 3. The test was performed from December 1993 through 1995 as part of the environmental Restoration Project's Phase 2 RCRA Facility Investigation of the Mixed Waste Landfill. The purpose of the test was to measure the unsaturated hydraulic properties of soils near the Mixed Waste Landfill. The instantaneous profile test and instrumentation are described, and the pressure and moisture content data from the test are presented. These data may be useful for understanding the unsaturated hydraulic properties of soils in Technical Area 3 and for model validation, verification, and calibration.

1033 (SAND–96-0815C) **Compatibility of packaging components with simulant mixed waste.** Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1996]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9604104–7: 20. compatibility, aging and stockpile stewardship conference, Kansas City, KS (United States), 30 Apr - 2 May 1996). Order Number DE96008165. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of hazardous and radioactive materials packaging is to enable these materials to be transported without posing a threat to the health or property of the general public. To achieve this aim, regulations in the US have been written establishing general design requirements for such packagings. While no regulations have been written specifically for mixed waste packaging, regulations for the constituents of mixed wastes, i.e., hazardous and radioactive substances, have been codified by the US Department of Transportation (US DOT, 49 CFR 173) and the US Nuclear Regulatory Commission (NRC, 10 CFR 71). Based on these national requirements, a Chemical Compatibility Testing Program was developed in the Transportation Systems Department at Sandia National Laboratories (SNL). The program provides a basis to assure any regulatory body that the issue of packaging material compatibility towards hazardous and radioactive materials has been addressed. In this paper, the authors present the results of the second phase of this testing program. The first phase screened five liner materials and six seal materials towards four simulant mixed wastes. This phase involved the comprehensive testing of five candidate liner materials to an aqueous Hanford Tank simulant mixed waste. The comprehensive testing protocol involved exposing the respective materials a matrix of four gamma radiation doses ($\sim$ 1, 3, 6, and 40 kGy), three temperatures (18, 50, and 60 C), and four exposure times (7, 14, 28, and 180 days). Following their exposure to these combinations of conditions, the materials were evaluated by measuring five material properties. These properties were specific gravity, dimensional changes, hardness, stress cracking, and mechanical properties.

1034 (SAND–96-0899C) **Application of a NAPL partitioning interwell tracer test (PITT) to support DNAPL remediation at the Sandia National Laboratories/New Mexico chemical waste landfill.** Studer, J.E. (INTERA Inc., Albuquerque, NM (United States)); Mariner, P.; Jin, M. Sandia National Labs., Albuquerque, NM (United States). 1996. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9605148–1: Superfund Hazwaste West, Las Vegas, NV (United States), 21 May - 5 Jun 1996). Order Number DE96008862. Source: OSTI; NTIS; INIS; GPO Dep.

Chlorinated solvents as dense non-aqueous phase liquid (DNAPL) are present at a large number of hazardous waste sites across the U.S. and world. DNAPL is difficult to detect in the subsurface, much less characterize to any degree of accuracy. Without proper site characterization, remedial decisions are often difficult to make and technically effective, cost-efficient remediations are even more difficult to obtain. A new non-aqueous phase liquid (NAPL) characterization technology that is superior to conventional technologies has been developed and applied at full-scale. This technology, referred to as the Partitioning Interwell Tracer Test (PITT), has been adopted from oil-field practices and tailored to environmental application in the vadose and saturated zones. A PITT has been applied for the first time at full-scale to characterize DNAPL in the vadose zone. The PITT was applied in December 1995 beneath two side-by-side organic disposal pits at Sandia National Laboratories/New Mexico (SNL/NM) RCRA Interim Status Chemical Waste Landfill (CWL), located in Albuquerque, New Mexico. DNAPL, consisting of a mixture of chlorinated solvents, aromatic hydrocarbons, and PCE oils, is known to exist in at least one of the two buried pits. The vadose zone PITT was conducted by injecting a slug of non-partitioning and NAPL-partitioning tracers into and through a zone of interest under a controlled forced gradient. The forced gradient was created by a balanced extraction of soil gas at a location 55 feet from the injector. The extracted gas stream was sampled over time to define tracer break-through curves. Soil gas sampling ports from multilevel monitoring installations were sampled to define break-through curves at specific locations and depths. Analytical instrumentation such as gas chromatographs and a photoacoustical analyzers operated autonomously, were used for tracer detection.

1035 (SAND–96-0972) **Identifying industrial best practices for the waste minimization of low-level radioactive materials.** Levin, V. Sandia National Labs., Albuquerque, NM (United States); Sandia National Labs., Livermore, CA (United States). Apr 1996. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010381. Source: OSTI; NTIS; INIS; GPO Dep.

In US DOE, changing circumstances are affecting the management and disposal of solid, low-level radioactive waste (LLW). From 1977 to 1991, the nuclear power industry achieved major reductions in solid waste disposal, and DOE is interested in applying those practices to reduce solid waste at DOE facilities. Project focus was to identify and document commercial nuclear industry best practices for radiological control programs supporting routine operations, outages, and decontamination and decommissioning activities. The project team (DOE facility and nuclear power industry representatives) defined a Work Control Process Model, collected nuclear power industry Best Practices, and made recommendations to minimize LLW at DOE facilities.

1036 (SAND–96-1088) **Phase 2 report on the evaluation of polyacrylonitrile (PAN) as a binding polymer for absorbers used to treat liquid radioactive wastes.** Sebesta, F. (Czech Technical Univ., Prague (Czech Republic). Dept. of Nuclear Chemistry); John, J.; Motl, A. Sandia National Labs., Albuquerque, NM (United States). May 1996. 40p. Sponsored by USDOE, Washington, DC (United States);Florida State Univ., Tallahassee, FL (United States). DOE Contract AC04-94AL85000. Contract AE-4761; Agreement FSU/CTU-1. Order Number DE96010906. Source: OSTI; NTIS; INIS; GPO Dep.

The performance of PAN-based composite absorbers was evaluated in dynamic experiments at flow rates ranging from 25–100 bed volumes (BV) per hour. Composite absorbers with active components of ammonium molybdophosphate (AMP) PAN and K-Co ferrocyanide (KCoFC) PAN were used for separating Cs from a 1 M HNO_3 + 1 M $NaNO_3$ + 2×10^{-5} M CsCl acidic simulant solution. KCoFC-PAN and two other FC-based composite absorbers were tested for separating Cs from alkaline simulant solutions containing 0.01 M to 1 M NaOH and 1 M $NaNO_3$ + $x \times 10^{-4}$ M CsCl. The efficiency of the Cs sorption on the AMP-PAN absorber from acidic simulant solutions was negatively influenced by the dissolution of the AMP active component. At flow rates of 50 BV/hr, the decontamination factor of about 10^3 could be maintained for treatment of 380 BV of the feed. With the KCoFC-PAN absorber, the decontamination factor of about 10^3 could be maintained for a feed volume as great as 1,800 BV. In alkaline simulant solutions, significant decomposition of the active components was observed, and the best performance was exhibited by the KCoFC-PAN absorber. Introductory experiments confirmed that Cs may be washed out of the composite absorbers. Regeneration of both absorbers for repetitive use was also found to be possible. The main result of the study is that PAN was proven to be a versatile polymer capable of forming porous composite absorbers with a large number of primary absorbers. The composite absorbers proved to be capable of withstanding the harsh acidic and alkaline conditions and significant radiation doses that may be expected in the treatment of US DOE wastes. A field demonstration is proposed as a follow-on activity.

1037 (SAND–96-1651C) **Comparison of passive soil vapor survey techniques at a Tijeras Arroyo site, Sandia National Laboratories, Albuquerque, New Mexico.** Eberle, C.S.; Wade, W.M.; Tharp, T.; Brinkman, J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–47: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96012953. Source: OSTI; NTIS; INIS; GPO Dep.

Soil vapor surveys were performed to characterize the approximate location of soil contaminants at a hazardous waste site. The samplers were from two separate companies and a comparison was made between the results of the two techniques. These results will be used to design further investigations at the site.

1038 (SAND–96-1652C) **Use of thermal desorption/ gas chromatography as a performance-based screening method for petroleum hydrocarbons.** Slavin, P.J. (GRAM, Inc., Albuquerque, NM (United States)); Crandall, K.; Dawson, L.; Kottenstette, R.; Wade, M. Sandia National Labs., Albuquerque, NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–51: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96012951. Source: OSTI; NTIS; GPO Dep.

Thermal desorption/gas chromatography (TD/GC) was used to screen soil samples on site for total petroleum hydrocarbon (TPH) content during a RCRA Facility Investigation (RFI). It proved to be a rapid, cost- effective tool for detecting non-aromatic mineral oil in soil. The on- site TD/GC results correlated well with those generated at an off-site laboratory for samples analyzed in accordance with EPA Method 418.1.

1039 (SAND–96-2090) **Unsaturated hydrologic flow parameters based on laboratory and field data for soils near the mixed waste landfill, technical area III, Sandia National Laboratories/New Mexico.** Roepke, C.S. (INTERA, Inc., Albuquerque, NM (United States)); Strong, W.R.; Nguyen, H.A. Sandia National Labs., Albuquerque, NM (United States). Aug 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96014311. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of laboratory tests conducted on soil core samples obtained prior to an instantaneous profile test conducted west of the Mixed Waste Landfill in Technical Area III. The instantaneous profile test was conducted to measure in situ hydrologic parameters controlling unsaturated flow and contaminant transport in the near - surface vadose zone. Soil core samples from the instantaneous profile test plot were tested in the Sandia National Laboratory's Environmental Restoration Project Hydrology Laboratory to measure saturated hydraulic conductivity and the relationships between moisture content and soil water tension. Data from laboratory tests and the instantaneous profile field test were then modeled using the computer code RETC to quantify moisture content, soil water tension, and unsaturated hydraulic conductivity relationships. Results content, soil verified that a combination of laboratory and field data yielded a more complete definition of hydrologic properties than either laboratory or field data alone. Results also indicated that at native moisture contents, the potential for significant unsaturated aqueous flow is limited, while at saturated or near - saturated conditions, preferential flow may occur.

1040 (UCRL-JC–118024) **Laboratory treatability studies preparatory to field testing a resting-cell in situ microbial filter bioremediation strategy.** Taylor, R.T.; Hanna, M.L. Lawrence Livermore National Lab., CA (United States). Apr 1995. 14p. Sponsored by USDOE, Washington, DC (United States);National Aeronautics and Space Administration, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950483–7: 3. international in situ and on-site bioreclamation symposium, San Diego, CA (United States), 24-27 Apr 1995). Order Number DE96000360. Source: OSTI; NTIS; INIS; GPO Dep.

Prior to a down-hole-column treatability test of a Methylosinus trichosporium OB3b attached-resting-cell in situ biofilter strategy, a set of three sequential laboratory experiments were carried out to define several key operational parameters and to evaluate the likely degree of success at a NASA Kennedy Space Center site. They involved the cell attachment to site-specific sediments, the intrinsic resting-cell biotransformation capacities for the contaminants of interest plus their time-dependent extents of biodegradative removal at the concentrations of concern, and a scaled in situ mini-flow-through-column system that closely mimics the subsurface conditions during a field-treatability or pilot test of an emplaced resting-cell filter. These experiments established the conditions required for the complete metabolic removal of a vinyl chloride (VC), cis-dichlororthylene (cis-DCE) and trichloroethylene (TCE) mixture. However, the gas chromatographic (GC) procedures that we utilized and the mini-flow-through column data demonstrated that, at most, only about 50–70% of the site-water VC, cis-DCE, and TCE would be biodegraded. This occurred because of a limiting level of dissolved oxygen, which was exacerbated by the simultaneous presence of several additional previously unrecognized groundwater components, especially methane, that are also competing substrates for the whole-cell soluble methane monooxygenase (sMMO) enzyme complex. Irrespective, collectively the simplicity of the methods that we have developed and the results obtainable with them appear to provide relevant laboratory-based test-criteria before taking our microbial filter strategy to an in situ field treatability or pilot demonstration stage at other sites in the future.

1041 (UCRL-JC–120442) **Development of advanced waste treatment technologies for demonstration in the Mixed Waste Management Facility.** Adamson, M.G.; Chiba, Z.; von Holtz, E.H.; Streit, R.D. Lawrence Livermore National Lab., CA (United States). Mar 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950877–5: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95009875. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Management Facility (MWMF) is a national demonstration test bed that will be used to evaluate, at pilot scale, emerging alternative-to-incineration technologies for the effective treatment of low-level radioactive, organic mixed wastes. Two primary treatment technologies have been selected from candidates of advanced processes that have been sufficiently demonstrated in laboratory and bench-scale tests, and most closely meet suitable criteria for demonstration. The two processes are Molten Salt Oxidation (MSO) and Mediated Electrochemical Oxidation (MEO). MSO destroys the organic constituent of wastes as a result of both the elevated temperature (700–950°C) and the catalytic action of molten carbonate salt. The MEO process destroys organic compounds under near-ambient conditions by employing an acid solution in conjunction with oxidizable metallic ions such as silver in an electrochemical cell. In this paper, we describe selection and current technology development for these two primary treatment technologies, as well as the conceptual designs for the technologies in the MWMF integrated process flowsheet. For MSO, we have performed a detailed study of the effect of salt composition (chloride level) on carbon monoxide emissions in the off gas. For MEO, we have developed efficient recovery processes for precipitated silver and for nitrous acid produced at the cathode.

1042 (UCRL-JC–120690) **Remote waste handling and feed preparation for Mixed Waste Management.** Couture, S.A. (Lawrence Livermore National Lab., CA (United States)); Merrill, R.D.; Densley, P.J. Lawrence Livermore National Lab., CA (United States). May 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950836–2: American Institute of Aeronautics and Astronautics guidance, navigation and control conference, Baltimore, MD (United

States), 7-10 Aug 1995). Order Number DE95012484. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Management Facility (MWMF) at the Lawrence Livermore National Laboratory (LLNL) will serve as a national testbed to demonstrate mature mixed waste handling and treatment technologies in a complete front-end to back-end –facility (1). Remote operations, modular processing units and telerobotics for initial waste characterization, sorting and feed preparation have been demonstrated at the bench scale and have been selected for demonstration in MWMF. The goal of the Feed Preparation design team was to design and deploy a robust system that meets the initial waste preparation flexibility and productivity needs while providing a smooth upgrade path to incorporate technology advances as they occur. The selection of telerobotics for remote handling in MWMF was made based on a number of factors – personnel protection, waste generation, maturity, cost, flexibility and extendibility. Modular processing units were selected to enable processing flexibility and facilitate reconfiguration as new treatment processes or waste streams are brought on line for demonstration. Modularity will be achieved through standard interfaces for mechanical attachment as well as process utilities, feeds and effluents. This will facilitate reconfiguration of contaminated systems without drilling, cutting or welding of contaminated materials and with a minimum of operator contact. Modular interfaces also provide a standard connection and disconnection method that can be engineered to allow convenient remote operation.

1043 (WHC-EP–0645) **Performance assessment for the disposal of low-level waste in the 200 West Area Burial Grounds.** Wood, M.I. (Westinghouse Hanford Co., Richland, WA (United States)); Khaleel, R.; Rittmann, P.D.; Lu, A.H.; Finfrock, S.H.; DeLorenzo, T.H.; Serne, R.J.; Cantrell, K.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 483p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017141. Source: OSTI; NTIS; INIS; GPO Dep.

This document reports the findings of a performance assessment (PA) analysis for the disposal of solid low-level radioactive waste (LLW) in the 200 West Area Low-Level Waste Burial Grounds (LLBG) in the northwest corner of the 200 West Area of the Hanford Site. This PA analysis is required by US Department of Energy (DOE) Order 5820.2A (DOE 1988a) to demonstrate that a given disposal practice is in compliance with a set of performance objectives quantified in the order. These performance objectives are applicable to the disposal of DOE-generated LLW at any DOE-operated site after the finalization of the order in September 1988. At the Hanford Site, DOE, Richland Operations Office (RL) has issued a site-specific supplement to DOE Order 5820.2A, DOE-RL 5820.2A (DOE 1993), which provides additiona l ce objectives that must be satisfied.

1044 (WHC-EP–0826-Rev.1) **Performance objectives of the tank waste remediation system low-level waste disposal program.** Westinghouse Hanford Co., Richland, WA (United States). 25 Aug 1994. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016325. Source: OSTI; NTIS; INIS; GPO Dep.

Before low-level waste may be disposed of, a performance assessment must be written and then approved by the U.S. Department of Energy. The performance assessment is to determine whether "reasonable assurance" exists that the performance objectives of the disposal facility will be met. The DOE requirements for waste disposal require: the protection of public health and safety; and the protection of the environment. Although quantitative limits are sometimes stated (for example, the all exposure pathways exposure limit is 25 mrem/year), usually the requirements are stated in a general nature. Quantitative limits were established by: investigating all potentially applicable regulations as well as interpretations of the Peer Review Panel which DOE has established to review performance assessments, interacting with program management to establish their needs, and interacting with the public (i.e., the Hanford Advisory Board members; as well as affected Indian tribes) to understand the values of residents in the Pacific Northwest.

1045 (WHC-EP–0827-Rev.1) **Overview of the performance objectives and scenarios of TWRS Low-Level Waste Disposal Program. Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010576. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of past Department of Energy (DOE) weapons material production operations, Hanford now stores nuclear waste from processing facilities in underground tanks on the 200 area plateau. An agreement between the DOE, the Environmental Protection Agency (EPA), and the Washington state Department of Ecology (the Tri-Party Agreement, or TPA) establishes an enforceable schedule and a technical framework for recovering, processing, solidifying, and disposing of the Hanford tank wastes. The present plan includes retrieving the tank waste, pre-treating the waste to separate into low level and high level streams, and converting both streams to a glass waste form. The low level glass will represent by far the largest volume and lowest quantity of radioactivity (i.e., large volume of waste chemicals) of waste requiring disposal. The low level glass waste will be retrievably stored in sub-surface disposal vaults for several decades. Assuming the low level disposal system proves to be acceptable, the disposal site will be closed with the low level waste in place. If the disposal system is not acceptable, then the waste will be subject to possible retrieval followed by some other disposal solution. Westinghouse Hanford Company is also planning to emplace the waste so that it is retrievable for up to 50 years after completion of the tank waste processing.

1046 (WHC-EP–0828) **Scenarios of the TWRS low-level waste disposal program.** Westinghouse Hanford Co., Richland, WA (United States). Oct 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012840. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of past Department of Energy (DOE) weapons material production operations, Hanford now stores nuclear waste from processing facilities in underground tanks on the 200 Area plateau. An agreement between the DOE, the Environmental Protection Agency (EPA), and the Washington state Department of Ecology (the Tri-Party Agreement, or TPA) establishes an enforceable schedule and a technical framework for recovering, processing, solidifying, and disposing of the Hanford tank wastes. The present plan includes retrieving the tank waste, pretreating the waste to separate into low level and high level streams, and converting both streams to a glass waste form. The low level glass will represent by far the largest volume and lowest quantity of radioactivity (i.e., large volume of waste chemicals) of waste requiring disposal. The low level glass waste will be retrievably stored in sub-surface disposal vaults for several decades. If the low level disposal system proves to be acceptable, the disposal site will be closed with the low level waste in place. If, however, at some time the disposal system is found to be unacceptable, then the waste can be retrieved and dealt with in some other manner. WHC is planning to emplace the waste so that it is retrievable for up to 50 years after completion of the tank waste processing. Acceptability of disposal of the TWRS low level waste at Hanford depends on technical, cultural, and political considerations. The Performance Assessment is a major part of determining whether the proposed disposal action is technically defensible. A Performance Assessment estimates the possible future impact to humans and the environment for thousands of years into the future. In accordance with the TPA technical strategy, WHC plans to design a near-surface facility suitable for disposal of the glass waste.

1047 (WHC-EP–0828-Rev.1) **Scenarios of the TWRS low-level waste disposal program. Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012791. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of past Department of Energy (DOE) weapons material production operations, Hanford now stores nuclear waste from processing facilities in underground tanks on the 200 area plateau. An agreement between the DOE, the Environmental Protection Agency (EPA), and the Washington state Department of Ecology (the Tri-Party Agreement, or TPA) establishes an enforceable schedule and a technical framework for recovering, processing, solidifying, and disposing of the Hanford tank wastes. The present plan includes retrieving the tank waste, pre-treating the waste to separate into low level and high level streams, and converting both streams to a glass waste form. The low level glass will represent by far the largest volume and lowest quantity of radioactivity (i.e., large volume of waste chemicals) of waste requiring disposal. The low level glass waste will be retrievably stored in sub-surface disposal vaults for several decades. If the low level disposal system proves to be acceptable, the disposal site will be closed with the low level waste in place. If, however, at some time the disposal system is found to be unacceptable, then the waste can be retrieved and dealt with in some other manner. WHC is planning to emplace the waste so that it is retrievable for up to 50 years after completion of the tank waste processing. Acceptability of disposal of the TWRS low level waste at Hanford depends on technical, cultural, and political considerations. The Performance Assessment is a major part of determining whether the proposed disposal action is technically defensible. A Performance Assessment estimates the possible future impact to humans and the environment for thousands of years into the future. In accordance with the TPA technical strategy, WHC plans to design a near-surface facility suitable for disposal of the glass waste.

1048 (WHC-EP–0846) **Waste specification system.** Kirkpatrick, K.L.; Oswald, B.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010938. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the acceptance process. r treatment, storage, or disposal of low-level waste (LLW), mixed waste (MW), and transuranic waste (TRU) at Hanford Site facilities. Section 3.0 describes the Waste Specification System (WSS) which facilitates proper characterization, acceptability, and management of waste streams. Section 4.0 explains the roles and responsibilities of the parties involved in the waste acceptance process. This document is intended to be used with the current revision of the "Hanford Site Solid Waste Acceptance Criteria," (WHC-EP-0063) to provide the necessary acceptance information for treatment, storage, or disposal of radioactive waste at the Hanford Site.

1049 (WHC-EP–0859) **Measurements of the corrosion of low-carbon steel drums under environmental conditions at Hanford: One-year test results.** Duncan, D.R. (Westinghouse Hanford Co., Richland, WA (United States)); Bunnell, L.R. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015548. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the methods used to expose low-carbon steel drums to atmospheric and soil corrosion and describes the methods used to examine specimens retrieved from both types of tests. These drums are being tested to meet requirements of radioactive waste storage for both low-level radioactive wastes and transuranic wastes.

1050 (WHC-EP–0863) **Centralized consolidation/recycling center.** St. Georges, L.T. (Westinghouse Hanford Co., Richland, WA (United States)); Poor, A.D. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013580. Source: OSTI; NTIS; INIS; GPO Dep.

There are approximately 175 separate locations on the Hanford Site where dangerous waste is accumulated in hundreds of containers according to compatibility. Materials that are designated as waste could be kept from entering the waste stream by establishing collection points for these materials and wastes and then transporting them to a centralized consolidation/recycling center (hereinafter referred to as the consolidation center). Once there the materials would be prepared for offsite recycling. This document discusses the removal of batteries, partially full aerosol cans, and DOP light ballasts from the traditional waste management approach, which eliminates 89 satellite accumulation areas from the Hanford Site (43 for batteries, 33 for aerosols, and 13 for DOP ballasts). Eliminating these 89 satellite accumulation areas would reduce by hundreds the total number of containers shipped offsite as hazardous waste (due to the increase in containers when the wastes that are accumulated are segregated according to compatibility for final shipment). This new approach is in line with the U.S. Environmental Protection Agency's (EPA) draft Universal Waste Rules for these "nuisance" and common waste streams. Additionally, future reviews of other types of wastes that can be handled in this less restrictive and more cost-effective manner will occur as part of daily operations at the consolidation center. The Hanford Site has been identified as a laboratory for reinventing government by the Secretary of the U.S. Department of Energy (DOE), Hazel O'Leary, and as a demonstration zone where "innovative ideas, processes and technologies can be created, tested and demonstrated." Additionally, DOE, EPA, and the Washington State Department of Ecology (Ecology) have agreed to cut Hanford cleanup costs by $1 billion over a 5-year period.

1051 (WHC-EP–0865) **1995 Solid Waste 30-year volume summary.** Valero, O.J. (Westinghouse Hanford Co., Richland, WA (United States)); DeForest, T.J.; Templeton, K.J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015657. Source: OSTI; NTIS; INIS; GPO Dep.

This document, prepared by Pacific Northwest Laboratory (PNL) under the direction of Westinghouse Hanford Company (WHC), provides a description of the annual low-level mixed waste (LLMW) and transuranic/transuranic mixed solid waste (TRU-TRUM) volumes expected to be managed by Hanford's Solid Waste Central Waste Complex (CWC) over the next 30 years. The waste generation sources and waste categories are also described. This document is intended to be used as a reference for short- and long-term planning of the Hanford treatment, storage, and disposal (TSD) activities over the next several decades. By estimating the waste volumes that will be generated in the future, facility planners can determine the timing of key waste management activities, evaluate alternative treatment strategies, and plan storage and disposal capacities. In addition, this document can be used by other waste sites and the general public to gain a better understanding of the types and volumes of waste that will be managed at Hanford.

1052 (WHC-EP–0871) **1995 solid waste 30-year container volume summary.** Templeton, K.J. (Pacific Northwest Lab., Richland, WA (United States)); DeForest, T.J.; Patridge, M.D. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017153. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a 30-year forecast of the solid waste volumes by container category. The volumes described are low-level mixed waste (LLMW) and transuranic/transuranic mixed (TRU-TRUM) waste. These volumes and their associated container categories will be generated or received at the US Department of Energy Hanford Site for storage, treatment, and disposal at Westinghouse Hanford Company's Solid Waste Operations Complex (SWOC) during a 30-year period from FY 1995 through FY 2024. The data presented in this report establish a baseline for solid waste management both in the present and future. With knowledge of the volumes by container type, decisions on the facility handling and storage requirements can be adequately made. It is recognized that the forecast estimates will vary as facility planning and missions continue to change and become better defined; however, the data presented in this report still provide useful insight into Hanford's future solid waste management requirements.

1053 (WHC-EP–0872) **Practical Modeling of aluminum species in high-pH waste.** Reynolds, D.A. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001605. Source: OSTI; NTIS; INIS; GPO Dep.

One of the main components of the nuclear waste stored at the Hanford Site is aluminum. As efforts are made to dispose of the waste, the need to predict the various phases of the aluminum becomes important for modeling of the disposal processes. Current databases of the aluminum species are not adequate as they stand. This study is not an attempt to present a rigorous discussion of aluminum chemistry, but to approach aluminum solubility as a practical application. The approach considers two different forms of aluminate; $Al(OH)_4^-$ and AlO_2^-. By taking both of these forms of aluminate into consideration, a workable system of aluminium chemistry is formed that can be used to model the various waste disposal processes.

1054 (WHC-EP–0885) **Facility effluent monitoring plan for the Waste Receiving and Processing Facility Module 1.** Lewis, C.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003337. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the US Department of Energy in Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal state, and local requirements. This facility effluent monitoring plan shall ensure lonq-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated as a minimum every three years.

1055 (WHC-EP–0888) **1995 solid waste 30-year characteristics volume summary.** Templeton, K.J. (Pacific Northwest Lab., Richland, WA (United States)); DeForest, T.J.; Rice, G.I.; Valero, O.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96004827. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site has been designated by the US Department of Energy (DOE) to store, treat, and dispose of solid waste received from both onsite and offsite generators. This waste is currently or planned to be generated from ongoing operations, maintenance and deactivation activities, decontamination and decommissioning (D&D) of facilities, and environmental restoration (ER) activities. This document, prepared by Pacific Northwest Laboratory (PNL) under the direction of Westinghouse Hanford Company (WHC), describes the characteristics of the waste to be shipped to Hanford's SWOC. The physical waste forms and hazardous constituents are described for the low-level mixed waste (LLMW) and the transuranic - transuranic mixed waste (TW_TRUM).

1056 (WHC-EP–0891) **Corrosion of low-carbon steel under environmental conditions at Hanford: Two-year soil corrosion test results.** Anantatmula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Divine, J.R. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96004832. Source: OSTI; NTIS; INIS; GPO Dep.

At the Hanford Site, located in southeastern Washington state, nuclear production reactors were operated from 1944 to 1970. The handling and processing of radioactive nuclear fuels produced a large volume of low-level nuclear wastes, chemical wastes, and a combination of the two (mixed wastes). These materials have historically been packaged in US Department of Transportation (DOT) approved drums made from low-carbon steel, then handled in one of three ways: (A) Before 1970, the drums were buried in the dry desert soil. It was assumed that chemical and radionuclide mobility would be low and that the isolated, government-owned site would provide sufficient protection for employees and the public. (B) After 1970, the drums containing long-lived transuranic radionuclides were protected from premature failure by stacking them in an ordered array on an asphalt concrete pad in the bottom of a burial trench. The array was then covered with a large, 0.28-mm- (011-in.-) thick polyethylene tarp and the trench was backfilled with 1.3 m (4 ft) of soil cover. This burial method is referred to as soil-shielded burial . Other configurations were also employed but the soil-shielded burial method contains most of the transuranic drums. (C) Since 1987, US Department of Energy sites have complied with the Resource Conservation and Recovery Act of 1976 (RCRA) regulations. These regulations require mixed waste drums to be stored in RCRA compliant large metal sheds with provisions for monitoring. These sheds are provided with forced ventilation but are not heated or cooled.

1057 (WHC-EP–0892) **Hanford/Rocky Flats collaboration on development of supercritical carbon dioxide extraction to treat mixed waste.** Hendrickson, D.W. (Westinghouse Hanford Co., Richland, WA (United States)); Biyani, R.K.; Brown, C.M.; Teter, W.L. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003256. Source: OSTI; NTIS; INIS; GPO Dep.

Proposals for demonstration work under the Department of Energy's Mixed Waste Focus Area, during the 1996 through 1997 fiscal years included two applications of supercritical carbon dioxide to mixed waste pretreatment. These proposals included task RF15MW58 of Rocky Flats and task RL46MW59 of Hanford. Analysis of compatibilities in wastes and work scopes yielded an expectation of substantial collaboration between sites whereby Hanford waste streams may undergo demonstration testing at Rocky Flats, thereby eliminating the need for test facilities at Hanford. This form of collaboration is premised the continued deployment at Rocky Flats and the capability for Hanford samples to be treated at Rocky Flats. The recent creation of a thermal treatment contract for a facility near Hanford may alleviate the need to conduct organic extraction upon Rocky Flats wastes by providing a cost effective thermal treatment alternative, however, some waste streams at Hanford will continue to require organic extraction. Final site waste stream treatment locations are not within the scope of this document.

1058 (WHC-MR–0507) **Glass science tutorial: Lecture No. 8, introduction cementitious systems for Low-Level Waste immobilization.** Young, J.F.; Kirkpatrick, R.J.; Mason, T.O.; Brough, A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016484. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents details about cementitious systems for low-level waste immobilization. Topics discussed include: composition and properties of portland cement; hydration properties; microstructure of concrete; pozzolans; slags; zeolites; transport properties; and geological aspects of long-term durability of concrete.

1059 (WHC-SA–2611) **Coal ash usage in environmental restoration at the Hanford site.** Scanlon, P.L.; Sonnichsen, J.C.; Phillips, S.J. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950414–4: 57. annual American power conference, Chicago, IL (United States), 18-20 Apr 1995). Order Number DE95013575. Source: OSTI; NTIS; GPO Dep.

The ash stockpiled next to the 284E steam plant is mixed fly ash, bottom ash, and slag. The ash consists of (1) baghouse residue and (2) a mixture of bottom ash and slag which is washed out of the bottom of the boilers daily. In 1991, a Toxicity Characteristic Leaching Procedure (TCLP) was performed on several samples of this ash (Hazen Research 1991). This procedure is designed to determine the mobility of organic and inorganic anatytes present in liquid, solid, or multiphasic wastes (EPA 1994). The ash tested came from surge bins, conveyor samples, and bottom ash and fly ash from the boilers at 284E. Antimony, cadmium, germanium, molybdenum, silver, thallium, tungsten, and vanadium were tested for, but on all samples were below detection Limits for the testing method. Analytes present in relatively high concentrations (but less than one part per thousand) included barium, boron, chromium, fluorine, and zinc. The size of ash particles passing through a Taylor sieve series was very evenly distributed from 1 to 200m.

1060 (WHC-SA–2857) **Melter technology evaluation for vitrification of Hanford Site low-level waste.** Wilson, C.N. (Westinghouse Hanford Co., Richland, WA (United States)); Burgard, K.C.; Weber, E.T.; Brown, N.R. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950401–23: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013720. Source: OSTI; INIS; NTIS; GPO Dep.

The current plan at the Hanford Site, in accordance with the Tri-Party Agreement among Washington State, the US Environmental Protection Agency, and the US Department of Energy, is to convert the low-level tank waste fraction into a silicate glass. The low-level waste will be composed primarily of sodium nitrate and nitrite salts concentrated in a highly alkaline aqueous solution. The capability to process up to 200 metric tons/day off glass will be established to produce an estimated 210,000 m^3 for onsite disposal. A program to test and evaluate high-capacity melter technologies is in progress. Testing performed by seven different industrial sources using Joule heating, combustion, plasma, and carbon arc melters is described.

1061 (WHC-SA–2865) **Early containment of high-alkaline solution simulating low-level radioactive waste stream in clay-bearing blended cement.** Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Olson, R.A.; Tennis, P.D. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013576. Source: OSTI; NTIS; INIS; GPO Dep.

Portland cement blended with fly ash and attapulgite clay was mixed with high-alkaline solution simulating low-level radioactive waste stream at a one-to-one weight ratio. Mixtures were adiabatically and isothermally cured at various temperatures and analyzed for phase composition, total alkalinity, pore solution chemistry, and transport properties as measured by impedance spectroscopy. Total alkalinity is characterized by two main drops. The early one corresponds to a rapid removal of phosphorous, aluminum, sodium, and to a lesser extent potassium solution. The second drop from about 10 h to 3 days is mainly associated with the removal of aluminum, silicon, and sodium. Thereafter, the total alkalinity continues descending, but at a lower rate. All pastes display a rapid flow loss that is attributed to an early precipitation of hydrated products. Hemicarbonate appears as early as one hour after mixing and is probably followed by apatite precipitation. However, the former is unstable and decomposes at a rate that is inversely related to the curing temperature. At high temperatures, zeolite appears at about 10 h after mixing. At 30 days, the stabilized crystalline composition Includes zeolite, apatite and other minor amounts of $CaCO_3$, quartz, and monosulfate Impedance spectra conform with the chemical and mineralogical data. The normalized conductivity of the pastes shows an early drop, which is followed by a main decrease from about 12 h to three days. At three days, the permeability of the cement-based waste as calculated by Katz-Thompson equation is over three orders of magnitude lower than that of ordinary portland cement paste. However, a further decrease in the calculated permeability is questionable. Chemical stabilization is favorable through incorporation of waste species into apatite and zeolite.

1062 (WHC-SA–2887) **In situ monitoring of grouted electrolytes.** Kahanda, G.L.M.K.S. (Brooklyn Coll., NY (United States). Dept. of Physics); Gu, Jingyan; Tomkiewicz, M.; Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016340. Source: OSTI; NTIS; INIS; GPO Dep.

We describe conductivity measurements of grouts flooded with water and in contact with a sink that consists of pure water. The conductivity measurements were designed and carried out in parallel with present quality verification methods and standard leach test of the nuclear waste management industry. For the first time, we show that the method of replacing intrusive chemical analysis with conductivity measurements of the leaching samples yield equivalent results.

1063 (WHC-SA–2905) **Pore solution chemistry of simulated low-level liquid waste incorporated in cement grouts.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951155–82: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96005229. Source: OSTI; NTIS; INIS; GPO Dep.

Expressed pore solutions from simulated low level liquid waste cement grouts cured at room temperature, 50°C and 90°C for various duration were analyzed by standard chemical methods and ion chromatography. The solid portions of the grouts were formulated with portland cement, fly ash, slag, and attapulgite clay in the ratios of 3:3:3:1. Two different solutions simulating off-gas condensates expected from vitrification of Hanford low level tank wastes were made. One is highly alkaline and contains the species Na^+, PO_4^{3-}, NO_2^-, NO_3^- and OH^-. The other is carbonated and contains the species, Na^+, PO_4^{3-}, NO_2^-, NO_3^-, and CO_3^{2-}. In both cases phosphate rapidly disappeared from the pore solution, leaving behind sodium in the form of hydroxide. The carbonates were also removed from the pore solution to form calcium carbonate and possibly calcium monocarboaluminate. These reactions resulted in the increase of hydroxide ion concentration in the early period. Subsequently there was a significant reduction OH^- and Na^+ ion concentrations. In contrast high concentration of NO_2^- and NO_3^- were retained in the pore solution indefinitely.

1064 (WHC-SA–2906) **Immobilization index of liquid low-level waste in cementitious grouts.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951155–31: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96005199. Source: OSTI; NTIS; INIS; GPO Dep.

The ability of grouts formulated from mixtures of cementitious materials and attapulgite clay to immobilize various chemical species in the projected off-gas waste stream from vitrification of Hanford low level tank wastes was studied. Three different solid blends were evaluated, with cement:fly ash: slag:clay weight ratios of 3:3:3:1, 3:0:6:1, and 0:0:9:1. The blended solids were mixed with a simulated low level liquid waste solution containing Na^+, NO_2^-, NO_3^-, PO_4^{3-} and OH^- ions, in the proportion of 1 liter of solution to 1 kg of solid blend, and were cured either at 22 C (room temperature), 50 C or 90 C. Pore solutions were expressed at various ages and were analyzed to determine the reductions in concentrations of the individual ionic species. The results were expressed in the form of immobilization index (I) calculated for each species. The immobilization indices for Na^+ (I Na^+) and for OH^- (I OH^-) were similar in each case, and were found to be highest when only slag and clay was present (blend 0:0:9:1). The immobilization index for phosphate, I PO_4^{3-}, was 1 in all cases, i.e. phosphate was completely removed from solution. On the other hand removal of NO_2^- and NO_3^- ions was generally ineffective.

1065 (WHC-SA–2908-FP) **Application of solvlent change techniques to blended cements used to immobilize low-level radioactive liquid waste.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9606155–1: 2. international conference on improvements geosystems, Tokyo (Japan), 1 Jun 1996). Order Number DE96009887. Source: OSTI; NTIS; INIS; GPO Dep.

The microstructures of hardened portland and blended cement pastes, including those being considered for use in immobilizing hazardous wastes, have a complex pore structure that changes with time. In solvent exchange, the pore structure is examined by immersing a saturated sample in a large volume of solvent that is miscible with the pore fluid. This paper reports the results of solvent replacement measurements on several blended cements mixed at a solution:solids ratio of 1.0 with alkaline solutions from the simulation of the off- gas treatment system in a vitrification facility treating low-level radioactive liquid wastes. The results show that these samples have a lower permeability than ordinary portland cement samples mixed at a water:solids ratio of 0.70, despite having a higher volume of porosity. The microstructure is changed by these alkaline solutions, and these changes have important consequences with regard to durability.

1066 (WHC-SA–2914) **Vitrification of low-level radioactive waste in a slagging combustor.** Holmes, M.J. (and others); Downs, W.; Higley, B.A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950868–11: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95017150. Source: OSTI; NTIS; INIS; GPO Dep.

The suitability of a Babcock & Wilcox cyclone furnace to vitrify a low-level radioactive liquid waste was evaluated. The feed stream contained a mixture of simulated radioactive liquid waste and glass formers. The U.S. Department of Energy is testing technologies to vitrify over 60,000,000 gallons of this waste at the Hanford site. The tests reported here demonstrated the technical feasibility of Babcock & Wilcox's cyclone vitrification technology to produce a glass for near surface disposal. Glass was produced over a period of 24-hours at a rate of 100 to 150 lb/hr. Based on glass analyses performed by an independent laboratory, all of the glass samples had leachabilities at least as low as those of the laboratory glass that the recipe was based upon. This paper presents the results of this demonstration, and includes descriptions of feed preparation, glass properties, system operation, and flue gas composition. The paper also provides discussions on key technical issues required to match cyclone furnace vitrification technology to this U.S. Department of Energy Hanford site application.

1067 (WHC-SA–2960-FP) **Disposition of PUREX contaminated nitric acid the role of stakeholder involvement.** Jasen, W.G.; Duncan, R.A. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212–58: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006377. Source: OSTI; NTIS; INIS; GPO Dep.

What does the United States space shuttle and the Hanford PUREX facility's contaminated nitric acid have in common. Both are reusable. The PUREX Transition Project has achieved success and, minimized project expenses and waste generation by looking at excess chemicals not as waste but as reusable substitutes for commercially available raw materials. This philosophy has helped PUREX personnel to reuse or recycle more than 2.5 million pounds of excess chemicals, a portion of which is the slightly contaminated nitric acid. After extensive public review, the first shipment of contaminated acid was made in May 1995. Removal of the acid was completed on November 6, 1995 when the fiftieth shipment left the Hanford site. This activity, which avoided dispositioning the contaminated acid as a waste, generated significantly more public input and concern than was expected. One of the lessons learned from this process is to not underestimate public perceptions regarding the reuse of contaminated materials.

1068 (WHC-SA–3015) **Durability of cement stabilized low-level wastes.** Kkruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951155–112: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96009106. Source: OSTI; NTIS; INIS; GPO Dep.

Cementitious materials containing high proportions of slag and fly ash have been tested for suitability to immobilize simulated alkaline and carbonated off-gas waste solutions after vitrification of low- level tank wastes stored at Hanford. To assess their performance, long-term durability was assessed by measuring stability of compressive strength and weight during leaching and exposure to sulfate and carbonate solutions. The important parameter controlling the durability is pore structure, because it affects both compressive strength and susceptibility to different kinds of chemical attack. Impedance spectroscopy was utilized to assess the connectivity of the pore system at early ages. Mercury intrusion porosimetry (MIP) and SEM were utilized to assess development of porosity at later ages. Phase alterations in the matrix exposed to aging and leaching in different media were followed using XRD. Mixtures were resistant to deterioration during immersion in solutions containing high concentrations of sulfate or carbonate ions. Mixtures were also resistant to leaching. These results are consistent with microstructural observations, which showed development of a finer pore structure and reduction in diffusivity over days or months of hydration.

1069 (WHC-SA–3022) **Chemical evolution of cementitious materials with high proportion of fly ash and slag.** Kruger, A.A. (Westinghouse Hanford Co., Richland, WA (United States)); Bakharev, T.; Brough, A.R.; Kirkpatrick, R.J.; Struble, L.J.; Young, J.F. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951155–113: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96009105. Source: OSTI; NTIS; INIS; GPO Dep.

Cement mixtures containing high proportions of slag and fly ash were tested to assess their suitability to immobilize simulated off-gas waste solutions after vitrification of low-level radioactive tank wastes stored at Hanford. Materials were mixed with carbonated or alkaline solutions and cured initially adiabatically, then at 70°C. Chemical changes were monitored for 7 months using X-ray diffraction, selective dissolution and SEM; NMR was utilized to follow the polymerization of silicate species. The process of hydration during the first months of curing was characterized by formation of quite crystalline Al-substituted C-S-H structurally related to 1.1 nm tobermorite and traces of zeolites in some materials. A low content of calcium hydroxide was found in all materials after I month of curing. The SEM examination demonstrated rapidly decreasing porosity, making the mixtures favorable for long-term durability.

1070 (WHC-SD-CP-TP–087) **Rocky Flats Ash test procedure (sludge stabilization).** Funston, G.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015583. Source: OSTI; NTIS; GPO Dep.

Rocky Flats Ash items have been identified as the next set of materials to be stabilized. This test is being run to determine charge sizes and soak times to completely stabilize the Rocky Flats Ash items. The information gathered will be used to generate the heating rampup cycle for stabilization. The test will provide information to determine charge sizes, soak times and mesh screen sizes (if available at time of test) for stabilization of Rocky Flats Ash items to be processed in the HC-21C Muffle Furnace Process. Once the charge size and soak times have been established, a program for the temperature controller of the HC-21C Muffle Furnace process will be generated for processing Rocky Flats Ash.

1071 (WHC-SD-CP-TP-087-REV1) **Rocky Flats ash test procedure (sludge stabilization).** Winstead, M.L. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050007. Source: OSTI; NTIS; INIS; GPO Dep.

Rocky Flats Ash items have been identified as the next set of materials to be stabilized. This test is being run to determine charge sizes and soak times to completely stabilize the Rocky Flats Ash items. The information gathered will be used to generate the heating rampup cycle for stabilization. This test will also gain information on the effects of the glovebox atmosphere (moisture) on the stabilized material. This document provides instructions for testing Rocky Flats Ash in the HC-21C muffle furnace process.

1072 (WHC-SD-CP-TRP-063) **HC-21C off-gas test report.** Cunningham, L.T. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050008. Source: OSTI; NTIS; INIS; GPO Dep.

Test procedure WHC-SD-CP-TC-032, HC-21C Off-Gas Test Procedure, was performed to determine the cause and establish a method of the elimination of liquid formation in the HC-21C Furnace off-gas system. This report discusses the findings of the test procedure and the changes implemented.

1073 (WHC-SD-FF-MP-01-Rev1) **Hanford site sodium management plan.** Guttenberg, S. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050012. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Sodium Management Plan, Revision 1, provides changes to the major elements and management strategy to ensure an integrated and coordinated approach for disposition of the more than 350,000 gallons of sodium and related sodium facilities located at the DOE's Hanford Site

1074 (WHC-SD-FF-QAPP-005-Rev.1) **Quality Assurance Program Plan for FFTF effluent controls. Revision 1.** Seamans, J.A. Westinghouse Hanford Co., Richland, WA (United States). 8 Jun 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014312. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan is specific to environmental related activities within the FFTF Property Protected Area. The activities include effluent monitoring and Low Level Waste Certification.

1075 (WHC-SD-GN-TI-20004) **A method for estimating ground areas contaminated by a postulated fire in a facility containing radioactive material.** Himes, D.A. Westinghouse Hanford Co., Richland, WA (United States). 31 Aug 1994. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010677. Source: OSTI; NTIS; INIS; GPO Dep.

A simple method has been developed for estimating the extent of radiological ground contamination associated with postulated fires in nuclear facilities to be used as input to the estimation of replacement and cleanup cost. The basic model assumes that the radioactive material is released in the form of particles in a wide range of sizes (0 to about 300 μm) and is carried aloft in the thermal plume from the fire. The particles are then assumed to be released where the thermal plume reaches equilibrium height, and to fall to the ground at a continuous range of speeds associated with the various particle sizes. The thermal output of the fire and resulting equilibrium plume height are determined using standard models. The downward movement and dispersion of the particles is modelled using a tilted Gaussian plume. This approach produces a realistic distribution of particulate material on the ground with the larger particles fatting close to the fire and smaller particles being carried further out and dispersed over a Larger area. The model includes simple methods to determine maximum allowable inventory or fire size so as not to exceed a limiting cleanup area (or cost), thus permitting direct calculation of the maximum sizes of inventory modules to be separated by fire barriers.

1076 (WHC-SD-L045H-PLN-004-Rev.1) **300 area TEDF NPDES Permit Compliance Monitoring Plan.** Loll, C.M. Westinghouse Hanford Co., Richland, WA (United States). 5 Sep 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050017. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the 300 Area Treated Effluent Disposal Facility (TEDF) National Pollutant Discharge Elimination System (NPDES) Permit Compliance Monitoring Plan (MP). The MP describes how ongoing monitoring of the TEDF effluent stream for compliance with the NPDES permit will occur. The MP also includes Quality Assurance protocols to be followed.

1077 (WHC-SD-PRP-HA-007-Rev.1) **Liquid Effluent Retention Facility/Effluent Treatment Facility Hazards Assessment.** Broz, R.E. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050019. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the LERF (Liquid Effluent Retention Facility)/ETF (Effluent Treatment Facility) on the Hanford Site. Through this document, the technical basis for the development of facility specific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

1078 (WHC-SD-SNF-DTR-001) **Development test report for the high pressure water jet system nozzles.** Takasumi, D.S. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050021. Source: OSTI; NTIS; INIS; GPO Dep.

The high pressure water jet nozzle tests were conducted to identify optimum water pressure, water flow rate, nozzle orifice size and fixture configuration needed to effectively decontaminate empty fuel storage canisters in KE-Basin. This report gives the tests results and recommendations from the these tests.

1079 (WHC-SD-TP-SEP-035-Rev.1) **Safety Evaluation for Packaging for onsite Transfer of plutonium**

recycle test reactor ion exchange columns. Smith, R.J. Westinghouse Hanford Co., Richland, WA (United States). 11 Sep 1995. 132p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050094. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Safety Evaluation for Packaging (SEP) is to authorize the use of three U.S. Department of Transportation (DOT) 7A, Type A metal boxes (Capital Industries Part No. S 0600-0600-1080- 0104) to package 12 Plutonium Recycle Test Reactor (PRTR) ion exchange columns as low-level waste (LLW). The packages will be transferred from the 309 Building in the 300 Area to low level waste burial in the 200 West Area. Revision 1 of WHC-SD-TP-SEP-035 (per ECN No. 621467) documents that the boxes containing ion exchange columns and grout will maintain the payload under normal conditions of transport if transferred without the box lids

1080 (WHC-SD-TP-SEP–040) **FFTF railroad tank car Safety Evaluation for Packaging.** Carlstrom, R.F. Westinghouse Hanford Co., Richland, WA (United States). 21 Sep 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050095. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Evaluation for Packaging (SEP) provides evaluations considered necessary to approve transfer of the 8,000 gallon Liquid Waste Tank Car (LWTC) from Fast Flux Test Facility (FFTF) to the 200 Areas. This SEP will demonstrate that the transfer of the LWTC will provide an equivalent degree of safety as would be provided by packages meeting U.S. Department of Transportation (DOT) requirements. This fulfills onsite transportation requirements implemented in the Hazardous Material Packaging and Shipping, WHC-CM-2-14

1081 (WHC-SD-W026-PLN–007) **WRAP module 1 treatment plan.** Mayancsik, B.A. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012952. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the methodology to treat waste in the Waste Receiving and Processing Module 1 facility to meet the Resource Conservation and Recovery Act (RCRA) land disposal restrictions or the Waste Isolation and Pilot Plant waste acceptance criteria. This includes Low-Level Mixed Waste, Transuranic Waste, and Transuranic Mixed Waste.

1082 (WHC-SD-W105-SWD–1-Rev.1) **242-A/LERF programmable Logic Controller Ladder. Revision 1.** Teats, M.C. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013905. Source: OSTI; NTIS; GPO Dep.

This document defines and describes the user-generated application software written to transmit digital and analog signals from the Liquid Effluent Retention Facility (LERF) to the 242-A Evaporator Distributed Control System (DCS). PLCs and modems were installed in the 242-A Evaporator by Project W-105 (LERF) to transmit 6 analog liquid level signals, 6 range alarms based on the analog signals, and 6 leak detection and pump status signals to the 242-A Distributive Control System (DCS) from LERF. Communications between the two facilities are also monitored and alarm on the DCS. Following the Project W-105 completion, the communications and signal mix were modified by Project C-018H (ETF). The current PLC software (including ladder logic and data tables), PLC hardware settings, and modern option settings to transmit the signals and monitor communications are documented and described in this document.

1083 (WHC-SD-W105-TM–001-Rev.3) **Technology basis for the Liquid Effluent Retention Facility Operating Specifications. Revision 3.** Johnson, P.G. Westinghouse Hanford Co., Richland, WA (United States). 17 May 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013336. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Retention Facility (LERF) consists of three retention basins, each with a nominal storage capacity of 6.5 million gallons. LERF serves as interim storage of 242-A Evaporator process condensate for treatment in the Effluent Treatment Facility. This document provides the technical basis for the LERF Operating Specifications, OSD-T-151-00029.

1084 (WHC-SD-W113-FDR–001-Vol.1) **Solid Waste Operations Complex W-113, Detail Design Report (Title II). Volume 1: Title II design report.** Westinghouse Hanford Co., Richland, WA (United States); Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States). Sep 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Contract MJJ-SVV-364162. Source: OSTI.

The Solid Waste Retrieval Facility–Phase 1 (Project W113) will provide the infrastructure and the facility required to retrieve from Trench 04, Burial ground 4C, contact handled (CH) drums and boxes at a rate that supports all retrieved TRU waste batching, treatment, storage, and disposal plans. This includes (1) operations related equipment and facilities, viz., a weather enclosure for the trench, retrieval equipment, weighing, venting, obtaining gas samples, overpacking, NDE, NDA, shipment of waste and (2) operations support related facilities, viz., a general office building, a retrieval staff change facility, and infrastructure upgrades such as supply and routing of water, sewer, electrical power, fire protection, roads, and telecommunication. Title I design for the operations related equipment and facilities was performed by Raytheon/BNFL, and that for the operations support related facilities including infrastructure upgrade was performed by KEH. These two scopes were combined into an integrated W113 Title II scope that was performed by Raytheon/BNFL. Volume 1 provides a comprehensive narrative description of the proposed facility and systems, the basis for each of the systems design, and the engineering assessments that were performed to support the technical basis of the Title II design. The intent of the system description presented is to provide WHC an understanding of the facilities and equipment provided and the A/E's perspective on how these systems will operate.

1085 (WHC-SD-W113-FDR–001-Vol.3) **Solid Waste Operations Complex W-113, Detail Design Report (Title II). Volume 3: Specifications.** Westinghouse Hanford Co., Richland, WA (United States); Raytheon Engineers and Constructors, Inc., Philadelphia, PA (United States). Sep 1995. 680p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Contract MJJ-SVV-364162. Order Number DE96000772. Source: OSTI; NTIS; INIS; OSTI.

The Solid Waste Retrieval Facility–Phase 1 (Project W113) will provide the infrastructure and the facility required to retrieve from Trench 04, Burial ground 4C, contact handled (CH) drums and boxes at a rate that supports all retrieved TRU waste batching, treatment, storage, and disposal plans. This includes (1) operations related equipment and facilities, viz., a weather enclosure for the trench, retrieval equipment, weighing, venting, obtaining gas samples, overpacking, NDE, NDA, shipment of waste and (2) operations support related facilities, viz., a general office building, a retrieval staff change facility, and infrastructure upgrades such as supply and routing of water, sewer, electrical power, fire protection, roads, and telecommunication. Title I design for the operations related equipment and facilities was performed by Raytheon/BNFL, and that for the operations support related facilities including infrastructure upgrade was performed by KEH. These two scopes were combined into an integrated W113 Title II scope that was performed by Raytheon/BNFL. Volume 3 is a compilation of the construction specifications that will constitute the Title II materials and performance specifications. This volume contains CSI specifications for non-equipment related construction material type items, performance type items, and facility mechanical equipment items. Data sheets are provided, as necessary, which specify the equipment overall design parameters.

1086 (WHC-SD-W320-DA–007) **Structural analysis of the Heel Jet secondary catch mechanism.** Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). 17 Apr 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010573. Source: OSTI; NTIS; INIS; GPO Dep.

Studies of the Heel Jet Pump lifting bail weld indicate that the weld process and/or weld material used may be incompatible with the base metal. For this reason, a backup design for hoist of the Heel Jet Pump is necessary. By using a 0.0508 m (2 in.) and 0.0762 m (3 in.) jumper connector in conjunction with the existing lifting bail the Heel Jet Pump can be safely hoisted.

1087 (WHC-SD-W378-DRD–001) **Preliminary design requirements document for Project W-378, low-level waste vitrification plant.** Swanson, L.M. Westinghouse Hanford Co., Richland, WA (United States). 31 Mar 1995. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010676. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this preliminary Design Requirements Document (DRD) is to identify and define the functions, with associated requirements, which must be performed to accomplish vitrification and disposal of the pretreated low-level waste (LLW) fraction of the Hanford Site tank waste. This document sets forth function requirements, performance requirements and design constraints necessary to begin conceptual design for the Low-Level Waste Vitrification Plant (LLWVP). System and physical interfaces between the LLWVP Project and the Tank Waste Remediation System (TWRS) are identified. The constraints, performance requirements, and transfer of information and data across a technical interface will be documented in an Interface Control Document. The design requirements provided in this document will be augmented by additional detailed design data to be documented by the project.

1088 (WHC-SD-WM-DA–194) **Analysis of the 241SY101 pump removal trailer and the 241SY101 strongback.** Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050106. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the calculations contained in the attached appendix is to determine the vibrational stability of the following combination (The Combination); shipping container, strongback and trailer. The vibrational stability of The Combination will be determined with the shipping container and strongback in the upright position. If the natural frequency of The Combination coincides with the input frequency and no damping is present, resonance will occur. The result of this is that the natural frequency of the Combination must be calculated as well as the input frequency. The input frequency in this case is caused by wind. Due to their geometrical complexity the upper and lower hydraulic clevises were analyzed for structural adequacy by using finite-element analysis (FEA). The FEA software COSMOS/M version 1.70 was used to model the upper and lower hydraulic clevis. All designs are in accordance with Standard Architectural-Civil Design Criteria, Design Loads for Facilities (DOE-RL 1989) and are safety class 3. The design and fabrication of each component is in accordance with American Institute of Steel Construction, Manual of Steel Construction, (AISC, 1989). The analyses contained in this document reflects the as-built condition of the 241SY101 hydraulic trailer.

1089 (WHC-SD-WM-DA–206) **Flexible receiver adapter and secondary bagger support frame analysis for 241AP102 mixer pump removal.** Axup, M.D.; Egger, J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050108. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Grout Process startup, the 241AP102 Mixer Pump, failed in 1993, is scheduled to be removed. A structural analysis was performed on two components to be used in the bagging process for the failed pump. The loading criteria was based on a worst case accident of the entire pump weight (including a 50% impact load) being applied over a small localized area. The results show that the design of each structure is adequate to protect against failure, i.e., yield

1090 (WHC-SD-WM-ER–434) **Engineering report of plasma vitrification of Hanford tank wastes.** Hendrickson, D.W. Westinghouse Hanford Co., Richland, WA (United States). 12 May 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013324. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an analysis of vendor-derived testing and technology applicability to full scale glass production from Hanford tank wastes using plasma vitrification. The subject vendor testing and concept was applied in support of the Hanford LLW Vitrification Program, Tank Waste Remediation System.

1091 (WHC-SD-WM-ER–502) **Documentation of a decision framework to support enhanced sludge washing.** Brothers, A.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050182. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes a proposed decision model that, if developed to its fullest, can provide a wide range of analysis options and insights to pretreatment/sludge washing alternatives. A recent decision has been made to terminate this work

1092 (WHC-SD-WM-EV–060-Rev.5) **242-A Evaporator Waste Analysis Plan. Revision 5.** Basra, T.S. Westinghouse Hanford Co., Richland, WA (United States). 13 Apr 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011503. Source: OSTI; NTIS; INIS; GPO Dep.

This Waste Analysis Plan (WAP) provides the plan for obtaining information needed for proper waste handling and processing in the 242-A Evaporator (Evaporator) located on the Hanford Site. In particular it addresses analysis necessary to manage the waste according to Washington Administrative Code (WAC) 173-303 and Parts 264 and 265 of the Code of Federal Regulations (CFR). Regulatory and safety issues are addressed by establishing boundary conditions for waste received and treated at the 242-A Evaporator. The boundary conditions are set by establishing limits for items such as potential exothermic reactions, waste compatibility, and control of vessel vent organic emissions. Boundary conditions are also set for operational considerations and to ensure waste acceptance at receiving facilities. The issues that are addressed in this plan include prevention of exotherms in the waste, waste compatibility, and vessel vent emissions. Samples from the other streams associated with the Evaporator are taken as required by Process Control Plans but are excluded from this plan because either the streams do not contain dangerous waste or the analyses are not required by WAC 173-303-300.

1093 (WHC-SD-WM-FHA–009) **Preliminary fire hazard analysis for the PUTDR and TRU trenches in the Solid Waste Burial Ground.** Gaschott, L.J. Hughes Associates, Inc., Columbia, MD (United States). 16 Jun 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015789. Source: OSTI; NTIS; INIS; GPO Dep.

This document represents the Preliminary Fire Hazards Analysis for the Pilot Unvented TRU Drum Retrieval effort and for the Transuranic drum trenches in the low level burial grounds. The FHA was developed in accordance with DOE Order 5480.7A to address major hazards inherent in the facility.

1094 (WHC-SD-WM-FHA–010) **Fire hazard analysis of the radioactive mixed waste trenchs.** McDonald, K.M. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Columbia Energy and Environmental Services, Inc., Richland, WA (United States). 27 Apr 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011509. Source: OSTI; NTIS; INIS; GPO Dep.

This Fire Hazards Analysis (FHA) is intended to assess comprehensively the risk from fire associated with the disposal of low level radioactive mixed waste in trenches within the lined landfills, provided by Project W-025, designated Trench 31 and 34 of the Burial Ground 218-W-5. Elements within the FHA make recommendations for minimizing risk to workers, the public, and the environment from fire during the course of the operation's activity. Transient flammables and combustibles present that support the operation's activity are considered and included in the analysis. The graded FHA contains the following elements: description of construction, protection of essential safety class equipment, fire protection features, description of fire hazards, life safety considerations, critical process equipment, high value property, damage potential–maximum credible fire loss (MCFL) and maximum possible fire loss (MPFL), fire department/brigade response, recovery potential, potential for a toxic, biological and/or radiation incident due to a fire, emergency planning, security considerations related to fire protection, natural hazards (earthquake, flood, wind) impact on fire safety, and exposure fire potential, including the potential for fire spread between fire areas. Recommendations for limiting risk are made in the text of this report and printed in bold type. All recommendations are repeated in a list in Section 18.0.

1095 (WHC-SD-WM-FHA–015) **Fire hazards analysis for solid waste burial grounds.** McDonald, K.M. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 165p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050210. Source: OSTI; NTIS; INIS; GPO Dep.

This document comprises the fire hazards analysis for the solid waste burial grounds, including TRU trenches, low-level burial grounds, radioactive mixed waste trenches, etc. It analyzes fire potential, and fire damage potential for these facilities. Fire scenarios may be utilized in future safety analysis work, or for increasing the understanding of where hazards may exist in the present operation.

1096 (WHC-SD-WM-ISB–007) **Central waste complex interim safety basis.** Cain, F.G. Westinghouse Hanford Co., Richland, WA (United States). 15 May 1995. 129p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013331. Source: OSTI; NTIS; INIS; GPO Dep.

This interim safety basis provides the necessary information to conclude that hazards at the Central Waste Complex are controlled and that current and planned activities at the CWC can be conducted safely. CWC is a multi-facility complex within the Solid Waste Management Complex that receives and stores most of the solid wastes generated and received at the Hanford Site. The solid wastes that will be handled at CWC include both currently stored and newly generated low-level waste, low-level mixed waste, contact-handled transuranic, and contact-handled TRU mixed waste.

1097 (WHC-SD-WM-LL–007) **Lessons Learned Report for the radioactive mixed waste land disposal facility (Trench 31, Project W-025).** Irons, L.G. Westinghouse Hanford Co., Richland, WA (United States). 20 Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015793. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the lessons learned from a project that involved modification to the existing burial grounds at the Hanford Reservation. This project has been focused on the development and operation of a Resource Conservation and Recovery Act compliant landfill which will accept low-level radioactive wastes that have been placed in proper containers.

1098 (WHC-SD-WM-PAP–062) **Statements of work for FY 1995 to 2000.** Mann, F.M. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 209p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011508. Source: OSTI; NTIS; INIS; GPO Dep.

The activities and tasks needed to successfully prepare an interim, preliminary, and final performance assessment on the disposal of the low-level fraction of Hanford tank wastes are given. Included are analytic, experimental, computational, writing, and approval tasks. These statements of work will be revised annually.

1099 (WHC-SD-WM-PAP-062-Rev.1) **Statements of work for FY 1996 to 2001 for the Hanford Low-Level Tank Waste Performance Assessment Project.** Mann, F.M. Westinghouse Hanford Co., Richland, WA (United States). 7 Jun 1995. 292p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015748. Source: OSTI; NTIS; INIS; GPO Dep.

The statements of work for each activity and task of the Hanford Low-Level Tank Waste Performance Assessment project are given for the fiscal years 1996 through 2001. The end product of this program is approval of a final performance assessment by the Department of Energy in the year 2000.

1100 (WHC-SD-WM-PCP-010) **Process control plan for 242-A Evaporator Campaign 95-1.** Le, E.Q.; Guthrie, M.D. Westinghouse Hanford Co., Richland, WA (United States). 18 May 1995. 235p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013334. Source: OSTI; NTIS; INIS; GPO Dep.

The wastes from tanks 106-AP, 107-AP, and 106-AW have been selected to be candidate feed wastes for Evaporator Campaign 95-1. The wastes in tank 106-AP and 107-AP are primarily from B-Plant strontium processing and PUREX neutralized cladding removal, respectively. The waste in tank 106-AW originated primarily from the partially concentrated product from 242-A Evaporator Campaign 94-2. Approximately 8.67 million liters of waste from these tanks will be transferred to tank 102-AW during the campaign. Tank 102-AW is the dedicated waste feed tank for the evaporator and currently contains 647,000 liters of processable waste. The purpose of the 242-A Evaporator Campaign 95-1 Process Control Plan (hereafter referred to as PCP) is to certify that the wastes in tanks 106-AP, 107-AP, 102-AW, and 106-AW are acceptable for processing through evaporator and provide a general description of process strategies and activities which will take place during Campaign 95-1. The PCP also summarizes and presents a comprehensive characterization of the wastes in these tanks.

1101 (WHC-SD-WM-PLN-104) **Solid Waste Assurance Program Implementation Plan.** Irons, L.G. Westinghouse Hanford Co., Richland, WA (United States). 19 Jun 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015781. Source: OSTI; NTIS; INIS; GPO Dep.

On June 6, 1995, a waiver to Hanford Site Solid Waste Acceptance Criteria, was approved by the US Department of Energy Richland Operations Office (RL) to replace the low-level, mixed, and transuranic (TRU) generator assessment programs with the Solid Waste Assurance Program (SWAP). This is associated with a waiver that was approved on March 16, 1995 to replace the Storage/Disposal Approval Record (SDAR) requirements with the Waste Specification System (WSS). This implementation plan and the SWAP applies to Solid Waste Disposal (SWD) functions, facilities, and personnel who perform waste acceptance, verification, receipt, and management functions of dangerous, radioactive, and mixed waste from on- and off-site generators who ship to or within the Hanford Site for treatment, storage, and/or disposal (TSD) at SWD TSD facilities.

1102 (WHC-SD-WM-RPT-099-Rev.2) **Compliance matrix for the mixed waste disposal facilities, trenches 31 and 34, burial ground 218-W-5. Revision 2.** Johnson, K.D. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012587. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a listing of applicable regulatory requirements to the Mixed Waste Disposal trenches. After the listing of regulations to be followed is a listing of documents that show how the regulations are being implemented and followed for the Mixed Waste trenches.

1103 (WHC-SD-WM-RPT-159) **Disposal facility data for the interim performance.** Eiholzer, C.R. Westinghouse Hanford Co., Richland, WA (United States). 15 May 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013360. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to identify and provide information on the waste package and disposal facility concepts to be used for the low-level waste tank interim performance assessment. Current concepts for the low-level waste form, canister, and the disposal facility will be used for the interim performance assessment. The concept for the waste form consists of vitrified glass cullet in a sulfur polymer cement matrix material. The waste form will be contained in a 2 × 2 × 8 meter carbon steel container. Two disposal facility concepts will be used for the interim performance assessment. These facility concepts are based on a preliminary disposal facility concept developed for estimating costs for a disposal options configuration study. These disposal concepts are based on vault type structures. None of the concepts given in this report have been approved by a Tank Waste Remediation Systems (TWRS) decision board. These concepts will only be used in th interim performance assessment. Future performance assessments will be based on approved designs.

1104 (WHC-SD-WM-TP-336) **Analysis and stabilization of Lawrence Berkeley Laboratory's multiphase mixed waste.** Crawford, B.A. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1995. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013326. Source: OSTI; NTIS; INIS; GPO Dep.

Five drums of mixed waste were accepted from LBL during FY 1994; they contain inorganic acids and compounds, as well as organic reagents and radioactive materials. This document defines the work plan for stabilization and characterization of the waste in three of these 5 drums.

1105 (WHC-SD-WM-TRP-243) **Physical property characterization of 183-H Basin sludge.** Biyani, R.K.; Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050213. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the characterization of 183-H Basin sludge physical properties, e.g. bulk density of sludge and absorbent, and determination of free liquids. Calcination of crucible-size samples of sludge was also done and the resulting 'loss-on-ignition' was compared to the theoretical weight loss based on sludge analysis obtained from Weston Labs.

1106 (WHC-SD-WM-TRP–245) **183-H Basin sludge treatability test report.** Biyani, R.K. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050191. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results from the treatability testing of a 1-kg sample of 183-H Basin sludge. Compressive strength measurements, Toxic Characteristic Leach Procedure, and a modified ANSI 16.1 leach test were conducted

1107 (WHC-SD-WM-VI–020) **Test Plan: Phase 1, Hanford LLW melter tests, GTS Duratek, Inc.** Eaton, W.C. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016331. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a test plan for the conduct of vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System (TWRS) Low-Level Waste (LLW) Vitrification Program. The vendor providing this test plan and conducting the work detailed within it [one of seven selected for glass melter testing under Purchase Order MMI-SVV-384215] is GTS Duratek, Inc., Columbia, Maryland. The GTS Duratek project manager for this work is J. Ruller. This test plan is for Phase I activities described in the above Purchase Order. Test conduct includes melting of glass with Hanford LLW Double-Shell Slurry Feed waste simulant in a DuraMelter™ vitrification system.

1108 (WHC-SD-WM-VI–021) **Test Plan: Phase 1 demonstration of 3-phase electric arc melting furnace technology for vitrifying high-sodium content low-level radioactive liquid wastes.** Eaton, W.C. (ed.). Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 55p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014303. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a test plan for the conduct of electric arc vitrification testing by a vendor in support of the Hanford Tank Waste Remediation System (TWRS) Low-Level Waste (LLW) Vitrification Program. The vendor providing this test plan and conducting the work detailed within it [one of seven selected for glass melter testing under Purchase Order MMI-SVV-384216] is the US Bureau of Mines, Department of the Interior, Albany Research Center, Albany, Oregon. This test plan is for Phase I activities described in the above Purchase Order. Test conduct includes feed preparation activities and melting of glass with Hanford LLW Double-Shell Slurry Feed waste simulant in a 3-phase electric arc (carbon electrode) furnace.

1109 (WHC-SD-WM-VI–024) **Glass melter system technologies for vitrification of high-sodium-content low-level, radioactive, liquid wastes: Phase 1, SBS demonstration with simulated low-level waste. Final test report.** Holmes, M.J. (Babcock & Wilcox, Alliance, OH (United States) Research Center); Scotto, M.V.; Shiao, S.Y. Westinghouse Hanford Co., Richland, WA (United States); Babcock and Wilcox Co., Alliance, OH (United States). Research Center. [1995]. 296p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050196. Source: OSTI; NTIS; INIS; GPO Dep.

The attached vendor report was prepared for Westinghouse Hanford Company by Babcock & Wilcox as documentation of the Phase I Final Test Report, Cyclone Combustion Melter Demonstration.

1110 (WHC-SP–1114-Rev.1) **Solid Waste Program Fiscal Year 1996 Multi-Year Program Plan WBS 1.2.1, Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001637. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the Fiscal Year 1996 Multi-Year Program Plan for the Solid Waste Program at the Hanford Reservation in Richland, Washington. The Solid Waste Program treats, stores, and disposes of a wide variety of solid wastes consisting of radioactive, nonradioactive and hazardous material types. Solid waste types are typically classified as transuranic waste, low-level radioactive waste, low-level mixed waste, and non-radioactive hazardous waste. This report describes the mission, goals and program strategies for the Solid Waste Program for fiscal year 1996 and beyond.

1111 (WHC-SP–1159) **HAMMER FY 1996 Multi-Year Program Plan: WBS #8.2.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001814. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Material Management and Emergency Response Training and Education Center – known simply as HAMMER – is being developed to assist the US Department of Energy (DOE) and others dedicated to improving worker health, safety and productivity. HAMMER is a training and education program for hazardous material, waste management, and emergency response workers. HAMMER is managed by the DOE Richland Operations Office under Work Breakdown Structure (8.2). The 1996 Multi-Year Program Plan (MYPP) includes the Execution Year data and provides the information for Programmatic Fiscal Year Site Management System Execution Baseline, as well as the detailed work plan for performance evaluation of the authorized work. The MYPP incorporates various planning methodologies to define the program and provides essential program integration, and a fully developed technical, cost, and schedule baseline. The MYPP will be utilized by WHC Program and Department Managers as the baseline management tool for status and progress monitoring, performance enhancement, impact analysis studies, and as the basis for detailed fiscal year and near-term planning.

1112 (WINCO–1196) **Modelling the unsteady growth state population balance for a nonlinear growth model in an MSMPR crystallizer.** Carver, C. (Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States)); Chipman, N.A.; Carleson, T.E. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Mar 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE96003548. Source: OSTI; NTIS; INIS; GPO Dep.

The precipitation of zirconium and other metal species as hydroxides (hydrous oxides) from simulated nuclear waste process solutions has been investigated as a potential method to reduce radioactive waste volumes. The reaction of ammonium hexaflourozirconate was used to simulate these waste streams. Studies were conducted to investigate the unsteady state response of crystallization in mixed suspension, mixed product removal (MSMPR) crystallizer. Size distributions below 40 μm from laboratory batch and MSMPR data indicate size-dependent growth may be occurring because they may fit the Abegg, Stevens and Larson (ASL) model. However, these distributions also may fit a transient growth model based on the Method of Lines numerical solution to the unsteady state population balance equation. The development of the Method of Lines solution as well as experimental agreement with both models were studied.

1113 (WINCO–1198) **Decontamination of metals by melt refining/slagging: First year progress report.** Mizia, R.E. (ed.); Worcester, S.A.; Twidwell, L.G.; Paolini, D.J.; Weldon, T.A. Westinghouse Idaho Nuclear Co., Inc., Idaho Falls, ID (United States). Mar 1994. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-84ID12435. Order Number DE96003532. Source: OSTI; NTIS; INIS; GPO Dep.

As the number of nuclear installations undergoing decontamination and decommissioning (D&D) increases, current radioactive waste storage space is consumed and establishment of new waste storage areas becomes increasingly difficult. The problem of handling and storing radioactive scrap metal (RSM) gains increasing importance in the DOE Environmental Restoration and Waste Management Program. To alleviate present and future waste storage problems, Westinghouse Idaho Nuclear Company (WINCO) is managing a program for the recycling of RSM for beneficial use within the DOE complex. As part of that effort, Montana Tech has been awarded a contract to help optimize melting and refining technologies for the recycling of stainless steel RSM. The scope of the Montana Tech program includes a literature survey, a decontaminating slag design study, small scale melting studies to determine optimum slag compositions for removal of radioactive contaminant surrogates, analysis of preferred melting techniques, and coordination of pilot scale melting demonstrations (100-500 lbs) to be conducted at selected commercial facilities. This program will identify methods that can be used to recycle stainless steel RSM which will be used to fabricate high and low level waste canisters for the Idaho Waste Immobilization Facility. This report summarizes the results of an extensive literature review and the first year's progress on slag design, small-scale melt refining of surrogate-containing stainless steel (presently only a three month effort), and pilot-scale preparation of surrogate master ingots.

1114 (WSRC-IM–91-53-Vol.X) **1993 RCRA Part B permit renewal application, Savannah River Site: Volume 10, Consolidated Incineration Facility, Section C, Revision 1.** Molen, G. Westinghouse Savannah River Co., Aiken, SC (United States). Aug 1993. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95017473. Source: OSTI; NTIS; INIS; GPO Dep.

This section describes the chemical and physical nature of the RCRA regulated hazardous wastes to be handled, stored, and incinerated at the Consolidated Incineration Facility (CIF) at the Savannah River Site. It is in accordance with requirements of South Carolina Hazardous Waste Management Regulations R.61-79.264.13(a) and(b), and 270.14(b)(2). This application is for permit to store and teat these hazardous wastes as required for the operation of CIF. The permit is to cover the storage of hazardous waste in containers and of waste in six hazardous waste storage tanks. Treatment processes include incineration, solidification of ash, and neutralization of scrubber blowdown.

1115 (WSRC-MS–94-0640) **Microwave technology for waste management applications including disposition of electronic circuitry.** Wicks, G.G. (Westinghouse Savannah River Co., Aiken, SC (United States)); Clark, D.E.; Schulz, R.L.; Folz, D.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9505249–11: 97. American Ceramic Society (ACS) annual meeting and exposition, Cincinnati, OH (United States), 1-4 May 1995). Order Number DE95017491. Source: OSTI; NTIS; INIS; GPO Dep.

Microwave technology is being developed nationally and internationally for a variety of environmental remediation purposes. These efforts include treatment and destruction of a vast array of gaseous, liquid and solid hazardous wastes as well as subsequent immobilization of selected components. Microwave technology provides an important contribution to an arsenal of existing remediation methods that are designed to protect the public and environment from undesirable consequences of hazardous materials. Applications of microwave energy for environmental remediation will be discussed. Emphasized will be a newly developed microwave process designed to treat discarded electronic circuitry and reclaim the precious metals within for reuse.

1116 (WSRC-MS–95-0038) **The effect of chemical composition on the PCT durability of mixed waste glasses from wastewater treatment sludges.** Bickford, D.F. (Westinghouse Savannah River Co., Aiken, SC (United States)); Cicero, C.A.; Resce, J.L.; Ragsdale, R.G.; Overcamp, T.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–135: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95010967. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/SR132004.

The Mixed Waste Integrated Program (NMIP) at the Department of Energy (DOE) has taken a serious look at vitrification for treatment of low-level mixed waste streams. This was prompted, in part, by the fact that the EPA has declared that vitrification is the Best Demonstrated Available Technology for the disposal of high-level radioactive waste. Among the low-level mixed waste streams within the DOE complex, which are under consideration for vitrification, are wastewater treatment sludges at the Savannah River Site (SRS), Oak Ridge Reservation (ORR), Rocky Flats Plant (RFP), and Los Alamos National Laboratory (LANL), These sludges typically contain low levels of radioactive and hazardous metals, water, and additives from the waste treatment process itself The treatment additives normally include precipitating and flocculating agents such as sodium, calcium, magnesium, and iron compounds or siliceous filter aids from the dewatering process. These treatment additives tend to be soluble in silicate glass and are thus amenable to vitrification.

1117 (WSRC-MS–95-0064) **Vitrification treatability studies of actual waste water treatment sludges.** Jantzen, C.M. (Westinghouse Savannah River Co., Aiken, SC (United States)); Hutson, N.D.; Gilliam, T.M.; Bleier, A.; Spence, R.D. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–134: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95010960. Source: OSTI; NTIS; INIS; GPO Dep.

Treatability studies have been conducted at the laboratory-scale to evaluate vitrification of waste water sludges at the Oak Ridge Reservation (ORR). These studies are being conducted jointly by Westinghouse Savannah River Technology Center (SRTC) and Oak Ridge National Laboratory (ORNL). These studies include testing with surrogate waste formulations at both the laboratory-scale and pilot-scale, and testing with actual waste at the laboratory-scale, pilot-scale, and field-scale. ORR was chosen as the host site for the field-scale demonstration. The Y-12 West End Treatment Facility (WETF) waste water treatment sludges, which are RCRA F-listed wastes, were chosen as the candidate waste stream for the first field-scale demonstration. The laboratory-scale "proof-of-principle" demonstrations reported in this study and the pilot-scale studies planned for FY95 on the WETF sludge will provide needed operating parameters for the planned field-scale demonstration. These laboratory-scale "proof-of-principle" and pilot-scale studies also provide needed data for the evaluation of the feasibility of vitrification as a stabilization option for a variety of wastes which do not currently meet RCRA/LDR (Resource Conservation and Recovery Act/Land Disposal Restrictions) requirements for storage/disposal and/or those for which treatment capacity does not presently exist.

1118 (WSRC-MS–95-0068) **Changes in chemical composition of tetraphenylboron slurry during pretreatment for vitrification.** Clamp, L.A. (Clemson Univ., SC (United States). Dept. of Chemical Engineering); Ferrara, D.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950216–133: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95010966. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents results from a study of changes in the composition of a high-level waste (HLW) stream at two stages of its treatment. The waste stream that was studied was a tetraphenylborate precipitate slurry of a HLW supernate from a storage tank at the Savannah River Site. Changes to the slurry composition were studied prior to treatment (a hydrolysis process) and then again after hydrolysis of the slurry. In addition, the success of the hydrolysis is briefly discussed. This study showed that prior to hydrolysis, the solubility of cesium 137 and potassium increased significantly under the influence of the beta and gamma radiation from cesium-137 decay. This was due to radiolytic decomposition of the tetraphenylborate precipitate. The concentration of soluble boron was also expected to increase. Although the boron concentration did seem to increase, the change could not be considered statistically significant. Composition of the hydrolysis product also changed. Concentrations of soluble mercury, calcium, and magnesium all increased by more than 2X in a six month period following the hydrolysis. Concentrations of soluble copper, boron and zinc decreased by more than 2X. The concentrations of the most soluble species in the sample, sodium and potassium, did not change significantly. Comparisons of results from four hydrolysis demonstrations with radioactive precipitate slurry indicated that the elemental composition of the hydrolysis product did not vary greatly even when the process was scaled down. The one exception was the concentration of soluble copper. This concentration was significantly lower in two of the four studies.

1119 (WSRC-MS–95-0080) **Nitric-phosphoric acid oxidation of organic waste materials.** Pierce, R.A.; Smith, J.R. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950877–21: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96001859. Source: OSTI; NTIS; INIS; GPO Dep.

A wet chemical oxidation technology has been developed to address issues facing defense-related facilities, private industry, and small-volume generators such as university and medical laboratories. Initially tested to destroy and decontaminate a heterogenous mixture of radioactive-contaminated solid waste, the technology can also remediate other hazardous waste forms. The process, unique to Savannah River, offers a valuable alternative to incineration and other high-temperature or high-pressure oxidation processes. The process uses nitric acid in phosphoric acid; phosphoric acid allows nitric acid to be retained in solution well above its normal boiling point. The reaction converts organics to carbon dioxide and water, and generates NO_x vapors which can be recycled using air and water. Oxidation is complete in one to three hours. In previous studies, many organic compounds were completely oxidized, within experimental error, at atmospheric pressure below 180°C; more stable compounds were decomposed at 200°C and 170 kPa. Recent studies have evaluated processing parameters and potential throughputs for three primary compounds: EDTA, polyethylene, and cellulose. The study of polyvinylchloride oxidation is incomplete at this time.

1120 (WSRC-MS–95-0087) **Initial Experience to Determine the Solubility of Salts in Low-Level Mix Waste Glasses.** Andrews, M.K.; Saur, C.C. Westinghouse Savannah River Co., Aiken, SC (United States). 17 Feb 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950877–9: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95060113. Source: OSTI; NTIS; INIS; GPO Dep.

Glass may be used to immobilize low-level mixed waste (LLMW) at the Savannah River Site because of its ability to accept a wide variety of components into its network structure. However, many common salts (sulfates, chlorides, phosphates, and chromates) present in the LLMW streams have limited solubility in glass. Processing and product problems may arise if the solubility of these salts is exceeded. In an effort to determine the factors that most affect salt solubilities, a statistical screening experiment was performed. The screening experiment, a Plackett-Burman design, allowed efficient estimation of the effects of variables, such as the composition of the glass, the temperature of the melt, the duration of melting, and the cooling rate. Each of these factors, along with a combination of sulfate, chloride, phosphate and chromate concentrations, were examined to provide an estimate of the solubility of each salt. The results of the screening experiment were interpreted to determine which variables should be further examined. The composition of the glass, especially the concentrations of boron, calcium and the alkalis, was found to have the greatest effect on the solubilities of the salts. This paper will discuss the results of the screening experiment and describe a path forward.

1121 (WSRC-MS-95-0153) **High temperature vitrification of surrogate Savannah River Site (SRS) mixed waste materials.** Applewhite-Ramsey, A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Schumacher, R.F.; Spatz, T.L.; Newsom, R.A.; Circeo, L.J.; Danjaji, M.B. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950401-29: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE96001849. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Technology Center (SRTC) has been funded through the DOE Office of Technology Development (DOE-OTD) to investigate high-temperature vitrification technologies for the treatment of diverse low-level and mixed wastes. High temperature vitrification is a likely candidate for processing heterogeneous solid wastes containing low levels of activity. Many SRS wastes fit into this category. Plasma torch technology is one high temperature vitrification method. A trial demonstration of plasma torch processing is being performed at the Georgia Institute of Technology on surrogate SRS wastes. This effort is in cooperation with the Engineering Research and Development Association of Georgia Universities (ERDA) program. The results of phase 1 of these plasma torch trials will be presented.

1122 (WSRC-MS-95-0184) **Defining the Glass Composition Limits for SRS Contaminated Soils.** Cicero, C.A. (Westinghouse Savannah River Company, Aiken, SC (United States)); Bickford, D.F.; Crews, W.O. Westinghouse Savannah River Co., Aiken, SC (United States). 12 May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950877-18: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96060001. Source: OSTI; NTIS; INIS; GPO Dep.

Contaminated soil resulting from the excavation, repair, and decommissioning of facilities located at the Savannah River Site (SRS) is currently being disposed of by shallow land burial or is being stored when considered only hazardous. Vitrification of this waste is being investigated, since it will bind the hazardous and radioactive species in a stable and durable glass matrix, which will reduce the risk of ground water contamination. However, the composition limits for producing durable glass have to be determined before the technology can be applied. Glass compositions, consisting of SRS soil and glass forming additives, were tested on a crucible-scale in three ternary phase systems. Nine different glass compositions were produced, with waste loadings ranging from 43 to 58 weight percent. These were characterized using varoius chemical methods and tested for durability in both alkaline and acidic environments. All nine performed well in alkaline environments, but only three met the strictest criteria for the acidic environment tests. Although the glasses did not meet all of the limits for the acidic tests, the test was performed on very conservative size samples, so the results were also conservative. Therefore, enough evidence was found to provide proof that SRS soil can be vitrified in a durable glass matrix

1123 (WSRC-MS-95-0185) **Defining the glass composition limits for the CaO-Al2O3-SiO2 ternary system.** Cicero, C.A. (and others); Andrews, M.K.; Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States);South Carolina Univ., Columbia, SC (United States). DOE Contract AC09-89SR18035. (CONF-950877-20: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96001858. Source: OSTI; NTIS; INIS; GPO Dep.

Vitrification is being investigated as an alternative wasteform for Department of Energy low-level mixed wastes. Since these wastes often contain significant amounts of calcium, the $CaO-Al_2O_3-SiO_2$ ternary system may be used when trying to determine suitable glass compositions. The objective of this research was to determine a leach-resistant glass forming region in the $CaO-Al_2O_3-SiO_2$ system. Several glasses were fabricated and characterized for chemical composition and durability to ensure that the glass-forming region was completely covered. A total of twenty-nine compositions were studied, with eighteen producing glass. Eleven of the glasses passed all the durability tests performed and could be characterized as durable and leach resistant. Five additional glasses passed the Product Consistency Test (PCT), but did not meet the most restrictive limits for the Toxicity Characteristic Leaching Procedure (TCLP). However, these glasses were also classified as acceptable because of the conservative sample size used for the test. The other two glasses performed well on the PCT, but had excessive releases on the TCLP. When plotted on the $CaO-Al_2O_3-SiO_2$ ternary, these compositions provided a good sized glass forming region, which will be utilized for further low-level mixed waste studies.

1124 (WSRC-MS-95-0261) **Waste certification review program at the Savannah River Site.** Faulk, G.W. (Westinghouse Savannah River Co., Aiken, SC (United States)); Kinney, J.C.; Knapp, D.C.; Burdette, T.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212-3: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96005347. Source: OSTI; NTIS; INIS; GPO Dep.

After approving the waste certification programs for 45 generators of low-level radioactive and mixed waste, Westinghouse Savannah River Company (WSRC) moved forward to implement a performance-based approach for assuring that approved waste generators maintain their waste certification programs. WSRC implemented the Waste Certification Review Program, which is comprised of two sitewide programs, waste generator self-assessments and Facility Evaluation Board reviews, integrated with the WSRC Solid Waste Management Department Waste Verification Program Evaluations. The waste generator self-assessments ensure compliance with waste certification requirements, and Facility Evaluation Board reviews provide independent oversight of generators' waste certification programs. Waste verification evaluations by the TSD facilities serve as the foundation of the program by confirming that waste contents and generator performance continue to meet waste acceptance criteria (WSRC 1994) prior to shipment to treatment, storage, and disposal facilities. Construction of the Savannah River Site (SRS) was started by the US Government in 1950. The site covers approximately 300 square miles located along the Savannah River near Aiken, South Carolina. It is operated by the US Department of Energy (DOE). Operations are conducted by managing and operating contractors, including the Westinghouse Savannah River Company (WSRC). Historically, the primary purpose of the

SRS was to produce special nuclear materials, primarily plutonium and tritium. In general, low-level radioactive and mixed waste is generated through activities in operations. Presently, 47 SRS facilities generate low-level radioactive and mixed waste. The policies, guidelines, and requirements for managing these wastes are determined by DOE and are reflected in DOE Order 5820.2A (US DOE 1988).

1125 (WSRC-MS--95-0328) **The effect of quench rate on the TCLP and PCT durability of environmental waste glass.** Resce, J.L. (Clemson Univ., Clemson, SC (United States). Dept. of Environmental Systems Engineering); Wolff, B.M.; Jurgensen, A.R.; Cicero, C.M.; Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9509139--9: 7. ACS special symposium: emerging technologies in hazardous waste management, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96002926. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. RADIOACTIVE WASTES/vitrification; GLASS/leaching; GLASS/crystallization; VITRIFICATION; GLASS; LEACHING; CRYSTALLIZATION; COMPILED DATA; RADIOACTIVE WASTE MANAGEMENT

1126 (WSRC-MS--95-0423) **Bench-scale vitrification studies with Savannah River Site mercury contaminated soil.** Cicero, C.A.; Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212--88: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009649. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Technology Center (SRTC) has been charted by the Department of Energy (DOE)--Office of Technology Development (OTD) to investigate vitrification technology for the treatment of Low Level Mixed Wastes (LLMW). In fiscal year 1995, mercury containing LLMW streams were targeted. In order to successfully apply vitrification technology to mercury containing LLMW, the types and quantities of glass forming additives necessary for producing homogeneous glasses from the wastes have to be determined and the treatment for the mercury portion must also be determined. Selected additives should ensure that a durable and leach resistant waste form is produced, while the mercury treatment should ensure that hazardous amounts of mercury are not released into the environment. The mercury containing LLMW selected for vitrification studies at the SRTC was mercury contaminated soil from the TNX pilot-plant facility at the Savannah River Site (SRS). Samples of this soil were obtained so bench-scale vitrification studies could be performed at the SRTC to determine the optimum waste loading obtainable in the glass product without sacrificing durability and leach resistance. Vitrifying this waste stream also required offgas treatment for the capture of the vaporized mercury.

1127 (WSRC-MS--96-0256) **Vitrification demonstration with surrogate Oak Ridge Reservation K-25 B and C pond sludge.** Cicero, C.A. (Westinghouse Savannah River Co., Aiken, SC (United States)); Overcamp, T.J.; Erich, D.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9605199--1: International symposium on the environmental issues and waste management technologies in ceramic and nuclear industry, Indianapolis, IN (United States), 31 May 1996). Order Number DE96060060. Source: OSTI; NTIS; INIS; GPO Dep.

Surrogate Oak Ridge Reservation (ORR) K-25 B&C Pond sludge was vitrified in a pilot-scale EnVit Co melter operated by Clemson University at the DOE/Industrial Center for Vitrification Research Center. This demonstration was performed for the Savannah River Technology Center (SRTC) in support of a Department of Energy (DOE) - Office of Technology Development (OTD) Technical Task Plan. The intent of the demonstration was to determine the feasibility of vitrifying actual K-25 B&C Pond sludge in an EnVitCo type melter. B&C Pond sludge is a mixed waste consisting primarily of various amounts of Ca, Fe, and Si, with Ni and U as the principal hazardous and radioactive components. The demonstration was successfully completed and homogeneous, durable glass was produced. Characterization of the glass product, as well as details of the demonstration, will be discussed.

1128 (WSRC-RP--94-927) **Final Report on Testing of Off-Gas Treatment Technologies for Abatement of Atmospheric Emissions of Chlorinated Volatile Organic Compounds.** Jarosch, T.R.; Haselow, J.S.; Rossabi, J.; Burdick, S.A.; Raymond, R.; Young, J.E.; Lombard, K.H. Westinghouse Savannah River Co., Aiken, SC (United States). 23 Jan 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060136. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to summarize the results of the program for off-gas treatment of atmospheric emissions of chlorinated volatile organic compounds (CVOCs), in particular trichloroethylene (TCE) and perchloroethylene (PCE). This program was funded through the Department of Energy Office of Technology Development's VOC's in Non-Arid Soils Integrated Demonstration (VNID). The off-gas treatment program was initiated after testing of in-situ air stripping with horizontal wells was completed (Looney et al., 1991). That successful test expectedly produced atmospheric emissions of CVOCs that were unabated. It was decided after that test that an off-gas treatment is an integral portion of remediation of CVOC contamination in groundwater and soil but also because several technologies were being developed across the United States to mitigate CVOC emissions. A single platform for testing off-gas treatment technologies would facilitate cost effective evaluation of the emerging technologies. Another motivation for the program is that many CVOCs will be regulated under the Clean Air Act Amendments of 1990 and are already regulated by many state regulatory programs. Additionally, compounds such as TCE and PCE are pervasive subsurface environmental contaminants, and, as a result, a small improvement in terms of abatement efficiency or cost will significantly reduce CVOC discharges to the environment as well as costs to United States government and industry.

1129 (WSRC-TR--94-0239) **A synopsis of environmental horizontal wells at the Savannah River Site.** Denham, M.E.; Lombard, K.H. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95014720. Source: OSTI; NTIS; INIS; GPO Dep.

Seven horizontal wells for environmental remediation were installed at the Savannah River Site as part of an Integrated Demonstration Project sponsored by the Department of Energy's Office of Technology Development. The wells were used to demonstrate innovative remediation systems for the clean up of chlorinated organic solvent contamination in groundwater and the vadose zone. The wells were installed in four demonstrations of different horizontal drilling technologies. A short-radius petroleum industry technology, a modified petroleum industry technology (using a downhole motor), a utility industry technology, and a river crossing technology were demonstrated. The goals of the demonstrations were to show the utility of horizontal wells in environmental remediation and further development of the technology required to install these wells. From the first demonstration in 1988 to the latest in 1991, there was significant evolution in horizontal drilling technology. The main technical challenges in the first demonstration were directional control during drilling and borehole instability. Through advancement of the technology these problems were overcome and did not affect the last demonstration. Those considering the use of horizontal wells for environmental remediation will benefit from the knowledge gained from these demonstrations.

1130 (WSRC-TR-94-0402) **Burst Test Qualification Analysis of DWPF Canister-Plug Weld.** Gupta, N.K.; Gong, Chung. Westinghouse Savannah River Co., Aiken, SC (United States). Feb 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060133. Source: OSTI; NTIS; INIS; GPO Dep.

The DWPF canister closure system uses resistance welding for sealing the canister nozzle and plug to ensure leak tightness. The welding group at SRTC is using the burst test to qualify this seal weld in lieu of the shear test in ASME B&PV Code, Section IX, paragraph QW-196. The burst test is considered simpler and more appropriate than the shear test for this application. Although the geometry, loading and boundary conditions are quite different in the two tests, structural analyses show similarity in the failure mode of the shear test in paragraph QW-196 and the burst test on the DWPF canister nozzle Non-linear structural analyses are performed using finite element techniques to study the failure mode of the two tests. Actual test geometry and realistic stress strain data for the 304L stainless steel and the weld material are used in the analyses. The finite element models are loaded until failure strains are reached. The failure modes in both tests are shear at the failure points. Based on these observations, it is concluded that the use of a burst test in lieu of the shear test for qualifying the canister-plug weld is acceptable. The burst test analysis for the canister-plug also yields the burst pressures which compare favorably with the actual pressure found during burst tests. Thus, the analysis also provides an estimate of the safety margins in the design of these vessels.

1131 (WSRC-TR-94-0608-Rev.2) **Savannah River Site mixed waste Proposed Site Treatment Plan (PSTP). Volumes 1 and 2 and reference document: Revision 2.** Helmich, E.; Noller, D.K.; Wierzbicki, K.S.; Bailey, L.L. Westinghouse Savannah River Co., Aiken, SC (United States). 13 Jul 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001688. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE is required by the Resource Conservation and Recovery Act to prepare site treatment plans describing the development of treatment capacities and technologies for treating mixed waste. This proposed plan contains Savannah River Site's preferred options and schedules for constructing new facilities, and otherwise obtaining treatment for mixed wastes. The proposed plan consists of 2 volumes. Volume 1, Compliance Plan, identifies the capacity to be developed and the schedules as required. Volume 2, Background, provides a detailed discussion of the preferred options with technical basis, plus a description of the specific waste streams. Chapters are: Introduction; Methodology; Mixed low level waste streams; Mixed transuranic waste; High level waste; Future generation of mixed waste streams; Storage; Process for evaluation of disposal issues in support of the site treatment plans discussions; Treatment facilities and treatment technologies; Offsite waste streams for which SRS treatment is the Preferred Option (Naval reactor wastes); Summary information; and Acronyms and glossary. This revision does not contain the complete revised report, but only those pages that have been revised.

1132 (WSRC-TR-94-0608-Rev.3) **Proposed site treatment plan (PSTP) Volumes I & II & reference document, Revision 3.** Helmich, E. (and others); Noller, D.K.; Wierzbicki, K.S. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Sep 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002955. Source: OSTI; NTIS; INIS; GPO Dep.

The Federal Facility Compliance Act requires the Department of Energy to undertake a national effort to develop Site Treatment Plans for each of its sites generating or storing mixed waste. Mixed waste contains both a hazardous waste subject to the Resource Conservation and Recovery Act and radioactive material subject to the Atomic Energy Act of 1954. The Site Treatment Plan for the Savannah River Site proposes how SRS will treat mixed waste that is now stored on the site and mixed waste that Will be generated in the future. Also, the Site Treatment Plan identifies Savannah River Site mixed wastes that other Department of Energy facilities could treat and mixed waste from other facilities that the Savannah River Site could treat. The Site Treatment Plan has been approved by the State of South Carolina. The Department of Energy Will enter into a consent order with the State of South Carolina by October 6, 1995. The consent order will contain enforceable commitments to treat mixed waste.

1133 (WSRC-TR-94-0608-Rev.4) **Approved Site Treatment Plan, Volumes 1 and 2. Revision 4.** Helmich, E.H.; Molen, G.; Noller, D. Westinghouse Savannah River Co., Aiken, SC (United States). 22 Mar 1996. 370p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96012433. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy, Savannah River Operations Office (DOE-SR), has prepared the Site Treatment Plan (STP) for Savannah River Site (SRS) mixed wastes in accordance with RCRA Section 3021(b), and SCDHEC has approved the STP (except for certain offsite wastes) and issued an order enforcing the STP commitments in Volume 1. DOE-SR and SCDHEC agree that this STP fulfills the requirements contained in the FFCAct, RCRA Section 3021, and therefore, pursuant to Section 105(a) of the FFCAct (RCRA Section 3021(b)(5)), DOE's requirements are to implement the plan for the development of treatment capacities and technologies pursuant to RCRA Section 3021. Emerging and new technologies not yet considered may be identified to manage waste more safely, effectively, and at lower cost than technologies currently identified in the plan. DOE will continue to evaluate and develop technologies that offer potential advantages in public acceptance, privatization, consolidation, risk abatement, performance, and life-cycle cost. Should technologies that offer such advantages be identified, DOE may request a revision/modification of the STP in accordance with the provisions of Consent Order 95-22-HW. The Compliance Plan Volume (Volume 1) identifies project activity schedule milestones for achieving compliance with Land Disposal Restrictions (LDR). Information regarding the technical evaluation of treatment options for SRS mixed wastes is contained in the Background Volume (Volume 2) and is provided for information.

1134 (WSRC-TR-94-0608-Vol.1-2) **Proposed Site Treatment Plan (PSTP). Volumes 1 and 2 and Reference Document.** Helmich, E.; Noller, D.K.; Wierzbicki, K.S.; Bailey, L.L. Westinghouse Savannah River Co., Aiken, SC (United States). 22 Dec 1994. 368p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060111. Source: OSTI; NTIS; INIS; GPO Dep.

The Compliance Plan Volume provides overall schedules with target dates for achieving compliance with the land disposal restrictions (LDR) and contains procedures to establish milestones to be enforced under the Order. Information regarding the technical evaluation of treatment options for SRS mixed wastes is contained in the Background Volume and is provided for informational purposes only.

1135 (WSRC-TR-95-0016) **Consolidated Incineration Facility waste burn test. Final report.** Burns, D.B. Westinghouse Savannah River Co., Aiken, SC (United States). 11 Jan 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95017492. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Technology Center (SRTC) is Providing technical support for start-up and operation of the Consolidated Incineration Facility. This support program includes a series of pilot incineration tests performed at the Environmental Protection Agency's (EPA's) Incineration Research Facility (MF) using surrogate CIF mixed wastes. The objectives for this test program included measuring incinerator offgas particulate loading and size distributions as a function of several operating variables, characterizing kiln bottom ash and offgas particulates, determining heavy metal partition between the kiln bottom ash and incinerator stack gas, and measuring kiln organics emissions (particularly polychlorinated dioxins and furans). These tests were designed to investigate the effect of the following operating parameters: Incineration Temperature; Waste Feed Rate; Waste Density; Kiln Solids Residence Time; and Waste Composition. Tests were conducted at three kiln operating temperatures. Three solid waste simulants were burned, two waste mixtures (paper, plastic, latex, and PVC) with one containing spiked toxic organic and metal compounds, and one waste type containing only paper. Secondary Combustion Chamber (SCC) offgases were sampled for particulate loading and size distribution, organic compounds, polychlorinated dibenzo[p]dioxins and polychlorinated dibenzofurans (PCDD/PCDF), metals, and combustion products. Kiln bottom ash and offgas particulates were characterized to determine the principal elements and compounds comprising these secondary wastes.

1136 (WSRC-TR-95-0034) **Glass composition development for plasma processing of Hanford high sodium content low-level radioactive liquid waste.** Marra, J.C. Westinghouse Savannah River Co., Aiken, SC (United States). Feb 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95014719. Source: OSTI; NTIS; INIS; GPO Dep.

To assess the acceptability of prospective compositions, response criteria based on durability, homogeneity, viscosity and volatility were defined. Response variables were weighted: durability 35%, homogeneity 25%, viscosity 25%, volatility 15%. A Plackett-Burman experimental design was used to define the first twelve glass formulations. Glass former additives included Al2O3, B2O3, CaO, Li2O, ZrO2 and SiO2. Lithia was added to facilitate fritting of the additives. The additives were normalized to silica content to ease experimental matrix definition and glass formulation. Preset high and low values of these ratios were determined for the initial twelve melts. Based on rankings of initial compositions, new formulations for testing were developed based on a simplex algorithm. Rating and ranking of subsequent compositions continued until no apparent improvement in glass quality was achieved in newly developed formulations. An optimized composition was determined by averaging the additive component values of the final best performing compositions. The glass former contents to form the optimized glass were: 16.1 wt % Al2O3, 12.3 wt % B2O3, 5.5 wt % CaO, 1.7 wt % Li2O, 3.3 wt % ZrO2, 61.1 wt % SiO2. An optimized composition resulted after only 25 trials despite studying six glass additives. A vitrification campaign was completed using a small-scale Joule heated melter. 80 lbs of glass was produced over 96 hours of continuous operation. Several salt compounds formed and deposited on melter components during the run and likely caused the failure of several pour chamber heaters. In an attempt to minimize sodium volatility, several low or no boron glasses were formulated. One composition containing no boron produced a homogeneous glass worthy of additional testing.

1137 (WSRC-TR-95-0085) **Approximate cylindrical blast theory: Application to pressure loading.** Hutchens, G.J.; Gong, C. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95017502. Source: OSTI; NTIS; INIS; GPO Dep.

SRTC is currently investigating the use of plasma systems for immobilization of mixed low-level waste and transuranic waste. Much of this waste contains organic materials which are unstable in high temperature environments. For plasma technology to be viable for immobilization of these wastes, the breakdown of the organic materials must not pose a safety problem. To support start-up and operational planning for waste vitrification activities at SRS, an analysis has been performed to estimate the pressure load on a vessel wall due to an explosion. If, during routine operation of a waste vitrifier, a container with reactive material is injected, an explosion may result. With this in mind it is important to determine the pressure load on the container wall that results. The analysis performed below is a scoping calculation and is considered an R&D level 2 calculation based on the WSRC manual E-7. The objective of this analysis is to use near-field cylindrical blast theory to estimate the pressure load on a container wall due to an internal explosion. The blast theory result will then be compared to a structural calculation performed using ABAQUS. The ABAQUS calculations are to determine the pressure at which the container wall will fracture. Then, that pressure will be compared to the pressure given by blast theory for several explosive loadings.

1138 (WSRC-TR-95-0176) **Electronic Denitration Savannah River Site Radioactive Waste.** Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). 11 Apr 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060149. Source: OSTI; NTIS; INIS; GPO Dep.

Electrochemical destruction of nitrate in radioactive Savannah River Site Waste has been demonstrated in a bench-scale flow cell reactor. Greater than 99% of the nitrate can be destroyed in either an undivided or a divided cell reactor. The rate of destruction and the overall power consumption is dependent on the cell configuration and electrode materials. The fastest rate was observed using an undivided cell equipped with a nickel cathode and nickel anode. The use of platinized titanium anode increased the energy requirement and costs compared to a nickel anode in both the undivided and divided cell configurations.

1139 (WSRC-TR-95-0199) **The Savannah River Site Waste Inventory Management Program.** Griffith, J.M.; Holmes, B.R. Westinghouse Savannah River Co., Aiken, SC (United States). 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9505111-4: 11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress, Knoxville, TN (United States), 16-18 May 1995). Order Number DE95017490. Source: OSTI; NTIS; INIS; GPO Dep.

Each hazardous and radioactive waste generator that delivers waste to Savannah River Site (SRS) treatment, storage and disposal (TSD) facilities is required to implement a waste certification plan. The waste certification process ensures that waste has been properly identified, characterized, segregated, packaged, and shipped according to the receiving facilities waste acceptance criteria. In order to comply with the rigid acceptance criteria, the Reactor Division developed and implemented the Waste Inventory Management Program (WIMP) to track the generation and disposal of low level radioactive waste. The WIMP system is a relational database with integrated barcode technology designed to track the inventory radioactive waste. During the development of the WIMP several waste minimization tools were incorporated into the design of the program. The inclusion of waste minimization tools as part of the WIMP has resulted in a 40% increase in the amount of waste designated as compactible and an overall volume reduction of 5,000 cu-ft.

1140 (WSRC-TR-95-0303) **Waste minimization methods for treating analyticl instrumentation effluents at the source.** Policke, T.R. (Westinghouse Savannah River Co., Aiken, SC (United States)); Ritter, J.A.; Barnhart, C. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9509139-6: 7. ACS special symposium: emerging technologies in hazardous waste management, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96002922. Source: OSTI; NTIS; INIS; GPO Dep.

Recently there has been increasing interest in minimizing analytical laboratory wastes. The driving forces behind this interest are the ever increasing costs and liabilities associated with waste disposal. Thus, many analytical laboratories, like the Defense Waste Processing Technology-Analytical Laboratory (DWPT-AL), located at the Savannah River Site (SRS), are looking into treating their own wastes. The DWPT-AL operates four laboratory modules that produce hazardous liquid effluents from the analytical instrumentation: Spectroscopy, Chromatography I, Chromatography II, and Wet Chemistry. The hazardous waste from these modules is being sent to SRS Waste Management at a cost of approximately $13,000 per drum, which corresponds to approximately $325,000 to $520,000 per year. If the hazardous characteristics of and the hazardous components in the analytical instrument effluents or example preparation wastes can be altered and/or reduced in such a way as to render the stream non-hazardous, the large volume of non-hazardous waste can be disposed of via process drains. Therefore, the primary goal of this project was to reduce the amount of hazardous waste being generated by the DWPT-AL, thereby substantially reducing the costs associated with its disposal. A secondary goal was to develop in-line methods using primarily adsorption/ion exchange columns that can be used to treat the liquid effluent as it emerges from the analytical instrument as a slow, dripping flow. The second goal allows the treatment method to become part of the operating procedure associated with the instrument; thus, the effluent would not be considered a waste until it emerges from the in-line column.

1141 (WSRC-TR-95-0304) **A bench scale study of a one-step dissolution process for treating contaminated fiberglass filters.** Policke, T.A.; Ritter, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9509139-8: 7. ACS special symposium: emerging technologies in hazardous waste management, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96002923. Source: OSTI; NTIS; INIS; GPO Dep.

High efficiency mist eliminators (HEME) and high efficiency particulate air filters (HEPA) made of High fiberglass will be used at the Savannah River Site (SRS) to remove particulate matter from offgases generated during melter feed preparation and vitrification of high-level radioactive waste (HLW) at the Defense Waste Processing Facility (DWPF). These filters will be contaminated with high-level, radioactive species and also with various high-boiling organic compounds. For this reason, a process was developed at the Savannah River Technology Center (SRTC) that will dissolve the spent filters so that the residues may be recycled to the HLW tanks for eventual vitrification. This process involves boiling the filters sequentially in NaOH, $HN0_3$ and NaOH, while contained in a stainless steal wire mesh frame assembly. The objective of this communication is to present some of the original preliminary work done by Ritter on the simple one-step dissolution process. The results from six bench-scale experiments are reported for the dissolution of an organically-fouled sample of HEME obtained from the Integrated DWPF Melter (IDMS) offgas filtration system. The preliminary effects of filter packing density, air sparging versus rotating basket agitation, fouling, and adding Triton X-405 as a dispersing agent are reported.

1142 (WSRC-TR-95-0310) **Evaluation of packed-bed and fluidized-bed cell technology for the destruction and removal of contaminants in alkaline waste solutions. Final report.** Hobbs, D.T. (Westinghouse Savannah River Co., Aiken, SC (United States)); Bockris, J.O.M.; Kim, Jinseong. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96005799. Source: OSTI; NTIS; INIS; GPO Dep.

Disposing of the large quantity of nuclear waste that has been produced within the DOE complex is an area of active research and development. Electrochemical processes have been reported for the treatment of alkaline wastes including the destruction of nitrate and nitrite and the removal of metals such as Tc and Ru. Electrolytic recovery of metals from dilute solution has been reported using conventional porous electrodes such as felt electrode and reticulated electrode, but use of such electrodes is limited. The pores of such electrodes become blocked as a consequence of metal deposition. If an attempt is made to regenerate these electrodes by dissolution of the deposited metals, oxygen evolution on the matrix competes with dissolution of metals deposited within the pores. On the other hand, the use of three dimensional packed-bed and fluidized-bed electrodes having large surface area per unit volume would offer an improvement on felt or reticulated system because of the greater ease of regeneration.

1143 (WSRC-TR--95-0395) **Fiscal year 1995 final report for TTP SR-1320-04.** Cicero, C.A.; Bickford, D.F.; Marra, J.C. Westinghouse Savannah River Co., Aiken, SC (United States). 30 Sep 1995. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96010994. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this Technical Task Plan (TTP) in fiscal year 1995 was to develop vitrification technology for application to mercury and organic waste streams, which are considered problem streams for a large portion of the DOE complexes. In addition, efforts were continued for pilot-scale demonstrations on Rocky Flats Plant (RFP) Precipitate sludge, and Los Alamos National Laboratory (LANL) TA-50 sludge, which was a carry-over of fiscal year 1994 activities. Crucible-scale studies were performed on mercury and organic waste streams to determine the optimum glass compositions. The optimal compositions were then used to treat actual wastes on a bench-top scale. Reports were written to summarize the data and results from the mercury and organic studies. The pilot-scale studies with RFP and LANL simulated sludge used glass compositions determined in fiscal year 1994 studies. The pilot-scale studies were attempted in the EnVitCo cold-top melter and the Stir-Melter® stirred melter at the DOE/Industrial Center for Vitrification Research (Center).

1144 (WSRC-TR--95-0403) **Summary of pilot-scale activities with resorcinol ion exchange resin.** Cicero, C.A. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Bickford, D.F.; Sargent, T.N.; Andrews, M.K.; Bibler, J.P.; Bibler, N.E.; Jantzen, C.M. Westinghouse Savannah River Co., Aiken, SC (United States). 2 Oct 1995. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060073. Source: OSTI; NTIS; INIS; GPO Dep.

The Mixed Waste Focus Area (MWFA) of the Department of Energy (DOE) is currently investigating vitrification technology for treatment of low level mixed wastes (LLMW). They have chartered the Savannah River Technology Center (SRTC) to study vitrification of the wastes through an Office of Technology Development (OTD) Technical Task Plan (TTP). SRTC's efforts have included crucible-scale studies and pilot scale testing on simulated LLMW sludges, resins, soils, and other solid wastes. Results from the crucible-scale studies have been used as the basis for the pilot-scale demonstrations. As part of the fiscal year (FY) 1995 activities, SRTC performed crucible-scale studies with organic resins. This waste stream was selected because of the large number of DOE sites, as well as commercial industries, that use resins for treatment of liquid wastes. Pilot-scale studies were to be completed in FY 1995, but could not be due to a reduction in funding. Instead, a compilation of pilot-scale tests with organic resins performed under the guidance of SRTC was provided in this report. The studies which will be discussed used a resorcinol-formaldehyde resin loaded with non-radioactive cesium, which was fed with simulated wastewater treatment sludge feed. The first study was performed at the SRTC in the mini-melter, 1/100th scale of the Defense Waste Processing Facility (DWPF) melter, and also involved limited crucible-scale studies to determine the resin loading obtainable. The other study was performed at the DOE/Industrial Center for Vitrification Research (Center) and involved both crucible and pilot-scale testing in the Stir-Melter stirred-melter. Both studies were successful in vitrifying the resin in simulated radioactive sludge and glass additive feeds.

1145 (WSRC-TR--95-0404) **Summary of Pilot-Scale Activities with Mercury Contaminated Sludges (U).** Cicero, C.A. (Westinghouse Savannah River Company, AIKEN, SC (United States)); Hutson, N.D.; Zamecnik, J.R.; Smith, M.E.; Miller, D. H.; Ritter, J.A.; Hardy, B.J.; Jantzen, C.M. Westinghouse Savannah River Co., Aiken, SC (United States). 2 Oct 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060074. Source: OSTI; NTIS; INIS; GPO Dep.

Technologies for treatment of low level mixed wastes (LLMW) are currently being investigated by the Mixed Waste Focus Area (MWFA) of the Department of Energy (DOE). The Savannah River Technology Center (SRTC) has been chartered by the MWFA to study vitrification treatment of the wastes through an Office of Technology Development (OTD) Technical Task Plan (TTP). SRTC's efforts have included crucible-scale studies and pilot-scale testing on simulated LLMW sludges, resins, soils, and other solid wastes. Results from the crucible-scale studies have been used as the basis for the pilot-scale demonstrations. One of the streams to be investigated in fiscal year (FY) 1995 by SRTC was a mercury waste. In FY 1995, SRTC performed crucible-scale studies with mercury contaminated soil. This waste stream was selected because of the large number of DOE sites that have an inventory of contaminated or hazardous soil. More importantly, it was readily available for treatment. Pilot-scale studies were to be completed in FY 1995, but could not be completed due to a reduction in funding. Since the main driver for focusing on a mercury waste stream was to determine how the mercury could be treated, a compilation of pilot-scale tests with mercury sludges performed under the guidance of SRTC is provided in this report. The studies summarized in this report include several pilot-scale vitrification demonstrations with simulated radioactive sludges that contained mercury. The pilot-scale studies were performed at the SRTC in the Integrated Defense Waste Processing Facility (DWPF) Melter System (IDMS). The studies involved complete glass and offgas product characterization. Future pilot-scale studies with mercury streams will likely be performed with mercury contaminated soils, sediments, or sludges because of the need to dispose of this technically challenging waste stream. (Abstract Truncated)

1146 (WSRC-TR–95-0438) **Progress report on the evaluation of porous cathode for the electrochemical reduction of nitrates and nitrites in liquid wastes.** Hobbs, D.T. (Westinghouse Savannah River Co., Aiken, SC (United States)); Jha, K.; Weidner, J.W.; White, R.E. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Dec 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96010997. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the experimental and modeling work performed to evaluate porous cathodes for the electrochemical reduction of nitrites in liquid wastes. The experiments were done using the MP† cell with two different porous cathodes: nickel foam and TySAR™SB‡. The experimental results are compared with each other and to those obtained with a planar nickel cathode. The results show that the ammonia production reaction is the dominant cathodic reaction (~80% efficiency) for all three electrodes. The temperature range used in this study was 29-37 oC while the catholyte feed was either 0.6M $NaNO_2$ or 1.9M $NaNO_3$, both supported by a 1.33 M NaOH solution. All experiments used a constant current density of 0.25 A/cm^2. The experimental results suggest that the porous nickel electrode at lower temperatures (~31oC) is the most efficient of the three electrodes for the reduction of nitrates and nitrites. The porous nickel electrode exhibited the highest conversion of nitrates and nitrites, and the lowest overpotential for a given current density. The partial current fractions at known catholyte concentrations were used to extract the exchange-current densities for the five cathodic reactions. Using these kinetic parameters, dynamic simulations of the four hour experiments were performed. Agreement was found between the model and experimental results for changes in the moles of the nitrate and nitrite and the cell overpotential with time. Future work will determine the effects of temperature and current densities on the exchange-current densities and reaction product distributions. The performance of other porous cathode materials (TySAR™EP§, TySAR™IM) will also be evaluated.

1147 (WSRC-TR–95-0454) **Evaluation of processing alternatives for the in-tank precipitation facility using flowsheet modeling to reduce waste streams.** Taylor, G.A. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212–84: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009656. Source: OSTI; NTIS; INIS; GPO Dep.

Due to increasing cost and decreasing funding it is becoming more important than ever to reduce the waste streams generated by the Savannah River Site's High Level Waste Management division. One of the process that generates a waste stream is the In-Tank Precipitation Facility. This study seeks to reduce the waste stream of excess washwater from the ITP facility. At the ITP, high level liquid waste is processed at a high sodium content in order to remove radionuclides. After the radionuclides have been precipitated and concentrated the sodium molarity must be reduced. This is done by washing the concentrate with a washwater stream. The washwater is then sent to either the Saltstone Facility to be turned into grout for final disposal or set to the evaporator system for volume reduction. It is this washwater stream that this study seeks to reduce.

1148 (WSRC-TR–95-0471) **Facilities for stabilization and stabilization end states.** Moore, E.N.; Allender, J.S. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-951259–10: Plutonium stabilization and immobilization workshop, Washington, DC (United States), 12-14 Dec 1995). Order Number DE96009648. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has embarked upon an aggressive program to stabilize and package nuclear materials for safe, interim storage. The scope and approach to accomplish this objective is documented in the DOE Implementation Plan prepared in response to Defense Nuclear Facilities Safety Board (DNFSB, or the Board) Recommendation 94-1. In support of this plan, DOE-Headquarters formed a Nuclear Material Stabilization Task Group (NMSTG) and each major site prepared a Site Integrated Stabilization Management Plan (SISMP) providing resource-loaded schedules to achieve the objectives. To assure intersite integration of the plans, DOE assembled an Integration Working Group (IWG), comprising contractor representatives from each site, with the primary initial purpose of preparing an Integrated Facilities Plan (IFP). This paper provides a brief summary of the IFP, with particular emphasis on the plutonium materials and facilities. In its Recommendation 94-1, the Board recommended that an integrated program plan be formulated, on a high priority basis, to integrate use of facilities and capabilities to deal with concerns about liquids and solids containing radioactive substances, located in spent fuel storage pools; reactor basins; reprocessing canyons; and various other facilities that were used for processing and weapons manufacture. Further, the DNFSB recommended that facilities that might be needed for future handling and treatment of these materials be maintained in a usable state.

1149 (WSRC-TR–96-0003) **Operation of a 1/10 scale mixed water incinerator air pollution control system.** Burns, D.B.; Wong, A.; Walker, W. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212–96: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96012427. Source: OSTI; NTIS; INIS; GPO Dep.

The Consolidated Incineration Facility (CIF) at the Savannah River Site is designed to treat solid and liquid RCRA hazardous and mixed wastes generated by site operations and clean-up activities. The technologies selected for use in the CIF air pollution control system (APCS) were based on reviews of existing commercial and DOE incinerators, onsite air pollution control experience, and recommendations from contracted consultants. In order to study the CIF APCS prior to operation, a 1/10 scale pilot facility, known as the Offgas Components Test Facility (OCTF) was constructed and has been in operation since late 1994. Its current mission is to demonstrate the design integrity of the CIF APCS and optimize equipment/instrument performance of the full scale production facility. Due to the nature of the wastes to be incinerated at the CIF, High Efficiency Particulate Air (HEPA) filters are used to remove hazardous and radioactive particulates from the exhaust gas stream before being released into the atmosphere. The HEPA filter change-out frequency has been a potential issue and was the first technical issue to be studied at the OCTF. Tests were conducted to evaluate the performance of HEPA filters under different operating conditions. These tests included evaluating the impact on HEPA life of scrubber operating parameters and the type of HEPA prefilter used. This pilot-scale testing demonstrated satisfactory HEPA filter life when using cleanable metal prefilters and high flows of steam and water in the offgas scrubber.

1150 (Y/NA–1801) **Depeted uranium market study. Final report.** Kaplan, S.A. (Kapline Enterprises, Inc., Knoxville, TN (United States)). Oak Ridge National Lab., TN (United States). Aug 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OS21400. Order Number DE96000383. Source: OSTI; NTIS (US Sales Only); GPO Dep.

The objective of this study is to identify potential markets for depleted uranium (DU) materials and products that may be developed by 2005. For each potential market, the study identifies the maximum amount of DU that might be used, the probability that the use will develop, and the time period or schedule for the product or market to reach maturity. The report also describes and attempts to quantify benefits from the development of the market and commercialization of a product, such as financial gains in a community due to increase in industrial base (i.e., jobs). A cost threshold for maximum development potential of each DU market or product is also established. This threshold is based on the cost of currently used products in each application. Such a threshold is necessary because the DU material considered is in the form of uranium hexafluoride (UF_6) and current conversion methods of depleted UF_6 are expensive and produces large quantities of waste products. In addition to cost, the study identifies other barriers such as public perception, environmental and health concerns, regulatory restrictions, and engineering constraints.

RADIOACTIVE TANK WASTE REMEDIATION

Refer also to citation(s) 12, 35, 106, 157, 214, 268, 321, 367, 483, 566, 617, 619, 620, 638, 646, 647, 648, 649, 650, 692, 697, 699, 700, 782, 783, 786, 792, 814, 851, 858, 868, 882, 890, 895, 909, 951, 953, 954, 956, 957, 958, 959, 960, 961, 971, 972, 973, 980, 987, 993, 995, 1007, 1012, 1013, 1044, 1045, 1049, 1051, 1055, 1056, 1079, 1081, 1087, 1090, 1109, 1110, 1112, 1121, 1122, 1123, 1945, 2216, 2217, 2218, 2239, 2240, 2258, 2268, 2273, 2378, 2423, 2424, 2425, 2456, 2460, 2479, 2520, 2554, 2555, 2610, 2646, 2647, 2648, 2649, 2651, 2652, 2654, 2655

1151 (ANL–95/20) **ANL technical support program for DOE environmental restoration and waste management. Annual report, October 1993–September 1994.** Bates, J.K. (and others); Brown, N.R.; Buck, E.C. Argonne National Lab., IL (United States). Jun 1995. 124p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95016554. Source: OSTI; NTIS; INIS; GPO Dep.

A program was established for DOE Environmental Restoration and Waste Management (EM) to evaluate factors that are anticipated to affect waste glass reaction during repository disposal, especially in an unsaturated environment typical of what may be expected for the proposed Yucca Mountain repository site. This report covers progress in FY 1994 on the following tasks: (1) Critical Reviews of important parameters that affect the reactivity of glass in an unsaturated environment are being prepared. (2) A series of tests is ongoing to evaluate the reactivity of fully radioactive glasses in a high-level waste repository environment and compare it to the reactivity of synthetic, nonradioactive glasses of similar composition. (3) The effect of radiation upon the durability of waste glasses at a high SA/V ratio and a high gas-to-liquid volume ratio has been assessed. (4) A series of tests is being performed to compare the extent of reaction of nuclear waste glasses at various SA/V ratios. Such differences in the SA/V ratio may significantly affect glass durability. At long-term periods and high SA/V ratios, acceleration in glass reaction has been observed. (5) Tests were initiated on West Valley Reference 6 (WV6) glass and on the Environmental Assessment (EA) glass. (6) Tests with the actinide-doped West Valley glass ATM-10 have been in progress for over seven years as a part of work for the Yucca Mountain Site Characterization Project (YMP). (7) Analytical electron microscopy (AEM) is being used to assess the glass/water reaction pathway by identifying intermediate phases that appear on the reacting glass. Also, colloids from the leach solutions are being studied using AEM.

1152 (ANL–95/23) **Advanced evaporator technology progress report FY 1992.** Chamberlain, D. (and others); Hutter, J.C.; Leonard, R.A. Argonne National Lab., IL (United States). Jan 1995. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96006112. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the work that was completed in FY 1992 on the program "Technology Development for Concentrating Process Streams." The purpose of this program is to evaluate and develop evaporator technology for concentrating radioactive waste and product streams such as those generated by the TRUEX process. Concentrating these streams and minimizing the volume of waste generated can significantly reduce disposal costs; however, equipment to concentrate the streams and recycle the decontaminated condensates must be installed. LICON, Inc., is developing an evaporator that shows a great deal of potential for this application. In this report, concepts that need to be incorporated into the design of an evaporator operated in a radioactive environment are discussed. These concepts include criticality safety, remote operation and maintenance, and materials of construction. Both solubility and vapor-liquid equilibrium data are needed to design an effective process for concentrating process streams. Therefore, literature surveys were completed and are summarized in this report. A model that is being developed to predict vapor phase compositions is described. A laboratory-scale evaporator was purchased and installed to study the evaporation process and to collect additional data. This unit is described in detail. Two new LICON evaporators are being designed for installation at Argonne-East in FY 1993 to process low-level radioactive waste generated throughout the laboratory. They will also provide operating data from a full-sized evaporator processing radioactive solutions. Details on these evaporators are included in this report.

1153 (ANL–96/11) **ANL technical support program for DOE Office of Environmental Management. Annual report, October 1994–September 1995.** Bates, J.K. (and others); Buck, E.C.; Dietz, N.L.; DiSanto, T.; Ebert, W.L. Argonne National Lab., IL (United States). Jul 1996. 153p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract W-31109-ENG-38. Order Number DE96014264. Source: OSTI; NTIS; INIS; GPO Dep.

A program was established for the DOE Office of Environmental Management (EM) to evaluate factors that are anticipated to affect waste glass reaction during repository disposal, especially in an unsaturated environment typical of what may be expected for the proposed Yucca Mountain repository site. This report covers progress in FY 1995 on the following tasks: (1) Tests are ongoing to evaluate and compare the reactivity of fully radioactive glasses with that of glasses having the same compositions except for the absence of radionuclides under conditions representative of a high-level waste repository environment. Data from these tests will be used to evaluate the effect of radionuclides on the glass corrosion behavior and to determine the disposition of the radionuclides as the glass corrodes. Static dissolution tests and unsaturated tests are being conducted with several Defense Waste Processing Facility (DWPF) and West Valley Demonstration Project (WVDP) glasses. (2) A series of static dissolution tests is being performed to compare the corrosion behavior of nuclear waste glasses made with SRL 131 and SRL 202 frits at different S/V ratios. The S/V ratio affects the extent to which dissolved glass species are diluted; the solution chemistry then affects continued glass dissolution. The solutions generated in tests at high S/V ratios are conducive to the formation of alteration phases that may be deleterious to the glass. After long time periods, the glass dissolution rates of both glasses increase coincidentally with the formation of analcime and other alteration phases. However, the release of radionuclides from the glasses into solution is controlled by their individual solubilities.

1154 (ANL/CHM/CP-84143) **A combined cesium-strontium extraction/recovery process.** Horwitz, E.P.; Dietz, M.L.; Jensen, M.P. Argonne National Lab., IL (United States). 1996. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960314-4: International solvent extraction conference, Melbourne (Australia), 17-21 Mar 1996). Order Number DE96007067. Source: OSTI; NTIS; INIS; GPO Dep.

A new solvent extraction process for the simultaneous extraction of cesium and strontium from acidic nitrate media is described. This process uses a solvent formulation comprised of 0.05 M di-t-butylcyclohexano-18-crown-6 (DtBuCH18C6), 0.1 M Crown 100′ (a proprietary, cesium-selective derivative of dibenzo-18-crown-6), 1.2 M tributyl phosphate (TBP), and 5% (v/v) lauryl nitrile in an isoparaffinic hydrocarbon diluent. Distribution ratios for cesium and strontium from 4 M nitric acid are 4.13 and 3.46, respectively. A benchtop batch countercurrent extraction experiment indicates that >98% of the cesium and strontium initially present in the feed solution can be removed in only four extraction stages. Through proper choice of extraction and strip conditions, extracted cesium and strontium can be recovered either together or individually.

1155 (ANL/CMT/CP-84524) **Laboratory testing of West Valley reference 6 glass.** Ebert, W.L. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950401-13: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95014235. Source: OSTI; NTIS; INIS; GPO Dep.

A series of laboratory tests is being conducted to characterize the corrosion of West Valley reference 6 glass (WV6) and to provide parametric values for modeling its long-term durability. Models require measurement of the corrosion rate in the absence of corrosion products and in fluids that are "saturated" with corrosion products, and the identification of alteration phases. Corrosion rates in dilute and saturated conditions were measured using MCC-1 and PCT tests, respectively. Vapor hydration tests were performed to generate secondary phases. The PCT tests show the WV6 glass to be more durable than SRL EA, SRL 202, and HW-39-1 glasses. Vapor hydration tests show weeksite (a uranyl silicate), a potassium-bearing zeolite, analcime, potassium feldspar, a calcium silicate phase, and lithium phosphate to form as WV6 glass corrodes. Test results are presented and their relevance to long-term performance discussed.

1156 (ANL/CMT/CP-84525) **Performance testing of West Valley Reference 6 glass.** Ebert, W.L. (Argonne National Lab., IL (United States). Chemical Technology Div.); Bates, J.K. Argonne National Lab., IL (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950570-26: International high-level radioactive waste management conference: progress toward understanding, Las Vegas, NV (United States), 1-5 May 1995). Order Number DE95013442. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical durability of West Valley Reference 6 glass is being evaluated by using a suite of laboratory tests which highlight the early, interim, and long-term stages of corrosion. The test results are being used to describe the glass corrosion path and its long-term durability. The long-term durability of the SRL Environmental Assessment glass is being evaluated for comparison. Test results also provide parameter values for an analytical corrosion model that can be used in performance assessments of specific disposal sites.

1157 (ANL/CMT/CP-84527) **Validation of the generic TRUEX model using data from TRUEX demonstrations with actual high-level waste.** Vandegrift, G.F.; Regalbuto, M.C. Argonne National Lab., IL (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950917-20: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96005207. Source: OSTI; NTIS; INIS; GPO Dep.

The main objective of the Generic TRUEX Model (GTM) is to calculate TRUEX solvent extraction flowsheets based on input of a specific feed and a specific set of process goals and constraints. The output will be (1) the compositions of all effluent streams, (2) the compositions of both phases (organic and aqueous) in each stage of the contacting equipment at steady state, and (3) estimates of the space and cost requirements for installing the flowsheet in a plant situation. Other options are available to calculate aqueous-phase speciation and thermodynamic activities, distribution ratios of extractable species, and solvent radiolytic and hydrolytic degradation. Calculation of these options is based on initial aqueous- and organic-phase compositions and other important variables supplied by the user. Three demonstrations of the TRUEX process have been run by Power Reactor and Nuclear Fuel Development Corp. (PNC) researchers at the Tokai Works using actual PUREX raffinates. A 19-stage mixer settler was used for the extraction and scrub sections, and a 16-to-19-stage unit for stripping. Stagewise data were collected on the behavior of nitric acid and several fission-product and actinide radioisotopes during these runs; Run 2 was the best documented and the one with which most comparisons were made. These data are important tools for validating predictions made by the GTM and understanding the intricacies of the TRUEX process. In this paper, results of the GTM calculations will be compared to the actual data published by PNC researchers. Differences between model predictions and experimental data were analyzed in terms of the process chemistry and demonstration conditions.

1158 (ANL/CMT/CP–84591) **Long-term test results from a West Valley actinide-doped reference glass.** Fortner, J.A.; Gerding, T.J.; Bates, J.K. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950401–20: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013693. Source: OSTI; NTIS; INIS; GPO Dep.

Results from drip tests designed to simulate unsaturated conditions in the proposed Yucca Mountain Repository are reported for an actinide-doped glass (reference glass ATM-10) used as a model waste form. These tests have been ongoing for nearly 7 years, with data collected on solution composition (including transuranics), colloid formation and disposition, glass corrosion layers, and solid secondary phases. This test is unique because of its long elapsed time, high content of thorium and transuranics, use of actual groundwater from the proposed site area, use of contact between the glass and sensitized stainless steel in the test, and the variety of analytical procedures applied to the components. Some tests have been terminated, and scanning electron microscopy (SEM) and analytical transmission electron microscopy (AEM) were used to directly measure glass corrosion and identify secondary phases. Other tests remain ongoing, with periodic sampling of the water that had contacted the glass. The importance of integrated testing has been demonstrated, as complex interactions between the glass, the groundwater, and the sensitized stainless steel have been observed. Secondary phases include smectite clay, iron silicates, and brockite. Actinides, except neptunium, concentrate into stable secondary phases. The release of actinides is then controlled by the behavior of these phases.

1159 (ANL/CMT/CP–84717) **Microscopic characterization of crystalline phases in waste forms.** Buck, E.C. (Argonne National Lab., IL (United States)); Dietz, N.L.; Wronkiewicz, D.J.; Bates, J.K.; Millar, A. Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950401–10: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013890. Source: OSTI; NTIS; INIS; GPO Dep.

Transmission electron microscopy (TEM) has been used to determine the microstructure of crystalline phases present in zirconium- and titanium-bearing glass crystalline composite (GCC) waste forms. The GCC materials were found to contain spinels (maghemite), zirconolites, perovskites ($CaTiO_3$) and plagiociase feldspar (anorthite) mineral phases. The structure of the uranium and cerium-bearing monoclinic zirconolite was characterized by medium resolution TEM imaging and electron and X-ray diffraction (XRD). The phase was found to contain high levels of iron in comparison to Synroc-type zirconolites. Excess zirconium in zirconolite has resulted in martensitic baddeleyite (ZrO_2) formation. Anorthite ($CaAl_2Si_2O_8$) was present as elongated crystallites within a calcium-rich aluminosilicate glass. Lead and iron-bearing anorthite lying along distinct precipitates were occasionally observed within the an crystallographic planes.

1160 (ANL/CMT/CP–84718) **Evaluation of models of waste glass durability.** Ellison, A. Argonne National Lab., IL (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950402–15: 209. American Chemical Society (ACS) national meeting, Anaheim, CA (United States), 2-6 Apr 1995). Order Number DE95015833. Source: OSTI; NTIS; INIS; GPO Dep.

The main variable under the control of the waste glass producer is the composition of the glass; thus a need exists to establish functional relationships between the composition of a waste glass and measures of processability, product consistency, and durability. Many years of research show that the structure and properties of a glass depend on its composition, so it seems reasonable to assume that there also is relationship between the composition of a waste glass and its resistance to attack by an aqueous solution. Several models have been developed to describe this dependence, and an evaluation their predictive capabilities is the subject of this paper. The objective is to determine whether any of these models describe the "correct" functional relationship between composition and corrosion rate. A more thorough treatment of the relationships between glass composition and durability has been presented elsewhere, and the reader is encouraged to consult it for a more detailed discussion. The models examined in this study are the free energy of hydration model, developed at the Savannah River Laboratory, the structural bond strength model, developed at the Vitreous State Laboratory at the Catholic University of America, and the Composition Variation Study, developed at Pacific Northwest Laboratory.

1161 (ANL/CMT/CP–84719) **The corrosion behavior of DWPF glasses.** Ebert, W.L. (Argonne National Lab., IL (United States). Chemical Technology Div.); Bates, J.K. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950401–6: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013466. Source: OSTI; NTIS; INIS; GPO Dep.

The authors analyzed the corroded surfaces of reference glasses developed for the Defense Waste Processing Facility (DWPF) to characterize their corrosion behavior. The corrosion mechanism of nuclear waste glasses must be known in order to provide source terms describing radionuclide release for performance assessment calculations. Different DWPF reference glasses were corroded under conditions that highlighted various aspects of the corrosion process and led to different extents of corrosion. The glasses corroded by similar mechanisms, and a phenomenological description of their corrosion behavior is presented here. The initial leaching of soluble glass components results in the formation of an amorphous gel layer on the glass surface. The gel layer is a transient phase that transforms into a layer of clay crystallites, which equilibrates with the solution as corrosion continues. The clay layer does not act as a barrier to either water penetration or glass dissolution, which continues beneath it, and may eventually separate from the glass. Solubility limits for glass components may be established by the eventual precipitation of secondary phases; thus, corrosion of the glass becomes controlled by the chemical equilibrium between the solution and the assemblage of secondary phases. In effect, the solution is an intermediate phase through which the glass transforms to an energetically more favorable assemblage of phases. Implications regarding the prediction of long-term glass corrosion behavior are discussed.

1162 (ANL/CMT/CP-86022) **Optimization of magnetite carrier precipitation process for transuranic waste reduction.** Slater, S.A. (Argonne National Lab., IL (United States). Chemical Technology Div.); Chamberlain, D.B.; Aase, S.A.; Babcock, B.D.; Conner, C.; Sedlet, J.; Vandegrift, G.F. Argonne National Lab., IL (United States). [1995]. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-951057-5: 9. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 22-26 Oct 1995). Order Number DE96005531. Source: OSTI; NTIS; INIS; GPO Dep.

Transuranic (TRU) waste that is being generated at Argonne National Laboratory has a TRU activity ranging from 10^2 to 10^7 nCi/g with a wide variety of chemical compositions. Currently, the waste is stored in highly acidic solutions that must be neutralized for intermediate storage. A magnetite carrier precipitation process has been adapted to concentrate TRU isotopes in a noncorrosive solid phase. In this paper, the authors report the results of a series of laboratory tests done to optimize the process. The parameters they optimized included (1) magnetite concentration used to precipitate the TRUs from solution, (2) formation of magnetite (in situ or ex situ), (3) processing pH, and (4) temperature and mixing time of the carrier precipitation. They also studied the effects of anions, cations, and complexing agents in the waste solutions on the carrier precipitation and the effect of magnetite solids loading on the filtration equipment. An overview is given of the planned full-scale process, which will be operated in a glovebox.

1163 (ANL/CMT/CP-86023) **Centrifugal contractors for laboratory-scale solvent extraction tests.** Leonard, R.A.; Chamberlain, D.B.; Conner, C. Argonne National Lab., IL (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-951057-9: 9. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 22-26 Oct 1995). Order Number DE96007204. Source: OSTI; NTIS; INIS; GPO Dep.

A 2-cm contactor (minicontactor) was developed and used at Argonne National Laboratory for laboratory-scale testing of solvent extraction flowsheets. This new contactor requires only 1 L of simulated waste feed, which is significantly less than the 10 L required for the 4-cm unit that had previously been used. In addition, the volume requirements for the other aqueous and organic feeds are reduced correspondingly. This paper (1) discusses the design of the minicontactor, (2) describes results from having applied the minicontactor to testing various solvent extraction flowsheets, and (3) compares the minicontactor with the 4-cm contactor as a device for testing solvent extraction flowsheets on a laboratory scale.

1164 (ANL/CMT/CP-86025) **Quantitative SEM/EDS analysis of high-level waste glasses.** Luo, J.S. (and others); Wolf, S.; Ebert, W. Argonne National Lab., IL (United States). Mar 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950865-4: 29. annual meeting of the Microbeam Analysis Society, Breckenridge, CO (United States), 6-11 Aug 1995). Order Number DE95014080. Source: OSTI; NTIS; INIS; GPO Dep.

Silicate glass will be used to stabilize high-level radioactive wastes (HLW) for disposal in a geological repository. The chemical durability of waste glass in the repository will be determined by the nature and progress of the glass-water (underground water) reaction. Aqueous corrosion of HLW glasses is known to result in the chemical alteration of the glass surface and the formation of secondary phases. Accurate quantitative analysis the altered glass surface and the reaction products that form is important for understanding the reaction kinetics and mechanism of glass corrosion. SEM/EDS is a powerful tool to study the alteration of waste-disposal glasses through quantitatively characterizing the reaction products. It is able to detect trace elements at concentrations less than 1 wt.%: for example, Fig. 1 shows the uranium peaks detected by SEM/EDS of a typical simulated waste glass, which contains 0.25 wt.% uranium in the matrix glass according to ICP/MS analysis. Nickel (0.44 wt.%) and chromium (0.47 wt.%) peaks are also clearly distinguishable in the spectrum. However, quantitative analyses of glass compositions are complicated by the lack of well-characterized reference samples having known and homogeneous compositions for candidate waste glasses, which may contain a combination of more than 20 different elements in one matrix. It has been proposed that unreacted glass with known compositions could satisfactorily serve as standards for quantitative analysis of waste-disposal glasses and the secondary phases. The main advantage of using such standards is that they contain all the elements to be analyzed in the homogeneous vitreous matrices. In this paper, we evaluate several reference waste glasses with respect to their suitability as standard samples for quantitative SEM/EDS analysis. The precision and accuracy using such standards for quantitative analysis are also discussed. All the experiments were carried out on a Topeon ABT 60 SEM operating at 20 kV.

1165 (ANL/CMT/CP-86907) **Radionuclide content of simulated and fully radioactive SRLLL waste gl;asses: comparison of results from ICP-MS, gamma spectrometry and alpha spectrometry.** Wolf, S.F.; Bates, J.K. Argonne National Lab., IL (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-951155-67: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96007218. Source: OSTI; NTIS; INIS; GPO Dep.

We have measured the transuranic content of two transuranic=doped, simulated waste glasses, using inductively coupled plasma-mass spectrometry (ICP-MS), γ-spectrometry, and α-spectrometry. Average concentrations measured by each technique were within $\pm$ 10% of the as-doped concentrations. We also report the transuranic content of three fully radioactive SRL waste glasses that were determined using γ- and α-spectrometry measurements to deconvolute isobaric interferences present in the ICP-MS analyses.

1166 (ANL/CMT/CP-86953) **The release of technetium from defense waste processing facility glasses.** Ebert, W.L.; Wolf, S.F.; Bates, J.K. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-951155-63: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27

Nov - 1 Dec 1995). Order Number DE96007206. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory tests are being, conducted using two radionuclide-doped Defense Waste Processing, Facility (DWPF) glasses (referred to as SRL 13IA and SRL 202A) to characterize the effects of the glass surface area/solution volume (SN) ratio on the release and disposition of $T_c$and several actinide elements. Tests are being conducted at 90°C in a tuff ground water solution at SN ratios of 10, 2000, and 20,000 m^{-1} and have been completed through 1822 days. Thė formation of certain alteration phases in tests at 2000 and 20,000 m^{-1} results in an increase in the dissolution rates of both classes. The release of $T_c$parallels that of B and Na under most test conditions and its release increases when alteration phases form. However, in tests with SRL 202A glass at 20,000 $,^{-1}$, the $T_c$concentration in solution decreases coincidentally with an increase in the nitrite/nitrate ratio that indicates a decrease in the solution Eh. This may have occurred due to radiolysis, glass dissolution, the formation of alteration phases, or vessel interactions. Technetium that was reduced from T_c(VII) to T_c(IV) may have precipitated, thou-h the amount of $T_c$was too low to detect any T_c-bearing phases. These results show the importance of conducting long-term tests with radioactive glasses to characterize the behavior of radionuclides, rather than relying on the observed behavior of nonradioactive surrogates.

1167 (ANL/CMT/CP–88395) **Long-term corrosion behavior of environmental assessment glass.** Ebert, W.L.; Bates, J.K. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960421–30: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96008451. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. BOROSILICATE GLASS/corrosion; BOROSILICATE GLASS/stability; HIGH-LEVEL RADIOACTIVE WASTES/radioactive waste disposal; GROUND WATER/corrosive effects; CORROSION; STABILITY; DISSOLUTION; LEACHING; CRYSTALLIZATION; TUFF

1168 (ANL/CMT/CP–88456) **Measurement of the glass dissolution rate in the presence of alteration phases.** Ebert, W.L. (Argonne National Lab., Idaho Falls, ID (United States)); Bakel, A.J.; Brown, N.R. Argonne National Lab., Idaho Falls, ID (United States); Pacific Northwest Lab., Richland, WA (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960804–40: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96012694. Source: OSTI; NTIS; INIS; GPO Dep.

The dissolution rate of LD6-5412 glass was measured at 90oC in the presence of its alteration phases with the Product Consistency Test (PCT) Method B, the Vapor Hydration Test (VHT), and the Accelerated Dissolution Test (ADT). Alteration phases formed during the PCTs and VHTs, but variations in the time required for their nucleation resulted in large uncertainties in the measured rates. The alteration phases are generated separately for use in the SDTs, so the measured rates are not affected by the kinetics of alteration phase nucleation. The rates measured in the PCTs, VHTs, and ADTs were 0.4 g/(m^2•d) (a lower bound), 2 g/(m^2•d) (extrapolated from the results of tests run at high temperatures), and 1.4 g/(m^2•d), respectively. The solution pHs were about 12 in all the tests.

1169 (ANL/CMT/CP–88983) **Secondary phase formation and the microstructural evolution of surface layers during vapor phase alteration of the French SON 68 nuclear waste glass at 200°C.** Gong, W.L. (Univ. of New Mexico, Albuquerque, NM (United States)); Ewing, R.C.; Wang, L.M. Argonne National Lab., IL (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States);National Science Foundation, Washington, DC (United States);CEA, 75 - Paris (France);New Mexico State Government, Santa Fe, NM (United States). DOE Contract W-31109-ENG-38. (CONF-951155–81: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96007210. Source: OSTI; NTIS; INIS; GPO Dep.

The SON 68 inactive "R7T7" composition is the French reference glass for the LWR nuclear waste glass. Vapor phase alteration was used to accelerate the reaction progress of glass corrosion and to develop the characteristic suite of secondary, alteration phases. Extensive solid-state characterization (AEM/SEM/HRTEM) was completed on six inactive R7T7 waste glasses which were altered in the presence of saturated water vapor (200°C) for 91, 241, 908, 1000, 1013, and 1021 days. The AEM samples were examined in cross-section (lattice-fringe imaging, microdiffraction, and quantitative thin-film EDS analysis). The glass monoliths were invariably covered with a thin altered rind. The layer became thicker with time: 0.5 μm for 22 days; 4 μm for 91 days; 6 μm for 241 days; 10 μm for 908 days; 26 μm for 1013 days; and <35 μm for 1021 days. The composite alteration layer of the SON 68 samples is at least four time less thick than that of the SRL 131 glass composition. Six distinctive zones, based on phase chemistry and microstructure, were distinguished within the well-developed surface layers. Numerous crystalline phases such as analcime, tobermorite, apatite, and weeksite were identified on the surfaces of the reacted glasses as precipitates. Two crystalline phases, Ag_2TeO_3 and $(Ca,Sr)Mo_3O_9(OH)_2$, were found within the inner zones of surface layers, and they must have nucleated in situ, indicating that Ag, Te, Sr, and Mo can be retained within the surface layer. The majority of the surface layer volume is composed of two morphologically and chemically different structures: one consists of well-crystallized fibrous smectite aggregates occurring along with cavities, the A-domain; and the other consists of poorly-crystallized regions containing needle-like smectite (montmorillonite) crystallites, a silica-rich amorphous matrix, and possibly ZrO_2 particles, the B-domain.

1170 (ANL/CMT/CP–89567) **Chemical effects of lanthanides and actinides in glasses determined with electron energy loss spectroscopy.** Fortner, J.A.; Buck, E.C.; Ellison, A.J.G.; Bates, J.K. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9608108–3: 30. annual meeting of Microbeam Analysis Society, Minneapolis, MN (United States), 11-15 Aug 1996). Order Number DE96012708. Source: OSTI; NTIS; INIS; GPO Dep.

Chemical and structural environments of f-electron elements in glasses are the origin of many of the important properties of materials with these elements; thus oxidation state and chemical coordination of lanthanides and actinides in host materials is an important design consideration in optically active glasses, magnetic materials, perovskite superconductors, and nuclear waste materials. We have made use of the line shapes of Ce to determine its oxidation state in alkali borosilicate glasses being developed for immobilization of Pu. Examination of several prototype waste glass compositions with EELS shows that the redox state of Ce doped to 7 wt% could be varied by suitable choice of alkali elements. EELS for a Pu-doped glass illustrate the small actinide N_4/N_5 intensity ratio and show that the Pu-$N_{4,5}$ white line cross section is comparable to that of Gd $M_{4,5}$.

1171 (ANL/CMT/CP--89578) **SEM/EDS analysis of boron in waste glasses with ultrathin window detector and digital pulse processor.** Luo, J.S.; Wolf, S.F.; Ebert, W.L.; Bates, J.K. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9608108--2: 30. annual meeting of Microbeam Analysis Society, Minneapolis, MN (United States), 11-15 Aug 1996). Order Number DE96012707. Source: OSTI; NTIS; INIS; GPO Dep.

Analysis of boron in waste glasses and in the reaction products that form during the reaction of glass is important for understanding the reaction kinetics and mechanism of glass corrosion. Two borosilicate waste glasses (1.55 and 3.47 wt% B) have been analyzed by SEM/EDS. The 1.55 wt% is the lowest B concentration detected with EDS. However, the B peaks severely overlap with the C peaks due to the carbon films used for conductive layers, but this problem can be solved by subtracting the C peaks, and possibly even lower B content could be detected by EDS with the digital pulse processor.

1172 (ANL/CMT/CP--89579) **Corroded spent nuclear fuel examined with EELS.** Buck, E.C.; Dietz, N.L.; Bates, J.K. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9608108--1: 30. annual meeting of Microbeam Analysis Society, Minneapolis, MN (United States), 11-15 Aug 1996). Order Number DE96012706. Source: OSTI; NTIS; INIS; GPO Dep.

Samples, exposed to dripping simulated groundwater, were prepared by ultramicrotomy for TEM. The alteration phase was identified as a layered Cs Mo uranyl oxide hydrate, structurally related to phases of the becquerelite group uranium minerals. Second-difference EELS of rare earth elements within the corroded particle detected low levels of TRUs.

1173 (ANL/CMT/CP--89865) **Chemistry and kinetics of waste glass corrosion.** Bates, J.K. Argonne National Lab., IL (United States). 1996. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9605162--1: National Academy of Sciences (NAS) on glass as a waste form and vitrification technology: an international workshop, Washington, DC (United States), 13 May 1996). Order Number DE96009424. Source: OSTI; NTIS; INIS; GPO Dep.

Under repository disposal conditions, the reaction of glass with water comprises the source term for release of radionuclides to the near-field environment. An understanding of glass reaction and the manner by which radionuclides are released is needed to design the waste package and to evaluate the total performance of the repository. The ASTM Standard C-1174-91 provides a general methodology for obtaining information related to the behavior of glass. This paper reviews the application of this standard to glass reaction. In the first step in the ASTM approach, the researcher identifies the materials and the conditions under which the long-term behavior is to be determined. Glass compositions have undergone a genesis over the past 15 years in response to concerns about feed streams, processing, and durability. A range of borosilicate compositions has been identified, but as new applications for vitrification occur, for example, immobilization of weapons plutonium and residue from plutonium processing, different compositions must be evaluated. The repository environment depends on the spatial emplacement of waste containers (glass and spent fuel), and both "hot" and "cold" scenarios have been proposed for the Yucca Mountain site. Regardless of the exact configuration, the near-field hydrology is expected to be unsaturated: that is, the waste packages are contacted initially by water vapor, and ultimately by small amounts of dripping or standing water. The behavior of glass can be studied as a function of composition within the constraints the environmental conditions place on the physical parameters that affect glass reaction (temperature, radiation field, groundwater composition, etc.). In the second step, the researcher reviews the literature and proposes a reaction pathway by which glass reacts in an unsaturated environment.

1174 (ANL/CMT/CP--89866) **Reproduction of natural corrosion by accelerated laboratory testing methods.** Luo, J.S.; Wronkiewicz, D.J.; Mazer, J.J.; Bates, J.K. Argonne National Lab., IL (United States). May 1996. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9605162--2: National Academy of Sciences (NAS) on glass as a waste form and vitrification technology: an international workshop, Washington, DC (United States), 13 May 1996). Order Number DE96009425. Source: OSTI; NTIS; INIS; GPO Dep.

Various laboratory corrosion tests have been developed to study the behavior of glass waste forms under conditions similar to those expected in an engineered repository. The data generated by laboratory experiments are useful for understanding corrosion mechanisms and for developing chemical models to predict the long-term behavior of glass. However, it is challenging to demonstrate that these test methods produce results that can be directly related to projecting the behavior of glass waste forms over time periods of thousands of years. One method to build confidence in the applicability of the test methods is to study the natural processes that have been taking place over very long periods in environments similar to those of the repository. In this paper, we discuss whether accelerated testing methods alter the fundamental mechanisms of glass corrosion by comparing the alteration patterns that occur in naturally altered glasses with those that occur in accelerated laboratory environments. This comparison is done by (1) describing the alteration of glasses reacted in nature over long periods of time and in accelerated laboratory environments and (2) establishing the reaction kinetics of naturally altered glass and laboratory reacted glass waste forms.

1175 (ANL/CMT/CP--89924) **Colloid formation during waste glass corrosion.** Mertz, C.J.; Buck, E.C.; Fortner, J.A.; Bates, J.K. Argonne National Lab., IL (United States). 1996. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9605162--3: National Academy of Sciences (NAS) on glass as a waste form and vitrification technology: an international workshop, Washington, DC (United States), 13 May 1996). Order Number DE96009460. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term behavior of nuclear waste glass in a geologic repository may require a technical consideration of the role of colloids in the release and transport of radionuclides. The neglect of colloidal properties in assessing the near- and far-field migration behavior of actinides may lead to significant underestimates and poor predictions of biosphere exposure from high-level waste (HLW) disposal. Existing data on colloid-facilitated transport suggests that radionuclide migration may be enhanced, but the importance of colloids is not adequately assessed. Indeed, the occurrence of radionuclide transport, attributed to colloidal species, has been reported at Mortandad Canyon, Los Alamos and at the Nevada Test Site; both unsaturated regions are similar to the proposed HLW repository at Yucca Mountain. Although some developments have been made on understanding the transport characteristics of colloids, the characterization of colloids generated from the corrosion of the waste form has been limited. Colloids are known to incorporate radionuclides either from hydrolysis of dissolved species (real colloids) or from adsorption of dissolved species onto existing groundwater colloids (pseudocolloids); however, these colloids may be considered secondary and solubility limited when compared to the colloids generated during glass alteration.

1176 (ANL/CMT/VU–86003) **Application of single ion activity coefficients to determine solvent extraction mechanism for components of high level nuclear waste.** Nunez, L.; Vandegrift, G.F. Argonne National Lab., IL (United States). [1995]. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-951057–6: 9. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 22-26 Oct 1995). Order Number DE96004291. Source: OSTI; NTIS; INIS; GPO Dep.

The TRUEX solvent extraction process is being developed to remove and concentrate transuranic (TRU) elements from high-level and TRU radioactive wastes currently stored at US Department of Energy sites. Phosphoric acid is one of the chemical species of concern at the Hanford site where bismuth phosphate was used to recover plutonium. The mechanism of phosphoric acid extraction with TRUEX-NPH solvent at 25°C was determined by phosphoric acid distribution ratios, which were measured by using phosphoric acid radiotracer and a variety of aqueous phases containing different concentrations of nitric acid and nitrate ions. A model was developed for predicting phosphoric acid distribution ratios as a function of the thermodynamic activities of nitrate ion and hydrogen ion. The Generic TRUEX Model (GTM) was used to calculate these activities based on the Bromley method. The derived model supports CMPO and TBP extraction of a phosphoric acid-nitric acid complex and a CMPO-phosphoric acid complex in TRUEX-NPH solvent.

1177 (ANL/EA/CP–89045) **Projected transuranic waste loads requiring treatment, storage, and disposal.** Hong, K.; Kotek, T. Argonne National Lab., IL (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960212–38: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006902. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides information on the volume of TRU waste loads requiring treatment, storage, and disposal at DOE facilities for three siting configurations. Input consisted of updated inventory and generation data from. Waste Isolation Pilot plant Transuranic Waste Baseline Inventory report. Results indicate that WIPP's design capacity is sufficient for the CH TRU waste found throughout the DOE Complex.

1178 (ANL/EAD/TM–17-Draft) **High-level waste inventory, characteristics, generation, and facility assessment for treatment, storage, and disposal alternatives considered in the U.S. Department of Energy Environmental Management Programmatic Environmental Impact Statement.** Folga, S.M. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Conzelmann, G.; Gillette, J.L.; Kier, P.H.; Poch, L.A. Argonne National Lab., IL (United States). Apr 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017834. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides data and information needed to support the risk and impact assessments of high-level waste (HLW) management alternatives in the US Department of Energy Waste Management (WM) Programmatic Environmental Impact Statement (PEIS). Available data on the physical form, chemical and isotopic composition, storage locations, and other waste characteristics of interest are presented. High-level waste management follows six implementation phases: current storage, retrieval, pretreatment, treatment, interim canister storage, and geologic repository disposal; pretreatment, treatment, and repository disposal are outside the scope of the WM PEIS. Brief descriptions of current and planned HLW management facilities are provided, including information on the type of waste managed in the facility, costs, product form, resource requirements, emissions, and current and future status. Data sources and technical and regulatory assumptions are identified. The range of HLW management alternatives (including decentralized, regionalized, and centralized approaches) is described. The required waste management facilities include expanded interim storage facilities under the various alternatives. Resource requirements for construction (e.g., land and materials) and operation (e.g., energy and process chemicals), work force, costs, effluents, design capacities, and emissions are presented for each alternative.

1179 (ANL/EAD/TM–22-Draft) **Transuranic waste inventory, characteristics, generation, and facility assessment for treatment, storage, and disposal alternatives considered in the U.S. Department of Energy waste management programmatic environmental impact statement.** Hong, K. (and others); Kotek, T.; Koebnick, B. Argonne National Lab., IL (United States). Environmental Assessment Div. Apr 1995. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017826. Source: OSTI; NTIS; INIS; GPO Dep.

Transuranic waste (TRUW) loads and potential contaminant releases at and en route to treatment, storage, and disposal sites in the U.S. Department of Energy (DOE) complex are important considerations in DOE's Waste Management Programmatic Environmental Impact Statement (WM PEIS). Waste loads are determined in part by the level of treatment the waste has undergone and the complexwide configuration of origination, treatment, storage, and disposal sites selected for TRUW management. Other elements that impact waste loads are treatment volumes, waste characteristics, and the unit operation parameters of the treatment technologies. Treatment levels and site configurations have been combined into 10 TRUW management alternatives for study in the WM PEIS. This supplemental report to the WM

PEIS gives the projected waste loads and contaminant release profiles for DOE treatment sites under each of the 10 TRUW management alternatives. It gives TRUW characteristics and inventories for current DOE generation and storage sites, describes the treatment technologies for three levels of TRUW treatment, and presents the representative unit operation parameters of the treatment technologies. The data presented are primary inputs to developing the costs, health risks, and socioeconomic and environmental impacts of treating, packaging, and shipping TRUW for disposal.

1180 (ANL/EAD/TM–29-Draft-Vol.1) **Analysis of accident sequences and source terms at waste treatment and storage facilities for waste generated by U.S. Department of Energy Waste Management Operations, Volume 1: Sections 1-9.** Mueller, C. (and others); Nabelssi, B.; Roglans-Ribas, J. Argonne National Lab., IL (United States). Apr 1995. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017805. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the methodology, computational framework, and results of facility accident analyses performed for the U.S. Department of Energy (DOE) Waste Management Programmatic Environmental Impact Statement (WM PEIS). The accident sequences potentially important to human health risk are specified, their frequencies are assessed, and the resultant radiological and chemical source terms are evaluated. A personal computer-based computational framework and database have been developed that provide these results as input to the WM PEIS for calculation of human health risk impacts. The methodology is in compliance with the most recent guidance from DOE. It considers the spectrum of accident sequences that could occur in activities covered by the WM PEIS and uses a graded approach emphasizing the risk-dominant scenarios to facilitate discrimination among the various WM PEIS alternatives. Although it allows reasonable estimates of the risk impacts associated with each alternative, the main goal of the accident analysis methodology is to allow reliable estimates of the relative risks among the alternatives. The WM PEIS addresses management of five waste streams in the DOE complex: low-level waste (LLW), hazardous waste (HW), high-level waste (HLW), low-level mixed waste (LLMW), and transuranic waste (TRUW). Currently projected waste generation rates, storage inventories, and treatment process throughputs have been calculated for each of the waste streams. This report summarizes the accident analyses and aggregates the key results for each of the waste streams. Source terms are estimated and results are presented for each of the major DOE sites and facilities by WM PEIS alternative for each waste stream. The appendices identify the potential atmospheric release of each toxic chemical or radionuclide for each accident scenario studied. They also provide discussion of specific accident analysis data and guidance used or consulted in this report.

1181 (ANL/ET/CP–83253) **Capabilities for spent fuel characterization at Argonne National Laboratory.** Neimark, L.A.; Strain, R.V. Argonne National Lab., IL (United States). Oct 1994. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-941207–37: Spent nuclear fuel meeting: challenges and initiatives, Salt Lake City, UT (United States), 14-16 Dec 1994). Order Number DE95012532. Source: OSTI; NTIS; INIS; GPO Dep.

Summaries of the status of spent nuclear fuel (SNF) owned by the Department of Energy have highlighted the need to obtain a better understanding of the current physical and chemical condition of the SNF as a foundation for establishing a clear path forward for the fuel's eventual geologic disposal in a long-term repository. To initiate obtaining the required information, DOE has generated an SNF Characterization Plan based on the needs for characterizing the materials stored at the individual major DOE storage sites. The principal focus of the plan is to characterize those fuel attributes that are key to the safe handling, transportation, and storage of the SNF. The drivers for specific attributes are regulatory requirements, resolution of technical issues, or a design need. Argonne National Laboratory's facilities in Illinois and Idaho possess capabilities that can be used to address many of the characterization issues that have been raised. This paper will describe these capabilities.

1182 (ANL/RE/CP–79448) **Effect of gravitation on the dynamic response of tanks containing two liquids.** Tang, Yu. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). (CONF-950740–70: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95014079. Source: OSTI; NTIS; INIS; GPO Dep.

The exact solution to the dynamic response of circular cylindrical tanks containing two liquids, considering the gravitational (g) effect at the interface of the two liquids, is presented. Only rigid tanks were studied. The solution is expressed as the superposition of the so-called impulsive and convective solutions. The results are compared with those obtained by neglecting the gravitational effect at the interface to elucidate the g effect and with those of the tanks containing only one liquid to elucidate the effect of the interaction between two liquids. The response functions examined include the hydrodynamic pressure, base shear, base moments, sloshing motions at surface and at the interface of two liquids, and the associated sloshing frequencies. It is found that there are two natural frequencies associated with each sloshing mode in contrast to only one frequency associated with each sloshing mode if the g effect a-t the interface is neglected; also, the convective pressure has a discontinuity at the interface of two liquids, whereas the impulsive pressure is continuous at the interface. Further, it is shown that in a tank containing two liquids the maximum sloshing wave height may increase significantly, and the fundamental frequency of the sloshing motion is lower than that of an identical tank filled with only one liquid. Additionally, the well-known mechanical model for tanks containing one liquid is generalized for tanks containing two liquids.

1183 (ANL/RE/CP–85929) **Sloshing analysis of viscous liquid storage tanks.** Uras, R.Z. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950740–63: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95014221. Source: OSTI; NTIS; INIS; GPO Dep.

The effect of viscosity on the sloshing response of tanks containing viscous liquids is studied using the in-house finite element computer code, FLUSTR-ANL. Two different tank sizes each filled at two levels, are modeled, and their dynamic responses under harmonic and seismic ground motions are simulated. The results are presented in terms of the wave height, and pressures at selected nodes and elements in the finite element mesh. The viscosity manifests itself as a damping effect, reducing the amplitudes. Under harmonic excitation, the dynamic response reaches the steady-state faster as the viscosity value becomes larger. The fundamental sloshing frequency for each study case stays virtually unaffected by an increase in viscosity. For the small tank case, a 5% difference is observed in the fundamental frequency of the smallest (1 cP) and the highest (1000 cP) viscosity cases considered in this study. The fundamental frequencies of the large tank are even less sensitive.

1184 (ANL/RE/CP–87833) **Sloshing impact in roofed tanks.** Uras, R.A. (Argonne National Lab., IL (United States). Reactor Engineering Div.). Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9511128–17: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96005263. Source: OSTI; NTIS; INIS; GPO Dep.

A large number of high-level waste (HLW) storage tanks exists in various tank farms. Seismic activities at those locations may cause significant sloshing in HLW tanks. These tanks are covered to avoid any spilling during large amplitude earthquakes. However, large amplitude sloshing may result in impact on the cover or the roof of the tank. Hence, a better understanding of the impact phenomenon is necessary to assess the safety of the tanks currently in existence, and to establish design guidelines for future designs. A pressure based formulation is derived to model sloshing impact in roofed tanks. It is incorporated into Argonne's in-house finite element code FLUSTR-ANL. A numerical test case with a harmonic input excitation is studied. The simulation results indicate that linear behavior is preserved beyond the first impact, and some mesh distortion is observed following a stronger second impact. During the impact, the displacement of the contacting surface nodes remains constant, and the velocities are reduced to zero. An identification of impacting nodes is possible from the dynamic pressures induced in surface elements.

1185 (BHI–00022-Rev.2) **Safety assessment for the 118-B-1 Burial Ground excavation treatability tests. Revision 2.** Zimmer, J.J.; Frain, J.M. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1994. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005707. Source: OSTI; NTIS; INIS; GPO Dep.

This revision of the Safety Assessment provides an auditable safety analysis of the hazards for the proposed treatability test activities per DOE-EM-STD-5502-94, DOE Limited Standard, Hazard Baseline Documentation (DOE 1994). The proposed activities are classified as radiological activities and as such, no longer require Operational Safety Limits (OSLs). The OSLS, Prudent Actions, and Institutional and Organization Controls have been removed from this revision and replaced with "Administrative Actions Important to Safety," as determined by the hazards analysis. Those Administrative Actions Important to Safety are summarized in Section 1.1, "Assessment Summary."

1186 (BHI–00174) **U Plant Aggregate Area Management study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1995. 122p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005836. Source: OSTI; NTIS; INIS; GPO Dep.

This document was prepared in support of an Aggregate Area Management Study of U Plant. It provides a technical baseline of the aggregate area and results from an environmental investigation that was undertaken by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Company (WHC), which is currently the Waste Site and Facility Research Office, Natural Resources, Bechtel Hanford, Inc. (BHI). It is based upon review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. U Plant refers to the 221-U Process Canyon Building, a chemical separation facility constructed during World War II. It also includes the Uranium Oxide (UO_3) Plant constructed at the same time as 221-U as an adjunct to the original plutonium separation process but which, like 221-U, was converted for other missions. Waste sites are associated primarily with U Plant's 1952 through 1958 Uranium Metal Recovery Program mission and the UO_3 Plant's ongoing UO_3 mission. Waste sites include cribs, reverse wells, french drains, septic tanks and drain fields, trenches, catch tanks, settling tanks, diversion boxes, a waste vault, and the lines and encasements that connect them. It also includes the U Pond and its feed ditches and an underground tank farm designed for high-level liquid wastes.

1187 (BHI–00176) **S Plant Aggregate Area Management study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005834. Source: OSTI; NTIS; INIS; GPO Dep.

This document is prepared in support of an Aggregate Area Management Study of S Plant, 200 West Area, at the US Department of Energy's (DOE) Hanford Site near Richland, Washington. It provides a technical baseline of the aggregate area and the results from an environmental investigation undertaken by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Company (WHC). This document is based on review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. This report describes the REDOX facility and its waste sites, including cribs, french drains, septic tanks and drain fields, trenches, catch tanks, settling tanks, diversion boxes, underground tank farms designed for high-level liquid wastes, and the lines and encasements that connect them.

1188 (BHI–00177) **T Plant Aggregate Area Management Study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1995. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005833. Source: OSTI; NTIS; INIS; GPO Dep.

T Plant is located in the Hanford 200 West Area. This document provides a technical baseline of the aggregate area and results from an environmental investigation undertaken by the Technical Baseline Section of the Environmental Engineering Group, Westinghouse Hanford Co.(WHC), and by EBASCO, providing support to WHC. It describes T Plant and its waste sites, including cribs, french drains, septic tanks and drain fields, trenches and ditches, ponds, catch tanks, settling tanks, diversion boxes, underground tank farms for high- level liquid wastes, and the lines and encasements that connect them. Each waste site in the aggregate area is described separately. Close relations between waste units, such as overflow from one to another, are also discussed.

1189 (BHI-00178) **PUREX Plant aggregate area management study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005048. Source: OSTI; NTIS; INIS; GPO Dep.

The PUREX aggregate area is made up of six operable units; 200-PO-1 through 200-PO-6 and consists of liquid and solid waste disposal sites in the vicinity of, and related to, PUREX Plant operations. This report describes PUREX and its waste sites, including cribs, french drains, septic tanks and drain fields, trenches and ditches, ponds, catch tanks, settling tanks, diversion boxes, underground tank farms, and the lines and encasements that connect them. Each waste site in the aggregate area is described separately. Close relationships between waste units, such as overflow from one to another, are also discussed. This document provides a technical baseline of the aggregate area and results from an environmental investigation. This document is based upon review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. No intrusive field investigations or sampling were conducted.

1190 (BHI-00179) **B Plant aggregate area management study technical baseline report.** DeFord, D.H.; Carpenter, R.W. Bechtel Hanford, Inc., Richland, WA (United States). May 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005047. Source: OSTI; NTIS; INIS; GPO Dep.

The B aggregate area is made up of 13 operable units; 200-BP 1 through 200-BP 1 1, 200-IU-6, and 200-SS-1 that consist of liquid and solid waste disposal sites in the vicinity of, and related to, B Plant operations. This report describes B Plant and its waste sites, including cribs, french drains, septic tanks and drain fields, trenches and ditches, ponds, catch tanks, settling tanks, diversion boxes, underground tank farms designed for high-level liquid wastes, and the lines and encasements that connect them. Each waste site in the aggregate area is described separately. Close relationships between waste units, such as overflow from one to another, are also discussed. This document provides a technical baseline of the aggregate area and results from an environmental investigation. This document is based upon review and evaluation of numerous Hanford Site current and historical reports, drawings and photographs, supplemented with site inspections and employee interviews. No intrusive field investigations or sampling were conducted.

1191 (BHI-00247-Rev.1) **241-CX-70, 241-CX-71, and 241-CX-72 underground storage tanks at the strontium semiworks facility supplemental information to the Hanford Facility Contingency Plan.** Ingle, S.J. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008207. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a unit-specific contingency plan for the underground storage tanks at the Strontium Semiworks Facility and is intended to be used as a supplement to the Hanford Facility Contingency Plan. This unit-specific plan is to be used to demonstrate compliance with the contingency plan requirements of WAC 173-303 for certain Resource Conservation and Recovery Act of 1976 (RCRA) waste management units. Radioactive material is contained in three underground storage tanks: 241-CX-70, 241-CX-71, and 241-CX-72. Tank 241-CX-70 has been emptied, except for residual quantities of waste, and has been classified as an elementary neutralization tank under the RCRA. Tanks 241-CX-71 and 241-CX-72 contain radioactive and Washington State-only dangerous waste material, but do not present a significant hazard to adjacent facilities, personnel, or the environment. Currently, dangerous waste management activities are not being applied at the tanks. It is unlikely that any incidents presenting hazards to public health or the environment would occur at the Strontium Semiworks Facility.

1192 (BHI-00616-Rev.) **216-T-4 interim stabilization final report.** Smith, D.L. Bechtel Hanford, Inc., Richland, WA (United States). [1996]. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005931. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a general description of the activities performed for the interim stabilization of the 216-T-4-1 ditch, 216-T-4-2 ditch, and 216-T-4-2 pond. Interim stabilization was required to reduce the amount of surface-contaminated acres and to minimize the migration of radioactive contamination. Work associated with the 216-T4-1 ditch and 216-T-4-2 pond was performed by the Radiation Area Remedial Action (RARA) Project. Work associated with the 216-T-4-2 ditch was done concurrently but was funded by Westinghouse Hanford Company (WHC) Tank Waste Remediation Systems (TWRS).

1193 (BNL-52361(Rev.10/95)) **Seismic design and evaluation guidelines for the Department of Energy High-Level Waste Storage Tanks and Appurtenances.** Bandyopadhyay, K.; Cornell, A.; Costantino, C.; Kennedy, R.; Miller, C.; Veletsos, A. Brookhaven National Lab., Upton, NY (United States). Oct 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96004058. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides seismic design and evaluation guidelines for underground high-level waste storage tanks. The guidelines reflect the knowledge acquired in the last two decades in defining seismic ground motion and calculating hydrodynamic loads, dynamic soil pressures and other loads for underground tank structures, piping and equipment. The application of the guidelines is illustrated with examples. The guidelines are developed for a specific design of underground storage tanks, namely double-shell structures. However, the methodology discussed is applicable for other types of tank structures as well. The application of these and of suitably adjusted versions of these concepts to other structural types will be addressed in a future version of this document. The original version of this document was published in January 1993. Since then, additional studies have been performed in several areas and the results are included in this revision. Comments received from the users are also addressed. Fundamental concepts supporting the basic seismic criteria contained in the original version have since then been incorporated and published in DOE-STD-1020-94 and its technical basis documents. This information has been deleted in the current revision.

1194 (BNL–61646) **Aging mechanisms for steel components of high-level waste storage tanks.** Weeks, J.; Bandyopadhyay, K.; Bush, S.; Kassir, M.; Mather, B.; Shewmon, P.; Streicher, M.; Thompson, B.; van Rooyen, D. Brookhaven National Lab., Upton, NY (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–48: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011775. Source: OSTI; NTIS; INIS; GPO Dep.

High level storage tanks in service at the present time were fabricated from either carbon steel or low-carbon stainless steel, in each case surrounded by a concrete vault. A variety of potential degradation mechanisms may affect these steel tanks, including corrosion, stress-corrosion cracking, fatigue, radiation, erosion, and hydrogen embrittlement. Historically, some of the non-stress-relieved carbon steel tanks have leaked; in the only failure analysis performed to date, stress corrosion cracking in the heat-affected zone (HAZ) of the weld was identified as the cause. Potentially significant aging mechanisms include general corrosion, pitting and/or crevice corrosion stress-corrosion cracking, microbiologically-induced corrosion, concentration cell attack, and corrosion of external tank surfaces by in-leakage of ground water. Aging mechanisms which are deemed non-significant include thermal and radiation embrittlement, creep and stress relaxation, fatigue, erosion and erosion/corrosion wear, and hydrogen embrittlement. Justification for the potential significance or non-significance for each mechanism is provided, based on the current understanding of these processes and the environments to which the tanks are exposed.

1195 (BNL–61647) **Nondestructive examination of DOE high-level waste storage tanks.** Bush, S.; Bandyopadhyay, K.; Kassir, M.; Mather, B.; Shewmon, P.; Streicher, M.; Thompson, B.; van Rooyen, D.; Weeks, J. Brookhaven National Lab., Upton, NY (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–46: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011776. Source: OSTI; NTIS; INIS; GPO Dep.

A number of DOE sites have buried tanks containing high-level waste. Tanks of particular interest am double-shell inside concrete cylinders. A program has been developed for the inservice inspection of the primary tank containing high-level waste (HLW), for testing of transfer lines and for the inspection of the concrete containment where possible. Emphasis is placed on the ultrasonic examination of selected areas of the primary tank, coupled with a leak-detection system capable of detecting small leaks through the wall of the primary tank. The NDE program is modelled after ASME Section XI in many respects, particularly with respects to the sampling protocol. Selected testing of concrete is planned to determine if there has been any significant degradation. The most probable failure mechanisms are corrosion-related so that the examination program gives major emphasis to possible locations for corrosion attack.

1196 (BNL–61648) **An overview of the DOE high-level waste storage tank structural integrity assessment guidelines.** Bandyopadhyay, K.; Bush, S.; Kassir, M.; Mather, B.; Shewmon, P.; Streicher, M.; Thompson, B.; van Rooyen, D.; Weeks, J. Brookhaven National Lab., Upton, NY (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–38: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95010449. Source: OSTI; NTIS; INIS; GPO Dep.

The basic elements of a structural integrity program for high-level waste storage tanks include identifying significant aging degradation mechanisms, developing programs to monitor and control these degradation processes, and developing management options and procedures to minimize impact on the environment should tank leakage develop. A Waste Tank Structural Integrity Panel (TSIP) was established by Brookhaven National Laboratory at the request of the DOE Office of Environmental Restoration and Waste Management to review these elements and prepare a set of guidelines that could be used by DOE and its contractors to manage the structural integrity of these tanks. These guidelines emphasize the identification of significant degradation mechanisms for both the steel and concrete components of the tanks, the recommended monitoring and inspection programs, and the indicated management options.

1197 (BNL–61651) **Aging mechanisms for concrete components of High-Level Waste storage tanks.** Kassir, M.; Bandyopadhyay, K.; Bush, S.; Mather, B.; Shewmon, P.; Streicher, M.; Thompson, B.; van Rooyen, D.; Weeks, J. Brookhaven National Lab., Upton, NY (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–34: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011403. Source: OSTI; NTIS; INIS; GPO Dep.

The age-related degradation mechanisms which affect the concrete and the reinforcing steel in the high-level waste (HLW) storage tanks art evaluated with respect to their potential significance to the continued performance of the concrete, and am classified into non-significant and potentially significant. The identified potentially significant degradation mechanisms include the effects of elevated temperature, freezing and thawing, leaching of calcium hydroxide, aggressive chemical attack, and corrosion of the reinforcing steel. To the extent that available knowledge permits, these mechanisms are generically evaluated and quantified so that site-specific plans may be developed to verify whether significant degradation has occurred in the concrete, and, if so, to formulate mitigating measures to avoid further deterioration and possibly repair the degradation or pursue other management options.

1198 (BNL–61711) **Seismic design evaluation guidelines for buried piping for the DOE HLW Facilities.** Lin, Chi-Wen (Consultant, Martinez, CA (United States)); Antaki, G.; Bandyopadhyay, K.; Bush, S.H.; Costantino, C.; Kennedy, R. Brookhaven National Lab., Upton, NY (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-950740–45: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95011777. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents the seismic design and evaluation guidelines for underground piping for the Department of Energy (DOE) High-Level-Waste (HLW) Facilities. The underground piping includes both single and double containment steel pipes and concrete pipes with steel lining, with particular emphasis on the double containment piping. The design and evaluation guidelines presented in this paper follow the generally accepted beam-on-elastic-foundation analysis principle and the inertial response calculation method, respectively, for piping directly in contact with the soil or contained in a jacket. A standard analysis procedure is described along with the discussion of factors deemed to be significant for the design of the underground piping. The following key considerations are addressed: the design feature and safety requirements for the inner (core) pipe and the outer pipe; the effect of soil strain and wave passage; assimilation of the necessary seismic and soil data; inertial response calculation for the inner pipe; determination of support anchor movement loads; combination of design loads; and code comparison. Specifications and justifications of the key parameters used, stress components to be calculated and the allowable stress and strain limits for code evaluation are presented.

1199 (BNL–62294) **Underground nuclear waste containments.** Bandyopadhyay, K.K. Brookhaven National Lab., Upton, NY (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-9507189–1: IABSE colloquium on reliable containment for the future, London (United Kingdom), 11-12 Jul 1995). Order Number DE96001917. Source: OSTI; NTIS; INIS; GPO Dep.

In the United States, about a hundred million gallons of high-level nuclear waste are stored in underground containments. Basically, these containments are of two different designs: single-shell and double-shell structures. The single-shell structures consist of reinforced concrete cylindrical walls seated on circular mats and enclosed on top with torispherical domes or circular flat roofs. The walls and the basemats are lined with carbon steel. The double-shell structures provide another layer of protection and constitute a completely enclosed steel containment within the single-shell structure leaving an annular space between the two walls. Single-shell containments are of earlier vintage and were built in the period 1945-1965. Double-shell structures were built through the 1960s and 1970s. Experience gained in building and operating the single-shell containments was used in enhancing the design and construction of the double-shell structures. Currently, there are about 250 underground single-shell and double-shell structures containing the high-level waste with an inventory of about 800 million curies. During their service lives, especially in early stages, these structures were subjected to thermal excursions of varying extents; also, they have aged in the chemical environment. Furthermore, in their remaining service lives, the structures may be subjected to loads for which they were not designed, such as larger earthquakes or chemical explosions. As a result, the demonstration of safety of these underground nuclear containments poses a challenge to structural engineers, which increases with time. Regardless of current plans for gradual retrieval of the waste and subsequent solidification for disposal, many of these structures are expected to continue to contain the waste through the next 20-40 years. In order to verify their structural capabilities in fulfilling this mission, several studies were recently performed at Brookhaven National Laboratory.

1200 (BNL–63030) **Consideration of kinematic interaction in determining seismic responses of underground structures.** Xu, J. (City Univ. of New York, NY (United States)); Bandyopadhyay, K.K.; Miller, C.A. Brookhaven National Lab., Upton, NY (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. (CONF-960706–20: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96010691. Source: OSTI; NTIS; INIS; GPO Dep.

This paper investigates the effect of kinematic interaction on the seismic responses of underground structures through a parametric study. A buried concrete, cylindrical tank, typical of those found in DOE high-level waste sites, was analyzed for the seismic response using the computer program SASSI. The key response parameters were evaluated to identify the potential effects of kinematic interactions The results of the study are presented in this paper.

1201 (CAO–94-1005-Rev.1-Vol.1) **Waste Isolation Pilot Plant Transuranic Waste Baseline inventory report. Volume 1. Revision 1.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div.; USDOE Carlsbad Area Office, NM (United States). Feb 1995. 144p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95009611. Source: OSTI; NTIS; INIS; GPO Dep.

Report includes diskette designed to run on IBM PC or compatible equipment.

This document provides baseline inventories of transuranic wastes for the WIPP facility. Information on waste forms, forecasting of future inventories, and waste stream originators is also provided. A diskette is provided which contains the inventory database.

1202 (CAO–94-1005-Rev.1-Vol.2) **Waste Isolation Pilot Plant Transuranic Waste Baseline inventory report. Volume 2. Revision 1.** USDOE Carlsbad Area Office, NM (United States). Feb 1995. 887p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95009612. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the Baseline Inventory Report for the transuranic (alpha-bearing) wastes stored at the Waste Isolation Pilot Plant (WIPP) in New Mexico. Waste stream profiles including origin, applicable EPA codes, typical isotopic composition, typical waste densities, and typical rates of waste generation for each facility are presented for wastes stored at the WIPP.

1203 (CAO–94-1005-Rev.1-Vol.3) **Waste Isolation Pilot Plant Transuranic Waste Baseline inventory report. Volume 3. Revision 1.** USDOE Carlsbad Area Office, NM (United States). Feb 1995. 234p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95009613. Source: OSTI; NTIS; INIS; GPO Dep.

This report consists of information related to the waste forms at the WIPP facility from the waste originators. Data for retrievably stored, projected and total wastes are given.

1204 (CAO–94-1010) **Transuranic Waste Characterization Quality Assurance Program Plan.** USDOE Carlsbad Area Office, NM (United States). 30 Apr 1995. 258p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012993. Source: OSTI; NTIS; INIS; GPO Dep.

This quality assurance plan identifies the data necessary, and techniques designed to attain the required quality, to meet the specific data quality objectives associated with the DOE Waste Isolation Pilot Plant (WIPP). This report specifies sampling, waste testing, and analytical methods for transuranic wastes.

1205 (CONF-940401–19) **LINAC-based transuranic waste characterization system.** Schultz, F.J. (Oak Ridge National Lab., TN (United States)); Womble, P.C.; Vourvopoulos, G.; Roberts, M.L. Oak Ridge National Lab., TN (United States). [1994]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International conference on methods and applications of radioanalytical chemistry; Kona, HI (United States); 10-16 Apr 1994. Order Number DE96010003. Source: OSTI; NTIS; INIS; GPO Dep.

Remote-handled transuranic nuclear waste poses a particular challenge for assaying due to the high neutron and gamma ray background that emanates from the non-fissile, but highly radioactive material, contained with the waste. The utilization of a RFQ linac with a neutron flux has shown that, in principle, the differential die-away technique can reliably assay this special class of nuclear waste.

1206 (CONF-950171–2) **Sludge washing and dissolution of Melton Valley Storage Tank waste.** Beahm, E.C. Oak Ridge National Lab., TN (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient Separations and Processing Integrated Program (ESPIP) technical integration and exchange (TIE) meeting; Gaithersburg, MD (United States); 24-26 Jan 1995. Order Number DE96008643. Source: OSTI; NTIS; INIS; GPO Dep.

Focus is on experimental and modeling R&D for comprehensive sludge/supernatant processing flowsheet being done for the Underground Storage Tank Integration Demonstration; emphasis is on Hanford tank waste disposal involving dissolution of the sluge before pretreatment. Combination of tests on actual Melton Valley Storage Tank (MVST) sludge, tests on sludge simulants, and modeling of sludge chemistry provides a broad evaluation of sludge and supernate processing. The information is useful for both MVST and Hanford tank wastes.

1207 (CONF-950232–32) **Testing of the West Valley Vitrification Facility transfer cart control system.** Halliwell, J.W.; Bradley, E.C. Oak Ridge National Lab., TN (United States); West Valley Nuclear Services Co., Inc., West Valley, NY (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC24-81NE44139. From 6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995. Order Number DE95006620. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory (ORNL) has designed and tested the control system for the West Valley Demonstration Project Vitrification Facility transfer cart. The transfer cart will transfer canisters of vitrified high-level waste remotely within the Vitrification Facility. The control system operates the cart under battery power by wireless control. The equipment includes cart-mounted control electronics, battery charger, control pendants, engineer's console, and facility antennas. Testing was performed in several phases of development: (1) prototype equipment was built and tested during design, (2) board-level testing was then performed at ORNL during fabrication, and (3) system-level testing was then performed by ORNL at the fabrication subcontractor's facility for the completed cart system. These tests verified (1) the performance of the cart relative to design requirements and (2) operation of various built-in cart features. The final phase of testing is planned to be conducted during installation at the West Valley Vitrification Facility.

1208 (CONF-950596–2) **Application of multisorbent traps to characterization and quantification of workplace exposure source terms.** Dindal, A.B.; Ma, Cheng-Yu; Jenkins, R.A.; Higgins, C.E.; Skeen, J.T.; Bayne, C.K. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on measurement of toxic and related air pollutants; Durham, NC (United States); 2-5 May 1995. Order Number DE95016354. Source: OSTI; NTIS; INIS; GPO Dep.

Multisorbent traps have been used for several years to characterize complex atmospheres. Only more recently have multisorbent traps been used for quantitative analysis. The traps provide an effective method for retaining a wide range of airborne Organic contaminants, since these carbonaceous sorbents are relatively hydrophobic, have large surface areas, do not have active functional groups, and have fewer chemical artifacts than other sorbents. Multisorbent traps, which are 76 mm in length and have a 6 mm outside diameter, contain sequentially loaded beds of Carbotrap C, Carbotrap, and Carbosieve SIII, similar to a commercially available trap. The injection port of a gas chromatograph is configured for thermal desorption analysis of the traps via an in-house modification. Currently, multisorbent traps are being used to sample the headspace of underground storage tanks at the Department of Energy's Hanford site, in Richland, Washington. The analyses are performed by flame ionization or mass spectrometric detection. Target organic analytes include C_6 to C_{13} alkanes, nitriles, alkyl ketones, dibutyl butyl phosphonate and tributyl phosphate. Pre-analytical holding times or practical reporting times for many target analytes are at least 84 days under either refrigerated or ambient conditions. Traps are fabricated, conditioned, and spiked with three surrogate standards in the vapor phase prior to shipment to the site. Recovery of the surrogates from the multisorbent traps serve as a statistical process control. Source concentrations of Hanford underground storage tank headspaces range from 0.96 mg/m^3 to 1200 mg/m^3.

1209 (CONF-9505101–1) **Batch test equilibration studies examining the removal of Cs, Sr, and Tc from supernatants from ORNL underground storage tanks by selected ion exchangers.** Collins, J.L.; Egan, B.Z.; Anderson, K.K.; Chase, C.W.; Bell, J.T. Oak Ridge National Lab., TN (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on challenges and innovations in the management of hazardous waste; Washington, DC (United States); 10-12 May 1995. Order Number DE95013204. Source: OSTI; NTIS; INIS; GPO Dep.

Bench-scale batch equilibration tests have been conducted with supernatants from two underground tanks at the

Melton Valley Storage Tank (MVST) Facility at Oak Ridge National Laboratory (ORNL) to determine the effectiveness of selected ion exchangers in removing cesium, strontium, and technetium. Seven sorbents were evaluated for cesium removal, nine for strontium removal, and four for technetium removal. The results indicate that granular potassium cobalt hexacyanoferrate was the most effective of the exchangers evaluated for removing cesium from the supernatants. The powdered forms of sodium titanate (NaTiO) and cystalline silicotitanate (CST) were superior in removing the strontium; however, for the sorbents of suitable particle size for column use, titanium monohydrogen phosphate (TiHP ϕ), sodium titanate/polyacrylonitrile (NaTiO-PAN), and titanium monohydrogen phosphate/polyacrylonitrile (TiP-PAN) gave the best results and were about equally effective. Reillex™ 402 was the most effective exchanger in removing the technetium; however, it was only slightly more satisfactory than Reillex™ HPQ.

1210 (CONF-9505101–5) **Waste processing demonstrations within the Waste Pretreatment and Processing Program of the Tank Focus Area.** Hunt, R.D.; McGinnis, C.P. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on challenges and innovations in the management of hazardous waste; Washington, DC (United States); 10-12 May 1995. Order Number DE95013984. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) Office of Environmental Management has created a new approach for the development of technology for DOE environmental remediation problems. Previously, technology development was conducted on a site-by-site basis and managed by multiple organizations. This new DOE strategy consolidates and focuses all technology development efforts on five priority problems. The remediation of the 1 × 10^8 gal of radioactive waste in the underground storage tanks (USTs) at five DOE sites is one of the priority problems. All tank remediation projects will be integrated into the Tank Focus Area (TFA). The TFA mission is to manage an integrated technology development program that results in the safe and efficient remediation of UST waste across the DOE complex. The TFA has divided its efforts into several areas such as safety, characterization, retrieval, pretreatment and processing, immobilization, and site closure. A key predecessor of the Waste Pretreatment and Processing Program (WPPP) of the TFA was the Waste Processing and Disposal Program (WPDP) of the Underground Storage Tank – Integrated Demonstration. Nearly all of the FY 1995 WPDP projects have been transferred into the WPPP. These WPPP projects can be divided into four systems: cesium removal, comprehensive sludge and supernate, out-of-tank evaporation, and cross-flow filtration. The current status of these WPPP projects is presented. The goal of the projects is to minimize the volume of high-level waste and the radioactivity in low-level waste.

1211 (CONF-9507119–10) **Case study to remove radioactive hazardous sludge from long horizontal storage tanks.** Hylton, T.D.; Youngblood, E.L.; Cummins, R.L. Oak Ridge National Lab., TN (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Summer national meeting of the American Institute of Chemical Engineers; Boston, MA (United States); 30 Jul - 2 Aug 1995. Order Number DE96010736. Source: OSTI; NTIS; INIS; GPO Dep.

The removal of radioactive hazardous sludge from waste tanks is a significant problem at several US Department of Energy (DOE) sites. The use of submerged jets produced by mixing pumps lowered into the supernatant/sludge interface to produce a homogeneous slurry is being studied at several DOE facilities. The homogeneous slurry can be pumped from the tanks to a treatment facility or alternative storage location. Most of the previous and current studies with this method are for flat-bottom tanks with vertical walls. Because of the difference in geometry, the results of these studies are not directly applicable to long horizontal tanks such as those used at the Oak Ridge National Laboratory. Mobilization and mixing studies were conducted with a surrogate sludge (e.g., kaolin clay) using submerged jets in two sizes of horizontal tanks. The nominal capacities of these tanks were 0.87 m^3 (230 gal) and 95 m^3 (25,000 gal). Mobilization efficiencies and mixing times were determined for single and bidirectional jets in both tanks with the discharge nozzles positioned at two locations in the tanks. Approximately 80% of the surrogate sludge was mobilized in the 95-m^3 tank using a fixed bidirectional jet (inside diameter = 0.035 m) and a jet velocity of 6.4 m/s (21 ft/s).

1212 (CONF-951006–29) **Quality assurance procedures for the analysis of TRU waste samples.** Glasgow, D.C. Giaquinto, J.M. (Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Robinson, L. Oak Ridge National Lab., TN (United States). 5 Oct 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE96004599. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) project was undertaken in response to the growing need for a national repository for transuranic (TRU) waste. Guidelines for WIPP specify that any waste item to be interred must be fully characterized and analyzed to determine the presence of chemical compounds designated hazardous and certain toxic elements. The Transuranic Waste Characterization Program (TWCP) was launched to develop analysis and quality guidelines, certify laboratories, and to oversee the actual waste characterizations at the laboratories. ORNL is participating in the waste characterization phase and brings to bear a variety of analytical techniques including ICP-AES, cold vapor atomic absorption, and instrumental neutron activation analysis (INAA) to collective determine arsenic, cadmium, barium, chromium, mercury, selenium, silver, and other elements. All of the analytical techniques involved participate in a cooperative effort to meet the project objectives. One important component of any good quality assurance program is determining when an alternate method is more suitable for a given analytical problem. By bringing to bear a whole arsenal of analytical techniques working toward common objectives, few analytical problems prove to be insurmountable. INAA and ICP-AES form a powerful pair when functioning in this cooperative manner. This paper will provide details of the quality assurance protocols, typical results from quality control samples for both INAA and ICP-AES, and detail method cooperation schemes used.

1213 (CONF-951057–8) **Department of Energy pretreatment of high-level and low-level wastes.** McGinnis, C.P.; Hunt, R.D. Oak Ridge National Lab., TN (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From

9. symposium on separation science and technology for energy applications; Gatlinburg, TN (United States); 22-26 Oct 1995. Order Number DE96005398. Source: OSTI; NTIS; INIS; GPO Dep.

The remediation of the 1×10^8 gal of highly radioactive waste in the underground storage tanks (USTs) at five US Department of Energy (DOE) sites is one of DOE's greatest challenges. Therefore, the DOE Office of Environmental Management has created the Tank Focus Area (TFA) to manage an integrated technology development program that results in the safe and efficient remediation of UST waste. The TFA has divided its efforts into five areas, which are safety, characterization, retrieval/closure, pretreatment, and immobilization. All DOE pretreatment activities are integrated by the Pretreatment Technical Integration Manager of the TFA. For FY 1996, the 14 pretreatment tasks are divided into 3 systems: supernate separations, sludge treatment, and solid/liquid separation. The plans and recent results of these TFA tasks, which include two 25,000-gal demonstrations and two former TFA tasks on Cs removal, are presented. The pretreatment goals are to minimize the volume of high-level waste and the radioactivity in low-level waste.

1214 (CONF-9511189–1) **Design of microwave vitrification systems for radioactive waste.** White, T.L. (Oak Ridge National Lab., TN (United States)); Wilson, C.T.; Schaich, C.R.; Bostick, T.L. Oak Ridge National Lab., TN (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Workshop on vitrification of low level waste: the process and potential; San Antonio, TX (United States); 5-6 Nov 1995. Order Number DE96005450. Source: OSTI; NTIS; INIS; GPO Dep.

Oak Ridge National Laboratory (ORNL) is involved in the research and development of high-power microwave heating systems for the vitrification of Department of Energy (DOE) radioactive sludges. Design criteria for a continuous microwave vitrification system capable of processing a surrogate filtercake sludge representative of a typical waste-water treatment operation are discussed. A prototype 915-MHz, 75-kW microwave vitrification system or "microwave melter" is described along with some early experimental results that demonstrate a 4 to 1 volume reduction of a surrogate ORNL filtercake sludge.

1215 (CONF-960158–2) **Task summary: Hot demonstration of proposed commercial nuclide removal technology.** Lee, D.D.; Travis, J.R. Oak Ridge National Lab., TN (United States). Nov 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient separations and processing crosscutting program 1996 technical meeting; Gaithersburg, MD (United States); 16-19 Jan 1996. Order Number DE96005667. Source: OSTI; NTIS; INIS; GPO Dep.

Radionuclides represent only a small fraction of the components in millions of gallons of storage tank supernatant at various sites, including Oak Ridge, Hanford, Savannah River, and Idaho. Most of the radioactivity is contributed by cesium, strontium, and technetium along with high concentrations of sodium and potassium salts. The purpose of this task is to test and select sorbents and commercial removal technologies supplied by ESP for removing and concentrating the radionuclides, thereby reducing the volume of waste to be stored or disposed.

1216 (CONF-960158–3) **Solvent extraction of radionuclides from aqueous tank waste.** Bonnesen, P.V.; Sachleben, R.A.; Moyer, B.A. Oak Ridge National Lab., TN (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient separations and processing crosscutting program 1996 technical meeting; Gaithersburg, MD (United States); 16-19 Jan 1996. Order Number DE96005368. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this task is to develop an efficient solvent-extraction and stripping process for the removal of the fission products Tc-99, Sr-90, and Cs-137 from alkaline tank wastes, such as those stored at Hanford and Oak Ridge. As such, this task expands upon FY 1995's successful development of a solvent-extraction and stripping process for technetium separation from @e tank-waste solutions. This process has in fact already been extended to include the capability of removing both Tc and Sr simultaneously. In this form, the process has been given the name SRTALK and will be developed further in this program as a prelude to developing a system capable of removing Tc, Sr, and Cs together. Such a system could potentially simplify and improve fission-product removal from tank waste. In addition, it would possess the advantages already inherent in our Tc solvent-extraction process: No required feed adjustment, economical water stripping, low consumption of materials, and low waste volume.

1217 (CONF-960158–5) **Comprehensive supernate treatment: Task summary.** Egan, B.Z.; Collins, J.L.; Anderson, K.K.; Chase, C.W. Oak Ridge National Lab., TN (United States). 29 Nov 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient separations and processing crosscutting program 1996 technical meeting; Gaithersburg, MD (United States); 16-19 Jan 1996. Order Number DE96005659. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. RADIOACTIVE WASTES/underground storage; CESIUM/sorption; STRONTIUM/sorption; TECHNETIUM/sorption; COBALT/sorption; ION EXCHANGE; RADIOACTIVE WASTE PROCESSING; CESIUM; SORPTION; STRONTIUM; TECHNETIUM; COBALT; MINIMIZATION; SEPARATION PROCESSES

1218 (CONF-960212–90) **The waste isolation pilot plant regulatory compliance program.** Mewhinney, J.A. (U.S. Dept. of Energy, Carlsbad, NM (United States)); Kehrman, R.F. Westinghouse Electric Corp., Carlsbad, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. From Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment; Tucson, AZ (United States); 25-29 Feb 1996. Order Number DE96010277. Source: OSTI; NTIS; INIS; GPO Dep.

The passage of the WIPP Land Withdrawal Act of 1992 (LWA) marked a turning point for the Waste Isolation Pilot Plant (WIPP) program. It established a Congressional mandate to open the WIPP in as short a time as possible, thereby initiating the process of addressing this nation's transuranic (TRU) waste problem. The DOE responded to the LWA by shifting the priority at the WIPP from scientific investigations to regulatory compliance and the completion of prerequisites for the initiation of operations. Regulatory compliance activities have taken four main focuses: (1) preparing regulatory submittals; (2) aggressive schedules; (3) regulator interface; and (4) public interactions

1219 (CONF-960421–35) **Benefits/impacts of utilizing depleted uranium silicate glass as backfill for spent fuel waste packages.** Pope, R.B.; Forsberg, C.W.; Ashline, R.C.; DeHart, M.D.; Childs, K.W.; Tang, J.S. Oak Ridge National Lab., TN (United States). [1996]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From 7. annual international high-level radioactive waste management conference; Las Vegas, NV (United States); 29 Apr - 3 May 1996. Order Number DE96008810. Source: OSTI; NTIS; INIS; GPO Dep.

An assessment has been made of the benefits and impacts which can be derived by filling a spent nuclear fuel multi-purpose canister with depleted uranium silicate (DUS) glass at a reactor site. Although the primary purpose of the DUS glass fill would be to enhance repository performance assessment and control criticality of geologic times, a number of benefits to the waste management system can be derived from adding the DUS glass prior to shipment from the reactor site.

1220 (DOE/AL/58309–59) **An analysis of the annual probability of failure of the waste hoist brake system at the Waste Isolation Pilot Plant (WIPP).** Greenfield, M.A. (Univ. of California, Los Angeles, CA (United States)); Sargent, T.J. New Mexico Inst. of Mining and Technology, Socorro, NM (United States). Nov 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. Order Number DE96003859. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Evaluation Group (EEG) previously analyzed the probability of a catastrophic accident in the waste hoist of the Waste Isolation Pilot Plant (WIPP) and published the results in Greenfield (1990; EEG-44) and Greenfield and Sargent (1993; EEG-53). The most significant safety element in the waste hoist is the hydraulic brake system, whose possible failure was identified in these studies as the most important contributor in accident scenarios. Westinghouse Electric Corporation, Waste Isolation Division has calculated the probability of an accident involving the brake system based on studies utilizing extensive fault tree analyses. This analysis conducted for the U.S. Department of Energy (DOE) used point estimates to describe the probability of failure and includes failure rates for the various components comprising the brake system. An additional controlling factor in the DOE calculations is the mode of operation of the brake system. This factor enters for the following reason. The basic failure rate per annum of any individual element is called the Event Probability (EP), and is expressed as the probability of failure per annum. The EP in turn is the product of two factors. One is the "reported" failure rate, usually expressed as the probability of failure per hour and the other is the expected number of hours that the element is in use, called the "mission time". In many instances the "mission time" will be the number of operating hours of the brake system per annum. However since the operation of the waste hoist system includes regular "reoperational check" tests, the "mission time" for standby components is reduced in accordance with the specifics of the operational time table.

1221 (DOE/AL/58309–60) **The influence of salt aerosol on alpha radiation detection by WIPP continuous air monitors.** Bartlett, W.T.; Walker, B.A. Environmental Evaluation Group, Albuquerque, NM (United States); Environmental Evaluation Group, Carlsbad, NM (United States). Jan 1996. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG–60). Order Number DE96004879. Source: OSTI; NTIS; INIS; GPO Dep.

Alpha continuous air monitors (CAMs) will be used at the Waste Isolation Pilot Plant (WIPP) to measure airborne transuranic radioactivity that might be present in air exhaust or in work-place areas. WIPP CAMs are important to health and safety because they are used to alert workers to airborne radioactivity, to actuate air-effluent filtration systems, and to detect airborne radioactivity so that the radioactivity can be confined in a limited area. In 1993, the Environmental Evaluation Group (EEG) reported that CAM operational performance was affected by salt aerosol, and subsequently, the WIPP CAM design and usage were modified. In this report, operational data and current theories on aerosol collection were reviewed to determine CAM quantitative performance limitations. Since 1993, the overall CAM performance appears to have improved, but anomalous alpha spectra are present when sampling-filter salt deposits are at normal to high levels. This report shows that sampling-filter salt deposits directly affect radon-thoron daughter alpha spectra and overall monitor efficiency. Previously it was assumed that aerosol was mechanically collected on the surface of CAM sampling filters, but this review suggests that electrostatic and other particle collection mechanisms are more important than previously thought. The mechanism of sampling-filter particle collection is critical to measurement of acute releases of radioactivity. 41 refs.

1222 (DOE/AL/58309–61) **Review of the WIPP draft application to show compliance with EPA transuranic waste disposal standards.** Neill, R.H. (and others); Chaturvedi, L.; Clemo, T.M. Environmental Evaluation Group, Albuquerque, NM (United States). Mar 1996. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL58309. (EEG–61). Order Number DE96006160. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the New Mexico Environmental Evaluation Group (EEG) is to conduct an independent technical evaluation of the Waste Isolation Pilot Plant (WIPP) Project to ensure the protection of the public health and safety and the environment. The WIPP Project, located in southeastern New Mexico, is being constructed as a repository for the disposal of transuranic (TRU) radioactive wastes generated by the national defense programs. The EEG was established in 1978 with funds provided by the U.S. Department of Energy (DOE) to the State of New Mexico. Public Law 100-456, the National Defense Authorization Act, Fiscal Year 1989, Section 1433, assigned EEG to the New Mexico Institute of Mining and Technology and continued the original contract DE-AC04-79AL10752 through DOE contract DE-AC04-89AL58309. The National Defense Authorization Act for Fiscal Year 1994, Public Law 103-160, continues the authorization. EEG performs independent technical analyses of the suitability of the proposed site; the design of the repository, its planned operation, and its long-term integrity; suitability and safety of the transportation systems; suitability of the Waste Acceptance Criteria and the generator sites' compliance with them; and related subjects. These analyses include assessments of reports issued by the DOE and its contractors, other federal agencies and organizations, as they relate to the potential health, safety and environmental impacts from WIPP. Another important function of EEG is the independent environmental monitoring of background radioactivity in air, water, and soil, both on-site and off-site.

1223 (DOE/CAO–95-1077) **Performance demonstration program plan for RCRA constituent analysis of solidified wastes.** USDOE Carlsbad Area Office, NM (United States). Jun 1995. 43p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003980. Source: OSTI; NTIS; INIS; GPO Dep.

Performance Demonstration Programs (PDPS) are designed to help ensure compliance with the Quality Assurance Objectives (QAOs) for the Waste Isolation Pilot Plant (WIPP). The PDPs are intended for use by the Department of Energy (DOE) Carlsbad Area Office (CAO) to assess and approve the laboratories and other measurement facilities supplying services for the characterization of WIPP TRU waste. The PDPs may also be used by CAO in qualifying laboratories proposing to supply additional analytical services that are required for other than waste characterization, such as WIPP site operations. The purpose of this PDP is to test laboratory performance for the analysis of solidified waste samples for TRU waste characterization. This performance will be demonstrated by the successful analysis of blind audit samples of simulated, solidified TRU waste according to the criteria established in this plan. Blind audit samples (hereinafter referred to as PDP samples) will be used as an independent means to assess laboratory performance regarding compliance with the QAOs. The concentration of analytes in the PDP samples will address levels of regulatory concern and will encompass the range of concentrations anticipated in actual waste characterization samples. Analyses that are required by the WIPP to demonstrate compliance with various regulatory requirements and which are included in the PDP must be performed by laboratories that demonstrate acceptable performance in the PDP. These analyses are referred to as WIPP analyses and the samples on which they are performed are referred to as WIPP samples for the balance of this document.

1224 (DOE/CAO–95-1095) **Remote-handled transuranic waste study.** USDOE Carlsbad Area Office, NM (United States). Oct 1995. 150p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003973. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) was developed by the US Department of Energy (DOE) as a research and development facility to demonstrate the safe disposal of transuranic (TRU) radioactive wastes generated from the Nation's defense activities. The WIPP disposal inventory will include up to 250,000 cubic feet of TRU wastes classified as remote handled (RH). The remaining inventory will include contact-handled (CH) TRU wastes, which characteristically have less specific activity (radioactivity per unit volume) than the RH-TRU wastes. The WIPP Land Withdrawal Act (LWA), Public Law 102-579, requires a study of the effect of RH-TRU waste on long-term performance. This RH-TRU Waste Study has been conducted to satisfy the requirements defined by the LWA and is considered by the DOE to be a prudent exercise in the compliance certification process of the WIPP repository. The objectives of this study include: conducting an evaluation of the impacts of RH-TRU wastes on the performance assessment (PA) of the repository to determine the effects of Rh-TRU waste as a part of the total WIPP disposal inventory; and conducting a comparison of CH-TRU and RH-TRU wastes to assess the differences and similarities for such issues as gas generation, flammability and explosiveness, solubility, and brine and geochemical interactions. This study was conducted using the data, models, computer codes, and information generated in support of long-term compliance programs, including the WIPP PA. The study is limited in scope to post-closure repository performance and includes an analysis of the issues associated with RH-TRU wastes subsequent to emplacement of these wastes at WIPP in consideration of the current baseline design. 41 refs.

1225 (DOE/CAO–95-1121-Rev.3) **Transuranic waste baseline inventory report. Revision No. 3.** Sandia National Labs., Albuquerque, NM (United States). Jun 1996. 216p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96012535. Source: OSTI; NTIS; INIS; GPO Dep.

The Transuranic Waste Baseline Inventory Report (TWBIR) establishes a methodology for grouping wastes of similar physical and chemical properties from across the U.S. Department of Energy (DOE) transuranic (TRU) waste system into a series of "waste profiles" that can be used as the basis for waste form discussions with regulatory agencies. The purpose of Revisions 0 and 1 of this report was to provide data to be included in the Sandia National Laboratories/New Mexico (SNL/NM) performance assessment (PA) processes for the Waste Isolation Pilot Plant (WIPP). Revision 2 of the document expanded the original purpose and was also intended to support the WIPP Land Withdrawal Act (LWA) requirement for providing the total DOE TRU waste inventory. The document included a chapter and an appendix that discussed the total DOE TRU waste inventory, including nondefense, commercial, polychlorinated biphenyls (PCB)-contaminated, and buried (predominately pre-1970) TRU wastes that are not planned to be disposed of at WIPP.

1226 (DOE/CAO–95-2043-Draft) **Draft no-migration variance petition. Volume 1.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 519p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

The Department of Energy is responsible for the disposition of transuranic (TRU) waste generated by national defense-related activities. Approximately 2,6 million cubic feet of these waste have been generated and are stored at various facilities across the country. The Waste Isolation Pilot Plant (WIPP), was sited and constructed to meet stringent disposal requirements. In order to permanently dispose of TRU waste, the DOE has elected to petition the US EPA for a variance from the Land Disposal Restrictions of RCRA. This document fulfills the reporting requirements for the petition. This report is Volume 1 which discusses the regulatory frame work, site characterization, facility description, waste description, environmental impact analysis, monitoring, quality assurance, long-term compliance analysis, and regulatory compliance assessment.

1227 (DOE/CAO–95-2043-Vol.2-Draft) **Draft no-migration variance petition. Volume 2, Appendices: ADM, BAD, BECR.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 785p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

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1228 (DOE/CAO–95-2043-Vol.3-Draft) **Draft no-migration variance petition. Volume 3, Appendices BH, BWQ, CLP, CONT, D&D, DEF.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 935p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

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1229 (DOE/CAO–95-2043-Vol.4-Draft) **No-migration variance petition: Draft. Volume 4, Appendices DIF, GAS, GCR (Volume 1).** USDOE Carlsbad Area Office, NM (United States). 31 May 1995. 638p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95014146. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy is responsible for the disposition of transuranic (TRU) waste generated by national defense-related activities. Approximately 2.6 million cubic feet of the se waste have been generated and are stored at various facilities across the country. The Waste Isolation Pilot Plant (WIPP), was sited and constructed to meet stringent disposal requirements. In order to permanently dispose of TRU waste, the DOE has elected to petition the US EPA for a variance from the Land Disposal Restrictions of RCRA. This document fulfills the reporting requirements for the petition. This report is volume 4 of the petition which presents details about the transport characteristics across drum filter vents and polymer bags; gas generation reactions and rates during long-term WIPP operation; and geological characterization of the WIPP site.

1230 (DOE/CAO–95-2043-Vol.5-Draft) **Draft no-migration variance petition. Volume 5, Appendices: GCR (Vol. 2), HSC, PAR.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 768p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

The Department of Energy is responsible for the disposition of transuranic (TRU) waste generated by national defense-related activities. Approximately 2,6 million cubic feet of these waste have been generated and are stored at various facilities across the country. The Waste Isolation Pilot Plant (WIPP), was sited and constructed to meet stringent disposal requirements. In order to permanently dispose of TRU waste, the DOE has elected to petition the US EPA for a variance from the Land Disposal Restrictions of RCRA. This document fulfills the reporting requirements for the petition. This is Volume 5 of the petition which present details about the geological characterization report, average VOC concentration calculations, and the permeability and porosity of the salado formation.

1231 (DOE/CAO–95-2043-Vol.6-Draft) **Draft no-migration variance petition. Volume 6, Appendices: QAPD, REG, RM, SCR, SER.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 342p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

The Department of Energy is responsible for the disposition of transuranic (TRU) waste generated by national defense-related activities. Approximately 2,6 million cubic feet of these waste have been generated and are stored at various facilities across the country. The Waste Isolation Pilot Plant (WIPP), was sited and constructed to meet stringent disposal requirements. In order to permanently dispose of TRU waste, the DOE has elected to petition the US EPA for a variance from the Land Disposal Restrictions of RCRA. This document fulfills the reporting requirements for the petition. This is Volume 6 of the petition which presents details about the 1993 site environmental report; metorite impact; damage from rock mechanics; regulatory interpretations; and the quality assurance program.

1232 (DOE/CAO–95-2043-Vol.7-Draft) **Draft no-migration variance petition. Volume 7, Appendices: SUM, SURV, VOC, WAP.** USDOE Albuquerque Operations Office, Carlsbad, NM (United States). Waste Isolation Pilot Plant Project Office. 31 May 1995. 708p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

The Department of Energy is responsible for the disposition of transuranic (TRU) waste generated by national defense-related activities. Approximately 2,6 million cubic feet of these waste have been generated and are stored at various facilities across the country. The Waste Isolation Pilot Plant (WIPP), was sited and constructed to meet stringent disposal requirements. In order to permanently dispose of TRU waste, the DOE has elected to petition the US EPA for a variance from the Land Disposal Restrictions of RCRA. This document fulfills the reporting requirements for the petition. This report is volume 7 of the petition which presents details about the waste analysis plan for WIPP. VOC screening methodologies; and a summary of the site characterization studies conducted from 1983 through 1987 at WIPP.

1233 (DOE/CAO–2056-Vol.1-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 1.** USDOE Carlsbad Area Office, NM (United States). 31 Mar 1995. 440p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95012433. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is a research and development facility for the demonstration of the permanent isolation of transuranic radioactive wastes in a geologic formation. The facility was constructed in southeastern New Mexico in a manner intended to meet criteria established by the scientific and regulatory community for the safe, long-term disposal of transuranic wastes. The US Department of

Energy (DOE) is preparing an application to demonstrate compliance with the requirements outlined in Title 40, Part 191 of the Code of Federal Regulations (CFR) for the permanent disposal of transuranic wastes. As mandated by the Waste Isolation Pilot Plant (WIPP) Land Withdrawal Act of 1992, the US Environmental Protection Agency (EPA) must evaluate this compliance application and provide a determination regarding compliance with the requirements within one year of receiving a complete application. Because the WIPP is a very complex program, the DOE has planned to submit the application as a draft in two parts. This strategy will allow for the DOE and the EPA to begin technical discussions on critical WIPP issues before the one-year compliance determination period begins. This report is the first of these two draft submittals.

1234 (DOE/CAO–2056-Vol.2-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 2: Appendices, AAC, BECR, BH.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 906p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95012436. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the conceptual design of a system the Department of Energy (DOE) may implement for compliance with the requirement to control access to the disposal site. In addition, this report addresses the scheduling process for control of inspection, maintenance, and periodic reporting related to Long Term Monitoring which addresses the monitoring of disposal system performance, environmental monitoring in accordance with the Consultation and Cooperation Agreement between the DOE and the state of New Mexico, and evaluation of testing activities related to the Permanent Marker System design. In addition to access control addressed by this report, the controlling or cleaning up of releases from the site is addressed in the Conceptual Decontamination and Decommissioning Plan. The monitoring of parameters related to disposal system performance is addressed in the Long Term Monitoring Design Concept Description. Together, these three documents address the full range of active institutional controls planned after disposal of the TRU waste in the WIPP repository.

1235 (DOE/CAO–2056-Vol.3-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 3: Appendix BIR Volume 1.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 559p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-93AL96904 ; AC04-86AL31950. (CAO–94-1005-Rev.1). Order Number DE95012437. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) Transuranic Waste Baseline Inventory Report (WTWBIR) establishes a methodology for grouping wastes of similar physical and chemical properties, from across the US Department of Energy (DOE) transuranic (TRU) waste system, into a series of "waste profiles" that can be used as the basis for waste form discussions with regulatory agencies. The majority of this document reports TRU waste inventories of DOE defense sites. An appendix is included which provides estimates of commercial TRU waste from the West Valley Demonstration Project. The WIPP baseline inventory is estimated using waste streams identified by the DOE TRU waste generator/storage sites, supplemented by information from the Mixed Waste Inventory Report (MWIR) and the 1994 Integrated Data Base (IDB). The sites provided and/or authorized all information in the Waste Stream Profiles except the EPA (hazardous waste) codes for the mixed inventories. These codes were taken from the MWIR (if a WTWBIR mixed waste stream was not in MWIR, the sites were consulted). The IDB was used to generate the WIPP radionuclide inventory. Each waste stream is defined in a waste stream profile and has been assigned a waste matrix code (WMC) by the DOE TRU waste generator/storage site. Waste stream profiles with WMCs that have similar physical and chemical properties can be combined into a waste matrix code group (WMCG), which is then documented in a site-specific waste profile for each TRU waste generator/storage site that contains waste streams in that particular WMCG.

1236 (DOE/CAO–2056-Vol.4-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 4: Appendix BIR Volume 2.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 704p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (CAO–94-1005-Rev.1). Order Number DE95012754. Source: OSTI; NTIS; INIS; GPO Dep.

This report consists of the waste stream profile for the WIPP transuranic waste baseline inventory at Lawrence Livermore National Laboratory. The following assumptions/modifications were made by the WTWBIR team in developing the LL waste stream profiles: since only current volumes were provided by LL, the final form volumes were assumed to be the same as the current volumes; the WTWBIR team had to assign identification numbers (IDs) to those LL waste streams not given an identifier by the site, the assigned identification numbers are consistent with the site reported numbers; LL Final Waste Form Groups were modified to be consistent with the nomenclature used in the WTWBID, these changes included word and spelling changes, the assigned Final Waste Form Groups are consistent with the information provided by LL; the volumes for the year 1993 were changed from an annual rate of generation (m^3/year) to a cumulative value (m^3).

1237 (DOE/CAO–2056-Vol.5-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 5: Appendices D and D, DEF, FAC.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 529p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (DOE/WIPP–95-2072). Order Number DE95012434. Source: OSTI; NTIS; INIS; GPO Dep.

This plan serves to describe the objectives of decommissioning for the Waste Isolation Pilot Plant (WIPP), identifies the elements necessary to accomplish the decommissioning, and defines the steps to execute those elements in a safe and environmentally sound manner. The plan provides a strategy for progressing from the final actions of the Disposal Phase, through the Decontamination and Decommissioning Phase, and into the initiation of the Long-Term Monitoring Phase. This plan describes a sequence of events for decontamination of the WIPP facilities and structures used to manage and contain TRU and TRU mixed waste during the receipt and emplacement operations. Alternative methods of decontamination are provided where practical.

The methods for packaging and disposal of the waste generated (derived waste) during this process are discussed. The best available technology at the time of this plan's development, may become outmoded by future technology and alternative strategies. If alternative technologies are identified the affected stakeholder(s), the Secretary of the Interior and the State will be consulted prior to implementation.

1238 (DOE/CAO–2056-Vol.6-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 6: Appendix GCR Volume 1.** USDOE Carlsbad Area Office, NM (United States); Sandia Labs., Albuquerque, NM (United States). 31 Mar 1995. 556p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (SAND–78-1596-Vol.1). Order Number DE95012435. Source: OSTI; NTIS; INIS; GPO Dep.

The Geological Characterization Report (GCR) for the WIPP site presents, in one document, a compilation of geologic information available to August, 1978, which is judged to be relevant to studies for the WIPP. The Geological Characterization Report for the WIPP site is neither a preliminary safety analysis report nor an environmental impact statement; these documents, when prepared, should be consulted for appropriate discussion of safety analysis and environmental impact. The Geological Characterization Report of the WIPP site is a unique document and at this time is not required by regulatory process. An overview is presented of the purpose of the WIPP, the purpose of the Geological Characterization Report, the site selection criteria, the events leading to studies in New Mexico, status of studies, and the techniques employed during geological characterization.

1239 (DOE/CAO–2056-Vol.7-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 7: Appendix GCR Volume 2.** USDOE Carlsbad Area Office, NM (United States); Sandia Labs., Albuquerque, NM (United States). 31 Mar 1995. 725p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (SAND–78-1596-Vol.2). Order Number DE95012752. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the second part of the geological characterization report for the Waste Isolation Pilot Plant. Both hydrology and geochemistry are evaluated. The following aspects of hydrology are discussed: surface hydrology; ground water hydrology; and hydrology drilling and testing. Hydrologic studies at the site and adjacent site areas have concentrated on defining the hydrogeology and associated salt dissolution phenomena. The geochemical aspects include a description of chemical properties of geologic media presently found in the surface and subsurface environments of southeastern New Mexico in general, and of the proposed WIPP withdrawal area in particular. The characterization does not consider any aspect of artificially-introduced material, temperature, pressure, or any other physico-chemical condition not native to the rocks of southeastern New Mexico.

1240 (DOE/CAO–2056-Vol.8-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 8: Appendices HYDRO, IRD, LTM, NUTS, PAR, PMR, QAPD, RBP.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 619p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95012753. Source: OSTI; NTIS; INIS; GPO Dep.

Geohydrologic data have been collected in the Los Medanos area at the US Department of Energy's proposed Waste Isolation Pilot Plant (WIPP) site in southeastern New Mexico since 1975 as part of a study evaluating the feasibility of storing defense-associated nuclear wastes within the bedded salt of the Salado Formation of Permian age. Drilling and hydrologic testing have identified three principal water-bearing zones above the Salado Formation and one below that could potentially transport wastes to the biosphere if the proposed facility were breached. The zones above the Salado are the contact between the Rustler and Salado Formations and the Culebra and Magenta Dolomite Members of the Rustler Formation of Permian age. The zone below the Salado Formation consists of channel sandstones in the Bell Canyon Formation of the Permian Delaware Mountain Group. Determinations of hydraulic gradients, directions of flow, and hydraulic properties were hindered because of the negligible permeability of the water-bearing zones. Special techniques in drilling, well completion, and hydraulic testing have been developed to determine the hydrologic characteristics of these water-producing zones.

1241 (DOE/CAO–2056-Vol.9-Draft) **Draft Title 40 CFR 191 compliance certification application for the Waste Isolation Pilot Plant. Volume 9: Appendices RM, SCR, SER, SUM, WRAC.** USDOE Carlsbad Area Office, NM (United States); Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. 31 Mar 1995. 580p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE95012755. Source: OSTI; NTIS; INIS; GPO Dep.

The Rock Mechanics Program is important to the establishment of a radioactive waste repository in salt because rock mechanics deals with the prediction of creep closure and eventual encapsulation of the waste. The intent of this paper is to give the current status of the program. This program consists of three major modeling efforts: continuum creep, fracture, and the disturbed rock zone. These models, together with laboratory material parameters, plastic flow potentials, initial and boundary input data, and other peripheral information forms the predictive technology. The extent to which the predictive technology is validated against in situ test data adds certainty to the method. Application of the technology is through simulations of the test results, design, or performance using numerical codes. In summary, the predictive capabilities are technically sound and reasonable. The current status of the program is that which would be advanced for compliance.

1242 (DOE/EIS–0203-Summ.) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Summary.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 78p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012049. Source: OSTI; NTIS; INIS; GPO Dep.

(This is a summary; following volumes contain Volumes 1, 2, 3, and appendices.) This document analyzes the potential environmental consequences over the next 40 years of transportation, receipt, processing, and storage of DOE spent fuel. It also analyzes INEL sitewide actions over the next 10 years for waste and spent fuel management and environmental resoration. Alternatives are analyzed.

1243 (DOE/EIS–0203-Vol.1) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 1.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 661p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012043. Source: OSTI; NTIS; INIS; GPO Dep.

US DOE is engaged in two related decisionmaking processes on the transportation, receipt, processing, and storage of spent nuclear fuel at INEL which will focus on the next 10 years, and on programmatic decisions on future spent nuclear fuel (SNF) management which will emphasize the next 40 years. DOE is analyzing the environment consequences of these spent fuel management actions in this two-volume Environmental Impact Statement (EIS). Volume 1 (this volume) supports broad programmatic decisions with application across the DOE complex and describes the purpose and need for this DOE action. Volume 2 is specific to actions at INEL; Volume 3 are public comments and responses. Volume 1 is supported by site-specific appendices (under separate cover) that provide detailed information for Hanford, INEL, Savannah River, naval SNF management facilities (including these at DOE facilities), other generator/storage sites, Oak Ridge, and NTS.

1244 (DOE/EIS–0203-Vol.1-App.B) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 1, Appendix B.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 275p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012036. Source: OSTI; NTIS; INIS; GPO Dep.

This Appendix B to Volume 1 considers the impacts on the INEL environment of the implementation of various DOE-wide spent spent nuclear fuel management alternatives. The Naval Nuclear Propulsion program, a joint Navy/DOE program, is responsible for spent naval nuclear fuel examination at INEL. (Naval fuel that has been examined at Naval Reactors Facility and turned over to DOE for storage is termed naval-type fuel.) This appendix evaluates the management of DOE spent fuel including naval-type fuel.

1245 (DOE/EIS–0203-Vol.1-App.C) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 1, Appendix C.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 304p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012037. Source: OSTI; NTIS; INIS; GPO Dep.

DOE is analyzing the environmental consequences of spent nuclear fuel management actions in this two-volume EIS. Volume 1 supports broad programmatic decisions that will be applicable across the DOE complex. Volume 2 is specific to actions at INEL. This document (appendix), which limits its discussion to the Savannah River Site (SRS) spent fuel management program, supports Volume 1 of the EIS. It contains an information background chapter, a chapter on alternatives for SRS, a chapter on existing SRS environmental resources that spent fuel activities could affect, and a chapter on the environmental consequences of each spent fuel management alternative and cumulative impacts.

1246 (DOE/EIS–0203-Vol.1-App.D-Pt.A) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs final environmental impact statement. Volume 1, Appendix D: Part A, Naval Spent Nuclear Fuel Management.** USDOE Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 481p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012038. Source: OSTI; NTIS; INIS; GPO Dep.

Volume 1 to the EIS evaluates a range of alternatives for managing naval spent nuclear fuel expected to be removed from US Navy nuclear-powered vessels and prototype reactors through the year 2035. This appendix covers aspects of the alternatives that involve managing naval spent nuclear fuel at four naval shipyards and the Naval Nuclear Propulsion Program Kesselring Site in West Milton, New York. It also covers impacts of alternatives involving examining naval spent fuel at the Expended Core Facility in Idaho and potential impacts of constructing and operating an inspection facility at any DOE facility considered in the EIS. Impacts of limited spent fuel examinations at Puget Sound Naval Shipyard are also considered. However, storage of naval spent fuel after inspection and transfer to DOE facilities is not addressed.

1247 (DOE/EIS–0203-Vol.1-App.D-Pt.B) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 1, Appendix D, Part B.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 477p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012039. Source: OSTI; NTIS; INIS; GPO Dep.

This part contains the following attachments: transportation of naval spent nuclear fuel, description of naval spent nuclear fuel receipt and handling at the Extended Core Facility at INEL, comparison of storage in new water pools vs dry container storage, descriptions of storage of naval spent nuclear fuel at servicing locations (shipyards and prototypes)and at alternate DOE facilities, analysis of normal operations and accident conditions, and comparison of the naval spent nuclear fuel storage environmental assessment and this EIS. Lists of glossary terms and of abbreviations and acronyms are also included.

1248 (DOE/EIS–0203-Vol.1-App.E) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs final environmental impact statement. Volume 1, Appendix E: Spent Nuclear Fuel Management Programs at other generator/storage locations.** USDOE Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 129p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012040. Source: OSTI; NTIS; INIS; GPO Dep.

DOE is performing a DOE-wide programmatic evaluation of spent nuclear fuel (SNF) management alternatives in order to determine the best way of managing SNF from now until the year 2035. Sites currently involved with major SNF management (Hanford, SRS, INEL), alternative sites being analyzed for SNF management (Oak Ridge, NTS), and sites involved with SNF from naval reactors are addressed in separate appendices to this volume of the environmental impact statement. This appendix addresses other DOE sites and locations which currently generate and manage small amounts of SNF: DOE, university, and other research and test reactors; commercial power reactors.

1249 (DOE/EIS–0203-Vol.1-App.F) **Department of Energy Programmatic Spent Nuclear Fuel management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 1, Appendix F.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 450p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012041. Source: OSTI; NTIS; INIS; GPO Dep.

This appendix addresses the interim storage of spent nuclear fuel at the Nevada Test Site and the Oak Ridge Reservation.

1250 (DOE/EIS–0203-Vol.2-Pt.A) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 2, Part A.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 753p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012044. Source: OSTI; NTIS; INIS; GPO Dep.

This volume covers the INEL Environmental Restoration and Waste Management programs, including site-specific spent nuclear fuel management. Five primary sections are presented that provide the purpose and need for an integrated 10-year environmental restoration, waste management, and spent fuel management program at INEL, background, management alternatives under consideration, the affected environment, and potential environmental consequences of each alternative.

1251 (DOE/EIS–0203-Vol.2-Pt.B) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 2, Part B.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 616p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012045. Source: OSTI; NTIS; INIS; GPO Dep.

This part includes the following appendices: primer on radioactivity and toxicology, consultation letters, information supporting the alternatives, acronyms and abbreviations, glossary, and technical methodologies and key data.

1252 (DOE/EIS–0203-Vol.3-Pt.A) **Department of Energy Programmatic Spent Nuclear Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 3, Part A.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 496p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012046. Source: OSTI; NTIS; INIS; GPO Dep.

This part summarizes public comments and provides responses on: preference for alternatives, NEPA-related comments, policy, proposed action and alternatives, and technical issues for spent fuel management. It also includes discussions of how public comments influenced the identification of the preferred alternatives, the extent to which public comments led to changes in the EIS, and a description of how to find specific comment summaries and responses (see part B).

1253 (DOE/EIS–0203-Vol.3-Pt.B) **Department of Energy Programmatic Spent Fuel Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs: Final Environmental Impact Statement. Volume 3, Part B.** USAEC Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 462p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012034. Source: OSTI; NTIS; INIS; GPO Dep.

This part of the volume on response to public comments, includes chapters on spent nuclear fuel management specific, INEL ER&WM programs specific, naval program specific, and miscellaneous (unrelated comments). Appendices with comment/response document indexes are also provided.

1254 (DOE/EM–0255) **Radioactive Tank Waste Remediation Focus Area. Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Jun 1995. 111p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016251. Source: OSTI; NTIS; INIS; GPO Dep.

In February 1991, DOE's Office of Technology Development created the Underground Storage Tank Integrated Demonstration (UST-ID), to develop technologies for tank remediation. Tank remediation across the DOE Complex has been driven by Federal Facility Compliance Agreements with individual sites. In 1994, the DOE Office of Environmental Management created the High Level Waste Tank Remediation Focus Area (TFA; of which UST-ID is now a part) to better integrate and coordinate tank waste remediation technology development efforts. The mission of both organizations is the same: to focus the development, testing, and evaluation of remediation technologies within a system architecture to characterize, retrieve, treat, concentrate, and dispose of radioactive waste stored in USTs at DOE facilities. The ultimate goal is to provide safe and cost-effective solutions that are acceptable to both the public and regulators. The TFA has focused on four DOE locations: the Hanford Site in Richland, Washington, the Idaho National Engineering Laboratory (INEL) near Idaho Falls, Idaho, the Oak Ridge Reservation in Oak Ridge, Tennessee, and the Savannah River Site (SRS) in Aiken, South Carolina.

1255 (DOE/EM–0295) **Radioactive tank waste remediation focus area.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 128p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013518. Source: OSTI; NTIS; INIS; GPO Dep.

EM's Office of Science and Technology has established the Tank Focus Area (TFA) to manage and carry out an integrated national program of technology development for tank waste remediation. The TFA is responsible for the development, testing, evaluation, and deployment of remediation technologies within a system architecture to characterize, retrieve, treat, concentrate, and dispose of radioactive waste stored in the underground stabilize and close the tanks. The goal is to provide safe and cost-effective solutions that are acceptable to both the public and regulators. Within the DOE complex, 335 underground storage tanks have been used to process and store radioactive and chemical mixed waste generated from weapon materials production and manufacturing. Collectively, thes tanks hold over 90 million gallons of high-level and low-level radioactive liquid waste in sludge, saltcake, and as supernate and vapor. Very little has been treated and/or disposed or in final form.

1256 (DOE/EM–52368-Pt.1) **Life cycle cost report of VHLW cask.** General Nuclear Systems, Inc., Columbia, SC (United States). Jun 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL53689. Order Number DE96012972. Source: OSTI; NTIS; INIS; GPO Dep.

This document, the Life Cycle Cost Report (LCCR) for the VHLW Cask, presents the life cycle costs for acquiring, using, and disposing of the VHLW casks. The VHLW cask consists of a ductile iron cask body, called the shielding insert, which is used for storage and transportation, and ultimately for disposal of Defense High Level Waste which has been vitrified and placed into VHLW canisters. Each ductile iron VHLW shielding insert holds one VHLW canister. For transportation, the shielding insert is placed into a containment overpack. The VHLW cask as configured for transportation is a legal weight truck cask which will be licensed by NRC. The purpose of this LCCR is to present the development of the life cycle costs for using the VHLW cask to transport VHLW canisters from the generating sites to a disposal site. Life cycle costs include the cost of acquiring, operating, maintaining, and ultimately dispositioning the VHLW cask and its associated hardware. This report summarizes costs associated with transportation of the VHLW casks. Costs are developed on the basis of expected usage, anticipated source and destination locations, and expected quantities of VHLW which must be transported. DOE overhead costs, such as the costs associated with source and destination facility handling of the VHLW, are not included. Also not included are costs exclusive to storage or disposal of the VHLW waste.

1257 (DOE/EM–52368-Pt.2) **Safety analysis report vitrified high level waste type B shipping cask.** General Nuclear Systems, Inc., Columbia, SC (United States). Mar 1995. 203p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-89AL53689. Order Number DE96012872. Source: OSTI; NTIS; INIS; GPO Dep.

This Safety Analysis Report describes the design, analyses, and principle features of the Vitrified High Level Waste (VHLW) Cask. In preparing this report a detailed evaluation of the design has been performed to ensure that all safety, licensing, and operational goals for the cask and its associated Department of Energy program can be met. The functions of this report are: (1) to fully document that all functional and regulatory requirements of 10CFR71 can be met by the package; and (2) to document the design and analyses of the cask for review by the Nuclear Regulatory Commission. The VHLW Cask is the reusable shipping package designed by GNSI under Department of Energy contract DE-AC04-89AL53-689 for transportation of Vitrified High Level Waste, and to meet the requirements for certification under 10CFR71 for a Type B(U) package. The VHLW cask has been designed as packaging for transport of canisters of Vitrified High Level Waste solidified at Department of Energy facilities.

1258 (DOE/ID–10515) **Vitrification melter study.** Jones, J.A. USDOE Idaho Operations Office, Idaho Falls, ID (United States). Apr 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96001155. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of a study performed to identify the most promising vitrification melter technologies that the Department of Energy (EM-50) might pursue with available funding. The primary focus was on plasma arc systems and graphite arc melters. The study was also intended to assist EM-50 in evaluating competing technologies, formulating effective technology strategy, developing focused technology development projects, and directing the work of contractors involved in vitrification melter development.

1259 (DOE/ID/12584–252) **Modeling needs assessment for Hanford Tank Farm Operations. Vadose Zone Characterization Project at the Hanford Tank Farms.** Rust Geotech, Inc., Grand Junction, CO (United States). Apr 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-HAN–2). Order Number DE96013696. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of a modeling-needs assessment conducted for Tank Farm Operations at the Hanford Site. The goal of this project is to integrate geophysical logging and subsurface transport modeling into a broader decision-based framework that will be made available to guide Tank Farm Operations in implementing future modeling studies. In support of this goal, previous subsurface transport modeling studies were reviewed, and stakeholder surveys and interviews were completed (1) to identify regulatory, stakeholder, and Native American concerns and the impacts of these concerns on Tank Farm Operations, (2) to identify technical constraints that impact site characterization and modeling efforts, and (3) to assess how subsurface transport modeling can best be used to support regulatory, stakeholder, Native American, and Tank Farm Operations needs. This report is organized into six sections. Following an introduction, Section 2.0 discusses background issues that relate to Tank Farm Operations. Section 3.0 summarizes the technical approach used to appraise the status of modeling and supporting characterization. Section 4.0 presents a detailed description of how the technical approach was implemented. Section 5.0 identifies findings and observations that relate to implementation of numerical modeling, and Section 6.0 presents recommendations for future activities.

1260 (DOE/ID/12584–266) **Biannual recalibration of two spectral gamma-ray logging systems used for baseline characterization measurements in the Hanford Tank Farms. Vadose Zone Characterization Project at the Hanford Tank Farms.** Koizumi, C.J. USDOE Grand Junction Projects Office, CO (United States). May 1996. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-HAN–3). Order Number DE96013697. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE's) Grand Junction Projects Office (GJPO) is engaged in establishing an initial, or baseline, characterization of the gamma-ray-emitting contaminants in the subsurface of the Tank Farms at the DOE Hanford site in the State of Washington. These baseline data are gathered by logging existing monitoring boreholes with two high-resolution passive gamma-ray logging systems informally known as Gamma 1 and Gamma 2. Calibration of the logging systems is crucial to the assurance of data quality. The project document Spectral Gamma-Ray borehole Geophysical Logging Characterization and Baseline Monitoring Plan for the Hanford Single-Shell Tanks (DOE 1995a) specifies that the initial, or base, calibration of both systems must be performed before commencement of field measurements at Hanford and that both systems must be recalibrated every 6 months thereafter using the calibration standards at the Hanford borehole logging calibration center. Data collection for the base calibrations was completed in April 1995; the results were published in Calibration of Two Spectral Gamma-Ray Logging Systems for Baseline Characterization Measurements in the Hanford Tank Farms (DOE 1995b). This report documents the first recalibration of the two systems that was performed in October 1995 at the Hanford Site. Analyses of data collected during the recalibrations are presented.

1261 (DOE/LLW–223) **National high-level waste systems analysis plan.** Kristofferson, K.; Oholleran, T.P.; Powell, R.H.; Thiel, E.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002301. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the development of modeling capabilities that can provide a system-wide view of all US Department of Energy (DOE) high-level waste (HLW) treatment and storage systems. This model can assess the impact of budget constraints on storage and treatment system schedules and throughput. These impacts can then be assessed against existing and pending milestones to determine the impact to the overall HLW system. A nation-wide view of waste treatment availability will help project the time required to prepare HLW for disposal. The impacts of the availability of various treatment systems and throughput can be compared to repository readiness to determine the prudent application of resources or the need to renegotiate milestones.

1262 (DOE/LLW–226) **National high-level waste systems analysis report.** Kristofferson, K.; Oholleran, T.P.; Powell, R.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002204. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the assessment of budgetary impacts, constraints, and repository availability on the storage and treatment of high-level waste and on both existing and pending negotiated milestones. The impacts of the availabilities of various treatment systems on schedule and throughput at four Department of Energy sites are compared to repository readiness in order to determine the prudent application of resources. The information modeled for each of these sites is integrated with a single national model. The report suggests a high-level-waste model that offers a national perspective on all high-level waste treatment and storage systems managed by the Department of Energy.

1263 (DOE/MC/29467–5042) **Decontamination systems information and research program – Literature review in support of development of standard test protocols and barrier design models for in situ formed barriers project.** National Research Center for Coal and Energy, Morgantown, WV (United States). Dec 1994. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE96000573. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy is responsible for approximately 3,000 sites in which contaminants such as carbon tetrachloride, trichlorethylene, perchlorethylene, non-volatile and soluble organic and insoluble organics (PCBs and pesticides) are encountered. In specific areas of these sites radioactive contaminants are stored in underground storage tanks which were originally designed and constructed with a 30-year projected life. Many of these tanks are now 10 years beyond the design life and failures have occurred allowing the basic liquids (ph of 8 to 9) to leak into the unconsolidated soils below. Nearly one half of the storage tanks located at the Hanford Washington Reservation are suspected of leaking and contaminating the soils beneath them. The Hanford site is located in a semi-arid climate region with rainfall of less than 6 inches annually, and studies have indicated that very little of this water finds its way to the groundwater to move the water down gradient toward the Columbia River. This provides the government with time to develop a barrier system to prevent further contamination of the groundwater, and to develop and test remediation systems to stabilize or remove the contaminant materials. In parallel to remediation efforts, confinement and containment technologies are needed to retard or prevent the advancement of contamination plumes through the environment until the implementation of remediation technology efforts are completed. This project examines the various confinement and containment technologies and protocols for testing the materials in relation to their function in-situ.

1264 (DOE/MC/31388–5141) **Stabilization of vitrified wastes: Task 4. Topical report, October 1994–September 1995.** Nowok, J.W.; Pflughoeft-Hassett, D.F.; Hassett, D.J.; Hurley, J.P. North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center. Sep 1995. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-94MC31388. Order Number DE96004364. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this task was to work with private industry to refine existing vitrification processes to produce a more stable vitrified product. The initial objectives were to (1) demonstrate a waste vitrification procedure for enhanced stabilization of waste materials and (2) develop a testing protocol to understand the long-term leaching behavior of the stabilized waste form. The testing protocol was expected to be based on a leaching procedure called the synthetic groundwater leaching procedure (SGLP). This task will contribute to the US DOE's identified technical needs in waste characterization, low-level mixed-waste processing, disposition technology, and improved waste forms. The proposed work was to proceed over 4 years in the following steps: literature surveys to aid in the selection and characterization of test mixtures for vitrification, characterization of optimized vitrified test wastes using advanced leaching protocols, and refinement and demonstration of vitrification methods leading to commercialization. For this year, literature surveys were completed, and computer modeling was performed to determine the feasibility of removing heavy metals from a waste during vitrification, thereby reducing the hazardous nature of the vitrified material and possibly producing a commercial metal concentrate. This report describes the following four subtasks: survey of vitrification technologies; survey of cleanup sites; selection and characterization of test mixtures for vitrification and crystallization; and selection of crystallization methods based on thermochemistry modeling.

1265 (DOE/MC/32113–96/CO633) **Nitrate to Ammonia Ceramic (NAC) bench scale stabilization study.** Caime, W.J.; Hoeffner, S.L. Rust Federal Services, Inc., Anderson, SC (United States). 1995. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32113. (CONF-9510108–30: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003689. Source: OSTI; NTIS; INIS; GPO Dep.

Department of Energy (DOE) sites such as the Hanford site, Idaho National Engineering Laboratory (INEL), Savannah River site, Oak Ridge National Laboratory (ORNL) have large quantities of sodium-nitrate based liquid wastes. At INEL alone there are 800,000 gallons. The largest quantity of these wastes is the 149 single shell tanks (SSTs) tanks at Hanford which can hold 1 million gallons each. The nitrate to ammonia ceramic (NAC) process has been developed to remove a majority of the nitrate content from the wastes.

1266 (DOE/RL--89-16-Rev.A) **Single-shell tank closure work plan. Revision A.** USDOE Richland Operations Office, WA (United States). Jun 1995. 534p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001202. Source: OSTI; NTIS; INIS; GPO Dep.

In January 1994, the Hanford Federal Facility Agreement and Conset Order (Tri-Party Agreement) was amended to reflect a revised strategy for remediation of radioactive waste in underground storage tanks. These amendments include milestones for closure of the single-shell tank (SST) operable units, to be initiated by March 2012 and completed by September 2024. This SST-CWP has been prepared to address the principal topical areas identified in Tri-Party Agreement Milestone M-45-06 (i.e., regulatory pathway, operable unit characterization, waste retrieval, technology development, and a strategy for achieving closure). Chapter 2.0 of this SST-CWP provides a brief description of the environmental setting, SST System, the origin and characteristics of SST waste, and ancillary equipment that will be remediated as part of SST operable unit closure. Appendix 2A provides a description of the hydrogeology of the Hanford Site, including information on the unsaturated sediments (vadose zone) beneath the 200 Areas Plateau. Chapter 3.0 provides a discussion of the laws and regulations applicable to closure of the SST farm operable units. Chapter 4.0 provides a summary description of the ongoing characterization activities that best align with the proposed regulatory pathway for closure. Chapter 5.0 describes aspects of the SST waste retrieval program, including retrieval strategy, technology, and sequence, potential tank leakage during retrieval, and considerations of deployment of subsurface barriers. Chapter 6.0 outlines a proposed strategy for closure. Chapter 7.0 provides a summary of the programs underway or planned to develop technologies to support closure. Ca. 325 refs.

1267 (DOE/SNF/REP--002-Rev.3) **National spent fuel program preliminary report RCRA characteristics of DOE-owned spent nuclear fuel DOE-SNF-REP-002. Revision 3.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Spent Fuel Management and Special Projects. Jul 1995. 171p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003485. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents information on the preliminary process knowledge to be used in characterizing all Department of Energy (DOE)-owned Spent Nuclear Fuel (SNF) types that potentially exhibit a Resource Conservation and Recovery Act (RCRA) characteristic. This report also includes the process knowledge, analyses, and rationale used to preliminarily exclude certain SNF types from RCRA regulation under 40 CFR §261.4(a)(4), "Identification and Listing of Hazardous Waste," as special nuclear and byproduct material. The evaluations and analyses detailed herein have been undertaken as a proactive approach. In the event that DOE-owned SNF is determined to be a RCRA solid waste, this report provides general direction for each site regarding further characterization efforts. The intent of this report is also to define the path forward to be taken for further evaluation of specific SNF types and a recommended position to be negotiated and established with regional and state regulators throughout the DOE Complex regarding the RCRA-related policy issues.

1268 (DOE/SR/18035--T3) **Vitrification of cesium-contaminated organic ion exchange resin.** Sargent, T.N. Jr. (Clemson Univ., SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). Aug 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96011535. Source: OSTI; NTIS; INIS; GPO Dep.

Thesis submitted to Clemson Univ., SC.

Vitrification has been declared by the Environmental Protection Agency (USEPA) as the Best Demonstrated Available Technology (BDAT) for the permanent disposal of high-level radioactive waste. Savannah River Site currently uses a sodium tetraphenylborate (NaTPB) precipitation process to remove Cs-137 from a wastewater solution created from the processing of nuclear fuel. This process has several disadvantages such as the formation of a benzene waste stream. It has been proposed to replace the precipitation process with an ion exchange process using a new resorcinol-formaldehyde resin developed by Savannah River Technical Center (SRTC). Preliminary tests, however, showed that problems such as crust formation and a reduced final glass wasteform exist when the resin is placed in the melter environment. The newly developed stirred melter could be capable of overcoming these problems. This research explored the operational feasibility of using the stirred tank melter to vitrify an organic ion exchange resin. Preliminary tests included crucible studies to determine the reducing potential of the resin and the extent of oxygen consuming reactions and oxygen transfer tests to approximate the extent of oxygen transfer into the molten glass using an impeller and a combination of the impeller and an external oxygen transfer system. These preliminary studies were used as a basis for the final test which was using the stirred tank melter to vitrify nonradioactive cesium loaded organic ion exchange resin. Results from this test included a cesium mass balance, a characterization of the semi-volatile organic compounds present in the off gas as products of incomplete combustion (PIC), a qualitative analysis of other volatile metals, and observations relating to the effect the resin had on the final redox state of the glass.

1269 (DOE/WIPP--069-Rev.5) **Waste acceptance criteria for the Waste Isolation Pilot Plant.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Apr 1996. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96010619. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) Waste Acceptance Criteria (WAC), DOE/WIPP-069, was initially developed by a U.S. Department of Energy (DOE) Steering Committee to provide performance requirements to ensure public health and safety as well as the safe handling of transuranic (TRU) waste at the WIPP. This revision updates the criteria and requirements of previous revisions and deletes those which were applicable only to the test phase. The criteria and requirements in this document must be met by participating DOE TRU Waste Generator/Storage Sites (Sites) prior to shipping contact-handled (CH) and remote-handled (RH) TRU waste forms to the WIPP. The WIPP Project will comply with applicable federal and state regulations and requirements, including those in Titles 10, 40, and 49 of the Code of Federal Regulations (CFR). The WAC, DOE/WIPP-069, serves as the primary directive for assuring the safe handling, transportation, and disposal of TRU wastes in the WIPP and for the certification of these wastes. The WAC identifies strict requirements that must be met by participating Sites before these TRU wastes may be shipped for disposal in the WIPP facility. These criteria and requirements will be reviewed and revised as appropriate, based on new technical or regulatory requirements. The WAC is a controlled document. Revised/changed pages will be supplied to all holders of controlled copies.

1270 (DOE/WIPP–91-005-Pt.B-Vol.2) **Resource Conservation and Recovery Act: Part B Permit application. Volume 2, Chapter C, Appendix C1-Appendix C8.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 311p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

Volume 2 contains appendices for the following: chemical compatibility analysis of waste forms and container materials; data accumulated from headspace-gas analyses; totals analysis versus toxicity characteristic leaching procedure; waste characterization sampling methods; applicability of real-time radiography; quality assurance objectives for waste characterization sampling and analytical methods; quality assurance project plan requirements; and Waste Isolation Pilot Plant generator/storage site waste screening and acceptance audit program.

1271 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.3) **Resource Conservation and Recovery Act. Part B permit application, Volume 3. Chapter D, Appendix D1 (beginning).** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 873p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (SAND–88-0157-Vol.3). Source: OSTI.

Volume three contains the following siting reports: Summary of site- characterization studies conducted from 1983 through 1987 at the Waste Isolation Pilot Plant (WIPP) site, southeastern New Mexico; and Waste Isolation Pilot Plant design validation final report.

1272 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.4) **Resource Conservation and Recovery Act, Part B permit application. Volume 4, Revision 5.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 968p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

This volume contains the following appendices: DOE stipulated agreement with state of New Mexico (partial); geologic correlations; mathematical simulation of underground in situ behavior; C & SH shaft geologic logs and maps; waste shaft geologic logs and maps; exhaust shaft geologic log; test rooms geologic maps and sections; drift cross sections; facility level geologic core hole logs; geomechanical instrumentation data plots; and analytical data plots.

1273 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.5) **Resource Conservation and Recovery Act: Part B permit application. Volume 5. Chapter D, Appendix D1 (continued).** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 560p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (SAND–78-1596-Vol.5). Source: OSTI.

Volume 5 contains geological characterization report for the Waste Isolation Pilot Plant (WIPP), a compilation of geologic information available to August, 1978. Contents include regional geology, site geology, seismology, hydrology, geochemistry, resources, special studies of WIPP repository rocks, and continuing studies.

1274 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.6) **Resource Conservation and Recovery Act: Part B permit application. Volume 6, Revision 5.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 895p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (SAND–78-1596-Vol.6). Source: OSTI.

Volume 6 contains Geological characterization report, Waste Isolation Pilot Plant (WIPP) site. The following topics are covered: surface hydrology; ground water hydrology; hydrology drilling and testing summary; geochemistry; resources; specific studies of WIPP repository rocks; and continuing studies.

1275 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.7) **Resource Conservation and Recovery Act: Part B permit application. Volume 7, Chapter D, Appendix D3. Revision 5.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

Volume seven contains appendix for detailed plans and drawings of the Waste Isolation Pilot Plant project. Engineering drawings for this project are identified as report no. CAPE-3105.

1276 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.8) **Resource Conservation and Recovery Act: Part B permit application. Volume 8, Revision 5.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 744p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

This is the tenth Annual Site Environmental Report (ASER), documenting the progress of environmental programs at the US Department of Energy (DOE) Waste Isolation Pilot Plant (WIPP). The most significant change affecting the WIPP facility in 1993 was the cancellation of the Test Phase. All activities pertaining to the Test Phase will now be conducted at the Idaho National Engineering laboratory. Even though the cancellation of the Test Phase was a significant change in work scope for the WIPP, there are still numerous environmental monitoring and reporting activities that must be preformed as a routine part of daily operations. These activities, and the WIPP's ability to demonstrate compliance with both state and federal environmental compliance requirements, are documented in this report. This report is a compilation and summarization of environmental data collected at the WIPP site.

1277 (DOE/WIPP–91-005-Rev.5.Pt.B-Vol.9) **Resource Conservation and Recovery Act: Part B permit application. Volume 9. Chapter E, Appendix E1-Chapter H, Appendix H3.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 580p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

Volume nine contains the following appendices: RCRA groundwater protection information; Examples of inspection sheets, logs and instructions for systems/equipment requiring inspection under 20 NMAC 4.1, Subpart V; Material safety data sheets; List of hazardous waste management job titles; and Waste Isolation Pilot Plant RCRA hazardous waste management job description.

1278 (DOE/WIPP–91-005-Rev.5-Pt.B-Vol.10) **Resource Conservation and Recovery Act: Part B permit application. Volume 10, Chapter I, Appendix I1-Chapter L, Appendix L1.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 861p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

Volume ten contains the following appendices; Conceptual design for operational phase panel closure systems; Repository seals program baseline position paper; Co-detection of hazardous and radioactive waste releases; Post-closure archived information and distribution; Solid waste management unit characterization sheets; Biennial environmental compliance report, October 1994; Summary of agreements between the U.S. Department of Energy and other agencies that affect the Waste Isolation Pilot Plant environmental program; and No-migration determination for the proposed test phase.

1279 (DOE/WIPP–91-005-Rev.-Pt.B-Vol.1) **Resource Conservation and Recovery Act: Part B permit application. Volume 1.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 534p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

Volume one contains the following: Regulatory cross-reference; Hazardous waste permit application part B; Facility description; Waste analysis plan; Facility and process information; Groundwater monitoring; Procedure to prevent hazards; RCRA contingency plan; Personnel training; Closure plans, post-closure plans, and financial requirements; Corrective action for solid waste management units; Other Federal laws; No-migration variance petition; and Certification.

1280 (DOE/WIPP–95-1149) **Carlsbad Area Office strategic plan.** USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office. Oct 1995. 18p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96005827. Source: OSTI; NTIS; INIS; GPO Dep.

This edition of the Carlsbad Area Office Strategic Plan captures the U.S. Department of Energy's new focus, and supercedes the edition issued previously in 1995. This revision reflects a revised strategy designed to demonstrate compliance with environmental regulations earlier than the previous course of action; and a focus on the selected combination of scientific investigations, engineered alternatives, and waste acceptance criteria for supporting the compliance applications. An overview of operations and historical aspects of the Waste Isolation Pilot Plant near Carlsbad, New Mexico is presented.

1281 (DOE/WIPP–95-2060) **Waste disposal in underground mines – A technology partnership to protect the environment.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96010278. Source: OSTI; NTIS; INIS; GPO Dep.

Environmentally compatible disposal sites must be found despite all efforts to avoid and reduce the generation of dangerous waste. Deep geologic disposal provides the logical solution as ever more categories of waste are barred from long-term disposal in near-surface sites through regulation and litigation. Past mining in the US has left in its wake large volumes of suitable underground space. EPA studies and foreign practice have demonstrated deep geologic disposal in mines to be rational and viable. In the US, where much of the mined underground space is located on public lands, disposal in mines would also serve the goal of multiple use. It is only logical to return the residues of materials mined from the underground to their origin. Therefore, disposal of dangerous wastes in mined underground openings constitutes a perfect match between mining and the protection and enhancement of the environment.

1282 (DOE/WIPP–95-2120) **The WIPP RCRA Part B permit application for TRU mixed waste disposal.** Johnson, J.E. (Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div.); Snider, C.A. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96010279. Source: OSTI; NTIS; INIS; GPO Dep.

In August 1993, the New Mexico Environment Department (NMED) issued a draft permit for the Waste Isolation Pilot Plant (WIPP) to begin experiments with transuranic (TRU) mixed waste. Subsequently, the Department of Energy (DOE) decided to cancel the on-site test program, opting instead for laboratory testing. The Secretary of the NMED withdrew the draft permit in 1994, ordering the State's Hazardous and Radioactive Waste Bureau to work with the DOE on submittal of a revised permit application. Revision 5 of the WIPP's Resource Conservation and Recovery Act (RCRA) Part B Permit Application was submitted to the NMED in May 1995, focusing on disposal of 175,600 m^3 of TRU mixed waste over a 25 year span plus ten years for closure. A key portion of the application, the Waste Analysis Plan, shifted from requirements to characterize a relatively small volume of TRU mixed waste for on-site experiments, to describing a complete program that would apply to all DOE TRU waste generating facilities and meet the appropriate RCRA regulations. Waste characterization will be conducted on a waste stream basis, fitting into three broad categories: (1) homogeneous solids, (2) soil/gravel, and (3) debris wastes. Techniques used include radiography, visually examining waste from opened containers, radioassay, headspace gas sampling, physical sampling and analysis of homogeneous wastes, and review of documented acceptable knowledge. Acceptable knowledge of the original organics and metals used, and the operations that generated these waste streams is sufficient in most cases to determine if the waste has toxicity characteristics, hazardous constituents, polychlorinated biphenyls (PBCs), or RCRA regulated metals.

1283 (DOE/WIPP–95-2132) **WIPP WAC REV. 5 applicability.** Bisping, R.L. (U.S. Dept. of Energy, Carlsbad, NM (United States)); Kelley, C.R. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (CONF-960212–97: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96014293. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is preparing for disposal operations at the Waste Isolation Pilot Plant (WIPP) in 1998. WIPP is a deep geological repository designed for the safe and efficient disposal of transuranic (TRU) wastes. The Waste Acceptance Criteria (WAC) for WIPP were initially developed by a DOE steering committee in 1980. Revision 5 reflects the latest negotiations and permit requirements from the Environmental Protection Agency (EPA), the State of New Mexico Environment Department (NMED), and the Nuclear Regulatory Commission (NRC). The regulatory requirements are combined with the requirements derived from the WIPP safety analysis performed for disposal operations and the original criteria established for safe waste handling operations. The WIPP WAC provides a comprehensive overview of the requirements and basis for developing waste acceptance criteria to meet today's rules and regulations for transportation and disposal of TRU wastes. The authors believe that it is a comprehensive criteria and a guidance manual for generator/storage sites who must characterize and certify TRU waste for disposal at WIPP. It also provides valuable insight to future projects that may develop their own waste acceptance criteria. The WIPP WAC presents the requirements from the following sources: 1) Resource Conservation and Recovery Act (RCRA) Permit Application; 2) Land Disposal No-migration Variance Petition; 3) 40 CFR 191 Draft Compliance Certification Application; 4) Certificate of Compliance (C of C) from the NRC for a Type B shipping container; 5) Federal Land Withdrawal Act for WIPP; WIPP Safety Analysis Report; 7) WIPP System Design Descriptions (SDDs). The WIPP WAC combines operations and nuclear safety requirements with transportation and hazardous waste regulatory requirements to provide a comprehensive set of criteria and requirements that ensure the safe disposal of TRU waste.

1284 (DOE/WIPP–95-2135) **Engineered alternatives cost/benefit study. Draft report.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Sep 1995. 1100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Source: OSTI.

The Waste Isolation Pilot Plant (WIPP) is a United States Department of Energy (DOE) project designed to demonstrate the safe disposal of Transuranic (TRU) waste in deep, geologic, bedded salt. The WIPP site is located in southeastern New Mexico. By law the WIPP site has been withdrawn from public use and has been set aside for use in the safe disposal of TRU waste. Also by law, disposal of TRU waste must comply with rules and regulations promulgated by the U.S. Environmental Protection Agency (EPA). The disposal system design consists of multiple barriers, both natural and man-made, located in a geologic salt deposit, 2,150 feet (655.3 meters) below ground. These barriers were selected because of their ability to permanently isolate the waste from the accessible environment as required to comply with subparts B and C of Title 40 Code of Federal Regulations Part 191 (40 CFR 191). As a part of the assurance requirements, 40 CFR §191.14 requires that barriers of different types shall be used to isolate the waste. The WIPP design uses both a geologic (natural) and engineered barriers for waste isolation as specified by these regulations. However, to provide additional confidence in containment prediction calculations used to demonstrate compliance with the containment requirements, Engineered Alternatives (EA) could be used as additional assurance measures beyond those used to meet the containment requirements. This report uses the term EA to represent engineered barriers that are technically feasible processes, technologies, methods, repository designs, or waste from modifications which make a significant positive impact on the disposal system in terms of reducing uncertainty in performance calculations or improving long-term performance. These EAs, if used, function as barriers to the release of radioactive material.

1285 (DOE/WIPP–95-2140) **Environmental impact statement for initiation of transuranic waste disposal at the waste isolation pilot plant.** Johnson, H.E. (U.S. Dept. of Energy, Carlsbad, NM (United States) Carlsbad Area Office); Whatley, M.E. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (CONF-960911–2: Canadian Nuclear Society (CNS) international conference on deep geological disposal of radioactive waste, Winnipeg (Canada), 15-18 Sep 1996). Order Number DE96014289. Source: OSTI; NTIS; INIS; GPO Dep.

WIPP's long-standing mission is to demonstrate the safe disposal of TRU waste from US defense activities. In 1980, to comply with NEPA, US DOE completed its first environmental impact statement (EIS) which compared impacts of alternatives for TRU waste disposal. Based on this 1980 analysis, DOE decided to construct WIPP in 1981. In a 1990 decision based on examination of alternatives in a 1990 Supplemental EIS, DOE decided to continue WIPP development by proceeding with a testing program to examine WIPP's suitability as a TRU waste repository. Now, as DOE's Carlsbad Area Office (CAO) attempts to complete its regulatory obligations to begin WIPP disposal operations, CAO is developing WIPP's second supplemental EIS (SEIS-II). To complete the SEIS-II, CAO will have to meet a number of challenges. This paper explores both the past and present EISs prepared to evaluate the suitability of WIPP. The challenges in completing an objective comparison of alternatives, while also finalizing other critical-path compliance documents, controlling costs, and keeping stakeholders involved during the decision-making process are addressed.

1286 (DOE/WIPP–95-2154) **Basic data report for WQSP 1; WQSP 2; WQSP 3; WQSP 4; WQSP 5; WQSP6; and WQSP 6a.** USDOE Albuquerque Operations Office, NM (United States). Waste Isolation Pilot Plant Project Office. [1996]. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96010604. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is located in southeastern New Mexico about 30 miles east of Carlsbad, New Mexico. The WIPP was authorized by Congress in 1979 (Public Law 96-194) and given the mission to provide "···a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from the defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission." The WIPP is intended to receive, handle, and permanently dispose of transuranic waste. To fulfill this mission, the U.S. Department of Energy is constructing a full scale facility to demonstrate both technical and operational principles of the permanent storage/disposal of transuranic waste. Technical aspects are those concerned with the design, construction, and performance of subsurface structures. Operational aspects refer to-the receiving, handling, and emplacement of transuranic waste in salt. The facility is also designed for in situ studies and experiments in salt. The Water Quality

Sampling Program (WQSP) evaluates the physical and chemical properties of the groundwater above the repository horizon that are part of the technical performance aspects.

1287 (DOE/WIPP–96-2087) **Time domain reflectometry as a rock mass monitoring technique.** Francke, J.L.; Terrill, L.J.; Allen, W.W. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (CONF-960303–2: Annual meeting and exhibition of the Society for Mining, Metallurgy and Exploration, Phoenix, AZ (United States), 11-14 Mar 1996). Order Number DE96010276. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the practices and methods used in a study of Time Domain Reflectometry (TDR) as an inexpensive deformation monitoring tool in underground excavations at the Waste Isolation Pilot Plant (WIPP). The WIPP is being developed near Carlsbad, New Mexico, for the disposal of transuranic nuclear wastes in bedded salt 655 m (2150 ft) below the surface. Data collected from WIPP geomechanical monitoring are used to characterize conditions, confirm design assumptions, and understand and predict the performance of the deep salt excavation. The geomechanical monitoring techniques ranging from inspection of observation boreholes to advanced radar surveys. In 1989 TDR was introduced as a monitoring tool with the installation of 12.7 mm (0.5 in) diameter TDR cables in the underground excavations. In 1993, a new TDR system was installed in a separate location. Based on experience with the previous installation, enhancements were implemented into the new TDR system that: (1) extended the period of performance by increasing cable diameter to 22. 2 mm (0.875 in), (2) increased accuracy in locating areas of deformation by aligning cables with nearby observation boreholes, and (3) improved data acquisition and analyses using a standard laptop computer, eliminating the chart recorder previously used. In summary, the results of a correlation between the TDR signatures to nearby observation boreholes and geomechanical instrumentation will be presented.

1288 (DOE/WIPP–96-2175) **Hazard and consequence analysis for waste emplacement at the Waste Isolation Pilot Plant.** Gerstner, D.M.; Clayton, S.G.; Farrell, R.F.; McCormick, J.A.; Ortiz, C.; Standiford, D.L. Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. [1996]. 2p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96010280. Source: OSTI; NTIS; INIS; GPO Dep.

The Carlsbad Area Office established and analyzed the safety bases for the design and operations as documented in the WIPP Safety Analysis Report (SAR). Additional independent efforts are currently underway to assess the hazards associated with the long-term (10,000 year) isolation period as required by 40 CFR 191. The structure of the WIPP SAR is unique due to the hazards involved, and the agreement between the State of New Mexico and the DOE regarding SAR content and format. However, the hazards and accident analysis philosophy as contained in DOE-STD-3009-94 was followed as closely as possible, while adhering to state agreements. Hazards associated with WIPP waste receipt, emplacement, and disposal operations were systematically identified using a modified Hazard and Operability Study (HAZOP) technique. The WIPP HAZOP assessed the potential internal, external, and natural phenomena events that can cause the identified hazards to develop into accidents. The hazard assessment identified deviations from the intended design and operation of the waste handling system, analyzed potential accident consequences to the public and workers, estimated likelihood of occurrence, and evaluated associated preventative and mitigative features. It was concluded from the assessment that the proposed WIPP waste emplacement operations and design are sufficient to ensure safety of the public, workers, and environment, over the 35 year disposal phase.

1289 (DOE/WIPP–96010611) **Waste treatability guidance program. User's guide. Revision 0.** Toth, C. Stoller (S.M.) Associates, New York, NY (United States). 21 Dec 1995. 25p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96010611. Source: OSTI; NTIS; INIS; GPO Dep.

DOE sites across the country generate and manage radioactive, hazardous, mixed, and sanitary wastes. It is necessary for each site to find the technologies and associated capacities required to manage its waste. One role of DOE HQ Office of Environmental Restoration and Waste Management is to facilitate the integration of the site- specific plans into coherent national plans. DOE has developed a standard methodology for defining and categorizing waste streams into treatability groups based on characteristic parameters that influence waste management technology needs. This Waste Treatability Guidance Program automates the Guidance Document for the categorization of waste information into treatability groups; this application provides a consistent implementation of the methodology across the National TRU Program. This User's Guide provides instructions on how to use the program, including installations instructions and program operation. This document satisfies the requirements of the Software Quality Assurance Plan.

1290 (EGG-TMI–7385-Rev.1) **TMI-2 core bore acquisition summary report.** Tolman, E.L.; Smith, R.P.; Martin, M.R.; McCardell, R.K.; Broughton, J.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1987. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96014149. Source: OSTI; NTIS; GPO Dep.

Core bore samples were obtained from the severely damaged TMI-2 core during July and August, 1986. A description of the TMI-2 core bore drilling unit used to obtain samples; a summary and discussion of the data from the ten core bore segments which were obtained; and the initial results of analysis and evaluation of these data are presented in this report. The impact of the major findings relative to our understanding of the accident scenario is also discussed.

1291 (INEL–94/0054) **Design documentation: Krypton encapsulation preconceptual design.** Knecht, D.A. (Idaho National Engineering Lab., Idaho Falls, ID (United States)). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Parsons-Redpath, Pasadena, CA (United States). Oct 1994. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002937. Source: OSTI; NTIS; INIS; GPO Dep.

US EPA regulations limit the release of Krypton-85 to the environment from commercial facilities after January 1, 1983. In order to comply with these regulations, Krypton-85, which would be released during reprocessing of commercial nuclear fuel, must be collected and stored. Technology currently exists for separation of krypton from other inert gases, and for its storage as a compressed gas in steel cylinders. The requirements, which would be imposed for 100-year storage of Krypton-85, have led to development of processes for encapsulation of krypton within a stable solid matrix. The objective of this effort was to provide preconceptual engineering designs, technical evaluations, and life cycle costing data for comparison of two alternate candidate processes for encapsulation of Krypton-85. This report has been prepared by The Ralph M. Parsons Company for the US Department of Energy.

1292 (INEL–94/0067) **INEL metal recycle annual report, FY-94.** Bechtold, T.E. (ed.). Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1994. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002950. Source: OSTI; NTIS; INIS; GPO Dep.

In 1992, the mission of the Idaho Chemical Processing Plant was changed from reprocessing of spent nuclear fuels to development of technologies for conditioning of spent nuclear fuels and other high-level wastes for disposal in a geologic repository. In addition, the Department of Energy (DOE) directed Idaho National Engineering Laboratory (INEL) to develop a program plan addressing the management of radioactive contaminated scrap metal (RSM) within the DOE complex. Based on discussions with the EM-30 organization, the INEL Metal Recycle program plan was developed to address all issues of RSM management. Major options considered for RSM management were engineered interim storage, land disposal as low-level waste, and beneficial reuse/recycle. From its inception, the Metal Recycle program has emphasized avoidance of storage and disposal costs through beneficial reuse of RSM. The Metal Recycle program plan includes three major activities: Site-by-site inventory of RSM resources; validation of technologies for conversion of RSM to usable products; and identification of parties prepared to participate in development of a RSM recycle business.

1293 (INEL–94/00106) **Evaluation of a potential nuclear fuel repository criticality: Lessons learned.** Wilson, J.R.; Evans, D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950740–99: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE96001616. Source: OSTI; NTIS; INIS; GPO Dep.

This paper presents lessons learned from a Probabilistic Risk Assessment (PRA) of the potential for a criticality in a repository containing spent nuclear fuel with high enriched uranium. The insights gained consisted of remarkably detailed conclusions about design issues, failure mechanisms, frequencies and source terms for events up to 10,000 years in the future. Also discussed are the approaches taken by the analysts in presenting this very technical report to a non-technical and possibly antagonistic audience.

1294 (INEL–94/0119) **ICPP radioactive liquid and calcine waste technologies evaluation final report and recommendation.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001338. Source: OSTI; NTIS; INIS; GPO Dep.

Using a formalized Systems Engineering approach, the Latched Idaho Technologies Company developed and evaluated numerous alternatives for treating, immobilizing, and disposing of radioactive liquid and calcine wastes at the Idaho Chemical Processing Plant. Based on technical analysis data as of March, 1995, it is recommended that the Department of Energy consider a phased processing approach – utilizing Radionuclide Partitioning for radioactive liquid and calcine waste treatment, FUETAP Grout for low-activity waste immobilization, and Glass (Vitrification) for high-activity waste immobilization – as the preferred treatment and immobilization alternative.

1295 (INEL–94/0395) **Criticality evaluation and protocol for DOE-owned spent nuclear fuels.** Cresap, D.A. (and others); Sentieri, P.J.; Wilson, J.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002193. Source: OSTI; NTIS; INIS; GPO Dep.

This report is a continuation of repository criticality evaluation work. Both the probability and consequences of a criticality were considered. A long-term, low-power, water-moderated criticality was the most likely of those considered. Its probability was low but not low enough to be dismissed. The governing regulation, 40 CFR 191, allows an event to be dismissed if it has less than one chance in 10,000 of occurring in 10,000 years. This implies a regulatory concern threshold of 10-8/yr. Even if such an event occurred, the repository inventory would still be dominated by the disposed fuel and waste and no significant additional releases would be expected. The major categories of criticality investigated were: water-moderated with fast or slow reactivity insertion, dry (hard-spectrum) with fast or slow reactivity insertion, water-moderated on the surface due to human intrusion, and far field. Fault trees were prepared to assess these scenarios. As a result of this study, the probability of a criticality in 10,000 years was revised from $3x10^{-3}$ to $5x10^{-4}$, primarily through the elimination of conservatism and correction of assumptions. The presence of water is a major concern in criticality studies. The possibility of flooding due to water table rise had been dismissed in previous studies. Conservative models indicate that this is a defensible position. The possibility of a silica moderated criticality was considered briefly. The preliminary study identified isotopes of concern for release and these were verified by several comparative methods. Most isotopes had similar ratios across source categories and those that did not could be accounted for by fuel or waste characteristics. The ORIGEN2 code was validated to be sufficiently accurate for PA purposes for the low-power, long-term scenario considered in the criticality study.

1296 (INEL–95/0041) **Selection of a glass-ceramic formulation to immobilize fluorinel- sodium calcine.** Staples, B.A.; Wood, H.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Dec 1994. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002932. Source: OSTI; NTIS; INIS; GPO Dep.

One option for immobilizing calcined high level wastes produced by nuclear fuel reprocessing activities at the Idaho Chemical Processing Plant (ICPP) is conversion to a glass-ceramic form through hot isostatic pressing. Calcines exist in several different chemical compositions, and thus candidate formulations have been developed for converting each to glass-ceramic forms which are potentially resistant to aqueous corrosion and stable enough to qualify for repository storage. Fluorinel/Na, a chemically complex calcine type, is one of the types being stored at ICPP, and development efforts have identified three formulations with potential for immobilizing it. These are a glass forming additive that uses aluminum metal to enhance reactivity, a second glass forming additive that uses titanium metal to enhance reactivity and a third that uses not only a combination of silicon and titanium metals but enough phosphorous pentoxide to form a calcium phosphate host phase in the glass-ceramic product. Glass-ceramics of each formulation performed well in restricted characterization tests. However, none of the three was subjected to rigorous testing that would provide information on whether each was processable, that is able to retain favorable characteristics over a practical range of processing conditions.

1297 (INEL–95/0063) **Waste form product characteristics.** Taylor, L.L.; Shikashio, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002938. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy has operated nuclear facilities at the Idaho National Engineering Laboratory (INEL) to support national interests for several decades. Since 1953, it has supported the development of technologies for the storage and reprocessing of spent nuclear fuels (SNF) and the resultant wastes. However, the 1992 decision to discontinue reprocessing of SNF has left nearly 768 MT of SNF in storage at the INEL with unspecified plans for future dispositioning. Past reprocessing of these fuels for uranium and other resource recovery has resulted in the production of 3800 M^3 calcine and a total inventory of 7600 M^3 of radioactive liquids (1900 M^3 destined for immediate calcination and the remaining sodium-bearing waste requiring further treatment before calcination). These issues, along with increased environmental compliance within DOE and its contractors, mandate operation of current and future facilities in an environmentally responsible manner. This will require satisfactory resolution of spent fuel and waste disposal issues resulting from the past activities. A national policy which identifies requirements for the disposal of SNF and high level wastes (HLW) has been established by the Nuclear Waste Policy Act (NWPA) Sec.8,(b) para(3)) [1982]. The materials have to be conditioned or treated, then packaged for disposal while meeting US Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) regulations. The spent fuel and HLW located at the INEL will have to be put into a form and package that meets these regulatory criteria. The emphasis of Idaho Chemical Processing Plant (ICPP) future operations has shifted toward investigating, testing, and selecting technologies to prepare current and future spent fuels and waste for final disposal. This preparation for disposal may include mechanical, physical and/or chemical processes, and may differ for each of the various fuels and wastes.

1298 (INEL–95/0097) **Experimental results: Pilot plant calcine dissolution and liquid feed stability.** Herbst, R.S.; Fryer, D.S.; Brewer, K.N.; Johnson, C.K.; Todd, T.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002944. Source: OSTI; NTIS; INIS; GPO Dep.

The dissolution of simulated Idaho Chemical Processing Plant pilot plant calcines, containing none of the radioactive actinides, lanthanides or fission products, was examined to evaluate the solubility of calcine matrix materials in acidic media. This study was a necessary precursor to dissolution and optimization experiments with actual radionuclide-containing calcines. The importance of temperature, nitric acid concentration, ratio of acid volume to calcine mass, and time on the amount, as a weight percentage of calcine dissolved, was evaluated. These parameters were studied for several representative pilot plant calcine types: (1) Run No. 74 Zirconia calcine; (2) Run No. 17 Zirconia/Sodium calcine; (3) Run No. 64 Zirconia/Sodium calcine; (3) Run No. 1027 Alumina calcine; and (4) Run No. 20 Alumina/Zirconia/Sodium calcine. Statistically designed experiments with the different pilot plant calcines indicated the effect of the studied process variables on the amount of calcine dissolved decreases in the order: Acid/Calcine Ratio > Temperature > HNO_3 Concentration > Dissolution Time. The following conditions are suitable to achieve greater than 90 wt. % dissolution of most Zr, Al, or Na blend calcines: (1) Maximum nitric acid concentration of 5M; (2) Minimum acid/calcine ratio of 10 mL acid/1 gram calcine; (3) Minimum dissolution temperature of 90°C; and (4) Minimum dissolution time of 30 minutes. The formation of calcium sulphate ($CaSO_4$) precipitates was observed in certain dissolved calcine solutions during the dissolution experiments. Consequently, a study was initiated to evaluate if and under what conditions the resulting dissolved calcine solutions would be unstable with regards to precipitate formation. The results indicate that precipitate formation in the calcine solutions prepared under the above proposed dissolution conditions are not anticipated.

1299 (INEL–95/00124) **Technology integration plan.** Henry, R.; Sumpter, K.C. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9502113–2: 1995 ACR conference on improving productivity in system development, Phoenix, AZ (United States), 6-10 Feb 1995). Order Number DE96003517. Source: OSTI; NTIS; INIS; GPO Dep.

In 1992, the Secretary of Energy directed the Assistant Secretary for Environmental Management (EM) to develop an integrated, long-term, spent nuclear fuel (SNF) management program. In response, EM created the Integrated SNF Program to assess the US Department of Energy (DOE) SNF and SNF storage facilities. As shown in Figure 1 the Integrated SNF Program is responsible for life-cycle management of DOE SNF; that is characterization, processing, interim storage and preparation for disposal. In order to implement the Program it was recognized that technology needs must be identified. A Technology Integration Program was formed to integrate the DOE complex-wide efforts for establishing timely, cost effective and consistent technical criteria for the development of technical solutions. The program is directed toward identification of: (a) what activities need to be done, (b) when they need to be completed, and (c) what priority should be assigned to the various activities.

1300 (INEL–95/0127-Draft) **Life-cycle costs for the Department of Energy waste management programmatic environmental impact statement (draft).** Sherick, M.J.; Shropshire, D.E.; Hsu, K.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002191. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) Office of Environmental Management has produced a Programmatic Environmental Impact Statement (PEIS) in order to assess the potential consequences resulting from a cross section of possible waste management strategies for the DOE complex. The PEIS has been prepared in compliance with the National Environmental Policy Act, and includes evaluations of a variety of alternatives. The analysis performed for the PEIS included the development of life-cycle cost estimates for the different waste management alternatives being considered. These cost estimates were used in the PEIS to support the identification and evaluation of economic impacts. Information developed during the preparation of the life-cycle cost estimates was also used to support risk and socioeconomic analyses performed for each of the alternatives. This technical report provides an overview of the methodology used to develop the life-cycle cost estimates for the PEIS alternatives. The methodology that was applied made use of the Waste Management Facility Cost Information Reports, which provided a consistent approach and estimating basis for the PEIS cost evaluations. By maintaining consistency throughout the cost analyses, life-cycle costs of the various alternatives can be compared and evaluated on a relative basis. This technical report also includes the life-cycle cost estimate results for each of the PEIS alternatives evaluated. Summary graphs showing the results for each waste type are provided in the main document, and tables showing different breakdowns of the cost estimates are provided in the Appendices A-D. Appendix E contains PEIS cost information that was developed using an approach different than the standard methodology described in this report.

1301 (INEL–95/0130) **TRUEX flowsheet development as applied to ICPP sodium-bearing waste using centrifugal contactors.** Law, J.D.; Herbst, R.S. Idaho National Engineering Lab., Idaho Falls, ID (United States). Feb 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002860. Source: OSTI; NTIS; INIS; GPO Dep.

Previous lab-scale work using batch contacts with sodium- bearing waste (SEW) simulant and samples of radioactive SEW from tank WM-185 suggested a potential flowsheet for partitioning actinides using solvent extraction (the TRUEX process). The suggested baseline flowsheet includes: an extraction section to remove actinides from liquid SEW into the TRUEX solvent (0.2 M CMP01 1.4 M TBP in Isopar-L); a dilute nitric acid scrub (0.07- 0.2 M HNO_3) to back extract co-extracted matrix materials (primarily Fe, Zr, and HNO_3) from the loaded solvent; thermally unstable complexants (TUCS) to back extract actinides; and a carbonate wash section for solvent cleanup. The purpose of the flowsheet development studies was to test and develop the baseline TRUEX flowsheet for ICPP SEW under continuous, countercurrent conditions using centrifugal contactors. All testing was performed using non-radioactive SEW simulant. Potential flowsheets were evaluated with regards to the behavior of the non-radioactive components known to be extracted by the TRUEX solvent. In general, the behavior of the individual components closely paralleled that anticipated from batch testing. The results indicate that eight extraction stages are more than sufficient to reduce the actinide content in the SEW to levels well below the NRC Class A LLW criteria of 10 nCi/g. Iron was effectively scrubbed from the organic and 5% ended up in the high-activity waste (HAW) fraction. Zirconium scrubbing was not as effective and as much as 60% of the Zr in the feed could end up in the HAW fraction. The TUCS strip was effective at quantitatively stripping all metals except mercury from the TRUEX solvent. Carbonate washing effectively back extracted mercury from the stripped solvent, resulting in 99.4% of the mercury selectively partitioned from the SEW.

1302 (INEL–95/0131) **A document review to characterize Atomic International SNAP fuels shipped to INEL 1966–1973.** Wahnschaffe, S.D.; Lords, R.E. (eds.); Kneff, D.W.; Nagel, W.E.; Pearlman, H.; Schaubert, V.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1995. 109p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002841. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides the results of a document search and review study to obtain information on the spent fuels for the following six Nuclear Auxiliary Power (SNAP) reactor cores now stored at the Idaho National Engineering Laboratory (INEL): SNAP-2 Experimental Reactor, SNAP-2 Development Reactor, SNAP-10A Ground Test Reactor, SNAP-8 Experimental Reactor, SNAP-8 Development Reactor, and Shield Test Reactor. The report also covers documentation on SNAP fuel materials from four in-pile materials tests: NAA-82-1, NAA-115-2, NAA-117-1, and NAA-121. Pieces of these fuel materials are also stored at INEL as part of the SNAP fuel shipments.

1303 (INEL–95/0145) **Results of intermediate-scale hot isostatic press can experiments.** Nelson, L.O.; Vinjamuri, K. Idaho National Engineering Lab., Idaho Falls, ID (United States). May 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001579. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive high-level waste (HLW) has been managed at the Idaho Chemical Processing Plant (ICPP) for a number of years. Since 1963, liquid HLW has been solidified into a granular solid (calcine). Presently, over 3,800 m^3 of calcine is stored in partially-underground stainless steel bins. Four intermediate- scale HLW can tests (two 6-in OD × 12-in tall and two 4-in OD × 7-in tall) are described and compared to small-scale HIP can tests (1- to 3-in OD × 1- to 4.5-in tall). The intermediate-scale HIP cans were loaded with a 70/30 calcine/frit blend and HIPped at an off-site facility at 1050°C; and 20 ksi. The dimensions of two cans (4-in OD × 7-in tall) were monitored during the HIP cycle with eddy-current sensors. The sensor measurements indicated that can deformation occurs rapidly at 700°C; after which, there is little additional can shrinkage. HIP cans were subjected to a number of analyses including calculation of the overall packing efficiency (56 to 59%), measurement of glass-ceramic (3.0 to 3.2 g/cc), 14-day MCC-1 leach testing (total mass loss rates < 1 g/m^2 day), and scanning electron microscopy (SEM). Based on these analyses, the glass-ceramic material produced in intermediate-scale cans is similar to material produced in small-scale cans. No major scale-up problems were indicated. Based on the packing efficiency observed in intermediate- and small-scale tests, the overall packing efficiency of production-scale (24-in OD × 36- to 190-in tall) cans would be approximately 64% for a pre-HIP right-circular cylinder geometry. An efficiency of 64% would represent a volume reduction factor of 2.5 over a candidate glass waste prepared at 33 wt% waste loading.

1304 (INEL–95/0161) **Emissions model of waste treatment operations at the Idaho Chemical Processing Plant.** Schindler, R.E. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 75p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC07-94ID13223. Order Number DE96001181. Source: OSTI; NTIS; INIS; GPO Dep.

An integrated model of the waste treatment systems at the Idaho Chemical Processing Plant (ICPP) was developed using a commercially-available process simulation software (ASPEN Plus) to calculate atmospheric emissions of hazardous chemicals for use in an application for an environmental permit to operate (PTO). The processes covered by the model are the Process Equipment Waste evaporator, High Level Liquid Waste evaporator, New Waste Calcining Facility and Liquid Effluent Treatment and Disposal facility. The processes are described along with the model and its assumptions. The model calculates emissions of NO_x, CO, volatile acids, hazardous metals, and organic chemicals. Some calculated relative emissions are summarized and insights on building simulations are discussed.

1305 (INEL–95/0184) **Estimation of alkali metal mole percent and weight of calcined solids for ICPP calcine.** O'Brien, B.H. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001549. Source: OSTI; NTIS; INIS; GPO Dep.

An updated method is given for estimation of the weight of calcined solids and volume reduction factor for calcine, and mole percent sodium plus potassium in calcine produced from radioactive waste in a fluidized-bed calciner at the Idaho Chemical Processing Plant (ICPP). It incorporates new information on a calcine chemistry from a study by K. N. Brewer and G. F. Kessinger in which they determined the compounds formed during calcination by both high temperature thermodynamic equilibrium calculations and by analyses of pilot-plant calcines. An explanation of the assumptions made in the calculations, along with several example calculations and comparisons with the previous calculation methods are included. This method allows calculation of the heat generation rate and sodium content of the calcine, which are used to determine the suitability of the calcine for storage in the ICPP bin sets. Although this method accurately predicts the weight of calcine and mole percent Na + K for its intended purpose, the compounds predicted should only be used as a first approximation for other purposes since the calculation does not incorporate all of the compounds, such as mixed-metal oxides, which may form during calcination.

1306 (INEL–95/0194) **Reliability evaluation methodologies for ensuring container integrity of stored transuranic (TRU) waste.** Smith, K.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001339. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides methodologies for providing defensible estimates of expected transuranic waste storage container lifetimes at the Radioactive Waste Management Complex. These methodologies can be used to estimate transuranic waste container reliability (for integrity and degradation) and as an analytical tool to optimize waste container integrity. Container packaging and storage configurations, which directly affect waste container integrity, are also addressed. The methodologies presented provide a means for demonstrating Resource Conservation and Recovery Act waste storage requirements.

1307 (INEL–95/0224) **TRUEX partitioning from radioactive ICPP sodium bearing waste.** Herbst, R.S.; Brewer, K.N.; Tranter, T.J.; Todd, T.A. Fermi National Accelerator Lab., Batavia, IL (United States). Mar 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001188. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Chemical Processing Plant (ICPP) located at the Idaho National Engineering Laboratory in Southeast Idaho is currently evaluating several treatment technologies applicable to waste streams generated over several decades of-nuclear fuel reprocessing. Liquid sodium bearing waste (SBW), generated primarily during decontamination activities, is one of the waste streams of interest. The TRansUranic EXtraction (TRUEX) process developed at Argonne National Laboratory is currently being evaluated to separate the actinides from SBW. On a mass basis, the amount of the radioactive species in SBW are low relative to inert matrix components. Thus, the advantage of separations is a dramatic decrease in resulting volumes of high activity waste (HAW) which must be dispositioned. Numerous studies conducted at the ICPP indicate the applicability of the TRUEX process has been demonstrated; however, these studies relied on a simulated SBW surrogate for the real waste. Consequently, a series of batch contacts were performed on samples of radioactive ICPP SBW taken from tank WM-185 to verify that actual waste would behave similarly to the simulated waste. The test results with SBW from tank WM-185 indicate the TRUEX solvent effectively extracts the actinides from the samples of actual waste. Gross alpha radioactivity, attributed predominantly to Pu and Am, was reduced from 3.14E+04 dps/mL to 1.46 dps/mL in three successive batch contacts with fresh TRUEX solvent. This reduction corresponds to a decontamination factor of DF = 20,000 or 99.995% removal of the gross a activity in the feed. The TRUEX solvent also extracted the matrix components Zr, Fe, and Hg to an appreciable extent ($D_{Zr} > 10$, $D_{Fe} \approx 2$, $D_{Hg} \approx 6$). Iron co-extracted with the actinides can be successfully scrubbed from the organic with 0.2 M HNO_3. Mercury can be selectively partitioned from the actinides with either sodium carbonate or nitric acid ($\geq$ 5 M HNO_3) solutions.

1308 (INEL–95/0225) **Actinide partitioning from actual ICPP dissolved zirconium calcine using the TRUEX solvent.** Brewer, K.N. (and others); Herbst, R.S.; Tranter, T.J. Fermi National Accelerator Lab., Batavia, IL (United States). May 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001184. Source: OSTI; NTIS; INIS; GPO Dep.

The TRansUranic EXtraction process (TRUEX), as developed by E.P. Horwitz and coworkers at Argonne National Laboratory (ANL), is being evaluated as a TRU extraction process for Idaho Chemical Processing Plant (ICPP) wastes. A criteria that must be met during this evaluation, is that the aqueous raffinate must be below the 10 nCi/g limit specified in 10 CFR 61.55. A test was performed where the TRUEX solvent (0.2 M octyl(phenyl)-N-N-diisobutylcarbamoylmethyl-phosphine oxide (CMPO), and 1.4 M tributylphosphate (TBP) in an Isopar-L diluent) was contacted with actual ICPP dissolved zirconium calcine. Two experimental flowsheets were used to determine TRU decontamination factors, and TRU, Zr, Fe, Cr, and Tc extraction, scrub, and strip distribution coefficients. Results from these two flowsheets show that >99.99% of the TRU alpha activity was removed from the acidic feed after three contacts with the TRUEX solvent (fresh solvent being used for each contact). The resulting aqueous raffinate solution contained an approximate TRU alpha activity of 0.02 nCi/g, which is well below the non-TRU waste limit of 10 nCi/g specified in 10 CFR 61.55. Favorable scrub and strip distribution coefficients were also observed for Am-241, Pu-238, and Pu-239, indicating the feasibility of recovering these isotopes from the TRUTEX solvent. A solution of 0.04 M 1-hydroxyethane-1,1-diphosphonic acid (HEDPA) in 0.04 M HNO_3 was used to successfully strip the TRUs from the TRUEX solvent. The results of the test using actual ICPP dissolved zirconium calcine, and subsequent GTM evaluation, show the feasibility of removing TRUs from the dissolved zirconium calcine with the TRUEX solvent and the deleterious effects zirconium poses with the ICPP zirconium calcine waste. Test results using actual ICPP zirconium calcine reveal the necessity of preventing zirconium from following the TRUs.

1309 (INEL--95/00290) **Zirconia solubility in boroaluminosilicate glass.** Raman, S.V. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Bopp, R.; Batcheller, T.A.; Yan, Q. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004672. Source: OSTI; NTIS; INIS; GPO Dep.

In the Idaho Chemical Processing Plant (ICPP) waste streams, zirconia is often the waste load limiting species. It modifies the glass network, enhances durability, increases viscosity and induces crystallization. The limits of its dissolution in boroaluminosilicate glass, with magnesia and soda additions were experimentally determined. A ternary compositional surface is evolved to present the isothermal regimes of liquid, liquid + zircon, liquid + forsterite, and liquid phase sintered ceramic. The potential of partitioning the transuranics, transition elements and solutes in these regimes is discussed. The visible Raman spectroscopic results are presented to elucidate the dependence among glass composition, structure and chemical durability.

1310 (INEL--95/00343) **Hot Isostatic Press (HIP) vitrification of radwaste concretes.** Siemer, D.D. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Scheetz, B.; Gougar, M.L.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951155--19: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96003502. Source: OSTI; NTIS; INIS; GPO Dep.

Properly formulated and properly "canned" radwaste concretes can be readily hot-isostatically-pressed (HIPed) into materials that exhibit performance equivalent to typical radwaste-type glasses. The HIPing conditions (temperature/pressure) required to turn a concrete waste form into a "vitrified" waste form are quite mild and therefore consistent with both safety and high productivity. This paper describes the process and its products with reference to its potential application to Idaho Chemical Processing Plant (ICPP) reprocessing wastes.

1311 (INEL--95/00390) **Characteristics of DOE spent nuclear fuel affecting pretreatment and final disposition.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9508178--2: Russia Federation/United States technical exchange on the non-reactor nuclear safety and waste management, Los Alamos, NM (United States), 14-17 Aug 1995). Order Number DE96001627. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) has more than 150 different types of Spent Nuclear Fuel (SNF), comprising more than 200,000 units, in storage at DOE, private non-DOE, university facilities across the United States and foreign countries. The present DOE SNF management plan does not include reprocessing the fuel for the recovery of uranium, but involves interim storage until DOE is prepared to disposition the fuel in a national repository. Prior to any long term actions the SNF will need to be characterized sufficiently to support the proposed actions. The determination of which characteristics will be important will depend on the proposed action. Some characteristics will be universally important. There is a need to understand the characteristics of the SNF and to put the fuel in categories of SNF with similar characteristics. This will allow the evaluation of the SNF and the proposed dispositioning options by categories rather than individually.

1312 (INEL--95/00410) **Remote inspection of the IFSF spent fuel storage rack.** Uldrich, E.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960426--10: 58. annual meeting of the American power conference, Chicago, IL (United States), 9-11 Apr 1996). Order Number DE96010447. Source: OSTI; NTIS; INIS; GPO Dep.

The Irradiated Fuel Storage Facility (IFSF) is a dry storage facility for spent nuclear fuels located at the Idaho Chemical Processing Plant; it was constructed in the 1970's specifically for the Fort Saint Vrain spent reactor fuels. Currently, it is being used for various spent fuels. It was not known if IFSF would met current DOE seismic criteria, so re-analysis was started, with the rack being analyzed first. The rack was inspected to determine the as-built condition. LazrLyne and VideoRuler were used in lieu of using a tape measure with the camera. It was concluded that when a visual inspection shows widely varying weld sizes, the engineer has to use all resources available to determine the most probable specified weld sizes.

1313 (INEL--95/00437) **Drying studies of simulated DOE aluminum plate fuels.** Lords, R.E. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Windes, W.E.; Crepeau, J.C.; Sidwell, R.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9606116--44: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96010440. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments have been conducted to validate the Idaho National Engineering Laboratory (INEL) drying procedures for preparation of corroded aluminum plate fuel for dry storage in an existing vented (and filtered) fuel storage facility. A mixture of hydrated aluminum oxide bound with a clay was used to model the aluminum corrosion product and sediment expected in these Department of Energy (DOE) owned fuel types. Previous studies demonstrated that the current drying procedures are adequate for removal of free water inside the storage canister and for transfer of this fuel to a vented dry storage facility. However, using these same drying procedures, the simulated corrosion product was found to be difficult to dry completely from between the aluminum clad plates of the fuel. Another related set of experiments was designed to ensure that the fuel would not be damaged during the drying process. Aluminum plate fuels are susceptible to pitting damage on the cladding that can result in a portion of UAl_x fuel meat being disgorged. This would leave a water-filled void beneath the pit in the cladding. The question was whether bursting would occur when water in the void flashes to steam, causing separation of the cladding from the fuel, and/or possible rupture. Aluminum coupons were fabricated to model damaged fuel plates. These coupons do not rupture or sustain any visible damage during credible drying scenarios.

1314 (INEL–95/00438) **Criticality safety for deactivation of the Rover dry headend process.** Henrikson, D.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9606116–17: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96009020. Source: OSTI; NTIS; INIS; GPO Dep.

The Rover dry headend process combusted Rover graphite fuels in preparation for dissolution and solvent extraction for the recovery of ^{235}U. At the end of the Rover processing campaign, significant quantities of ^{235}U were left in the dry system. The Rover Dry Headend Process Deactivation Project goal is to remove the remaining uranium bearing material (UBM) from the dry system and then decontaminate the cells. Criticality safety issues associated with the Rover Deactivation Project have been influenced by project design refinement and schedule acceleration initiatives. The uranium ash composition used for calculations must envelope a wide range of material compositions, and yet result in cost effective final packaging and storage. Innovative thinking must be used to provide a timely safety authorization basis while the project design continues to be refined.

1315 (INEL–95/0442) **Nondestructive examination technologies for inspection of radioactive waste storage tanks.** Anderson, M.T.; Kunerth, D.C.; Davidson, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001334. Source: OSTI; NTIS; INIS; GPO Dep.

The evaluation of underground radioactive waste storage tank structural integrity poses a unique set of challenges. Radiation fields, limited access, personnel safety and internal structures are just some of the problems faced. To examine the internal surfaces a sensor suite must be deployed as an end effector on a robotic arm. The purpose of this report is to examine the potential failure modes of the tanks, rank the viability of various NDE technologies for internal surface evaluation, select a technology for initial EE implementation, and project future needs for NDE EE sensor suites.

1316 (INEL–95/00460) **The TRUPACT-II Matrix Depletion Program.** Connolly, M.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Djordjevic, S.M.; Loehr, C.A.; Smith, M.C.; Banjac, V.; Lyon, W.F. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950216–159: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE96003508. Source: OSTI; NTIS; INIS; GPO Dep.

Contact-handled transuranic (CH-TRU) wastes will be shipped and disposed at the Waste Isolation Pilot Plant (WIPP) repository in the Transuranic Package Transporter-II (TRUPACT-II) shipping package. A primary transportation requirement for the TRUPACT-II is that the concentration of potentially flammable gases (i.e., hydrogen and methane) must not exceed 5 percent by volume in the package or the payload during a 60-day shipping period. Decomposition of waste materials by radiation, or radiolysis, is the predominant mechanism of gas generation during transport. The gas generation potential of a target waste material is characterized by a G-value, which is the number of molecules of gas generated per 100 eV of ionizing radiation absorbed by the target material. To demonstrate compliance with the flammable gas concentration requirement, theoretical worst-case calculations were performed to establish allowable wattage (decay heat) limits for waste containers. The calculations were based on the G-value for the waste material with the highest potential for flammable gas generation. The calculations also made no allowances for decreases of the G-value over time due to matrix depletion phenomena that have been observed by many experimenters. Matrix depletion occurs over time when an alpha-generating source particle alters the target material (by evaporation, reaction, or decomposition) into a material of lower gas generating potential. The net effect of these alterations is represented by the "effective G-value."

1317 (INEL–95/00466) **Remediating the INEL's buried mixed waste tanks.** Kuhns, D.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Matthern, G.E.; Reese, C.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 28 Feb 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–14: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007276. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL), formerly the National Reactor Testing Station (NRTS), encompasses 890 square miles and is located in southeast Idaho. In 1949, the United States Atomic Energy Commission, now the Department of Energy (DOE), established the NRTS as a site for the building and testing of nuclear facilities. Wastes generated during the building and testing of these nuclear facilities were disposed within the boundaries of the site. These mixed wastes, containing radionuclides and hazardous materials, were often stored in underground tanks for future disposal. The INEL has 11 buried mixed waste storage tanks regulated under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) ranging in size from 400 to 50,000 gallons. These tanks are constructed of either stainless or carbon steel and are located at 3 distinct geographic locations across the INEL. These tanks have been grouped based on their similarities in an effort to save money and decrease the time required to complete the necessary remediation. Environmental Restoration and Technology Development personnel are teaming in an effort to address the remediation problem systematically.

1318 (INEL–95/0477) **CPP-603 Underwater Fuel Storage Facility Site Integrated Stabilization Management Plan (SISMP), Volume I.** Denney, R.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002185. Source: OSTI; NTIS; INIS; GPO Dep.

The CPP-603 Underwater Fuel Storage Facility (UFSF) Site Integrated Stabilization Management Plan (SISMP) has been constructed to describe the activities required for the relocation of spent nuclear fuel (SNF) from the CPP-603 facility. These activities are the only Idaho National Engineering Laboratory (INEL) actions identified in the Implementation Plan developed to meet the requirements of the Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 to the Secretary of Energy regarding an improved schedule for remediation in the Defense Nuclear Facilities Complex. As described in the DNFSB Recommendation 94-1 Implementation Plan, issued February 28, 1995, an INEL Spent Nuclear Fuel Management Plan is currently under development to direct the placement of SNF currently in existing INEL facilities into interim storage, and to address the coordination of intrasite SNF movements with new receipts and intersite transfers that were identified in the DOE SNF Programmatic and INEL Environmental Restoration and Waste Management Environmental Impact Statement Record, of Decision. This SISMP will be a subset of the INEL Spent Nuclear Fuel Management Plan and the activities described are being coordinated with other INEL SNF management activities. The CPP-603 relocation activities have been assigned a high priority so that established milestones will be meet, but there will be some cases where other activities will take precedence in utilization of available resources. The Draft INEL Site Integrated Stabilization Management Plan (SISMP), INEL-94/0279, Draft Rev. 2, dated March 10, 1995, is being superseded by the INEL Spent Nuclear Fuel Management Plan and this CPP-603 specific SISMP.

1319 (INEL–95/00505) **Implementation process and deployment initiatives for the regionalized storage of DOE-owned spent nuclear fuel.** Dearien, J.A.; Smith, N.E.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9606116–42: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96009017. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes how DOE-owned spent nuclear fuel (SNF) will be stored in the interim 40-year period from 1996 to 2035, by which time it is expected to be in a National Nuclear Repository. The process is described in terms of its primary components: fuel inventory, facilities where it is stored, how the fuel will be moved, and legal issues associated with the process. Tools developed to deploy and fulfill the implementation needs of the National Spent Nuclear Fuel Program are also discussed.

1320 (INEL–95/00507) **National high-level waste systems analysis.** Kristofferson, K.; O'Holleran, T.P. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960804–23: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96009060. Source: OSTI; NTIS; INIS; GPO Dep.

Previously, no mechanism existed that provided a systematic, interrelated view or national perspective of all high-level waste treatment and storage systems that the US Department of Energy manages. The impacts of budgetary constraints and repository availability on storage and treatment must be assessed against existing and pending negotiated milestones for their impact on the overall HLW system. This assessment can give DOE a complex-wide view of the availability of waste treatment and help project the time required to prepare HLW for disposal. Facilities, throughputs, schedules, and milestones were modeled to ascertain the treatment and storage systems resource requirements at the Hanford Site, Savannah River Site, Idaho National Engineering Laboratory, and West Valley Demonstration Project. The impacts of various treatment system availabilities on schedule and throughput were compared to repository readiness to determine the prudent application of resources. To assess the various impacts, the model was exercised against a number of plausible scenarios as discussed in this paper.

1321 (INEL–95/0534) **Potential dispositioning flowsheets for ICPP SNF and wastes.** Olson, A.L. (ed.) (and others); Anderson, P.A.; Bendixsen, C.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1995. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003535. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Chemical Processing Plant (ICPP), located at the Idaho National Laboratory (INEL), has reprocessed irradiated nuclear fuels for the US Department of Energy (DOE) since 1953. This activity resulted mainly in the recovery of uranium and the management of the resulting wastes. The acidic radioactive high-level liquid waste was routinely stored in stainless steel tanks and then calcined to form a dry granular solid. The calcine is stored in stainless steel bins that are housed in underground concrete vaults. In April 1992, the DOE discontinued the practice of reprocessing irradiated nuclear fuels. This decision has left a legacy of 1.8 million gallons of radioactive liquid wastes (1.5 million gallons of radioactive sodium-bearing liquid wastes and 0.3 million gallons of high-level liquid waste), 3800 cubic meters of calcine waste, and 289 metric tons of heavy metal within unprocessed spent nuclear fuel (SNF) left in inventory at the ICPP. The nation's radioactive waste policy has been established by the Nuclear Waste Policy Act (NWPA), which requires the final disposal of SNF and radioactive waste in accordance with US Environmental Protection Agency (EPA) and Nuclear Regulatory Commission (NRC) standards. In accordance with these regulations and other legal agreements between the State of Idaho and the DOE, the DOE must, among other requirements, (1) complete a final Environmental Impact Statement by April 30, 1995, (2) evaluate and test sodium-bearing waste pre-treatment technologies, (3) select the sodium-bearing and calcine waste pretreatment technology, if necessary, by June 1, 1995, and (4) select a technology for converting calcined waste into an appropriate disposal form by June 1, 1995.

1322 (INEL–95/00603) **TRUEX process applied to radioactive Idaho Chemical Processing Plant high-level waste calcine.** Brewer, K.N.; Herbst, R.S.; Law, J.D.; Todd, T.A.; Olson, A.L. Idaho National Engineering Lab., Idaho Falls, ID (United States). 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC07-76ID01570. (CONF-960804–26: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010437. Source: OSTI; NTIS; INIS; GPO Dep.

Equal volume batch contact experiments were performed with dissolved, radioactive high-level waste (HLW) calcine and the TRansUranic EXtraction (TRUEX) process solvent. Extraction, scrub, and strip distribution coefficients (D) were obtained for the transuranic (TRU) elements in order to evaluate the efficiency of the TRUEX process in treating this waste. The extraction, scrub, and strip behavior of other elements, such as chromium, zirconium, and technetium, was also observed. A TRU alpha decontamination factor of >10,000 was achieved; after three extraction batch contacts TRU alpha activity was reduced from 1,420 nCi/g to 0.02 nCi/g. Dilute nitric acid was used to scrub extracted acid, zirconium, and iron from the solvent prior to stripping. Dilute 1-hydroxyethane, 1-1, diphosphonic acid (HEDPA) was used as a gross TRU stripping reagent to recover the extracted TRUs. Data from these batch contact experiments were used to develop a counter-current flowsheet for TRU removal using the Generic TRUEX Model (GTM). Process improvements and optimizations of the flowsheet have been evaluated using a non-radioactive dissolved calcine simulant spiked with tracers to obtain additional distribution coefficient data. These data were used in the GTM to refine the flowsheet. The flowsheet was then evaluated using a counter-current 5.5 cm centrifugal contactor pilot plant with a non-radioactive dissolved calcine simulant. The experiments involving radioactive waste provided crucial data for developing a baseline TRUEX process flowsheet which can effectively separate TRU components from ICPP high-level waste.

1323 (INEL–95/0642) **The extraction of rare earth elements from ICPP sodium-bearing waste and dissolved zirconium calcine by CMP and TRUEX solvents.** Todd, T.A.; Glagolenko, I.Y.; Herbst, R.S.; Brewer, K.N. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Nov 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003835. Source: OSTI; NTIS; INIS; GPO Dep.

The extraction of stable isotopes of Eu and Ce was investigated from simulated sodium-bearing waste (SBW) and dissolved zirconium calcine by TRUEX and CMP solvents at the Idaho Chemical Processing Plant (ICPP). Single batch contacts were carried out in order to evaluate the rare earth behavior in the extraction, scrub, strip and wash sections for the proposed flowsheets. It has been shown that these lanthanides are efficiently extracted from the sodium-bearing wastes into either solvent, are not scrubbed and are stripped from both of the extractants with dilute HEDPA. The extraction distribution coefficients for Ce and Eu are higher in the TRUEX solvent (D_{Ce} = 11.7, D_{Eu} = 14.9) compared with CMP (D_{Ce} = 9.3, D_{Eu} = 7.23) for SBW. The extraction distribution coefficients for Ce and Eu are considerably less in the TRUEX solvent (D_{Ce}=1.13, D_{Eu}=1.8) than in the CMP solvent (D_{Ce}=7.4, D_{Eu}=6.1) for dissolved zirconium calcine feeds. The lower distribution coefficients for the extraction of lanthanides in the TRUEX/dissolved zirconium calcine system can be explained by zirconium loading of the solvent. The data obtained also confirmed that Ce and Eu can be used as non-radioactive surrogates for Am in separation experiments with acidic solutions.

1324 (INEL–96/0036) **Actinide extraction from ICPP sodium bearing waste with 0.75 M DHDECMP/TBP in Isopar L®.** Herbst, R.S.; Brewer, K.N.; Garn, T.G.; Law, J.D.; Rodriguez, A.M.; Tillotson, R.T. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1996. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007521. Source: OSTI; NTIS; INIS; GPO Dep.

Recent process development efforts at the Idaho Chemical Processing Plant include examination of solvent extraction technologies for actinide partitioning from sodium bearing waste (SBW) solutions. The use of 0.75 M dihexyl-N, N-diethylcarbamoylmethylphosphonate (DHDECMP or simply CMP) and 1.0 M tri-n-butyl phosphate (TBP) diluted in Isopar L® was explored for actinide removal from simulated SBW solutions. Experimental evaluations included batch contacts in radiotracer tests with simulated sodium bearing waste solution to measure the extraction and recovery efficiency of the organic solvent. The radioactive isotopes utilized for this study included Pu-238, Pu-239, Am-241, U-233, Np-239, Zr-95, Tc-99m, and Hg-203. Extraction contacts of the organic solvent with the traced SBW stimulant, strip (back-extraction) contacts of the loaded organic solvent with either a 1-hydroxyethane-1, 1-diphosphonic acid (HEDPA) in nitric acid solution or an oxalic acid in nitric acid solution, and solvent wash contacts with sodium carbonate were performed.

1325 (INEL–96/0067) **Independent review of design and analysis for Holtec spent fuel storage racks of CPP 666 Pool 1.** Miller, G.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009670. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the analyses and review performed to develop and validate the design of the new fuel storage racks for the Idaho Chemical Processing Plant (ICPP) Fuel Storage Area (FSA). Holtec International is responsible for the design and fabrication of the storage racks. This report describes the issues raised in the review effort and the resolutions to these issues. The conclusion is reached that the review issues for the racks of Pool 1 have been satisfactorily resolved in the final design and analysis for these racks. Section 1 of this report gives a brief description of the project. Section 2 describes the approach that Holtec used in analyzing the racks and results from these analyses. Section 3 describes the independent review process. Section 4 discusses the identification of and resolution to comments on the design analysis. Section 5 describes additional analysis performed to address major concerns with the Holtec design analysis. Section 6 presents a summary of AEC's independent review, which is based on AEC's final review report. Finally, Section 7 gives the Lockheed Idaho Technologies Company (LITCO) position on the acceptability of Holtec's design.

1326 (INEL–96/0094) **A comparision of TRUEX and CMP solvent extraction processes for actinide removal from ICPP wastes.** Herbst, R.S. (and others); Brewer, K.N.; Garn, T.G.; Law, J.D. Idaho National Engineering Lab., Idaho Falls, ID (United States). Apr 1996. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010356. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho Chemical Processing Plant (ICPP) is currently engaged in development efforts for the decontamination of high-level radioactive wastes generated from decades of nuclear fuel reprocessing. These wastes include several types of calcine, generated by high temperature solidification of reprocessing raffinates. In addition to calcine, there are smaller quantities of secondary wastes from decontamination and solvent wash activities which are typically referred to as sodium-bearing waste (SBW). Solvent extraction technologies based on octyl(phenyl)-N,N-diisobutyl-carbamoylmethylphosphine oxide (CMPO, the active extractant in the TRUEX process) and dihexyl-N,N-diethylcarbamoylmethylphosphonate (DHDECMP, the active extractant in the CMP process) are being evaluated for actinide partitioning from these waste streams. Calcines must first be dissolved in an appropriate acidic solution prior to treatment in solvent extraction based processes. The SBW is currently stored as an acidic solution and readily amenable to liquid extraction techniques. Development efforts to date have revolved around defining and refining baseline flowsheets with the TRUEX and CMP processes for each waste stream. Another objective of this work was to determine which of these technologies are best suited for the treatment of ICPP wastes. Laboratory batch contacts were performed to identify relevant chemistry and distribution coefficients. This information was then used to establish baseline flowsheet configuration with regard to chemistry. The laboratory data were used to model the behavior of the actinides and other constituents in the wastes in countercurrent, continuous processes based on centrifugal contactor technology. The laboratory data and modelling results form the basis for comparison of the two processes.

1327 (INEL–96/00134) **Drying studies for corroded DOE aluminum plate fuels.** Lords, R.E. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Windes, W.E.; Crepeau, J.C.; Sidwell, R.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. (CONF-960804–29: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010448. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) currently stores a wide variety of spent nuclear fuel. The fuel was originally intended to be stored underwater for a short period of thermal cooling, then removed and reprocessed. However, it has been stored underwater for much longer thank originally anticipated. During this time dust and airborne desert soil have entered the oldest INEL pool, accumulating on the fuel. Also, the aluminum fuel cladding has corroded compromising the exposed surfaces of the fuel. Plans are now underway to move some the the more vulnerable aluminum plate type fuels into dry storage in an existing vented and filtered fuel storage facility. In preparation for dry storage of the fuel a drying and canning station is being built at the INEL. The two primary objectives of this facility are to determine the influence of corrosion products on the drying process and to establish temperature distribution inside the canister during heating.

1328 (INEL–96/0140) **Initial evaluation of dry storage issues for spent nuclear fuels in wet storage at the Idaho Chemical Processing Plant.** Guenther, R.J. (and others); Johnson, A.B. Jr.; Lund, A.L.; Gilbert, E.R. Idaho National Engineering Lab., Idaho Falls, ID (United States). Nov 1994. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014176. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory has evaluated the basis for moving selected spent nuclear fuels in the CPP-603 and CPP-666 storage pools at the Idaho Chemical Processing Plant from wet to dry interim storage. This work is being conducted for the Lockheed Idaho Technologies Company as part of the effort to determine appropriate conditioning and dry storage requirements for these fuels. These spent fuels are from 22 test reactors and include elements clad with aluminum or stainless steel and a wide variety of fuel materials: UAl_x, UAl_x-Al and U_3O_8-Al cermets, U-5% fissium, UMo, $UZrH_x$, UErZrH, UO_2-stainless steel cermet, and U_3O_8-stainless steel cermet. The study also included declad uranium-zirconium hydride spent fuel stored in the CPP-603 storage pools. The current condition and potential failure mechanisms for these spent fuels were evaluated to determine the impact on conditioning and dry storage requirements. Initial recommendations for conditioning and dry storage requirements are made based on the potential degradation mechanisms and their impacts on moving the spent fuel from wet to dry storage. Areas needing further evaluation are identified.

1329 (INEL–96/0187) **TRU drum corrosion task team report.** Kooda, K.E.; Lavery, C.A.; Zeek, D.P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1996. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013296. Source: OSTI; NTIS; INIS; GPO Dep.

During routine inspections in March 1996, transuranic (TRU) waste drums stored at the Radioactive Waste Management Complex (RWMC) were found with pinholes and leaking fluid. These drums were overpacked, and further inspection discovered over 200 drums with similar corrosion. A task team was assigned to investigate the problem with four specific objectives: to identify any other drums in RWMC TRU storage with pinhole corrosion; to evaluate the adequacy of the RWMC inspection process; to determine the precise mechanism(s) generating the pinhole drum corrosion; and to assess the implications of this event for WIPP certifiability of waste drums. The task team investigations analyzed the source of the pinholes to be Hcl-induced localized pitting corrosion. Hcl formation is directly related to the polychlorinated hydrocarbon volatile organic compounds (VOCs) in the waste. Most of the drums showing pinhole corrosion are from Content Code-003 (CC-003) because they contain the highest amounts of polychlorinated VOCs as determined by headspace gas analysis. CC-001 drums represent the only other content code with a significant number of pinhole corrosion drums because their headspace gas VOC content, although significantly less than CC-003, is far greater than that of the other content codes. The exact mechanisms of Hcl formation could not be determined, but radiolytic and reductive dechlorination and direct reduction of halocarbons were analyzed as the likely operable reactions. The team considered the entire range of feasible options, ranked and prioritized the alternatives, and recommended the optimal solution that maximizes protection of worker and public safety while minimizing impacts on RWMC and TRU program operations.

1330 (INEL–96/0189) **HWMA closure plan for the Waste Calcining Facility at the Idaho National Engineering Laboratory.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC07-94ID13223. Order Number DE96012819. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Calcining Facility (WCF) calcined and evaporated aqueous wastes generated from the reprocessing of spent nuclear fuel. The calciner operated from 1963 to 1981, primarily processing high level waste from the first cycle of spent fuel extraction. Following the calciner shutdown the evaporator system concentrated high activity aqueous waste from 1983 until 1987. In 1988, US Department of Energy Idaho Operations Office (DOE-ID) requested interim status for the evaporator system, in anticipation of future use of the evaporator system. The evaporator system has not been operated since it received interim status. At the present time, DOE-ID is completing construction on a new evaporator at the New Waste Calcining Facility (NWCF) and the evaporator at the WCF is not needed. The decision to not use the WCF evaporator requires Lockheed Idaho Technologies Company (LITCO) and DOE-ID to close these units. After a detailed evaluation of closure options, LITCO and DOE-ID have determined the safest option is to fill the voids (grout the vessels, cells and waste pile) and close the WCF to meet the requirements applicable to landfills. The WCF will be covered with a concrete cap that will meet the closure standards. In addition, it was decided to apply these closure standards to the calcining system since it is contained within the WCF building. The paper describes the site, waste inventory, closure activities, and post-closure care plans.

1331 (INEL–96/0246) **Radioactive liquid waste generation goals at the ICPP.** Tripp, J.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1996. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014180. Source: OSTI; NTIS; INIS; GPO Dep.

Processes at ICPP generating hazardous radioactive liquid wastes (which are sent to the tank farm) include NWCF, PEW evaporator, LET&D, tank farm, fuel storage operations, etc. In May 1994, the INEL Radioactive Liquid Waste Management Plan was issued but not implemented. Waste generation goals have been reviewed and updated in this report (details are given in appendix). A meeting was held to determine the new waste generation goals and best approach to reaching them. Waste streams were individually analyzed in this meeting and several adjustments made both during the meeting and following the meeting. The information was adjusted and modeling completed to determine the waste reduction achieved (spreadsheets are included in appendix). Results of this update indicate that there has been a significant reduction in the waste generation goals from 2 years ago. If the updated baseline goals are met, a 35% waste reduction will be achieved; this coupled with increased calcination rate, will enable the waste in the tank farm to be processed by 2012; however a program is needed to ensure these waste goals are met. A monitoring and reporting function in conjunction with company level incentives will fill this need; a logic diagram of this monitoring program is given.

1332 (INEL–96/00251) **Comparison of spent nuclear fuel management alternatives.** Beebe, C.L.; Caldwell, M.A,. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960767–30: 37. annual meeting of the Institute of Nuclear Materials Management, Naples, FL (United States), 28-31 Jul 1996). Order Number DE96014123. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reports the process an results of a trade study of spent nuclear fuel (SNF)management alternatives. The purpose of the trade study was to provide: (1) a summary of various SNF management alternatives, (2) an objective comparison of the various alternatives to facilitate the decision making process, and (3) documentation of trade study rational and the basis for decisions.

1333 (LA–12943) **Effects of soluble organic complexants and their degradation products on the removal of selected radionuclides from high-level waste. Part II: Distributions of Sr, Cs, Tc, and Am onto 32 absorbers from four variations of Hanford tank 101-SY simulant solution.** Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). Apr 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95013479. Distribution: UC-2030. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the radioactive waste storage tanks at U.S. Department of Energy facilities contain organic compounds that have been degraded by radiolysis and chemical reactions during decades of storage. In this second part of our three-part investigation of the effects of soluble organic complexants and their degradation products, we measured the sorption of strontium, cesium, technetium, and americium onto 32 absorbers that offer high sorption of these elements in the absence of organic complexants. The four solutions tested were (1) a simulant for a 3:1 dilution of Hanford Tank 101-SY contents that initially contained ethylenediaminetetraacetic acid (EDTA), (2) this simulant after gamma-irradiation to 34 Mrads, (3) the unirradiated simulant after treatment with a hydrothermal organic-destruction process, and (4) the irradiated simulant after hydrothermal processing. For each of 512 element/absorber/solution combinations, we measured distribution coefficients (Kds) twice for each period for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about sorption kinetics. On the basis of our 3,072 measured Kd values, the sorption of strontium and americium is significantly decreased by the organic components of the simulant solutions, whereas the sorption of cesium and technetium appears unaffected by the organic components of the simulant solutions.

1334 (LA–13000) **Effects of soluble organic complexants and their degradation products on the removal of selected radionuclides from high-level waste. Part 3, Distributions of Sr, Cs, Tc, Pu, and Am onto 33 absorbers from four variations of a 3:1 dilution of Hanford complexant concentrate (CC) simulant: Part 4, The effects of varying dilution ratios on the distributions of Sr, Cs, Tc, Pu, and Am onto 12 absorbers.** Marsh, S.F. (Sandia National Labs., Albuquerque, NM (United States)); Svitra, Z.V.; Bowen, S.M. Los Alamos National Lab., NM (United States). Sep 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96000291. Distribution: UC-2030. Source: OSTI; NTIS; INIS; GPO Dep.

Many of the radioactive waste storage tanks at USDOE facilities contain organic compounds that have been degraded by radiolysis and chemical reactions during decades of storage. Objective of this study was to measure effects of soluble organic complexants and their degradation products on sorption of Sr, Cs, Tc, Pu and Am onto 33 absorbers that in the absence of these organic compounds offer high sorption of these elements. The elements were in a generic simulant for Hanford complexant concentrate supernate that initially contained six organic complexants: EDTA, HEDTA, NTA, citrate, gluconate, and iminodiacetate. This simulant was tested as prepared and after gamma-irradiation to approximately 34 Mrads. Two other variations consisted of the unirradiated and irradiated simulants after treatment at 450C and 15,000 psi in a hydrothermal organic-destruction process. These experiments were conducted with a 3:1 water-to-simulant dilution of each of the four simulant variations. To determine effects of varying dilution ratios on the sorption of these five elements from the unirradiated and gamma-irradiated simulants that were not treated with the hydrothermal process, we measured their distribution from a 1:1 dilution, using 1 M NaOH as the diluent, onto the 12 best-performing absorbers. We then measured the sorption of these five elements from solutions having diluent-simulant ratios of 0, 0.5, 2.0, and 3.0 onto the three absorbers that performed best for sorbing Sr, Pu and Am from the 1:1 dilution. For each of 900 element/absorber/solution combinations, we measured distribution coefficients (Kd values) twice for each period for dynamic contact periods of 30 min, 2 h, and 6 h to obtain information about absorber stability and sorption kinetics. The 5400 measured Kd values indicate that the sorption of Sr, Pu, and Am is significantly decreased by the organic complexants in these simulant solutions, whereas the sorption of Cs and Tc is much less affected.

1335 (LA-SUB–95-191) **Acoustic imaging of underground storage tank wastes: A feasibility study. Final report.** Turpening, R. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Earth Resources Lab.); Zhu, Z.; Caravana, C.; Matarese, J.; Turpening, W. Los Alamos National Lab., NM (United States); Massachusetts Inst. of Tech., Cambridge, MA (United States). Earth Resources Lab. [1995]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96006856. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives for this underground storage tank (UST) imaging investigation are: (1) to assess the feasibility of using acoustic methods in UST wastes, if shown to be feasible, develop and assess imaging strategies; (2) to assess the validity of using chemical simulants for the development of acoustic methods and equipment. This investigation examined the velocity of surrogates, both salt cake and sludge surrogates. In addition collected seismic cross well data in a real tank (114-TX) on the Hanford Reservation. Lastly, drawing on the knowledge of the simulants and the estimates of the velocities of the waste in tank 114-TX the authors generated a hypothetical model of waste in a tank and showed that non-linear travel time tomographic imaging would faithfully image that stratigraphy.

1336 (LA-SUB–96-36) **Los Alamos National Laboratory environmental restoration program group audit report for underground storage tank removal: Audit ER-92- 04, July 22–August 11, 1992.** Gillespie, P.F. (Los Alamos Technical Associates, Inc., NM (United States)). Los Alamos National Lab., NM (United States); Los Alamos Technical Associates, Inc., NM (United States). 31 Aug 1992. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96009555. Source: OSTI; NTIS; INIS; GPO Dep.

Audit ER-92-04 was conducted on activities being performed by Waste Management (EM-7), Environmental Protection (EM-8), and Environmental Restoration (EM-13) groups for the LANL's underground storage tank removal program. Scope of the audit was limited to an evaluation of the implementation of the State of New Mexico requirements for underground storage-tank removal. Activities were evaluated using requirements specified in the State of New Mexico Environmental Improvement Board Underground Storage Tank Regulations, EIB/USTR. Two recommendations are made: (1) that a single organization be given the responsibility and authority for the implementation of the program, and (2) that the requirements of the NM State environmental improvement board underground storage tank regulations be reviewed and a Los Alamos procedure written to address requirements and interfaces not contained in SOP-EM7-D&D-001.

1337 (LA-UR–94-4234) **Long-term safety issues associated with mixer pump operation.** Kubic, W.L. Jr. Los Alamos National Lab., NM (United States). [1994]. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95016876. Source: OSTI; NTIS; INIS; GPO Dep.

In this report, we examine several long-term issues: the effect of pump operation on future gas release events (GREs), uncontrolled chemical reactions, chronic toxic gas releases, foaming, and erosion and corrosion. Heat load in excess of the design limit, uncontrolled chemical reactions, chronic toxic gas releases, foaming, and erosion and corrosion have been shown not to be safety concerns. The effect of pump operation on future GREs could not be quantified. The problem with evaluating the long-term effects of pump operation on GREs is a lack of knowledge and uncertainty. In particular, the phenomena governing gas retention, particle size distribution, and settling are not well understood, nor are the interactions among these factors understood. There is a possibility that changes in these factors could increase the size of future GREs. Bounding estimates of the potential increase in size of GREs are not possible because of a lack of engineering data. Proper management of the hazards can reduce, but not eliminate, the possibility of undesirable changes. Maintaining temperature within the historical limits can reduce the possibility of undesirable changes. A monitoring program to detect changes in the gas composition and crust thickness will help detect slowly occurring changes. Because pump operation has be shown to eliminate GREs, continued pump operation can eliminate the hazards associated with future GREs.

1338 (ORNL–6854) **Extraction of nitric acid, uranyl nitrate, and bismuth nitrate from aqueous nitric acid solutions with CMPO.** Spencer, B.B. Oak Ridge National Lab., TN (United States). Aug 1995. 223p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000899. Source: OSTI; NTIS; INIS; GPO Dep.

DOE sponsored development of the transuranium extraction (TRUEX) process for removing actinides from radioactive wastes. The solvent is a mixture of CMPO and TBP. Since the extraction characteristics of CMPO are not as well understood as those of TBP, the extraction of nitric acid, uranyl nitrate, and bismuth nitrate with CMPO (dissolved in n-dodecane) were studied. Results indicate that CMPO extracts nitric acid with a 1:1 stoichiometry; equilibrium constant is 2. 660$\pm$0.092 at 25 C, and extraction enthalpy is -5. 46$\pm$0.46 kcal/mol. Slope analysis indicates that uranyl nitrate extracts with a mixed equilibria of 1:1 and 2:1 stoichiometries in nearly equal proportion. Equil. constant of the 2: 1 extraction was $1.213 \times 10^6 \pm 3.56 \times 10^4$ at 25 C; reaction enthalpy was -9.610$\pm$0.594 kcal/mol. Nitration complexation constant is 8.412$\pm$0.579, with an enthalpy of -10.72±1.87 kcal/mol. Bismuth nitrate also extracts with a mixed equilibria of (perhaps) 1:1 and 2:1 stoichiometries. A 2:1 extraction equilibrium and a nitrate complexation adequately model the data. Kinetics and enthalpies were also measured.

1339 (ORNL/ER–257) **Structural analysis of underground gunite storage tanks. Environmental Restoration Program.** Oak Ridge National Lab., TN (United States). Aug 1995. 204p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006603. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the structural analysis of the 50-ft diameter underground gunite storage tanks constructed in 1943 and located in the Oak Ridge National Laboratory (ORNL) South Tank Farm, known as Facility 3507 in the 3500-3999 area. The six gunite tanks (W-5 through W-10) are spaced in a 2 × 3 matrix at 60 ft on centers with 6 ft of soil cover. Each tank (Figures 1, 2, and 3) has an inside diameter of 50 ft, a 12-ft vertical sidewall having a thickness of 6 in. (there is an additional 1.5-in. inner liner for much of the height), and a spherical domed roof (nominal thickness is 10 in.) rising another 6 ft, 3 in. at the center of the tank. The thickness of both the sidewall and the domed roof increases to 30 in. near their juncture. The tank floor is nominally 3-in. thick, except at the juncture with the wall where the thickness increases to 9 in. The tanks are constructed of gunite (a mixture of Portland cement, sand, and water in the form of a mortar) sprayed from the nozzle of a cement gun against a form or a solid surface. The floor and the dome are reinforced with one layer of welded wire mesh and reinforcing rods placed in the radial direction. The sidewall is reinforced with three layers of welded wire mesh, vertical $\frac{1}{2}$-in. rods, and 21 horizontal rebar hoops (attached to the vertical rods) post-tensioned to 35,000 psi stress. The haunch at the sidewall/roof junction is reinforced with 17 horizontal rebar hoops post-tensioned with 35,000 to 40,000 psi stress. The yield strength of the post-tensioning steel rods is specified to be 60,000 psi, and all other steel is 40,000 psi steel. The specified 28-day design strength of the gunite is 5,000 psi.

1340 (ORNL/ER–365) **Evaluation of phase 1 and phase 2 sampling and analysis data for the Gunite and Associated Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); MACTEC, Oak Ridge, TN (United States). Mar 1996. 281p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400 ; AC05-96OR22464. Order Number DE96009365. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

The Gunite and Associated Tanks (GAAT) are located at Oak Ridge National Laboratory in Waste Area Grouping 1. GAAT is designated as a Comprehensive Environmental Response, Compensation, and Liability Act site. GAAT is considered a high priority for remediation because of the potential risk associated with the contaminants of concern and the condition of the Gunite walls. The objective of this report is to (1) support the GAAT treatability study and (2) provide input to the Record of Decision for the remediation of selected tanks that are part of the North Tank Farm and the South Tank Farm. This report presents a statistical and operational evaluation of GAAT sampling and analysis of data from various tanks in the North Tank Farm and the South Tank Farm.

1341 (ORNL/ER/Sub–87-99053/74) **Results of Fall 1994 sampling of gunite and associated tanks at the Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge Inst. for Science and Education, TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Jun 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016128. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

This Technical Memorandum, was developed under Work Breakdown Structure 1.4.12.6.1.01.41.12.02. 11 (Activity Data Sheet 3301, "WAG 1"). This document provides the Environmental Restoration Program with analytical results from liquid and sludge samples from the Gunite and Associated Tanks (GAAT). Information provided in this report forms part of the technical basis for criticality safety, systems safety, engineering design, and waste management as they apply to the GAAT treatability study and remediation.

1342 (ORNL/ER/Sub–87-99053/79) **Results of 1995 characterization of Gunite and Associated Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Feb 1996. 118p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012206. Source: OSTI; NTIS; INIS; GPO Dep.

This technical memorandum (TM) documents the 1995 characterization of eight underground radioactive waste tanks at Oak Ridge National Laboratory (ORNL). These tanks belong to the Gunite and Associated Tanks (GAAT) operable unit, and the characterization is part of the ongoing GAAT remedial investigation/feasibility study (RI/FS) process. This TM reports both field observations and analytical results; analytical results are also available from the Oak Ridge Environmental Information System (OREIS) data base under the project name GAAT (PROJ-NAME = GAAT). This characterization effort (Phase II) was a follow-up to the "Phase I" sampling campaign reported in Results of Fall 1994 Sampling of Gunite and Associated Tanks at the Oak Ridge National Laboratory, Oak Ridge, Tennessee, ORNL/ER/Sub/87-99053/74, June 1995. The information contained here should be used in conjunction with that in the previous TM. The sampling plan is documented in ORNL Inactive Waste Tanks Sampling and Analysis Plan, ORNL/RAP/LTR-88/24, dated April 1988, as amended by Addendum 1, Revision 2: ORNL Inactive Tanks Sampling and Analysis Plan, DOE/OR/02-1354&D2, dated February 1995. Field team instructions are found in ORNL RI/FS Project Field Work Guides 01-WG-20, Field Work Guide for Sampling of Gunite and Associated Tanks, and 01-WG-21, Field Work Guide for Tank Characterization System Operations at ORNL. The field effort was conducted under the programmatic and procedural umbrella of the ORNL RI/FS Program, and the analysis was in accordance with ORNL Chemical and Analytical Sciences Division (CASD) procedures. The characterization campaign is intended to provide data for criticality safety, engineering design, and waste management as they apply to the GAAT treatability study and remediation. The Department of Energy (DOE) Carlsbad office was interested in results of this sampling campaign and provided funding for certain additional sample collection and analysis.

1343 (ORNL/TM–12784) **Application of the TRUEX process to highly irradiated targets.** Felker, L.K.; Benker, D.E. Oak Ridge National Lab., TN (United States). Mar 1995. 37p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC05-84OR21400. Order Number DE95011630. Source: OSTI; NTIS; INIS; GPO Dep.

The Radiochemical Engineering Development Center (REDC) at Oak Ridge National Laboratory processes highly irradiated targets for the Mark 42 program to separate americium, curium, and plutonium. Argonne National Laboratory (ANL) has developed the TRUEX process for the removal of transuranic elements from aqueous waste streams and a computer model that aids in the design of potential flowsheets. Because the TRUEX process is attractive for application to the large volumes of high-activity tank wastes stored at various Department of Energy sites, a test of the process on the highly irradiated Mark 42 target material would yield useful information on the performance of the process under "real" conditions. Researchers at ANL used the Generic TRUEX Model (GTM) to design a TRUEX flowsheet to process Mark 42 target material. Researchers at the REDC refurbished the Solvent Extraction Test Facility mixer-settler contactors and conducted three test runs using the TRUEX process. The results from the three demonstration tests are presented along with the predicted results from the GTM.

1344 (ORNL/TM-12935) **Tank Focus Area Pretreatment Program. FY 1995 Program Management Plan.** Morrison, M.I. (Midwest Technical Inc., Oak Ridge, Tennessee (United States)); McGinnis, C.P.; Wilkenson, W.T.; Hunt, R.D. Oak Ridge National Lab., TN (United States). Feb 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012546. Source: OSTI; NTIS; INIS; GPO Dep.

This program management plan (PMP) describes the FY 1995 project plans for the Pretreatment Program of the Tank Focus Area. The Tank Focus Area is one of five areas of environmental concerns originally identified by the Deputy Assistant Secretary for Technology Development (EM-50). Projects in the Tank Focus Area relate to the remediation of liquid waste stored in underground storage tanks at various US Department of Energy sites. The Pretreatment Program is an organizational unit performing work within the Tank Focus Area. The function of the Pretreatment Program is to develop, test, evaluate, and demonstrate new technologies, with emphasis on separations. The 11 Pretreatment Program projects for FY 1995 are (1) Cesium Extraction Testing, (2) Comprehensive Supernate Treatment, (3) Hot Cell Studies, (4) Cesium Removal Demonstration, (5) Out-of-Tank Evaporator Demonstration, (6) Crossflow Filtration, (7) Technical Interchange with CEA, (8) TRUEX Applications, (9) NAC/NAG Process Studies (conducted at Oak Ridge National Laboratory), (10) NAC/NAG Process and Waste Form Studies (conducted at Florida International University), and (11) Program Management. Section 2 of this PMP contains a separate subsection for each FY 1995 project. A brief description of the project, a schedule of major milestones, and a breakdown of costs are provided for each project. The PMP also contains sections that describe the project controls that are in place. Quality assurance, document control, the project management system, and the management organization are described in these sections.

1345 (ORNL/TM-13017) **Sampling and analysis of inactive radioactive waste tanks W-17, W-18, WC-5, WC-6, WC-8, and WC-11 through WC-14 at ORNL.** Sears, M.B.; Giaquinto, J.M.; Griest, W.H.; Pack, R.T.; Ross, T.; Schenley, R.L. Oak Ridge National Lab., TN (United States). Dec 1995. 195p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006191. Source: OSTI; NTIS; INIS; GPO Dep.

The sampling and analysis of nine inactive liquid low-level waste (LLLW) tanks at the Oak Ridge National Laboratory (ORNL) are described-tanks W-17, W-18, WC-5, WC-6, WC-8, and WC-11 through WC-14. Samples of the waste tank liquids and sludges were analyzed to determine (1) the major chemical constituents, (2) the principal radionuclides, (3) metals listed on the US Environmental Protection Agency (EPA) Contract Laboratory Program Inorganic Target Analyte List, (4) organic compounds, and (5) some physical properties. The organic chemical characterization consisted of determinations of the EPA Contract Laboratory Program Target Compound List volatile and semivolatile compounds, pesticides, and polychlorinated biphenyis (PCBs). This report provides data (1) to meet requirements under the Federal Facility Agreement (FFA) for the Oak Ridge Reservation to characterize the contents of LLLW tanks which have been removed from service and (2) to support planning for the treatment and disposal of the wastes.

1346 (ORNL/TM-13034) **A facility design for repackaging ORNL CH-TRU legacy waste in Building 3525.** Huxford, T.J. (Oak Ridge National Lab., TN (United States)); Cooper, R.H. Jr.; Davis, L.E.; Fuller, A.B.; Gabbard, W.A.; Smith, R.B.; Guay, K.P.; Smith, L.C. Oak Ridge National Lab., TN (United States). Jul 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008645. Source: OSTI; NTIS; INIS; GPO Dep.

For the last 25 years, the Oak Ridge National Laboratory (ORNL) has conducted operations which have generated solid, contact-handled transuranic (CH-TRU) waste. At present the CH-TRU waste inventory at ORNL is about 3400 55-gal drums retrievably stored in RCRA-permitted, aboveground facilities. Of the 3400 drums, approximately 2600 drums will need to be repackaged. The current US Department of Energy (DOE) strategy for disposal of these drums is to transport them to the Waste Isolation Pilot Plant (WIPP) in New Mexico which only accepts TRU waste that meets a very specific set of criteria documented in the WIPP-WAC (waste acceptance criteria). This report describes activities that were performed from January 1994 to May 1995 associated with the design and preparation of an existing facility for repackaging and certifying some or all of the CH-TRU drums at ORNL to meet the WIPP-WAC. For this study, the Irradiated Fuel Examination Laboratory (IFEL) in Building 3525 was selected as the reference facility for modification. These design activities were terminated in May 1995 as more attractive options for CH-TRU waste repackaging were considered to be available. As a result, this document serves as a final report of those design activities.

1347 (ORNL/TM-13045) **DUSCOBS - a depleted-uranium silicate backfill for transport, storage, and disposal of spent nuclear fuel.** Forsberg, C.W.; Pope, R.B.; Ashline, R.C.; DeHart, M.D.; Childs, K.W.; Tang, J.S. Oak Ridge National Lab., TN (United States). 30 Nov 1995. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96011586. Source: OSTI; NTIS; INIS; GPO Dep.

A Depleted Uranium Silicate COntainer Backfill System (DUSCOBS) is proposed that would use small, isotopically-depleted uranium silicate glass beads as a backfill material inside storage, transport, and repository waste packages containing spent nuclear fuel (SNF). The uranium silicate glass beads would fill all void space inside the package including the coolant channels inside SNF assemblies. Based on preliminary analysis, the following benefits have been identified. DUSCOBS improves repository waste package performance by three mechanisms. First, it reduces the radionuclide releases from SNF when water enters the waste package by creating a local uranium silicate saturated groundwater environment that suppresses (1) the dissolution and/or transformation of uranium dioxide fuel pellets and, hence, (2) the release of radionuclides incorporated into the SNF pellets. Second, the potential for long-term nuclear criticality is reduced by isotopic exchange of enriched uranium in SNF with the depleted uranium (DU) in the glass. Third, the backfill reduces radiation interactions between SNF and the local environment (package and local geology) and thus reduces generation of hydrogen, acids, and other chemicals that degrade the waste package system. In addition, the DUSCOBS improves the integrity of the package by acting as a packing material and ensures criticality control for the package during SNF storage and transport. Finally, DUSCOBS provides a potential method to dispose of significant quantities of excess DU from uranium enrichment plants at potential economic savings. DUSCOBS is a new concept. Consequently, the concept has not been optimized or demonstrated in laboratory experiments.

1348 (PNL–8557-Rev.1) **Calculation of reaction energies and adiabatic temperatures for waste tank reactions.** Burger, L.L. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002322. Source: OSTI; NTIS; INIS; GPO Dep.

Continual concern has been expressed over potentially hazardous exothermic reactions that might occur in Hanford Site underground waste storage tanks. These tanks contain many different oxidizable compounds covering a wide range of concentrations. The chemical hazards are a function of several interrelated factors, including the amount of energy (heat) produced, how fast it is produced, and the thermal absorption and heat transfer properties of the system. The reaction path(s) will determine the amount of energy produced and kinetics will determine the rate that it is produced. The tanks also contain many inorganic compounds inert to oxidation. These compounds act as diluents and can inhibit exothermic reactions because of their heat capacity and thus, in contrast to the oxidizable compounds, provide mitigation of hazardous reactions. In this report the energy that may be released when various organic and inorganic compounds react is computed as a function of the reaction-mix composition and the temperature. The enthalpy, or integrated heat capacity, of these compounds and various reaction products is presented as a function of temperature; the enthalpy of a given mixture can then be equated to the energy release from various reactions to predict the maximum temperature which may be reached. This is estimated for several different compositions. Alternatively, the amounts of various diluents required to prevent the temperature from reaching a critical value can be estimated. Reactions taking different paths, forming different products such as N_2O in place of N_2 are also considered, as are reactions where an excess of caustic is present. Oxidants other than nitrate and nitrite are considered briefly.

1349 (PNL–10069) **Integrity assessment plan for PNL 300 area radioactive hazardous waste tank system. Final report.** Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 231p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008034. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory (PNL), operated by Battelle Memorial Institute under contract to the U.S. Department of Energy, operates tank systems for the U.S. Department of Energy, Richland Operations Office (DOE-RL), that contain dangerous waste constituents as defined by Washington State Department of Ecology (WDOE) Dangerous Waste Regulations, Washington Administrative Code (WAC) 173-303-040(18). Chapter 173-303-640(2) of the WAC requires the performance of integrity assessments for each existing tank system that treats or stores dangerous waste, except those operating under interim status with compliant secondary containment. This Integrity Assessment Plan (IAP) identifies all tasks that will be performed during the integrity assessment of the PNL-operated Radioactive Liquid Waste Systems (RLWS) associated with the 324 and 325 Buildings located in the 300 Area of the Hanford Site. It describes the inspections, tests, and analyses required to assess the integrity of the PNL RLWS (tanks, ancillary equipment, and secondary containment) and provides sufficient information for adequate budgeting and control of the assessment program. It also provides necessary information to permit the Independent, Qualified, Registered Professional Engineer (IQRPE) to approve the integrity assessment program.

1350 (PNL–10100) **Tank characterization report for single-shell Tank B-201.** Heasler, P.G.; Remund, K.M.; Tingey, J.M.; Baird, D.B.; Ryan, F.M. Pacific Northwest Lab., Richland, WA (United States). Sep 1994. 93p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE95001311. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to characterize the waste in single shell Tank B-201. Characterization includes the determination of the physical, chemical (e.g., concentrations of elements and organic species), and radiological properties of the waste. These determinations are made using analytical results from B-201 core samples as well as historical information about the tank. The main objective is to determine average waste properties: but in some cases, concentrations of analytes as a function of depth were also determined. This report also consolidates the available historical information regarding Tank B-201, arranges the analytical information from the recent core sampling in a useful format, and provides an interpretation of the data within the context of what is known about the tank.

1351 (PNL–10175-Suppl.1) **Ferrocyanide safety project: Comparison of actual and simulated ferrocyanide waste properties.** Scheele, R.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002223. Source: OSTI; NTIS; INIS; GPO Dep.

In 1995, available subsegment samples of wastes taken from the Hanford Site underground radioactive waste storage tanks 241-C-112 (C-112) and 241-C-109 (C-109) were reanalyzed to determine the nickel concentrations in the samples and to determine whether the use of a nickel crucible in the analytical sample preparation biased the reported nickel concentrations reported by Simpson and coworkers and in the original report that this report supplements. The reanalysis strategy to determine nickel was to use a sodium peroxide flux in a zirconium crucible instead of the previously used potassium hydroxide flux in a nickel crucible. This supplemental report provides the results of the reanalyses and updates tables from the original report which reflect the new nickel analyses. Nickel is important with respect to management of the potentially reactive ferrocyanide wastes as it is one of the key defining characteristics of the solids that resulted from scavenging radiocesium using ferrocyanides. In Hanford Site wastes, few other processes introduced nickel into the wastes other than radiocobalt scavenging, which was often coupled with the ferrocyanide-scavenging process. Thus the presence of nickel in a waste provides strong evidence that the original waste was or contained ferrocyanide waste at one time. Given the potential import of nickel as a defining characteristic and marker for ferrocyanide wastes, the Pacific Northwest Laboratory's (PNL) Analytical Chemistry Laboratory (ACL) reanalyzed available samples from tanks C-112 and C-109 using inductively coupled argon plasma/atomic emission spectrometry (ICP/AES) and an alternative sample preparation method which precluded contamination of the analytical samples with nickel.

1352 (PNL–10213) **Organic tank safety project: Preliminary results of energetics and thermal behavior studies of model organic nitrate and/or nitrite mixtures and a simulated organic waste.** Scheele, R.D.; Sell, R.L.; Sobolik, J.L.; Burger, L.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017064. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of years of production and recovery of nuclear defense materials and subsequent waste management at the Hanford Site, organic-bearing radioactive high-level wastes (HLW) are currently stored in large (up to 3. ML) single-shell storage tanks (SSTs). Because these wastes contain both fuels (organics) and the oxidants nitrate and nitrite, rapid energetic reactions at certain conditions could occur. In support of Westinghouse Hanford Company's (WHC) efforts to ensure continued safe storage of these organic- and oxidant-bearing wastes and to define the conditions necessary for reactions to occur, we measured the thermal sensitivities and thermochemical and thermokinetic properties of mixtures of selected organics and sodium nitrate and/or nitrite and a simulated Hanford organic-bearing waste using thermoanalytical technologies. These thermoanalytical technologies are used by chemical reactivity hazards evaluation organizations within the chemical industry to assess chemical reaction hazards.

1353 (PNL–10248) **Vapor space characterization of waste tank 241-BY-106: Results from samples collected through the vapor sampling system on July 8, 1994.** Lucke, R.B.; Pool, K.H.; Ligotke, M.W.; Clauss, T.W.; McVeety, B.D.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001197. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-BY-106. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1354 (PNL–10255) **Evaluation of HWVP feed preparation chemistry for an NCAW simulant – Fiscal year 1993: Effect of noble metals concentration on offgas generation and ammonia formation.** Patello, G.K.; Wiemers, K.D.; Bell, R.D.; Smith, H.D.; Williford, R.E.; Clemmer, R.G. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 149p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010687. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste Vitrification Program is developing technology for the Department of Energy to immobilize high-level and transuranic wastes as glass for permanent disposal. Pacific Northwest Laboratory (PNL) is conducting laboratory-scale melter feed preparation studies using a HWVP simulated waste slurry, Neutralized Current Acid Waste (NCAW). A FY 1993 laboratory-scale study focused on the effects of noble metals (Pd, Rh, and Ru) on feed preparation offgas generation and NH_3 production. The noble metals catalyze H_2 and NH_3 production, which leads to safety concerns. The information gained from this study is intended to be used for technology development in pilot scale testing and design of the Hanford High-Level Waste Vitrification Facility. Six laboratory-scale feed preparation tests were performed as part of the FY 1993 testing activities using nonradioactive NCAW simulant. Tests were performed with 10%, 25%, 50% of nominal noble metals content. Also tested were 25% of the nominal Rh and a repeat of 25% nominal noble metals. The results of the test activities are described. 6 refs., 28 figs., 12 tabs.

1355 (PNL–10256) **Vapor space characterization of waste tank 241-BY-105: Results from samples collected on 7/7/94.** Pool, K.H.; Ligotke, M.W.; Clauss, T.W.; Lucke, R.B.; McVeety, B.D.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012229. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes organic and inorganic results from vapors of the Hanford single-shell waste storage Tank 241-BY-105 (referred to as Tank BY-105). The results described here were obtained to support safety and toxicological evaluations. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. Several organic analytes were quantitatively determined, but quantities of non-TO-14 analytes were only estimated. Approximately 40 tentatively identified organic analytes were observed above the detection limit of (ca.) 10 ppb, but standards for most of these were not available at the time of analysis, and their quantitative determination is beyond the scope of this study. The SUMMA™ Canisters were also analyzed for components listed in U.S. Environmental Protection Agency (EPA) compendium Method TO-14. Of these only a few were observed above the 2-ppb detection limits. These are summarized in Table 3.1. Estimated quantitations also determined were of tentatively identified compounds (TICs). A summary of these results shows quantities of all TICs above the concentration of ca. 10 ppb. This consists of more than 40 organic analytes. The 6 organic analytes with the highest estimated concentrations are shown in Table 1. These 6 analytes account for approximately 45% of the total organic components in Tank BY-105. Detailed descriptions of the results appear in the text. Unlike tanks previously studied, normal paraffin hydrocarbons (NPHs) did not contribute significantly to the total organic concentration of the vapor headspace of Tank BY-105. The total concentration of TICs detected in the tank headspace samples was also much lower than that seen in other reported tanks averaging 6.5 Mg/m^3 for all three canisters collected.

1356 (PNL–10257) **Vapor space characterization of waste Tank 241-BY-107: Results from in situ sample collected on 3/25/94.** Sharma, A.K.; Lucke, R.B.; Clauss, T.W.; McVeety, B.D.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015808. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes organic results from vapors of the Hanford single-shell waste storage Tank 241-BY-107 (referred to as Tank BY-107). Samples for selected inorganic compounds were obtained but not anlayzed (Section 2.0). Quantitative results were obtained for several organic analytes, but quantities of analytes not listed in US Environmental Protection Agency (EPA) compendium Method TO-14 were estimated. Approximately 80 tentatively identified organic analytes were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and their quantitative determination is beyond the scope of this study. The SUMMATM canister samples were also analyzed for the 41 organic compounds listed in EPA compendium Method TO-14. Of these, only a few were observed above the 2-ppbv detection limits. These are summarized in Table 3.1. Estimated quantities were determined of tentatively identified compounds (TICs). A summary of these results shows quantities of all TICs above the concentration of ca. 10 ppbv. This consists of more than 80 organic analytes. The 12 organic analytes with the highest estimated concentrations are shown.

1357 (PNL–10282) **Vapor space characterization of waste tank 241-BY-105 (in situ): Results from samples collected on May 9, 1994.** McVeety, B.D.; Pool, K.H.; Ligotke, M.W.; Clauss, T.W.; Lucke, R.B.; Sharma, A.K.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012230. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the tank headspace of the Hanford waste storage Tank 241-BY-105 (referred to as Tank BY-105). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds NH_3, NO_2, NO, HCN, and H_2O. Sampling for sulfur oxides was not requested. Results of the inorganic samples were affected by sampling errors that led to an undefined uncertainty in sample volume. Consequently, tank-headspace concentrations are estimated only. Thirty-nine tentatively identified organic analytes were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and their quantitation is beyond the scope of this study. In addition, we looked for the 41 standard TO-14 analytes. Of these, only a few were observed above the 2-ppbv detection limit. The 16 organic analytes with the highest estimated concentrations are listed. These 16 analytes account for approximately 68% of the total or organic components in Tank BY-105.

1358 (PNL–10284) **Vapor space characterization of waste Tank 241-BY-106 (in situ): Results from samples collected on 5/4/94 and 5/5/94.** Clauss, T.W.; Ligotke, M.W.; Pool, K.H.; Lucke, R.B.; McVeety, B.D.; Sharma, A.K.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011682. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-BY-106 (referred to as Tank BY-106). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds NH_3, NO_2, NO, HCN, and H_2O. Sampling for sulfur oxides was not requested. Organic compounds were also quantitatively determined. Twenty-three organic tentatively identified compounds (TICS) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 41 standard TO-14 analytes. Of these, only a few were observed above the 2-ppbv detection limit. The 10 organic analytes with the highest estimated concentrations are listed in Table 1. The 10 analytes account for approximately 64% of the total organic components in Tank BY-106. Tank BY-106 is on the Ferrocyanide Watch List.

1359 (PNL–10288) **Vapor space characterization of waste Tank 241-BY-108: Results from in situ sample collected on March 24, 1994. Waste Tank Vapor Project.** McVeety, B.D.; Lucke, R.B.; Clauss, T.W.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015814. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the organic analysis that was performed on samples from the headspace of Hanford waste tank 241-BY-108. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the organic analytes is included, as well as, a detailed description of the results which appears in the text.

1360 (PNL–10351) **Vapor space characterization of waste Tank 241-C-108: Results from samples collected through the vapor sampling system on 8/5/94.** Lucke, R.B.; Ligotke, M.W.; Pool, K.H.; Clauss, T.W.; Sharma, A.K.; McVeety, B.D.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001902. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-C-108 (referred to as Tank C-108). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. Organic compounds were also quantitatively determined. Two organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 41 standard TO-14 analytes. Of these, only a few were observed above the 2-ppbv detection limit. The five organic analytes with the highest estimated concentrations are listed in Table 1. The five analytes account for approximately 85% of the total organic components in Tank C-108.

1361 (PNL–10360) **Analysis of organic carbon and moisture in Hanford single-shell tank waste.** Toth, J.J.; Heasler, P.G.; Lerchen, M.E.; Hill, J.G.; Whitney, P.D. Pacific Northwest Lab., Richland, WA (United States). May 1995. 162p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95014506. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents a revised analysis performed by Pacific Northwest Laboratory involving the organic carbon laboratory measurement data for Hanford single-shell tanks (SSTs) obtained from a review of the laboratory analytical data. This activity has as its objective to provide a best-estimate, including confidence levels, of total organic carbon (TOC) and moisture in each of the 149 SSTs at Hanford. The TOC and moisture information presented in this report is useful as part of the criteria to identify SSTs for additional measurements, or monitoring for the Organic Safety Program. In April 1994, an initial study of the organic carbon in Hanford single-shell tanks was completed at PNL. That study reflected the estimates of TOC based on tank characterizations datasets that were available at the time. Also in that study, estimation of dry basis TOC was based on generalized assumptions pertaining to the moisture of the tank wastes. The new information pertaining to tank moisture and TOC data that has become available from the current study influences the best estimates of TOC in each of the SSTs. This investigation of tank TOC and moisture has resulted in improved estimates based on waste phase: saltcake, sludge, or liquid. This report details the assumptions and methodologies used to develop the estimates of TOC and moisture in each of the 149 SSTs at Hanford.

1362 (PNL–10361) **Vapor space characterization of waste Tank 241-BY-104 (in situ): Results from samples collected on 4/22/94.** Pool, K.H.; Ligotke, M.W.; Clauss, T.W.; Lucke, R.B.; McVeety, B.D.; Sharma, A.K.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 21p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001811. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the space of the Hanford waste storage Tank 241-BY-104 (referred to as Tank BY-104). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds NH_3, NO_2, NO, HCN, and H_2O. Sampling for sulfur oxides was not requested. Several organic compounds were also quantitatively determined. Eighty-nine tentatively identified organic analytes were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semi-quantitative estimates. In addition, the 41 standard TO 14 analytes were sought. Of these, only a few were observed above the 2-ppbv detection limit. The 10 organic analytes with the highest estimated concentrations are listed in Table 1. These 10 analytes account for approximately 48% of the total organic components in the headspace of Tank BY-104. Detailed results appear in the text. Tank BY-104 is on the Ferrocyanide Watch List.

1363 (PNL–10366) **Vapor space characterization of waste Tank 241-C-109 (in situ): Results from samples collected on 6/23/94.** Clauss, T.W.; Ligotke, M.W.; Pool, K.H.; Lucke, R.B.; McVeety, B.D.; Sharma, A.K.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001901. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-C-109 (referred to as Tank C-109). The results described here were obtained to support safety and toxicological evaluations. Organic compounds were quantitatively determined. Thirteen organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 40 standard TO-14 analytes. Of these, only one was observed above the 2-ppbv calibrated instrumental detection limit. However, it is believed, even though the values for dichlorodifluoromethane and trichlorofluoromethane are below the instrumental detection limit, they are accurate at these low concentrations. The six analytes account for approximately 100% of the total organic components in Tank C-109. These six organic analytes with the highest estimated concentrations are listed in Summary Table 1. Detailed descriptions of the results appear in the text.

1364 (PNL–10367) **Vapor space characterization of waste Tank 241-C-111 (in situ): Results from samples collected on 6/20/94.** Ligotke, M.W.; Pool, K.H.; Lucke, R.B.; McVeety, B.D.; Clauss, T.W.; McCulloch, M.; Young, J.S.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001900. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-C-111 (referred to as Tank C-111). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Summary Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), hydrogen cyanide (HCN), and water vapor (H_2O). Sampling for sulfur oxides was not requested. Organic compounds were quantitatively determined. Five organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 40 standard TO-14 analytes and observed 39. None of these compounds were above the 2-ppbv calibrated instrumental detection limit. However, it is believed that the detection of dichlorodifluoromethane and methyl benzene are real at these low concentrations. The five organic analytes with the highest estimated concentrations are listed in Summary Table 1. The five analytes account for approximately 100% of the total organic components in Tank C-111.

1365 (PNL–10369) **HWVP feed preparation chemistry for an NCAW simulant, fiscal year 1992: Evaluation of offgas generation and ammonia formation.** Smith, H.D.; Wiemers, K.D.; Langowski, M.H.; Matheson, J.D.; Merz, M.D.; Powell, M.R.; Larson, D.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 302p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010774. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Waste Vitrification Plant (HWVP) was being designed for the US Department of Energy (DOE) to immobilize high-level and transuranic wastes as glass for permanent disposal. Pacific Northwest Laboratory (PNL) supported the HWVP design activities by conducting laboratory-scale studies using an HWVP simulated waste slurry. PNL collected and evaluated data to provide a basis for predicting the HWVP feed processing chemistry as a function of feed composition and operation variables, recommending criteria for chemical adjustments, and providing guidelines with respect to important control parameters to consider during routine and upset plant operation. Conditions that affect the slurry processing chemistry were evaluated in terms of processing conditions, offgas compositions and peak generation rates, and changes in slurry compositions. A standard offgas profile defined in terms of three reaction phases, decomposition of H_2CO_3, destruction of NO_2^- and production of H_2 and NH_3, was used as a baseline against which changes were evaluated. The test variables included NO_2 concentration, acid neutralization capacity, process temperature, HCOOH addition rate, and the presence of selected process-related organics and a processed slurry (heel). Results indicate that pH is an important parameter influencing the N_2O/NO_x generation ratio; NO_2^- can both inhibit and activate rhodium as a catalyst for HCOOH decomposition to CO_2 and H_2; and the presence of a process "heel" appears to accelerate the formation of a separate reduced-metal phase. Temperature was observed to strongly influence the H_2 generation rate. The process chemistry described in this document provides a preliminary bases for predicting the behavior of alternative feed streams and process steps applicable to future generation vitrification plants.

1366 (PNL–10388) **Organic analysis of ambient samples collected near Tank 241-C-103: Results from samples collected on May 12, 1994.** Clauss, T.W.; Ligotke, M.W.; McVeety, B.D.; Lucke, R.B.; Young, J.S.; McCulloch, M.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015771. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes organic analyses results from ambient samples collected both upwind and through the vapor sampling system (VSS) near Hanford waste storage Tank 241-C-103 (referred to as Tank C-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed. Quantitative results were obtained for organic compounds. Five organic tentatively identified compounds (TICS) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, we looked for the 40 standard TO-14 analytes. We observed 39. Of these, only one was observed above the 2-ppbv calibrated instrument detection limit. Dichloromethane was above the detection limits using both methods, but the result from the TO-14 method is traceable to a standard gas mixture and is considered more accurate. Organic analytes were found only in the sample collected through the VSS, suggesting that these compounds were residual contamination from a previous sampling job. Detailed descriptions of the results appear in the text.

1367 (PNL–10389) **Vapor space characterization of waste tank 241-BY-109 (in situ): Results from samples collected on 9/22/94.** Pool, K.H.; Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015404. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-BY-109 (referred to as Tank BY-109). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Summary Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. Organic compounds were also quantitatively determined. Twenty-three organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, we looked for the 40 standard TO-14 analytes. We observed 38. Of these, only a few were observed above the 2-ppbv calibrated instrument detection limit. The ten organic analytes with the highest estimated concentrations are listed in Summary Table 1. The ten analytes account for approximately 84% of the total organic components in Tank BY-109.

1368 (PNL–10412) **Permeation of Tank C-103 sludge simulant by organic solvent.** Gerber, M.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010424. Source: OSTI; NTIS; INIS; GPO Dep.

The plan for stabilizing underground storage tanks (USTs) calls for draining the supernate from the tanks; however, there is concern that draining the supernate from Tank C-103 will degrade safety in the tank. The sludge in Tank C-103 contains ranges in depth from 1 to 1.5 m and is covered by both an aqueous phase and a separate organic layer. The main concern is that draining the supernate will cause the solvent to permeate the sludge solids and provide a source of fuel for a fire on the surface of the drained sludge. The question of whether the solvent will permeate sludge that is 1 to 1.5 m deep after the tank is dewatered is the purpose of the tests conducted and described in this report. Evaluation of the solvent permeation mechanism required the preparation of solvent, supernate, and sludge simulants based on the known chemistry of Tank C-103. Solvent and aqueous phase supernate simulants are based on the results of fiscal year 1994 sampling of the tank solvent and supernate. Sludge simulant is based on the chemical analyses of tank sludge samples retrieved in 1986. Experiments were conducted with each simulant to evaluate solvent permeation under matric potentials ranging from 0.8 m to 1.8 m of supernate. The amount of solvent recovered for each experiment was recorded as well as the maximum amount of solvent that could be din the sludge based on solvent recovered from resuspended sludge and solvent not recovered. The wt% of water remaining in the sludge was also recorded for each experiment, which was determined by measuring the weight of the sludge after drying it. One observation noted from the test results is that the finer sludge material tended to have a greater amount of solvent loss compared to the coarser sludge material at comparable levels of vacuum. At this time, there is no explanation.

1369 (PNL–10412-Rev.1) **Permeation of Tank C-103 sludge simulant by organic solvent. Revision 1.** Gerber, M.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017017. Source: OSTI; NTIS; INIS; GPO Dep.

The plan for stabilizing underground storage tanks calls for draining the supernate from the tanks; however, there is concern that draining the supernate from Tank C-103 will degrade safety in the tank. The sludge in Tank C-103 contains ranges in depth from 1 to 1.5 m and is covered by both an aqueous phase and a separate organic layer. The main concern is that draining the supernate will cause the solvent to permeate the sludge solids and provide a source of fuel for a fire on the surface of the drained sludge. The question of whether the solvent will permeate sludge that is 1 to 1.5 m deep after the tank is dewatered is the purpose of the tests conducted and described in this report.

1370 (PNL–10418) **Vapor space characterization of waste tank 241-C-109: Results from samples collected on 8/10/94.** Pool, K.H. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015406. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from the Hanford waste Tank 241-C-109 (referred to as Tank C-109). Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace and ambient air near the tank. The sample job was designated S4053, and samples were collected by WHC on August 10, 1994, using the vapor sampling system (VSS). Sampling devices, including six sorbent trains (for inorganic analyses) and five SUMMA™ canisters (for organic analyses) were supplied to the WHC sampling staff on August 8. Samples were taken (by WHC) from the tank headspace on August 10 and were returned to PNL from the field on August 12. The samples were inspected upon delivery to the 326/23B laboratory and logged into PNL record book 55408 before implementation of PNL Technical Procedure PNL-TVP-07. Custody of the sorbent traps was transferred to PNL personnel performing the inorganic analysis and stored at refrigerated ($\leq$10°C) temperature until the time of analysis. The canister was stored in the 326/23B laboratory at ambient (25°C) temperature until time of analysis. Access to the 326/23B laboratory is limited to PNL personnel working on the waste-tank safety program. Analyses described in this report were performed at PNL in the 300 area of the Hanford Reservation. Analytical methods that were used are described in the text. In summary, sorbent traps for inorganic analyses containing sample materials were either weighed (for water analysis) or desorbed with the appropriate aqueous solutions (for ammonia (NH_3) or nitrite (NO_2) analyses). The aqueous extracts were analyzed either by selective electrode or by ion chromatography (IC). Organic analyses were performed using cryogenic preconcentration followed by gas chromatography/mass spectrometry (GC/MS).

1371 (PNL–10464) **Fiscal year 1993 1/25-scale sludge mobilization testing.** Powell, M.R.; Golcar, G.R.; Hymas, C.R.; McKay, R.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 161p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011404. Source: OSTI; NTIS; INIS; GPO Dep.

Sixteen 1/25-scale sludge mobilization experiments were conducted in fiscal year (FY) 1993. The results of this testing are presented in this document. The ability of a single, centrally-located, scale model mixer pump to resuspend a layer of simulated tank sludge was evaluated for five different simulant types. The resistance of these simulants to the mobilizing action of the mixer pump jets was not found to adequately correlate with simulant vane shear strength. The data indicate that the simulant cohesion, as quantified by tensile strength, may provide a good measure of mobilization resistance. A single test was done to evaluate whether indexed mixer pump rotation is significantly more effective than the planned continuous oscillation. No significant difference was found in the sludge mobilization caused by these two modes of operation. Two tests were conducted using a clay-based sludge simulant that contained approximately 5 wt% soluble solids. The distance to which the mixer pump jets were effective for this simulant was approximately 50% greater than on similar simulants that did not contain soluble solids. The implication is that sludge dissolution effects may significantly enhance the performance of mixer pumps in some tanks. The development of a means to correlate the magnitude of this effect with waste properties is a direction for future work. Two tests were performed with the goal of determining whether the 1/25-scale sludge mobilization data can be scaled linearly to 1/12-scale. The two 1/25-scale tests were conducted using the same simulant recipe as had been used in previous 1/12-scale tests. The difficulty of matching the 1/25-scale simulants, with those used previously is thought to have adversely affected the results. Further tests are needed to determine whether the data from sludge mobilization tests can be linearly scaled.

1372 (PNL–10466) **Vapor space characterization of waste tank 241-C-105: Results from samples collected on 2/16/94.** Clauss, T.W.; Lucke, R.B.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Jun

1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015405. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from the Hanford waste Tank 241-C-105 (referred to as Tank C-105). Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace. For organic analyses, six SUMMA™ canisters were delivered to WHC on COC 0061 11 on 2/14/94. At the request of WHC, an additional six SUMMA™ canisters were supplied on COC 005127 on 2/16/94. Samples were collected by WHC from the headspace of Tank C-105 through the VSS on 2/16/94, but only three SUMMA™ canisters were returned to PNL using COC 0061 11 on 2/18/94. The canisters were stored in the 326/23B laboratory at ambient (25°C) temperature until the time of the analysis. Analyses described in this report were performed at PNL in the 300 area of the Hanford Reservation. Analytical methods that were used are described in the text. In summary, sorbent traps for inorganic analyses containing sample materials were either weighed (for water analysis) or desorbed with the appropriate aqueous solutions. The aqueous extracts were analyzed either by selective electrode or by ion chromatography (IC). Organic analyses were performed using cryogenic preconcentration followed by gas chromatography/mass spectrometry (GC/MS).

1373 (PNL–10468) **Vapor space characterization of waste tank 241-BY-107: Results from samples collected on 10/26/94.** Clauss, T.W. (and others); Ligotke, M.W.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002222. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from the Hanford waste Tank 241-BY-107 (referred to as Tank BY-107). Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace and ambient air near the tank. The organic analytes for TO-14 compounds were extended to include 15 analytes identified by the Toxicological Review Panel for Tank C-103 and reported in Toxicological Evaluation of Analytes from Tank 241-C-103 PAE-10189. While these analytes are only of toxicological concern for Tank C-103, program management included these analytes for future tank analyses as identified in the fiscal year work plan. This plan is attached to a letter dated 9/30/94 and addressed to Mr. T. J. Kelly of WHC. The plan also requires PNL to analyze for the permanent gases as shown in Table 3.5. The sample job was designated S4077, and samples were collected by WHC on October 26, 1994, using the vapor sampling system (VSS). Sampling devices, including six sorbent trains (for inorganic analyses), and six SUMMA™ canisters (for organic analyses) were supplied to the WHC sampling staff on October 24. Samples were taken (by WHC) from the tank headspace on October 26 and were returned to PNL from the field on November 8. Inorganic (sorbent trap) samples were delivered to PNL on chain of custody (COC) 008071. The SUMMA™ canisters were delivered on COC 008070. Three SUMMA™ canister samples were stored at the PNL 326/23B laboratory pending further instruction from WHC to send them to the Oregon Graduate Institute (OGI) for analysis.

1374 (PNL–10473) **Vapor space characterization of waste tank 241-TY-101 (in situ): Results from samples collected on August 5, 1994. Waste Tank Vapor Program.** Pool, K.H.; Ligotke, M.W.; McVeety, B.D.; McCulloch, M.; Goheen, S.C.; Clauss, T.W.; Lucke, R.B.; Young, J.S.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016041. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-TY-101. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1375 (PNL–10491) **Vapor space characterization of waste tank 241-C-101: Results from samples collected on 9/1/94.** Lucke, R.B. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002229. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from the Hanford waste Tank 241-C-101 (referred to as Tank C-101) and the ambient air collected - 30 ft upwind near the tank and through the VSS near the tank. Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford Company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace and ambient air near the tank. The sample job was designated S4056, and samples were collected by WHC on September 1, 1994, using the vapor sampling system (VSS). The samples were inspected upon delivery to the 326/23B laboratory and logged into PNL record book 55408 before implementation of PNL Technical Procedure PNL-TVP-07. Custody of the sorbent traps was transferred to PNL personnel performing the inorganic analysis and stored at refrigerated ($\leq$ 10°C) temperature until the time of analysis. The canisters were stored in the 326/23B laboratory at ambient (25°C) temperature until the time of the analysis. Access to the 326/23B laboratory is limited to PNL personnel working on the waste-tank safety program. Analyses described in this report were performed at PNL in the 300 area of the Hanford Reservation. Analytical methods that were used are described in the text. In summary, sorbent traps for inorganic analyses containing sample materials were either weighed (for water analysis) or desorbed with the appropriate aqueous solutions (for NH_3, NO_2, and NO analyses). The aqueous extracts were analyzed either by selective electrode or by ion chromatography (IC). Organic analyses were performed using cryogenic preconcentration followed by gas chromatography/mass spectrometry (GC/MS).

1376 (PNL–10495) **Vapor space characterization of waste Tank 241-BY-108: Results from samples collected on 10/27/94.** McVeety, B.D. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001899. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the

Hanford waste storage Tank 241-BY-108 (referred to as Tank BY-108). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Trends in NH_3 and H_2O samples indicated a possible sampling problem. Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, the authors looked for the 40 TO-14 compounds plus an additional 15 analytes. Of these, 17 were observed above the 5-ppbv reporting cutoff. Also, eighty-one organic tentatively identified compounds (TICs) were observed above the reporting cutoff (ca.) 10 ppbv, and are reported with concentrations that are semiquantitative estimates based on internal standard response factors. The nine organic analytes with the highest estimated concentrations are listed in Summary Table 1 and account for approximately 48% of the total organic components in the headspace of Tank BY-108. Three permanent gases, hydrogen (H_2), carbon dioxide (CO_2), and nitrous oxide (N_2O) were also detected. Tank BY-108 is on the Ferrocyanide Watch List.

1377 (PNL–10498) **Vapor space characterization of waste tank 241-C-106: Results from samples collected on February 15, 1994.** McVeety, B.D.; Clauss, T.W.; Young, J.S.; Ligotke, M.W.; Goheen, S.C.; Lucke, R.B.; Pool, K.H.; McCulloch, M.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015772. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-C-106. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1378 (PNL–10499) **Vapor space characterization of waste Tank 241-C-104: Results from samples collected on 2/17/94 and 3/3/94.** Lucke, R.B.; McVeety, B.D.; Clauss, T.W.; Pool, K.H.; Young, J.S.; McCulloch, M.; Ligotke, M.W.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 28p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001898. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-C-104 (referred to as Tank C-104). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Summary Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), sulfur oxides (SO_x), and water vapor (H_2O). Organic compounds were also quantitatively determined. Occupational Safety and Health Administration (OSHA) versatile sampler (OVS) tubes were analyzed for tributyl phosphate. Twenty-four organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 40 standard TO-14 analytes. Of these, two were observed above the 2-ppbv calibrated instrument detection limit. The 10 organic analytes with the highest estimated concentrations are listed in Summary Table 1. These 10 analytes account for approximately 88% of the total organic components in Tank C 104. Tank C-104 is not on any of the Watch Lists.

1379 (PNL–10505) **Vapor space characterization of waste tank 241-BY-110: Results for samples collected on 11/11/94.** Clauss, T.W. (and others); Ligotke, M.W.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015445. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-BY-110 (referred to as Tank BY-110). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2, nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, we looked for the 40 TO-14 compounds plus an additional 15 analytes. Of these, 10 were observed above the 5-ppbv reporting cutoff. Forty-six organic tentatively identified compounds (TICS) were observed above the reporting cutoff of (ca.) 10 ppbv, and are reported with concentrations that are semiquantative estimates based on internal standard response factors. The 10 organic analytes with the highest estimated concentrations are listed and account for approximately 78% of the total organic components in Tank BY-110. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected.

1380 (PNL–10510) **Redox reaction and foaming in nuclear waste glass melting.** Ryan, J.L. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000871. Source: OSTI; NTIS; INIS; GPO Dep.

This document was prepared by Pacific Northwest Laboratory (PNL) and is an attempt to analyze and estimate the effects of feed composition variables and reducing agent variables on the expected chemistry of reactions occurring in the cold cap and in the glass melt in the nuclear waste glass Slurry-fed, joule-heated melters as they might affect foaming during the glass-making process. Numerous redox reactions of waste glass components and potential feed additives, and the effects of other feed variables on these reactions are reviewed with regard to their potential effect on glass foaming. A major emphasis of this report is to examine the potential positive or negative aspects of adjusting feed with formic acid as opposed to other feed modification techniques including but not limited to use of other reducing agents. Feed modification techniques other than the use of reductants that should influence foaming behavior include control of glass melter feed pH through use of nitric acid. They also include partial replacement of sodium salts by lithium salts. This latter action (b) apparently lowers glass viscosity and raises surface tension. This replacement should decrease foaming by decreasing foam stability.

1381 (PNL–10511) **Laboratory studies of gas generation and potential for tank wall corrosion during blending of high-level wastes at the West Valley Demonstration Project.** Gray, W.J.; Westerman, R.E. Pacific Northwest Lab., Richland, WA (United States). May 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012764. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory experiments were conducted to simulate the transfer of acidic THOREX waste from Tank 8D-4 into the alkaline PUREX waste in Tank 8D-2 at West Valley. The purpose of the experiments was to explore means of minimizing the production of nitric oxide (NO) gas during mixing of the two wastes and to assess the potential for the gas to further react in the vapor space possibly leading to enhanced corrosion of the tank walls. Forty one THOREX/PUREX mixing tests were conducted to explore the effects of stirring rate, pH, THOREX addition rate, THOREX or PUREX dilution, and temperature. The two most important criteria for minimizing NO production were to maintain some degree of agitation and the keep the pH in the PUREX high, preferably >12. Steel corrosion tests were performed in the presence of low partial pressures of NO_2 and liquid water or water vapor. The NO_2 (from oxidation of NO in the vapor space) concentrations were representative of those derived from the THOREX/PUREX mixing tests. It was concluded that no significant corrosion of the tank walls would be expected under the anticipated THOREX/PUREX mixing conditions if the exposure was short (<100 days).

1382 (PNL–10514) **Assessment of Tank 241-C-106 temperature response indications.** Eyler, L.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010425. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents an assessment of waste tank 241-C-106 temperature response indications. The results are obtained through evaluation of historical data for FIC surface level data and temperature indication data from thermocouples in risers 8 and 14, contained in the SACS and TMACS databases. Computer analysis is used to augment observations and conclusions about hypothesized mechanisms present in the tank that could explain the data observations. From the historical temperature indications of risers 8 and 14 (neglecting the ventilation outages), several general observational conclusions are drawn that support hypotheses explaining more recently observed behavior.

1383 (PNL–10517) **NCAW feed chemistry: Effect of starting chemistry on melter offgas and iron redox.** Smith, P.A.; Vienna, J.D.; Merz, M.D. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008005. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory (PNL) Vitrification Technology Development (PVTD) program has been established to develop technology to support immobilization of selected Hanford wastes. The effort of the PVTD program is directed by the U.S. Department of Energy (DOE). This report is part of the effort and focuses on the effect of starting waste chemistry on the vitrification process. The objective of the investigation was the evaluation of the effect of starting chemistry on the cold cap behavior in the vitrification of simulated neutralized current acid waste (NCAW). In addition this investigation provides an initial laboratory investigation of the cold cap and method for evaluation of alternate reductants.

1384 (PNL–10564) **Evaluation of Hanford high level waste vitrification chemistry for an NCAW simulant – FY 1994: Potential exothermic reactions in the presence of formic acid, glycolic acid, and oxalic acid.** Sills, J.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016774. Source: OSTI; NTIS; INIS; GPO Dep.

A potential for an uncontrollable exothermic reaction between nitrate and organic salts during preparation of a high level waste melter feed has been identified. In order to examine this potential more closely, the thermal behavior of simulated neutralized current acid waste (NCAW) treated with various organic reductants was studied. Differential scanning calorimetry (DSC) measurements were collected on simulated waste samples and their supernates treated with organics. Organic reductants used were formic acid, glycolic acid, and oxalic acid. For comparison, samples of untreated simulant and untreated simulant with added noble metals were tested. When heated, untreated simulant samples both with and without noble metals showed no exothermic behavior. All of the treated waste simulant samples showed exothermic behavior. Onset temperatures of exothermic reactions were 120 C to 210 C. Many onset temperatures, particularly those for formic acid treated samples, are well below 181 C, the estimated maximum steam coil temperature (considered to be a worst case maximum temperature for chemical process tank contents). The enthalpies of the reactions were -180×10^{-3} J/Kg supernate (−181 J/g) for the oxalic acid treated simulant supernate to $-1,150 \times 10^{-3}$ J/Kg supernate (−1,153 J/g) for the formic acid treated simulant supernate.

1385 (PNL–10570) **External corrosion of tanks 8D-1 and 8D-2. Final report.** Mackey, D.B.; Westerman, R.E. Pacific Northwest Lab., Richland, WA (United States). May 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96004518. Source: OSTI; NTIS; INIS; GPO Dep.

Tanks 8D-1 and 8D-2 at the West Valley Nuclear Services (WVNS) site, West Valley, New York, rest on layers of perlite brick contained within steel pans. The pans tend to collect water, which can contact the tanks directly and which also can be "wicked" to the external surfaces of the tank through the perlite brick. The presence of air in the tank vault is conducive to the formation of oxygen concentration cells, which can promote localized corrosion of the carbon steel tank wall. Pacific Northwest Laboratory conducted an experiment to estimate the extent to which the external surfaces of the tanks could have corroded in the 30 years since their construction. Specimens of carbon steel, similar to that used in the tank construction, were partially embedded in an upright position in particulate perlite in closed containers. The water line in the containers.was maintained at two levels: above the perlite level (high water level tests) and below the bottoms of the specimens (low water level tests). The water used in the tests was obtained from the pan of tank 8D-1. The containers were maintained in an aerated condition. Specimens were examined after 3-, 6-, 12-, 18-, 24-, and 30-month exposures.

1386 (PNL–10582) **Fiscal year 1994 1/25-scale sludge mobilization testing.** Powell, M.R. (Pacific Northwest Lab., Richland, WA (United States)); Gates, C.M.;

Hymas, C.R.; Sprecher, M.A.; Morter, N.J. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 256p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016773. Source: OSTI; NTIS; INIS; GPO Dep.

There are 28 one-million-gallon double-shell radioactive waste tanks on the Hanford Reservation in southeastern Washington State. The waste in these tanks was generated during processing of nuclear materials. Solids-laden slurries were placed into many of the tanks. Over time, the waste solids have settled to form a layer of sludge in the bottom of these tanks. The sludge layer thickness varies from tank to tank with some having only a few centimeters or no sludge up to some tanks which have about 4.5 m (15 ft) of sludge. It is planned that the waste will be removed from these tanks as part of the overall Hanford site cleanup efforts. Jet mixer pumps are to be placed into the tanks to stir up (mobilize) the sludge and form a uniform slurry suitable for pumping to downstream processing facilities. These mixer pumps use powerful jets of tank fluid directed horizontally out of two, diametrically opposed nozzles near the tank bottom. These fluid jets impinge upon the sludge and stir it up. The amount of sludge mobilized by the mixer pump jets depends not only on the jet properties, but also on the ability of the sludge to resist the jets. It is the goal of the work described in this document to develop the ability to predict how much sludge will be mobilized by the mixer pumps based on the size and velocity of the mixer pump jets and the physical and chemical properties of the tank sludge.

1387 (PNL–10584) **Vapor space characterization of waste Tank 241-SX-106: Results from samples collected on 3/24/95.** Klinger, G.S. (and others); Clauss, T.W.; Litgotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002065. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-SX-106 (referred to as Tank SX-106). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 4 were observed above the 5-ppbv reporting cutoff. Three tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 7 organic analytes identified are listed in Table 1 and account for approximately 100% of the total organic components in Tank SX-106. Carbon dioxide (CO_2) was the only permanent gas detected. Tank SX-106 is on the Ferrocyanide Watch List.

1388 (PNL–10587) **Vapor space characterization of waste tank 241-S-102: Results from samples collected on 3/14/95.** Pool, K.H. (and others); McVeety, B.D.; Clauss, T.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001138. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-S-102 (referred to as Tank S-102). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 11 were observed above the 5-ppbv reporting cutoff. Eleven tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 95% of the total organic components in Tank S-102. Two permanent gases, hydrogen (H_2) and nitrous oxide (N_2O), were also detected.

1389 (PNL–10588) **Vapor space characterization of waste tank 241-U-111: Results from samples collected on February 28, 1995. Waste Tank Vapor Program.** Clauss, T.W.; Pool, K.H.; McVeety, B.D.; Bredt, O.P.; Goheen, S.C.; Ligotke, M.W.; Lucke, R.B.; Klinger, G.S.; Fruchter, J.S. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016042. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-U-111. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1390 (PNL–10589) **Tank Waste Remediation System Guide.** Robershotte, M.A.; Dirks, L.L.; Seaver, D.A.; Bothers, A.J.; Madden, M.S. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015134. Source: OSTI; NTIS; INIS; GPO Dep.

The scope, number and complexity of Tank Waste Remediation System (TWRS) decisions require an integrated, consistent, and logical approach to decision making. TWRS has adopted a seven-step decision process applicable to all decisions. Not all decisions, however, require the same degree of rigor/detail. The decision impact will dictate the appropriate required detail. In the entire process, values, both from the public as well as from the decision makers, play a key role. This document concludes with a general discussion of the implementation process that includes the roles of concerned parties.

1391 (PNL–10593) **Vapor space characterization of waste Tank 241-U-106: Results from samples collected on March 7, 1995. Waste Tank Vapor Program.** Klinger, G.S. (and others); Lucke, R.B.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016043. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-U-106 (referred to as Tank U-106). The results described here were obtained to support safety and toxicological evaluations. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O) Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. The NH_3 concentration was 16% greater than that determined from an ISS sample obtained in August 1994; the H_2O concentration was about 10% less. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 5 were observed in two or more canisters above the 5-ppbv reporting cutoff. Eleven organic tentatively identified compounds (TICS) were observed in two or more canisters above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations account for approximately 90% of the total organic components in Tank U-106. Three permanent gases, nitrous oxide (N_2O), hydrogen (H_2) and carbon dioxide (COD were also detected.

1392 (PNL–10594) **Vapor space characterization of waste tank 241-TX-105: Results from samples collected on December 20, 1994. Waste Tank Vapor Project.** Klinger, G.S. (and others); Ligotke, M.W.; Lucke, R.B. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016040. Source: OSTI; NTIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-TX-105. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1393 (PNL–10595) **Waste Tank Vapor Program: Vapor space characterization of Waste Tank 241-T-107. Results from samples collected on January 18, 1995.** Pool, K.H. (and others); Lucke, R.B.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016039. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-T-107 (referred to as Tank T-107). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, I was observed above the 5-ppbv reporting cutoff. Six organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The estimated concentration of all 7 organic analytes observed in the tank headspace are listed in Table I and account for approximately 100% of the total organic components in Tank T-107. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected in the tank-headspace samples.

1394 (PNL–10597) **Vapor space characterization of waste tank 241-TY-103 (in situ): Results from samples collected on August 5, 1994.** Pool, K.H. (and others); McVeety, B.D.; Clauss, T.W. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015813. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-TY-103. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1395 (PNL–10599) **Vapor space characterization of waste Tank 241-BY-111: Results from samples collected on November 15, 1994.** Lucke, R.B. (and others); Ligotke, M.W.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015750. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes results of the analyses of tank-headspace samples taken from the Hanford waste Tank 241-BY-111 (referred to as Tank By-111). Pacific Northwest Laboratory (PNL) contracted with Westinghouse Hanford company (WHC) to provide sampling devices and to analyze inorganic and organic analytes collected from the tank headspace and ambient air near the tank. The target analytes for TO- 14 compounds were extended to include 14 analytes identified by the Toxicological Review Panel for Tank C-103 and reported by Mahlum et al. (1994). Program management included these analytes for future tank analyses as identified in the fiscal year work plan. This plan is attached to a letter dated 9/30/94 and addressed to Mr. T.J. Kelly of WHC. The plan also requires PNL to analyze for the permanent gases as shown in Table 3.7. The sample job was designated S4083, and samples wee collected by WHC on November 16, 1994, using the vapor sampling system (VSS). The results of the analyses are expected to be used to estimate the potential toxicity of tank-headspace gas as described in Data Quality Objectives for Generic In-Tank Health and Safety Vapor Issue Resolution, WHC-SD-WM-DQO-002, Rev. 0.

1396 (PNL–10625) **Vapor space characterization of waste tank 241-TX-118: Results from samples collected on 12/16/94.** Lucke, R.B. (and others); Ligotke, M.W.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001136. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-TX-118 (referred to as Tank TX-118). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 3 were observed above the 5-ppbv reporting cutoff. Twenty three organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv, and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 84% of the total organic components in Tank TX-118. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected.

1397 (PNL–10637) **Identification of physical properties for the retrieval data quality objective process.** Gates, C.M.; Beckette, M.R. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015443. Source: OSTI; NTIS; INIS; GPO Dep.

This activity supports the retrieval data quality objective (DQO) process by identifying the material properties that are important to the design, development, and operation of retrieval equipment; the activity also provides justification for characterizing those properties. These properties, which control tank waste behavior during retrieval operations, are also critical to the development of valid physical simulants for designing retrieval equipment. The waste is to be retrieved in a series of four steps. First, a selected retrieval technology breaks up or dislodges the waste into subsequently smaller pieces. Then, the dislodged waste is conveyed out of the tank through the conveyance line. Next, the waste flows into a separator unit that separates the gaseous phase from the liquid and solid phases. Finally, a unit may be present to condition the slurried waste before transporting it to the treatment facility. This document describes the characterization needs for the proposed processes to accomplish waste retrieval. Baseline mobilization technologies include mixer pump technology, sluicing, and high-pressure water-jet cutting. Other processes that are discussed in this document include slurry formation, pneumatic conveyance, and slurry transport. Section 2.0 gives a background of the DQO process and the different retrieval technologies. Section 3.0 provides the mechanistic descriptions and material properties critical to the different technologies and processes. Supplemental information on specific technologies and processes is provided in the appendices. Appendix A contains a preliminary sluicing model, and Appendices B and C cover pneumatic transport and slurry transport, respectively, as prepared for this document. Appendix D contains sample calculations for various equations.

1398 (PNL–10642) **Vapor space characterization of waste tank 241-BX-104: Results from samples collected on 12/30/94.** Pool, K.H. (and others); Ligotke, M.W.; McVeety, B.D. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001134. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-BX-104 (referred to as Tank BX-104). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained. for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SOx) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 13 were observed above the 5-ppbv reporting cutoff. Sixty-six organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes, with the highest estimated concentrations are listed in Table 1 and account for approximately 70% of the total organic components in Tank BX-104. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected.

1399 (PNL–10643) **Vapor space characterization of waste tank 241-C-112: Results from samples collected on 8/11/94.** Ligotke, M.W. (and others); McVeety, B.D.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001137. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-C-112 (referred to as Tank C-112). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. Organic compounds were also quantitatively determined. Five organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, we looked for the 40 standard TO-14 analytes. None were observed above the 2-ppbv detection limit. The five organic analytes with the highest concentration are listed in Table 1 and account for 100% of the total organic components in Tank C-112.

1400 (PNL–10644) **Vapor space characterization of waste tank 241-TY-103: Results from samples collected on 4/11/95.** Ligotke, M.W. (and others); Clauss, T.W.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001135. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-TY-103 (referred to as Tank TY-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 16 were observed above the 5-ppbv reporting cutoff. Sixteen tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 95% of the total organic components in Tank TY-103. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected.

1401 (PNL–10645) **Waste Tank Vapor Program: Vapor space characterization of waste tank 241-C-110. Results from samples collected on August 18, 1994.** Ligotke, M.W. (and others); Clauss, T.W.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001198. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 24l-C-110. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1402 (PNL–10646) **Waste Tank Vapor Program: Vapor space characterization of waste tank 241;C-102: Results from samples collected on August 23, 1994.** Klinger, G.S. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001417. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-C-102. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1403 (PNL–10647) **Vapor space characterization of Waste Tank 241-TY-104: Results from samples collected on 4/27/95.** Klinger, G.S. (and others); Olsen, K.B.; Clauss, T.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96002032. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-TY-104 (referred to as Tank TY-104). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 8 were observed above the 5-ppbv reporting cutoff. Five tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 94% of the total organic components in Tank TY-104. Nitrous oxide (N_2O) was the only permanent gas detected in the tank-headspace samples. Tank TY-104 is on the Ferrocyanide Watch List.

1404 (PNL–10648) **Waste Tank Vapor Program: Vapor space characterization of waste tank 241-T-111. Results from samples collected on January 20, 1995.** Klinger, G.S.; Clauss, T.W.; Ligotke, M.W.; Pool, K.H.; McVeety, B.D.; Olsen, K.B.; Bredt, O.P.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001150. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the inorganic and organic analysis that was performed on samples from the headspace of Hanford waste tank 241-T-111. The results described were obtained to support the safety and toxicological evaluations. A summary of the results for the inorganic and organic analytes is included, as well as, a detailed description of the results which appears in the text.

1405 (PNL–10650) **Tanks focus area multiyear program plan - FY96-FY98.** Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016637. Source: OSTI; NTIS; INIS; GPO Dep.

The Tanks Focus Area (TFA) Multiyear Program Plan (MYPP) presents the recommended TFA technical program. The recommendation covers a 3-year funding outlook (FY96-FY98), with an emphasis on FY96 and FY97. In addition to defining the recommended program, this document also describes the processes used to develop the program, the implementation strategy for the program, the references used to write this report, data on the U.S. Department of Energy (DOE) tank site baselines, details on baseline assumptions and the technical elements, and a glossary.

1406 (PNL–10655) **Statistical analysis of shard and canister glass correlation test.** Pulsipher, B. Pacific Northwest National Lab., Richland, WA (United States). Dec 1990. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96012315. Source: OSTI; NTIS; GPO Dep.

The vitrification facility at West Valley, New York will be used to incorporate nuclear waste into a vitrified waste form. Waste Acceptance Preliminary Specifications (WAPS) will be used to determine the acceptability of the waste form product. These specifications require chemical characterization of the waste form produced. West Valley Nuclear Services (WVNS) intends to characterize canister contents by obtaining shard samples from the top of the canisters prior to final sealing. A study was conducted to determine whether shard samples taken from the top of canisters filled with vitrified nuclear waste could be considered representative and therefore used to characterize the elemental composition of the entire canister contents. Three canisters produced during the SF-12 melter run conducted at WVNS were thoroughly sampled by core drilling at several axial and radial locations and by obtaining shard samples from the top of the canisters. Chemical analyses were performed and the resulting data were statistically analyzed by Pacific

Northwest Laboratory (PNL). If one can assume that the process controls employed by WVNS during the SF-12 run are representative of those to be employed during future melter runs, shard samples can be used to characterize the canister contents. However, if batch-to-batch variations cannot be controlled to the acceptable levels observed from the SF-12 data, the representativeness of shard samples will be in question. The estimates of process and within-canister variations provided herein will prove valuable in determining the required frequency and number of shard samples to meet waste form qualification objectives.

1407 (PNL–10661) **Bubble retention in synthetic sludge: Testing of alternative gas retention apparatus.** Rassat, S.D.; Gauglitz, P.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016635. Source: OSTI; NTIS; INIS; GPO Dep.

Several of the underground storage tanks currently used to store waste at Hanford have been placed on the Flammable Gas Watch List, because the waste is either known or suspected to generate, store, and episodically release flammable gases. The objective of this experimental study is to develop a method to measure gas bubble retention in simulated tank waste and in diluted simulant. The method and apparatus should (1) allow for reasonably rapid experiments, (2) minimize sample disturbance, and (3) provide realistic bubble nucleation and growth. The scope of this experimental study is to build an apparatus for measuring gas retention in simulated waste and to design the apparatus to be compatible with future testing on actual waste. The approach employed for creating bubbles in sludge involves dissolving a soluble gas into the supernatant liquid at an elevated pressure, recirculating the liquid containing the dissolved gas through the sludge, then reducing the pressure to allow bubbles to nucleate and grow. Results have been obtained for ammonia as the soluble gas and SY1-SIM-91A, a chemically representative simulated tank waste. In addition, proof-of-principle experiments were conducted with both ammonia and CO_2 as soluble gases and sludge composed of 90-micron glass beads. Results are described.

1408 (PNL–10681) **The behavior, quantity, and location of undissolved gas in Tank 241-SY-101.** Brewster, M.E.; Gallagher, N.B.; Hudson, J.D.; Stewart, C.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002822. Source: OSTI; NTIS; GPO Dep.

Mitigation of episodic flammable gas releases from Hanford Waste Tank 241-SY-101 was accomplished in July 1993 with the installation of a mixer pump that prevents gas retention. But is has not been possible until recently to measure the effects of mixing on the waste or how much gas remains and where it is located. Direct measurements of the void fraction and rheology of the mixed waste by the void fraction instrument (VFI) and ball rheometer along with previous data provide estimates of the location, quantity, and behavior of undissolved gas in the tank. This report documents the compilation and integration of the information that enables this understanding.

1409 (PNL–10683) **Thermal modeling of tanks 241-AW-101 and 241-AN-104 with the TEMPEST code.** Antoniak, Z.I.; Recknagle, K.P. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95016038. Source: OSTI; NTIS; INIS; GPO Dep.

The TEMPEST code was exercised in a preliminary study of double-shell Tanks 241 -AW-101 and 241-AN-104 thermal behavior. The two-dimensional model used is derived from our earlier studies on heat transfer from Tank 241-SY-101. Several changes were made to the model to simulate the waste and conditions in 241-AW-101 and 241-AN-104. The nonconvective waste layer was assumed to be 254 cm (100 in.) thick for Tank 241-AW-101, and 381 cm (150 in.) in Tank 241-AN-104. The remaining waste was assumed, for each tank, to consist of a convective layer with a 7.6-cm (3-inch) crust on top. The waste heat loads for 241-AW-101 and 241-AN-104 were taken to be 10 kW (3.4E4 Btu/hr) and 12 kW (4.0E4 Btu/hr), respectively. Present model predictions of maximum and convecting waste temperatures are within 1.7°C (3°F) of those measured in Tanks 241-AW-101 and 241-AN-104. The difference between the predicted and measured temperature is comparable to the uncertainty of the measurement equipment. These models, therefore, are suitable for estimating the temperatures within the tanks in the event of changing air flows, waste levels, and/or waste configurations.

1410 (PNL–10694) **Bayesian methods for the combination of core sampling data with historical models for tank characterization.** York, J.C. (Pacific Northwest Lab., Richland, WA (United States)); Remund, K.M.; Chen, G.; Simpson, B.C.; Brown, T.M. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017600. Source: OSTI; NTIS; INIS; GPO Dep.

A wide variety of information is available on the contents of the nuclear waste tanks at the Hanford site. This report describes an attempt to combine several sources of information using a Bayesian statistical approach. This methodology allows the combination of multiple disparate information sources. After each source of information is summarized in terms of a probability distribution function (pdf), Bayes' theorem is applied to combine them. This approach has been applied to characterizing tanks B-110, B-111, and B-201. These tanks were chosen for their simple waste matrices: B-110 and B-111 contain mostly 2C waste, and B-201 contains mostly 224 waste. Additionally,, the results of this analysis axe used to make predictions for tank T-111 (which contains both 2C and 224 waste). These predictions are compared to the estimates based on core samples from tank T-111.

1411 (PNL–10697) **Ferrocyanide tank safety program: Cesium uptake capacity of simulated ferrocyanide tank waste. Final report.** Burgeson, I.E.; Bryan, S.A. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000750. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to determine the capacity for ^{137}Cs uptake by mixed metal ferrocyanides present in Hanford Site waste tanks, and to assess the potential for aggregation of these ^{137}Cs-exchanged materials to form "hot-spots" in the tanks. This research, performed at Pacific Northwest Laboratory (PNL) for Westinghouse Hanford Company, stems from concerns regarding possible localized radiolytic heating within the tanks. After ferrocyanide was added to 18 high-level waste tanks in the 1950s, some of the ferrocyanide tanks received considerable quantities of saltcake waste that was rich in ^{137}Cs. If radioactive cesium was exchanged and concentrated by the nickel ferrocyanide present in the tanks, the associated heating could cause tank temperatures to rise above the safety limits specified for the ferrocyanide-containing tanks, especially if the supernate in the tanks is pumped out and the waste becomes drier.

1412 (PNL–10702) **Vapor space characterization of Waste Tank 241-U-105: Results from samples collected on 2/24/95.** Pool, K.H. (Pacific Northwest Lab., Richland, WA (United States)); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002030. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-U-105 (referred to as Tank U-105). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, six were observed above the 5-ppbv reporting cutoff. Three tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. All nine of the organic analytes identified are listed in Table 1 and account for 100% of the total organic components in Tank U-105. Nitrous oxide (N_2O) was the only permanent gas detected in the tank-headspace sample. Tank U-105 is on the Hydrogen Watch List.

1413 (PNL–10703) **Vapor space characterization of waste Tank 241-BY-103: Results from samples collected on 11/1/94.** McVeety, B.D. (and others); Klinger, G.S.; Clauss, T.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 29p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001810. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-BY-103 (referred to as Tank BY-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Trends in NH_3 and H_2O samples indicated a possible minor sampling problem. Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for target organic analytes, 39 TO-14 compounds, plus an additional 14 analytes. Of these, four were observed above the 5-ppbv reporting cutoff. Fourteen organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv, and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 88% of the total organic components in Tank BY-103. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected in the tank headspace. Carbon monoxide (CO) and carbon dioxide (CO_2) were detected in the ambient air sample. Tank BY-103 is on the Ferrocyanide Watch List.

1414 (PNL–10704) **Vapor space characterization of waste Tank 241-B-103: Results from samples collected on 2/8/95.** Ligotke, M.W. (and others); Pool, K.H.; Lucke, R.B. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001905. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-B-103 (referred to as Tank B-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, five were observed above the 5-ppbv reporting cutoff. Twenty-six organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv, and are reported with concentrations that are semiquantitative estimates based on internal standard response factors. Twenty-three TICs were measured in two or more SUMMA™ canisters. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 66% of the total organic components in Tank BB-103. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected. Tank B-103 is on the Organic Watch List.

1415 (PNL–10706) **Vapor space characterization of waste Tank 241-TY-101: Results from samples collected on 4/6/95.** Klinger, G.S.; Clauss, T.W.; Ligotke, M.W.; Pool, K.H.; McVeety, B.D.; Olsen, K.B.; Bredt, O.P.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002063. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-TY-101 (referred to as Tank TY-101). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Off these, 5 were observed above the 5-ppbv reporting cutoff. One tentatively identified compound (TIC) was observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The six organic analyses identified are listed in Table 1 and account for approximately 100% of the total organic components in Tank TY-101. Two permanent gases, carbon dioxide (CO_2) and nitrous oxide (N_2O), were also detected. Tank TY-101 is on the Ferrocyanide Watch List.

1416 (PNL–10712) **Washing and caustic leaching of Hanford tank sludges: Results of FY 1995 studies.** Rapko, B.M.; Lumetta, G.J.; Wagner, M.J. Pacific Northwest Lab., Richland, WA (United States). 11 Aug 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017592. Source: OSTI; NTIS; INIS; GPO Dep.

During the past few years, the primary mission at the US Department of Energy's Hanford Site has changed from producing plutonium to environmental restoration. Large volumes of high-level radioactive wastes (HLW), generated during past Pu production and other operations, are stored in underground tanks on site. The current plan for remediating the Hanford tank farms consists of waste retrieval, pretreatment, treatment (immobilization), and disposal. The HLW will be immobilized in a borosilicate glass matrix; the resulting glass canisters will then be disposed of in a geologic repository. Because of the expected high cost of HLW immobilization and disposal, pretreatment processes will be implemented to reduce the volume of borosilicate glass produced in processing the tank wastes. This document describes sludge washing and caustic leaching tests conducted in FY 1995 at the Pacific Northwest Laboratory (PNL) at the request of Westinghouse Hanford Company. These tests were performed using sludges from seven Hanford waste tanks – B-111, BX-107, C-103, S-104, SY-103, T-104, and T-111. The primary and secondary types of waste stored in each of these tanks are given in Table 1. 1. The data collected in this effort will be used to support the March 1998 Tri-Party Agreement decision on the extent of pretreatment to be performed on the Hanford tank sludges (Ecology, EPA, and DOE 1994).

1417 (PNL–10713) **Ferrocyanide safety project ferrocyanide aging studies FY 1995 annual report.** Lilga, M.A. (and others); Alderson, E.V.; Hallen, R.T. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001342. Source: OSTI; NTIS; INIS; GPO Dep.

This annual report gives the results of the work conducted by the Pacific Northwest Laboratory in FY 1995 on Task 3 of the Ferrocyanide Safety Project, Ferrocyanide Aging Studies. Aging refers to the dissolution and hydrolysis of simulated Hanford ferrocyanide waste in alkaline aqueous solutions by radiolytic and chemical means. The ferrocyanide simulant primarily used in these studies was dried In-Farm-1B, Rev. 7, prepared by Westinghouse Hanford Company to simulate the waste generated when the In-Farm flowsheet was used to remove radiocesium from waste supernates in single-shell tanks at the Hanford Site. In the In-Farm flowsheet, nickel ion and ferrocyanide anion were added to waste supernates to precipitate sodium nickel ferrocyanide, $Na_2NiFe(CN)_6$, and co-precipitate radiocesium. Once the radiocesium was removed, supernates were pumped from the tanks, and new wastes from cladding removal processes or from evaporators were added. These new wastes were typically highly caustic, having hydroxide ion concentrations of over 1 M and as high as 4 M. The Aging Studies task is investigating reactions this caustic waste may have had with the precipitated ferrocyanide waste in a radiation field. In previous Aging Studies research, $Na_2NiFe(CN)_6$ in simulants was shown to dissolve in basic solutions, forming insoluble $Ni(OH)_2$ and soluble $Na_4Fe(CN)_6$. The influence on solubility of base strength, sodium ion concentration, anions, and temperature was previously investigated. The results may indicate that even ferrocyanide sludge that did not come into direct contact with highly basic wastes may also have aged significantly.

1418 (PNL–10723) **Solid-phase characterization in flammable-gas-tank sludges by electron microscopy.** Liu, J.; Pederson, L.R.; Qang, L.Q. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001362. Source: OSTI; NTIS; INIS; GPO Dep.

The crystallinity, morphology, chemical composition, and crystalline phases of several Tank 241-SY-101 (hereinafter referred to as SY-101) and Tank 241-SY-103 (hereinafter referred to as SY-103) solid samples were studied by transmission electron microscopy (TEM), electron energy dispersive spectroscopy (EDS), and electron diffraction. The main focus is on the identification of aluminum hydroxide thought to be present in these tank samples. Aluminum hydroxide was found in SY-103, but not in SY-101. This difference can be explained by the different OH/Al ratios found in the two tank samples: a high OH/Al ratio in SY-101 favors the formation of sodium aluminate, but a low OH/Al ratio in SY-103 favors aluminum hydroxide. These results were confirmed by a magnetic resonance study on SY-101 and SY-103 simulant. The transition from aluminum hydroxide to sodium aluminate occurs at an OH/Al molar ratio of 3.6. It is believed that the study of $Al(OH)_3$ was not affected by sample preparation because all $Al(OH)_3$ is in the solid form according to the NMR experiments. There is no $Al(OH)_3$ in the liquid. It is, therefore, most likely that the observation of $Al(OH)_3$ is representative of the real sludge sample, and is not affected by drying. Similar conclusions also apply to other insoluble phases such as iron and chromium.

1419 (PNL–10725) **Scoring methods and results for qualitative evaluation of public health impacts from the Hanford high-level waste tanks. Integrated Risk Assessment Program.** Buck, J.W.; Gelston, G.M.; Farris, W.T. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001200. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this analysis is to qualitatively rank the Hanford Site high-level waste (HLW) tanks according to their potential public health impacts through various (groundwater, surface water, and atmospheric) exposure pathways. Data from all 149 single-shell tanks (SSTs) and 23 of the 28 double-shell tanks (DSTs) in the Tank Waste Remediation System (TWRS) Program were analyzed for chemical and radiological carcinogenic as well as chemical noncarcinogenic health impacts. The preliminary aggregate score (PAS) ranking system was used to generate information from various release scenarios. Results based on the PAS ranking values should be considered relative health impacts rather than absolute risk values.

1420 (PNL–10729) **Vapor space characterization of Waste Tank 241-U-107: Results from samples collected on 2/17/95.** McVeety, B.D. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002027. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-U-107 (referred to as Tank U-107). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 10 were observed above the 5-ppbv reporting cutoff. Sixteen organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv, and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 88% of the total organic components in Tank U-107. Nitrous oxide (N_2O) was the only permanent gas detected in the tank-headspace samples. Tank U-107 is on the Organic and the Hydrogen Watch Lists.

1421 (PNL–10730) **Vapor space characterization of Waste Tank 241-U-106 (in situ): Results from samples collected on 8/25/94.** Ligotke, M.W. (and others); Lucke, R.B.; Pool, K.H. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002028. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-U-106 (referred to as Tank U-106). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not performed. In addition, the authors looked for the 39 TO-14 compounds plus an additional 14 target analytes. Of these, six were observed above the 5-ppbv reporting cutoff. Ten organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv in two or more of the three samples collected and are reported with concentrations that are semiquantitative estimates based on internal standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 89% of the total organic components in Tank U-106. Methyl isocyanate, a compound of possible concern in Tank U-106, was not detected. Tank U-106 is on the Organic Watch List.

1422 (PNL–10732) **Vapor space characterization of waste Tank 241-TX-118 (in situ): Results from samples collected on 9/7/94.** Thomas, B.L.; Clauss, T.W.; Ligotke, M.W.; Pool, K.H.; McVeety, B.D.; Olsen, K.B.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001906. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-TX-118 (referred to as Tank TX-118). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), hydrogen cyanide (CHN), and water (H_2O). Sampling for sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 13 analytes. Hexane, normally included in the additional analytes, was removed because a calibration standard was not available during analysis of Tank TX-118 SUMMA™ canisters. Of these, 12 were observed above the 5-ppbv reporting cutoff. Fourteen tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 86% of the total organic components in Tank TX-118. Permanent gas analysis was not conducted on the tank-headspace samples. Tank TX-118 is on both the Ferrocyanide and Organic Watch List.

1423 (PNL–10733) **Vapor space characterization of Waste Tank 241-S-111: Results from samples collected on 3/21/95.** Klinger, G.S. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002031. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-S-111 (referred to as Tank S-111). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, seven were observed above the 5-ppbv reporting cutoff. Five tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 98% of the total organic components in Tank S-111. Two permanent gases, hydrogen (H_2) and nitrous oxide (N_2O), were also detected. Tank S-111 is on the Hydrogen Watch List.

1424 (PNL–10736) **Vapor space characterization of waste Tank 241-C-107: Results from samples collected on 9/29/94.** Pool, K.H. (and others); Clauss, T.W.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002066. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-C-107 (referred to as Tank C-107). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for sulfur oxides (SO_x) was not requested. Organic compounds were also quantitatively determined. Twenty organic tentatively identified compounds (TICs) were observed above the detection limit of (ca.) 10 ppbv, but standards for most of these were not available at the time of analysis, and the reported concentrations are semiquantitative estimates. In addition, the authors looked for the 55 TO-14 extended analytes. Of these, 3 were observed above the 5-ppbv detection limit. The 10 organic analytes with the highest estimated concentrations are listed in Summary Table 1 and account for approximately 96% of the total organic components in Tank C-107. Two permanent gases, carbon dioxide and nitrous oxide, were also detected.

1425 (PNL--10737) **Vapor space characterization of Waste Tank 241-TY-104 (in situ): Results from samples collected on 8/5/94.** Ligotke, M.W. (and others); Pool, K.H.; Lucke, R.B. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002029. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from in situ samples obtained from the headspace of the Hanford waste storage Tank 241-TY-104 (referred to as Tank TY-104). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not performed. In addition, the authors looked for the 39 TO-14 compounds plus an additional 14 analytes. Of these, eight were observed above the 5-ppbv reporting cutoff. Twenty-four organic tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 86% of the total organic components in Tank TY-104. Tank TY-104 is on the Ferrocyanide Watch List.

1426 (PNL--10740) **Gas bubble retention and its effect on waste properties: Retention mechanisms, viscosity, and tensile and shear strengths.** Gauglitz, P.A. (and others); Rassat, S.D.; Powell, M.R. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017707. Source: OSTI; NTIS; INIS; GPO Dep.

Several of the underground nuclear storage tanks at Hanford have been placed on a flammable gas watch list, because the waste is either known or suspected to generate, store, and episodically release flammable gases. Because retention and episodic release of flammable gases from these tanks containing radioactive waste slurries are critical safety concerns, Pacific Northwest Laboratory (PNL) is studying physical mechanisms and waste properties that contribute to the episodic gas release from these storage tanks. This study is being conducted for Westinghouse Hanford Company as part of the PNL Flammable Gas project. Previous investigations have concluded that gas bubbles are retained by the slurry or sludge that has settled at the bottom of the tanks; however, the mechanisms responsible for the retention of these bubbles are not well understood. Understanding the rheological behavior of the waste, particularly of the settled sludge, is critical to characterizing the tendency of the waste to retain gas bubbles and the dynamics of how these bubbles are released from the waste. The presence of gas bubbles is expected to affect the rheology of the sludge, specifically its viscosity and tensile and shear strengths, but essentially no literature data are available to assess the effect of bubbles. The objectives of this study were to conduct experiments and develop theories to understand better how bubbles are retained by slurries and sludges, to measure the effect of gas bubbles on the viscosity of simulated slurries, and to measure the effect of gas bubbles on the tensile and shear strengths of simulated slurries and sludges. In addition to accomplishing these objectives, this study developed correlations, based on the new experimental data, that can be used in large-scale computations of waste tank physical phenomena.

1427 (PNL--10749) **Hanford single-shell tank grouping study.** Remund, K.M.; Anderson, C.M.; Simpson, B.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001887. Source: OSTI; NTIS; INIS; GPO Dep.

A tank grouping study has been conducted to find Hanford single-shell tanks with similar waste properties. The limited sampling resources of the characterization program could be allocated more effectively by having a better understanding of the groups of tanks that have similar waste types. If meaningful groups of tanks can be identified, tank sampling requirements may be reduced, and the uncertainty of the characterization estimates may be narrowed. This tank grouping study considers the analytical sampling information and the historical information that is available for all single-shell tanks. The two primary sources of historical characterization estimates and information come from the Historical Tank Content Estimate (HTCE) Model and the Sort on Radioactive Waste Tanks (SORWT) Model. The sampling and historical information are used together to come up with meaningful groups of similar tanks. Based on the results of analyses presented in this report, credible tank grouping looks very promising. Some groups defined using historical information (HTCE and SORWT) correspond well with those based on analytical data alone.

1428 (PNL--10755) **A survey and description of candidate technologies to support single shell tank waste retrieval, leak detection, monitoring, and mitigation.** Lewis, R.E.; Teel, S.S.; Wegener, W.H.; Iwatate, D.F. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000727. Source: OSTI; NTIS; INIS; GPO Dep.

This report was initially designed to provide a comprehensive review of potential leak detection technologies (LDTs). To this end, the report would contain several sections outlining the selection process. The purpose was twofold:(I) the reader would have a clear understanding of why specific technologies were recommended or not recommended, and (2) the reader could apply the same process in the future as new LDTs become available. Curtailment of project scope has prevented the development of the requisite judging criteria. The report has been modified accordingly. Section 2 of this report presents the baseline and guiding assumptions that were used to judge the LDTs. These assumptions include the environment where the technologies would be employed, the potential leak detection targets, and anticipated leak mechanisms. Section 3 presents a brief review of the methods used to arrive at the recommended LDTs. It also includes a description of the different technology families considered. Section 4 presents the recommended LDTs along with detailed descriptions of each that include sensitivities, operating parameters, and costs.

1429 (PNL–10761) **Effect of colloidal aggregation on the sedimentation and rheological properties of tank waste.** Rector, D.R.; Bunker, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000745. Source: OSTI; NTIS; INIS; GPO Dep.

Tank farm experience and work performed under the Tank Waste Treatment Science task of the Tank Waste Remediation System (TWRS) Pretreatment Technology Development Project indicate that colloidal interactions can have an enormous impact on tank waste processing. This report provides the theoretical and experimental background required to understand how such agglomeration phenomena control the sedimentation and theological behavior of colloidal tank wastes. First, the report describes the conditions under which the colloidal particles present in tank sludge are expected to aggregate. Computational models have been developed to predict solution conditions leading to agglomeration, and to predict the rate and size of aggregate growth. The models show that tank sludge should be heavily agglomerated under most baseline processing conditions. Second, the report describes models used to predict sedimentation rates and equilibrium sediment density profiles based on knowledge of agglomerate structures. The sedimentation models provide a self-consistent picture that explains the apparent discrepancies between bench-top experiments and tank-farm experience. Finally, both discrete and empirical models are presented that can be used to rationalize and predict the rheological properties of colloidal sludge suspensions. In all cases, model predictions are compared and contrasted with experimental results. The net results indicate that most of the observed behaviors of real sludges can be predicted, understood, and perhaps ultimately controlled by understanding a few key central concepts regarding agglomeration phenomena.

1430 (PNL–10762) **Tank Waste Treatment Science Task quarterly report for October–December 1994.** LaFemina, J.P. (and others); Anderson, G.S.; Blanchard, D.L. Pacific Northwest Lab., Richland, WA (United States). Jan 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000732. Source: OSTI; NTIS; GPO Dep.

The Pretreatment Technology Development Project is one of seven Tank Waste Remediation System (TWRS) projects being conducted at Pacific Northwest Laboratory (PNL). A key objective of this project, which includes the Tank Waste Treatment Science Task, is to provide the technical basis and scientific understanding to support TWRS baseline decisions and actions, in particular, the 1998 sludge pretreatment decision regarding the level of pretreatment to be incorporated into the tank waste process flowsheets being developed by Westinghouse Hanford Company. This report details work performed by the Tank Waste Treatment Science Task during the first quarter of FY 1995 (October–December 1994) in support of the project objective. Specific activities discussed in the main text are: analytical methods development; sludge dissolution modeling; sludge characterization studies; sludge component speciation; pretreatment chemistry evaluation; and colloidal studies for solid-liquid separations.

1431 (PNL–10763) **Tank Waste Treatment Science Task quarterly report for January–March 1995.** LaFemina, J.P.; Anderson, G.S.; Blanchard, D.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000728. Source: OSTI; NTIS; GPO Dep.

The pretreatment Technology Development Project is one of seven Tank Waste Remediation (TWRS) System projects being conducted at the Pacific Northwest Laboratory. A key objective of this Project, and of the Tank Waste Treatment Science Task within it, is to provide the technical basis and scientific understanding to support TWRS baseline decisions and actions; in particular, TPA Milestone M50-03, the 1998 sludge pretreatment decision regarding the level of pretreatment to be incorporated into the tank waste process flowsheets. Work performed by this task during the second quarter of FY 1995 (January–March 1995) is detailed in this report. Work for the first quarter reported in Tank Waste Treatment Science Task, Quarterly Report for October–December 1994.

1432 (PNL–10766) **Removal of strontium and transuranics from Hanford tank waste via addition of metal cations and chemical oxidant: FY 1995 test results.** Orth, R.J.; Zacher, A.H.; Schmidt, A.J.; Elmore, M.R.; Elliott, K.R.; Neuenschwander, G.G.; Gano, S.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000714. Source: OSTI; NTIS; INIS; GPO Dep.

Chelating organics and some of their degradation products in the Hanford tank waste, such as EDTA, HEDTA, and NTA act to solubilize strontium and transuranics (TRU) in the tank waste supernatant. Displacement of strontium and TRU will facilitate the removal of these radionuclides via precipitation/filtration, ion exchange, or solvent extraction so that low-level waste feed specifications can be met. Pacific Northwest Laboratory has investigated two methods for releasing organic-complexed strontium and TRU components to allow for effective pretreatment of tank waste supernatant: metal cation addition (to promote displacement and flocculation) and chemical oxidant (pennanganate) addition (to promote chelator destruction/defunctionalization and possibly flocculation). These methods, which can be conducted at near-ambient. temperatures and pressures, could be deployed as intank processes.

1433 (PNL–10772) **Chemical and radiation stability of SuperLig®644, resorcinol-formaldehyde, and CS-100 cesium ion exchange materials.** Brown, G.N. (and others); Adami, S.R.; Bray, L.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000819. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

At the request of the Initial Pretreatment Module Project within Westinghouse Hanford Company, Pacific Northwest Laboratory (PNL) conducted this study for the Efficient Separations and Processing Crosscutting Program (ESP) under the task "Develop and Test Sorbents." The purpose of the study was to assess and compare the chemical and radiolytic stability of several cesium-selective ion exchange materials in simulated alkaline Hanford tank waste matrices. Pretreatment of nuclear process wastes to remove of cesium and other radionuclides by ion exchange was proposed previously as one method of minimizing the amount of high-level radioactive waste at Hanford. In this study, PNL evaluated three cesium-selective materials SuperLig®644, resorcinol-formaldehyde (R-F), and CS-100 for chemical and radiation stability in 1 M NaOH and a simulated neutralized current acid waste (NCAW). The objective of the study is to investigate the stability of the newly produced SuperLig®644 under a variety of conditions in an attempt to simulate and predict the degradation process. The following specific conclusions and recommendations resulted from the study.

1434 (PNL–10773) **Hanford tank clean up: A guide to understanding the technical issues.** Gephart, R.E.; Lundgren, R.E. Pacific Northwest Lab., Richland, WA (United States). [1995]. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96004127. Source: OSTI; NTIS; INIS; GPO Dep.

One of the most difficult technical challenges in cleaning up the US Department of Energy's (DOE) Hanford Site in southeast Washington State will be to process the radioactive and chemically complex waste found in the Site's 177 underground storage tanks. Solid, liquid, and sludge-like wastes are contained in 149 single- and 28 double-shelled steel tanks. These wastes contain about one half of the curies of radioactivity and mass of hazardous chemicals found on the Hanford Site. Therefore, Hanford cleanup means tank cleanup. Safely removing the waste from the tanks, separating radioactive elements from inert chemicals, and creating a final waste form for disposal will require the use of our nation's best available technology coupled with scientific advances, and an extraordinary commitment by all involved. The purpose of this guide is to inform the reader about critical issues facing tank cleanup. It is written as an information resource for the general reader as well as the technically trained person wanting to gain a basic understanding about the waste in Hanford's tanks – how the waste was created, what is in the waste, how it is stored, and what are the key technical issues facing tank cleanup. Access to information is key to better understanding the issues and more knowledgeably participating in cleanup decisions. This guide provides such information without promoting a given cleanup approach or technology use.

1435 (PNL–10777) **Advanced organic analysis and analytical methods development: FY 1995 progress report. Waste Tank Organic Safety Program.** Wahl, K.L. (and others); Campbell, J.A.; Clauss, S.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000731. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the work performed during FY 1995 by Pacific Northwest Laboratory in developing and optimizing analysis techniques for identifying organics present in Hanford waste tanks. The main focus was to provide a means for rapidly obtaining the most useful information concerning the organics present in tank waste, with minimal sample handling and with minimal waste generation. One major focus has been to optimize analytical methods for organic speciation. Select methods, such as atmospheric pressure chemical ionization mass spectrometry and matrix-assisted laser desorption/ionization mass spectrometry, were developed to increase the speciation capabilities, while minimizing sample handling. A capillary electrophoresis method was developed to improve separation capabilities while minimizing additional waste generation. In addition, considerable emphasis has been placed on developing a rapid screening tool, based on Raman and infrared spectroscopy, for determining organic functional group content when complete organic speciation is not required. This capability would allow for a cost-effective means to screen the waste tanks to identify tanks that require more specialized and complete organic speciation to determine tank safety.

1436 (PNL–10778) **K-Basin spent nuclear fuel characterization data report.** Abrefah, J.; Gray, W.J.; Ketner, G.L.; Marschman, S.C.; Pyecha, T.D.; Thornton, T.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003600. Source: OSTI; NTIS; INIS; GPO Dep.

The spent nuclear fuel (SNF) project characterization activities will be furnishing technical data on SNF stored at the K Basins in support of a pathway for placement of a "stabilized" form of SNF into an interim storage facility. This report summarizes the results so far of visual inspection of the fuel samples, physical characterization (e.g., weight and immersion density measurements), metallographic examinations, and controlled atmosphere furnace testing of three fuel samples shipped from the KW Basin to the Postirradiation Testing Laboratory (PTL). Data on sludge material collected by filtering the single fuel element canister (SFEC) water are also discussed in this report.

1437 (PNL–10781) **The effect of dilution on the gas-retention behavior of Tank 241-SY-101 waste.** Bredt, P.R.; Tingey, S.M.; Shade, E.H. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000747. Source: OSTI; NTIS; INIS; GPO Dep.

The effect of dilution on gas retention in waste from Tank 241-SY-101 was investigated. A composite sample was prepared from material collected during the Window "C" and Window "E" sampling events. The composite contained material from both the convective and nonconvective layer in the proportions existing in the tank. Operation of the mixer pump in Tank 241-SY-101 has homogenized the tank material, and dilution of the current waste would require additional mixing; therefore, no attempt was made to use unhomogenized tank waste to prepare the composite. The composite was diluted with 2 M NaOH at ratios of 0.5:1, 0.75: 1, 1:1, and 3:1 per volume (2 M NaOH:tank waste).

1438 (PNL–10785) **Solubilities of gases in simulated Tank 241-SY-101 wastes.** Norton, J.D.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 35p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-76RL01830. Order Number DE96000713. Source: OSTI; NTIS; INIS; GPO Dep.

Oxygen, nitrogen, hydrogen, methane, and nitrous oxide solubilities were evaluated as a function of temperature in SYI-SIM-93B, a homogeneous simulated waste mixture containing sodium hydroxide, sodium nitrite, sodium nitrate, sodium aluminate, and sodium carbonate, the principal inorganic constituents of the wastes in Tank 241-SY-101. Ammonia solubility data for this simulated waste was obtained as a function of temperature in an earlier study. The choice of a homogeneous waste mixture in this study has the advantage of eliminating complications associated with a changing electrolyte concentration as a function of temperature that would be encountered with a slurry simulant. Dissolution is one of the means by which gases may be retained in Hanford Site wastes. While models are available to estimate gas solubilities in electrolyte solutions, few data are in existence that pertain to highly concentrated, multicomponent electrolytes such as those stored in Hanford Site waste tanks.

1439 (PNL–10794) **Organic tanks safety program FY95 waste aging studies.** Camaioni, D.M.; Samuels, W.D.; Clauss, S.A.; Lenihan, B.D.; Wahl, K.L.; Campbell, J.A.; Shaw, W.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003371. Source: OSTI; NTIS; INIS; GPO Dep.

This report gives the second year's findings of a study of how thermal and radiological processes may change the composition of organic compounds in the underground tanks at Hanford. Efforts were focused on the global reaction kinetics in a simulated waste exposed to γ rays and the reactions of organic radicals with nitrite ion. The gas production is predominantly radiolytic. Decarboxylation of carboxylates is probably an aging pathway. TBP was totaly consumed in almost every run. Radiation clearly accelerated consumption of the other compounds. EDTA is more reactive than citrate. Oximes and possibly organic nitro compounds are key intermediates in the radiolytic redox reactions of organic compounds with nitrate/nitrite. Observations are consistent with organic compounds being progressively degraded to compounds with greater numbers of C-O bonds and fewer C-H and C-C bonds, resulting in an overall lower energy content. If the radwaste tanks are adequately ventilated and continually dosed by radioactivity, their total energy content should have declined. Level of risk depends on how rapidly carboxylate salts of moderate energy content (including EDTA fragments) degrade to low energy oxalate and formate.

1440 (PNL–10797) **Probabilistic finite element modeling of waste rollover.** Khaleel, M.A. (Pacific Northwest Lab., Richland, WA (United States)); Cofer, W.F.; Al-fouqaha, A.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001146. Source: OSTI; NTIS; INIS; GPO Dep.

Stratification of the wastes in many Hanford storage tanks has resulted in sludge layers which are capable of retaining gases formed by chemical and/or radiolytic reactions. As the gas is produced, the mechanisms of gas storage evolve until the resulting buoyancy in the sludge leads to instability, at which point the sludge "rolls over" and a significant volume of gas is suddenly released. Because the releases may contain flammable gases, these episodes of release are potentially hazardous. Mitigation techniques are desirable for more controlled releases at more frequent intervals. To aid the mitigation efforts, a methodology for predicting of sludge rollover at specific times is desired. This methodology would then provide a rational basis for the development of a schedule for the mitigation procedures. In addition, a knowledge of the sensitivity of the sludge rollovers to various physical and chemical properties within the tanks would provide direction for efforts to reduce the frequency and severity of these events. In this report, the use of probabilistic finite element analyses for computing the probability of rollover and the sensitivity of rollover probability to various parameters is described.

1441 (PNL–10803) **A simplified model of saltcake moisture distribution. Letter report.** Simmons, C.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002935. Source: OSTI; NTIS; INIS; GPO Dep.

This letter report describes the formulation of a simplified model for finding the moisture distribution in a saltcake waste profile that has been stabilized by pumping out the drainable interstitial liquid. The model is based on assuming that capillarity mainly governs the distribution of moisture in the porous saltcake waste. A stead upward flow of moisture driven by evaporation from the waste surface is conceptualized to occur for isothermal conditions. To obtain hydraulic parameters for unsaturated conditions, the model is calibrated or matched to the relative saturation distribution as measured by neutron probe scans. The model is demonstrated on Tanks 104-BY and 105-TX as examples. A value of the model is that it identifies the key physical parameters that control the surface moisture content in a waste profile. Moreover, the model can be used to estimate the brine application rate at the waste surface that would raise the moisture content there to a safe level. Thus, the model can be applied to help design a strategy for correcting the moisture conditions in a saltcake waste tank.

1442 (PNL–10808) **Tank Vapor Characterization Project: Vapor space characterization of waste Tank A-101, Results from samples collected on June 8, 1995.** Pool, K.H.; Clauss, T.W.; McVeety, B.D.; Evans, J.C.; Thomas, B.L.; Olsen, K.B.; Fruchter, J.S.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003222. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analytical results of vapor samples taken from the headspace of the waste storage tank 241-A-101 (Tank A-101) at the Hanford Site in Washington State. The results described in this report were obtained to characterize the vapors present in the tank headspace and to support safety evaluations and tank-farm operations. The results include air concentrations of selected inorganic and organic analytes and grouped compounds from samples obtained by Westinghouse Hanford Company (WHC) and provided for analysis to Pacific Northwest National Laboratory (PNL). Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNL. Analyte concentrations were based on analytical results and, where appropriate, sample volumes provided by WHC. A summary of the results is listed in Table 1. Detailed descriptions of the analytical results appear in the text.

1443 (PNL–10809) **Tank Vapor Characterization Project. Headspace vapor characterization of Hanford Waste Tank AX-102: Results from samples collected on June 27, 1995.** Clauss, T.W.; Pool, K.H.; Evans, J.C.; McVeety, B.D.; Thomas, B.L.; Olsen, K.B.; Fruchter, J.S.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003173. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analytical results of vapor samples taken from the headspace of the waste storage tank 241-AX-102 (Tank AX-102) at the Hanford Site in Washington State. The results described in this report were obtained to characterize the vapors present in the tank headspace and to support safety evaluations and tank-farm operations. The results include air concentrations of selected inorganic and organic analytes and grouped compounds from samples obtained by Westinghouse Hanford Company (WHC) and provided for analysis to Pacific Northwest Laboratory (PNL). Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNL. Analyte concentrations were based on analytical results and, where appropriate, sample volumes provided by WHC. Detailed descriptions of the analytical results appear in the text.

1444 (PNL–10811) **Tank Vapor Characterization Project: Headspace vapor characterization of Hanford Waste Tank U-204, Results from samples collected on August 8, 1995.** Clauss, T.W.; Evans, J.C.; McVeety, B.D.; Pool, K.H.; Thomas, B.L.; Olsen, K.B.; Fruchter, J.S.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003224. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analytical results of vapor samples taken from the headspace of the waste storage tank 241-U-204 (Tank U-204) at the Hanford Site in Washington State. The results described in this report were obtained to characterize the vapors present in the tank headspace and to support safety evaluations and tank-farm operations. The results include air concentrations of selected inorganic and organic analytes and grouped compounds from samples obtained by Westinghouse Hanford Company (WHC) and provided for analysis to Pacific Northwest National Laboratory (PNL). Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNL. Analyte concentrations were based on analytical results and, where appropriate, sample volumes provided by WHC. A summary of the results is listed. Detailed descriptions of the analytical results appear in the text.

1445 (PNL–10812) **Tank Vapor Characterization Project: Headspace vapor characterization of Hanford Waste Tank U-203, Results from samples collected on August 8, 1995.** Pool, K.H.; Clauss, T.W.; Evans, J.C.; McVeety, B.D.; Thomas, B.L.; Olsen, K.B.; Fruchter, J.S.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003225. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the analytical results of vapor samples taken from the headspace of the waste storage tank 241-U-203 (Tank U-203) at the Hanford Site in Washington State. The results described in this report were obtained to characterize the vapors present in the tank headspace and to support safety evaluations and tank-farm operations. The results include air concentrations of selected inorganic and organic analytes and grouped compounds from samples obtained by Westinghouse Hanford Company (WHC) and provided for analysis to Pacific Northwest Laboratory (PNL). Analyses were performed by the Vapor Analytical Laboratory (VAL) at PNL. Analyte concentrations were based on analytical results and, where appropriate, sample volumes provided by WHC. A summary of the results is listed. Detailed descriptions of the analytical results appear in the text.

1446 (PNL–10813) **Vapor space characterization of waste Tank 241-U-103: Results from samples collected on 2/15/95.** Ligotke, M.W.; Pool, K.H.; Clauss, T.W.; McVeety, B.D.; Klinger, G.S.; Olsen, K.B.; Bredt, O.P.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002064. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage Tank 241-U-103 (referred to as Tank U-103). The results described her were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, 11 were observed above the 5-ppbv reporting cutoff. Eleven tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The 10 organic analytes with the highest estimated concentrations are listed in Table 1 and account for approximately 90% of the total organic components in Tank U-103. Two permanent gases, hydrogen (H_2) and nitrous oxide (N_2O), were also detected. Tank U-103 is on the Hydrogen Watch List.

1447 (PNL–10814) **Vapor space characterization of waste Tank 241-SX-103: Results from samples collected on 3/23/95.** Ligotke, M.W.; Clauss, T.W.; Pool, K.H.; McVeety, B.D.; Klinger, G.S.; Olsen, K.B.; Bredt, O.P.; Fruchter, J.S.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002057. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes inorganic and organic analyses results from samples obtained from the headspace of the Hanford waste storage tank 241-SX-103 (referred to as Tank SX-103). The results described here were obtained to support safety and toxicological evaluations. A summary of the results for inorganic and organic analytes is listed in Table 1. Detailed descriptions of the results appear in the text. Quantitative results were obtained for the inorganic compounds ammonia (NH_3), nitrogen dioxide (NO_2), nitric oxide (NO), and water vapor (H_2O). Sampling for hydrogen cyanide (HCN) and sulfur oxides (SO_x) was not requested. In addition, quantitative results were obtained for the 39 TO-14 compounds plus an additional 14 analytes. Of these, two were observed above the 5-ppbv reporting cutoff. Two tentatively identified compounds (TICs) were observed above the reporting cutoff of (ca.) 10 ppbv and are reported with concentrations that are semiquantitative estimates based on internal-standard response factors. The four organic analytes identified are listed in Table 1 and account for approximately 100% of the total organic components in Tank SX-103. Carbon dioxide (CO_2) was the only permanent gas detected in the tank-headspace samples. Tank SX-103 is on the Hydrogen Watch List.

1448 (PNL–10815) **Dilution physics modeling: Dissolution/precipitation chemistry.** Onishi, Y.; Reid, H.C.; Trent, D.S. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000813. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents progress made to date on integrating dilution/precipitation chemistry and new physical models into the TEMPEST thermal-hydraulics computer code. Implementation of dissolution/precipitation chemistry models is necessary for predicting nonhomogeneous, time-dependent, physical/chemical behavior of tank wastes with and without a variety of possible engineered remediation and mitigation activities. Such behavior includes chemical reactions, gas retention, solids resuspension, solids dissolution and generation, solids settling/rising, and convective motion of physical and chemical species. Thus this model development is important from the standpoint of predicting the consequences of various engineered activities, such as mitigation by dilution, retrieval, or pretreatment, that can affect safe operations. The integration of a dissolution/precipitation chemistry module allows the various phase species concentrations to enter into the physical calculations that affect the TEMPEST hydrodynamic flow calculations. The yield strength model of non-Newtonian sludge correlates yield to a power function of solids concentration. Likewise, shear stress is concentration-dependent, and the dissolution/precipitation chemistry calculations develop the species concentration evolution that produces fluid flow resistance changes. Dilution of waste with pure water, molar concentrations of sodium hydroxide, and other chemical streams can be analyzed for the reactive species changes and hydrodynamic flow characteristics.

1449 (PNL–10821) **Screening the Hanford tanks for trapped gas.** Whitney, P. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 365p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001141. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site is home to 177 large, underground nuclear waste storage tanks. Hydrogen gas is generated within the waste in these tanks. This document presents the results of a screening of Hanford's nuclear waste storage tanks for the presence of gas trapped in the waste. The method used for the screening is to look for an inverse correlation between waste level measurements and ambient atmospheric pressure. If the waste level in a tank decreases with an increase in ambient atmospheric pressure, then the compressibility may be attributed to gas trapped within the waste. In this report, this methodology is not used to estimate the volume of gas trapped in the waste. The waste level measurements used in this study were made primarily to monitor the tanks for leaks and intrusions. Four measurement devices are widely used in these tanks. Three of these measure the level of the waste surface. The remaining device measures from within a well embedded in the waste, thereby monitoring the liquid level even if the liquid level is below a dry waste crust. In the past, a steady rise in waste level has been taken as an indicator of trapped gas. This indicator is not part of the screening calculation described in this report; however, a possible explanation for the rise is given by the mathematical relation between atmospheric pressure and waste level used to support the screening calculation. The screening was applied to data from each measurement device in each tank. If any of these data for a single tank indicated trapped gas, that tank was flagged by this screening process. A total of 58 of the 177 Hanford tanks were flagged as containing trapped gas, including 21 of the 25 tanks currently on the flammable gas watch list.

1450 (PNL–10822) **Flammable Gas Safety Program: Mechanisms of gas generation from simulated SY Tank Farm wastes. Progress report, FY 1994.** Barefield, E.K. (Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemistry and Biochemistry); Boadtright, D.; Deshpande, A.; Doctorovich, F.; Liotta, C.L.; Neumann, H.M.; Seymore, S. Pacific Northwest Lab., Richland, WA (United States); Georgia Inst. of Tech., Atlanta, GA (United States). School of Chemistry and Biochemistry. Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001199. Source: OSTI; NTIS; INIS; GPO Dep.

This is the final report for work done at Georgia Tech during Fiscal Year 1994. The objectives of this work were to develop a better understanding of the mechanism of formation of flammable gases in the thermal decomposition of metal complexants, such as HEDTA and sodium glycolate, in simulated SY waste mixtures. This project is a continuation of work begun under earlier contracts with Westinghouse Hanford Co. Three major areas are discussed: development of a reliable analysis for dissolved ammonia, the initiation of long term studies of HEDTA decomposition in stainless steel vessels and product analyses through 3800 h, and further consideration of product analyses and kinetic data reported in FY 1993 for decomposition of HEDTA and sodium glycolate in Teflon-lined glass vessels. A brief exploration was also made of the speciation of aluminum(I1I) in the presence of HEDTA as a function of pH using ^{27}Al NMR.

1451 (PNL–10837) **Moisture measurement for high-level-waste tanks using copper activation probe in cone penetrometer.** Reeder, P.L.; Stromswold, D.C.; Brodzinski, R.L.; Reeves, J.H.; Wilson, W.E. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 50p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-87RL10930 ; AC06-76RL01830. Order Number DE96001812. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory tests have established the feasibility of using neutron activation of copper as a means for measuring the moisture in Hanford's high-level radioactive waste tanks. The performance of the neutron activation technique to measure moisture is equivalent to the neutron moisture gauges or neutron logs commonly used in commercial well-logging. The principle difference is that the activation of ^{64}Cu ($t_{1/2}$ = 12.7 h) replaces the neutron counters used in moisture gauges or neutron logs. For application to highly radioactive waste tanks, the Cu activation technique has the advantage that it is insensitive to very strong gamma radiation fields or high temperatures. In addition, this technique can be deployed through tortuous paths or in confined spaces such as within the bore of a cone penetrometer. However, the results are not available in "real-time". The copper probe's sensitivity to moisture was measured using simulated tank waste of known moisture content. This report describes the preparation of the simulated waste mixtures and the experiments performed to demonstrate the capabilities of the neutron activation technique. These experiments included determination of the calibration curve of count rate versus moisture content using a single copper probe, measurement of the calibration curve based on "near-field " to "far-field" counting ratios using a multiple probe technique, and profiling the activity of the copper probe as a function of the vertical height within a simulated waste barrel.

1452 (PNL–10840) **Historical Tank Content Estimate (HTCE) and sampling estimate comparisons.** Remund, K.M. (and others); Chen, G.; Hartley, S.A. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002679. Source: OSTI; NTIS; INIS; GPO Dep.

There has been a substantial effort over the years to characterize the waste content in Hanford's waste tanks. This characterization is vital to future efforts to retrieve, pretreat, and dispose of the waste in the proper manner. The present study is being conducted to help escalate this effort. This study compares estimates from two independent tank characterization approaches. One approach is based on tank sampling while the other is based on historical records. In order to statistically compare the two independent approaches, quantified variabilities (or uncertainty estimates) around the estimates of the mean concentrations are required. For the sampling-based estimates, the uncertainty estimates are provided in the Tank Characterization Reports (TCR's). However, the historically based estimates are determined from a model, and therefore possess no quantified variabilities. Steps must be taken to provide quantified variabilities for these estimates. These steps involve a parameter influence study (factorial experiment study) and an uncertainty analysis (Monte Carlo study) of the Historical Tank Content Estimate (HTCE). The purpose of the factorial experiment is to identify in the Hanford Defined Wastes (HDW) model which parameters, as they vary, have the largest effect on the HTCE. The results of this study provide the proper input parameters for the Monte Carlo study. The two estimates (HTCE and sampling-based) can then be compared. The purpose of the Monte Carlo study is to provide estimates of variability around the estimate derived the historical records.

1453 (PNL–10865) **In situ determination of rheological properties and void fraction: Hanford Waste Tank 241-SY-103.** Shepard, C.L. (Pacific Northwest Lab., Richland, WA (United States)); Stewart, C.W.; Alzheimer, J.M.; Terrones, G.; Chen, G.; Wilkins, N.E. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003562. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the operation of the void fraction instrument (VFI) and ball rheometer in Hanford Tank 241-SY-103. The two instruments were deployed through risers 17C and 22A in July and August 1995 to gather data on the gas content and rheology of the waste. The results indicate that the nonconvective sludge layer contains up to 12% void and an apparent viscosity of 104 to 105 cP with a yield strength less than 210 Pa. The convective layer measured zero void and had no measurable yield strength. Its average viscosity was about 45 cP, and the density was less than 1.5 g/cc. The average void fraction was 0.047 $\pm$ 0.015 at riser 17C and 0.091 $\pm$ 0.015 at riser 22A. The stored gas volume based on these void fraction measurements is 213 $\pm$ 42 M^3 at 1 atmosphere.

1454 (PNL–10870) **Running scenarios using the Waste Tank Safety and Operations Hanford Site model.** Stahlman, E.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003081. Source: OSTI; NTIS; INIS; GPO Dep.

Management of the Waste Tank Safety and Operations (WTS&O) at Hanford is a large and complex task encompassing 177 tanks and having a budget of over $500 million per year. To assist managers in this task, a model based on system dynamics was developed by the Massachusetts Institute of Technology. The model simulates the WTS&O at the Hanford Tank Farms by modeling the planning, control, and flow of work conducted by Managers, Engineers, and Crafts. The model is described in Policy Analysis of Hanford Tank Farm Operations with System Dynamics Approach (Kwak 1995b) and Management Simulator for Hanford Tank Farm Operations (Kwak 1995a). This document provides guidance for users of the model in developing, running, and analyzing results of management scenarios. The reader is assumed to have an understanding of the model and its operation. Important parameters and variables in the model are described, and two scenarios are formulated as examples.

1455 (PNL–10873) **Waste Tank Vapor Characterization Project: Annual status report for FY 1995.** Ligotke, M.W.; Fruchter, J.S.; Huckaby, J.L.; Birn, M.B.; McVeety, B.D.; Evans, J.C. Jr.; Pool, K.H.; Silvers, K.L.; Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96003223. Source: OSTI; NTIS; INIS; GPO Dep.

This report compiles information collected during the Fiscal Year 1995 pertaining to the waste tank vapor characterization project. Information covers the following topics: project management; organic sampling and analysis; inorganic sampling and analysis; waste tank vapor data reports; and the waste tanks vapor database.

1456 (PNL–10890) **324 Building REC and HLV Tank Closure Plan.** Becker-Khaleel, B (Scienfific Ecology Group, Inc. Richland, WA (United States)); Schlick, K. Pacific Northwest Lab., Richland, WA (United States). Dec 1995. 91p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96006078. Source: OSTI; NTIS; INIS; GPO Dep.

This closure plan describes the activities necessary to close the 324 Radiochemical Engineering Cells (REC) and High-Level Vault (HLV) in accordance with the Washington State Dangerous Waste regulations. To provide a complete description of the activities required, the closure plan relies on information contained in the 324 Building B-Cell Safety Cleanout Project (BCCP) plans, the 324 Building REC HLV Interim Waste Management Plan (IWMP), the Project Management Plan for Nuclear Facilities Management 300 Area Compliance Program, and the 324 High Level Vault Interim Removal Action Project (project management plan [PMP]). The IWMP addresses the management of mixed waste in accordance with state and federal hazardous waste regulations. It provides a strategy for managing high-activity mixed waste in compliance with Resource Conservation and Recovery Act (RCRA) requirements or provides for an alternative management approach for the waste. The BCCP outlines the past, present, and future activities necessary for removing from B-Cell the solid waste, including mixed waste generated as a result of historical research and development (R&D) activities conducted in the cell. The BCCP also includes all records and project files associated with the B-Cell cleanout. This information is referenced throughout the closure plan. The PMP sets forth the plans, organization, and systems that Pacific Northwest National Laboratory (PNNL) will use to direct and control the 324 High-Level Vault Interim Removal Action Project. This project will develop and implement a treatment strategy that will remove and stabilize the inventory of liquid waste from the 324 HLV tanks. The PMP also provides for flushing and sampling the flush solution.

1457 (PNL–10893) **The effect of dilution on the gas retention behavior of Tank 241-SY- 103 waste.** Bredt, P.R.; Tingey, S.M. Pacific Northwest Lab., Richland, WA (United States). Jan 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96004519. Source: OSTI; NTIS; INIS; GPO Dep.

Twenty-five of the 177 underground waste storage tanks on the Hanford Site have been placed on the Flammable Gas watch list. These 25 tanks, containing high-level waste generated during plutonium and uranium processing, have been identified as potentially capable of accumulating flammable gases above the lower flammability limit (Babad et al. 1991). In the case of Tanks 241-SY-101 and 241-SY-103, it has been proposed that diluting the tank waste may mitigate this hazard (Hudson et al. 1995; Stewart et al. 1994). The effect of dilution on the ability of waste from Tank 241-SY-103 to accumulate gas was studied at Pacific Northwest National Laboratory. A similar study has been completed for waste from Tank 241-SY-101 (Bredt et al. 1995). Because of the additional waste-storage volume available in Tank 241-SY-103 and because the waste is assumed to be similar to that currently in Tank 241-SY-101, Tank 241-SY-103 became the target for a demonstration of passive mitigation through in-tank dilution. In 1994, plans for the in-tank dilution demonstration were deferred pending a decision on whether to pursue dilution as a mitigation strategy. However, because Tank 241-SY-103 is an early retrieval target, determination of how waste properties vary with dilution will still be required.

1458 (PNL-SA–24044) **Carbonylation as a separation technique for removal of non-radioactive species for tank waste.** Visnapuu, A. (Bureau of Mines, Rolla, MO (United States). Rolla Research Center); Hollenberg, G.W.; Creed, R.F. Jr. Pacific Northwest Lab., Richland, WA (United States). May 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. U.S. Bureau of Mines. (CONF-9405155–3: 18. actinide separations conference, Durango, CO (United States), 23-26 May 1994). Order Number DE95014176. Source: OSTI; NTIS; INIS; GPO Dep.

Much of the waste generated from five decades of weapons production in the US Department of Energy complex contains highly radioactive constituents. With the high cost of permanent disposal space, it is necessary to separate as many of the nonradioactive species from the radioactive as possible. This paper discusses the transfer of carbonyl processing technology from mineral beneficiation and powder metallurgy operations to the separation of Fe and Ni from radioactively contaminated waste streams. Samples of simulated composite Hanford Tank Waste residue were first processed with a calcine/dissolution technique which resulted in a residue powder consisting of 31.9 pct Fe and 3.3 pct Ni. Because of the specification for waste glass compositions, these two constituents become important in determining the number of waste glass logs produced. Pyrometallurgical reduction of the residue powders, followed by subsequent carbonylation, extracted up to 92.0 pct of the Fe and 95.7 pct of the Ni. The resultant product contained as little as 4.9 pct Fe and 0.3 pct Ni. At this level, Fe would no longer be a limiting constituent in the waste glass.

1459 (PNL-SA–24720) **Hanford high level waste: Sample Exchange/Evaluation (SEE) Program.** King, A.G. Pacific Northwest Lab., Richland, WA (United States). Aug 1994. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940815–113: SPECTRUM '94: international nuclear and hazardous waste management conference, Atlanta, GA (United States), 14-18 Aug 1994). Order Number DE95014639. Source: OSTI; NTIS; INIS; GPO Dep.

The Pacific Northwest Laboratory (PNL)/Analytical Chemistry Laboratory (ACL) and the Westinghouse Hanford Company (WHC)/Process Analytical Laboratory (PAL) provide analytical support services to various environmental restoration and waste management projects/programs at Hanford. In response to a US Department of Energy – Richland Field Office (DOE-RL) audit, which questioned the comparability of analytical methods employed at each laboratory, the Sample Exchange/Exchange (SEE) program was initiated. The SEE Program is a selfassessment program designed to compare analytical methods of the PAL and ACL laboratories using sitespecific waste material. The SEE program is managed by a collaborative, the Quality Assurance Triad (Triad). Triad membership is made up of representatives from the WHC/PAL, PNL/ACL, and WHC Hanford Analytical Services Management (HASM) organizations. The Triad works together to design/evaluate/implement each phase of the SEE Program.

1460 (PNL-SA–25033) **West Valley Demonstration Project full-scale canister impact tests.** Whittington, K.F. (Pacific Northwest Lab., Richland, WA (United States)); Alzheimer, J.M.; Lutz, C.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950917–17: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96002632. Source: OSTI; NTIS; INIS; GPO Dep.

Five West Valley Nuclear Services (WVNS) high-level waste (HLW) canisters were impact tested during 1994 to demonstrate compliance with the drop test requirements of the Waste Acceptance Product Specifications. The specifications state that the canistered waste form must be able to survive a 7–m (23 ft) drop unbreached. The 10-gauge (0.125 in. wall thickness) stainless steel canisters were approximately 85% filled with simulated vitrified waste and weighed about 2100 kg (4600 lb). Each canister was dropped vertically from a height of 7 m (23 ft) onto an essentially unyielding surface. The integrity of the canister was determined by the application and analysis of strain circles, dimensional measurements, and helium leak testing. The canisters were also visually inspected before and after the drop for physical damage. The results of the impact test verify that the canisters survived the 7–m drops unbreached. Therefore, these results demonstrate that the reference canister meets the drop test specification of the Waste Acceptance Product Specification.

1461 (PNL-SA–25132) **Hazardous waste retrieval strategies using a high-pressure water jet scarifier.** Hatchell, B.K. (Pacific Northwest Lab., Richland, WA (United States)); Rinker, M.W.; Mullen, O.D. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9508192–1: 8. American water jet conference, Houston, TX (United States), 27-30 Aug 1995). Order Number DE96002631. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Dislodging and Conveyance Program is sponsored by the US Department of Energy Office of Technology Development to investigate waste dislodging and conveyance processes suitable for the retrieval of high-level radioactive waste. This program, represented by industry, national laboratories, and academia, has proposed a baseline technology of high-pressure water jet dislodging and pneumatic conveyance integrated as a scarifier as a means of retrieval of waste inside Hanford single-shell tanks. A testing program has been initiated to investigate system deployment techniques to determine appropriate mining strategies, level of control, sensor requirements, and address integration issues associated with deploying the scarifier by a long robotic manipulator arm. A test facility denoted the Hydraulics Testbed (HTB) is being constructed to achieve these objectives and to allow longer-duration, multiple-pass tests on large waste fields using a versatile gantry-style manipulator. Mining strategy tests with materials simulating salt cake and sludge waste forms will be conducted to evaluate the effectiveness of mining strategies, forces related to scarifier and conveyance line, and retrieval rate. This paper will describe the testbed facility and testing program and present initial test results to date.

1462 (PNL-SA–25954) **Noble metal-catalyzed homogeneous and heterogeneous processes in treating simulated nuclear waste media with formic acid.** King, R.B. (Univ. of Georgia, Athens, GA (United States)); Bhattacharyya, N.K.; Smith, H.D. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9509175–1: 8. international symposium on relations between homogeneous and heterogeneous catalysis, Balatonfuered (Hungary), 10-14 Sep 1995). Order Number DE96002718. Source: OSTI; NTIS; INIS; GPO Dep.

Simulants for the Hanford Waste Vitrification Plant feed containing the major non-radioactive components Al, Cd, Fe, Mn, Nd, Ni, Si, Zr, Na, CO_3^{2-}, NO_3-, and NO_2- were used to study reactions of formic acid at 90°C catalyzed by the noble metals Ru, Rh, and/or Pd found in significant quantities in uranium fission products. Such reactions were monitored using gas chromatography to analyze the CO_2, H_2, NO, and N_2O in the gas phase and a microammonia electrode to analyze the NH_4+/NH_3 in the liquid phase as a function of time. The following reactions have been studied in these systems since they are undesirable side reactions in nuclear waste processing: (1) Decomposition of formic acid to CO_2 + H_2 is undesirable because of the potential fire and explosion hazard of H_2. Rhodium, which was introduced as soluble $RhCl_3$-$3H_2O$, was found to be the most active catalyst for H_2 generation from formic acid above ~ 80°C in the presence of nitrite ion. The H_2 production rate has an approximate pseudo first-order dependence on the Rh concentration, (2) Generation of NH_3 from the formic acid reduction of nitrate and/or nitrite is undesirable because of a possible explosion hazard from NH_4NO_3 accumulation in a waste processing plant off-gas system. The Rh-catalyzed reduction of nitrogen-oxygen compounds to ammonia by formic acid was found to exhibit the following features: (a) Nitrate rather than nitrite is the principal source of NH_3. (b) Ammonia production occurs at the expense of hydrogen production. (c) Supported rhodium metal catalysts are more active than rhodium in any other form, suggesting that ammonia production involves heterogeneous rather than homogeneous catalysis.

1463 (PNL-SA–26071) **Waste forms based on Cs-loaded silicotitanates.** Balmer, M.L.; Bunker, B.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950401–18: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95014169. Source: OSTI; NTIS; INIS; GPO Dep.

Silicotitanate ion exchange materials are being considered for removal of radioactive Cs and Sr from tank wastes at the Hanford site. The phase evolution as a function of heat treatment temperature for several sol gel derived compositions within the Cs_2O-SiO_2-TiO_2 system was investigated, in order to determine if an adequate waste form can be achieved by direct thermal conversion. The Cs leach rates and Cs loss during heat treatment of select materials were measured. Some compositions which contain large amounts of Ti melt to form a glass with reasonably low aqueous leach rates. A new Cs-silicotitanate material with a structure isomorphous to pollucite was discovered. This material forms at low temperatures (700–800 C) where Cs volatility is negligible. The silicotitanate-pollucite exhibits extremely low leach rates (1.42 g/m^2day) at 90 C, and has been identified as a promising waste form for Cs containment.

1464 (PNL-SA–26111) **Enterprise wide transparent information access.** Brown, J. Pacific Northwest Lab., Richland, WA (United States). May 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9505236–1: Sybase Users Group conference, Dallas, TX (United States), 15-18 May 1995). Order Number DE95014198. Source: OSTI; NTIS; INIS; GPO Dep.

The information management needs of the Department of Energy (DOE) represents a fertile domain for the development of highly sophisticated yet intuitive enterprise-wide computing solutions. These solutions must support business operations, research agendas, technology development efforts, decision support, and other application areas with a user base ranging from technical staff to the highest levels of management. One area of primary interest is in the Environmental Restoration and Waste Management Branch of DOE. In this arena, the issue of tracking and managing nuclear waste related to the long legacy of prior defense production and research programs is one of high visibility and great concern. The Tank Waste Information Network System (TWINS) application has been created by the Pacific Northwest Laboratory (PNL) for the DOE to assist in managing and accessing the information related to this mission. The TWINS solution addresses many of the technical issues faced by other efforts to provide integrated information access to a wide variety of stakeholders. TWINS provides secure transparent access to distributed heterogeneous multimedia information sources from around the DOE complex. The users interact with the information through a consistent user interface that presents the desired data in a common format regardless of the structure of the source information. The solutions developed by the TWINS project represent an integration of several technologies and products that can be applied to other mission areas within DOE and other government agencies. These solutions are now being applied to public and private sector problem domains as well. The successful integration and inter-operation of both commercial and custom modules into a flexible and extensible information architecture will help ensure that new problems facing DOE and other clients can be addressed more rapidly in the future by re-use of existing tools and techniques proven viable through the TWINS efforts.

1465 (PNL-SA–26219) **Chemical durability of simulated nuclear glasses containing water.** Li, H. (Pacific Northwest Lab., Richland, WA (United States)); Tomozawa, M. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950401–21: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95014178. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical durability of simulated nuclear waste glasses having different water contents was studied. Results from the product consistency test (PCT) showed that glass dissolution increased with water content in the glass. This trend was not observed during MCC-1 testing. This difference was attributed to the differences in reactions between glass and water. In the PCT, the glass network dissolution controlled the elemental releases, and water in the glass accelerated the reaction rate. On the other hand, alkali ion exchange with hydronium played an important role in the MCC-1. For the latter, the amount of water introduced into a leached layer from ion-exchange was found to be much greater than that of initially incorporated water in the glass. Hence, the initial water content has no effect on glass dissolution as measured by the MCC-1 test.

1466 (PNL-SA–26441) **High level waste at Hanford: Potential for waste loading maximization.** Hrma, P.R.; Bailey, A.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950917–18: 5. international conference on radioactive waste management and environmental remediation, Berlin (Germany), 3-9 Sep 1995). Order Number DE96002608. Source: OSTI; NTIS; INIS; GPO Dep.

The loading of Hanford nuclear waste in borosilicate glass is limited by phase-related phenomena, such as crystallization or formation of immiscible liquids, and by breakdown of the glass structure because of an excessive concentration of modifiers. The phase-related phenomena cause both processing and product quality problems. The deterioration of product durability determines the ultimate waste loading limit if all processing problems are resolved. Concrete examples and mass-balance based calculations show that a substantial potential exists for increasing waste loading of high-level wastes that contain a large fraction of refractory components.

1467 (PNNL–10748) **Thermal and combined thermal and radiolytic reactions involving nitrous oxide, hydrogen, nitrogen, and ammonia in contact with tank 241-SY-101 simulated waste.** Bryan, S.A.; Pederson, L.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96009209. Source: OSTI; NTIS; INIS; GPO Dep.

Work described in this report was conducted at Pacific Northwest National Laboratory (PNNL) for the Flammable Gas Safety Project, the purpose of which is to develop information needed to support Westinghouse Hanford Company (WHC) in their efforts to ensure the safe interim storage of wastes at the Hanford Site. Described in this report are the results of tests to evaluate the rates of thermal and combined thermal and radiolytic reactions involving flammable gases in the presence of Tank 241-SY-101 simulated waste. Flammable gases generated by the radiolysis of water and by the thermal and radiolytic decomposition of organic waste constituents may themselves participate in further reactions. Examples include the decomposition of nitrous oxide to yield nitrogen and oxygen, the reaction of nitrous oxide and hydrogen to produce nitrogen and water, and the reaction of nitrogen and hydrogen to produce ammonia. The composition of the gases trapped in bubbles in the wastes might therefore change continuously as a function of the time that the gas bubbles are retained.

1468 (PNNL–10883) **Use of organic functional group concentrations as a means of screening for energetics.** Burgeson, I.E.; Bryan, S.A.; Camaioni, D.M.; Hallen, R.T.; Lerner, B.D.; Scheele, R.D. Pacific Northwest National Lab., Richland, WA (United States). Jun 1996. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96014004. Source: OSTI; NTIS; INIS; GPO Dep.

One of the safety concerns associated with the waste tanks on the Hanford site is the presence of organics in a highly oxidizing environment that could potentially act as a fuel source to maintain a propagating reaction. To determine this risk, it is necessary to determine the amount of high enthalpy organics present in the tanks. Currently, the primary ways of obtaining this information are to either rely on tank-fill histories, which are often unreliable and do not account for waste-aging processes, or obtain samples from the tank and speciate the organics present through a series of analytical procedures. While organic speciation has been successful in providing very valuable information about organics present in the tanks and the waste aging processes that are occurring in general, it can be costly and time consuming analyzing a large number of waste tanks. Differential scanning calorimetry has previously been used to obtain heat of reaction measurements of Hanford tank waste samples. However, differential scanning calorimetry is shown here to inadequately measure calculated heats of reaction of simulant tank mixtures. Overall, the preliminary results presented here, suggest that indeed Fourier transform infrared and Raman spectroscopy would be useful screening tools for determination of C-H and COO- organic content in tank waste samples analyzed in a hot cell environment. These techniques however, are not truly quantitative for this application and would be primarily used for identifying tanks of potential safety concern that would require further, more detailed confirmatory analysis by organic speciation techniques.

1469 (PNNL–10927) **Waste mixing and diluent selection for the planned retrieval of Hanford Tank 241-SY-102: A preliminary assessment.** Onishi, Y.; Hudson, J.D. Pacific Northwest Lab., Richland, WA (United States). Jan 1996. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96004513. Source: OSTI; NTIS; INIS; GPO Dep.

This preliminary assessment documents a set of analyses that were performed to determine the potential for Hanford waste Tank 241-SY-102 waste properties to be adversely affected by mixing the current tank contents or by injecting additional diluent into the tank during sludge mobilization. As a part of this effort, the effects of waste heating that will occur as a result of mixer pump operations are also examined. Finally, the predicted transport behavior of the resulting slurries is compared with the waste acceptance criteria for the Cross-Site Transfer System (CSTS). This work is being performed by Pacific Northwest National Laboratory in support of Westinghouse Hanford Company's W-211 Retrieval Project. We applied the equilibrium chemical code, GMIN, to predict potential chemical reactions. We examined the potential effects of mixing the current tank contents (sludge and supernatant liquid) at a range of temperatures and, separately, of adding pure water at a volume ratio of 1:2:2 (sludge:supernatant liquid:water) as an example of further diluting the current tank contents. The main conclusion of the chemical modeling is that mixing the sludge and the supernate (with or without additional water) in Tank 241-SY-102 dissolves all sodium-containing solids (i.e., $NaNO_3(s)$, thenardite, $NaF(s)$, and halite), but does not significantly affect the amorphous $Cr(OH)_3$ and calcite phase distribution. A very small amount of gibbsite [$Al(OH)_3(s)$] might precipitate at 25°C, but a somewhat larger amount of gibbsite is predicted to dissolve at the higher temperatures. In concurrence with the reported tank data, the model affirmed that the interstitial solution within the sludge is saturated with respect to many of the solids species in the sludge, but that the supernatant liquid is not in saturation with many of major solids species in sludge. This indicates that a further evaluation of the sludge mixing could prove beneficial.

1470 (PNNL–10937) **A systematic look at Tank Waste Remediation System privatization.** Holbrook, J.H.; Duffy, M.A.; Vieth, D.L.; Sohn, C.L. Pacific Northwest National Lab., Richland, WA (United States). Jan 1996. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011471. Source: OSTI; NTIS; INIS; GPO Dep.

The mission of the Tank Waste Remediation System (TWRS) Program is to store, treat, immobilize, and dispose, or prepare for disposal, the Hanford radioactive tank waste in an environmentally sound, safe, and cost effective manner. Highly radioactive Hanford waste includes current and future tank waste plus the cesium and strontium capsules. In the TWRS program, as in other Department of Energy (DOE) clean-up activities, there is an increasing gap between the estimated funding required to enable DOE to meet all of its clean-up commitments and level of funding that is perceived to be available. Privatization is one contracting/management approach being explored by DOE as a means to achieve cost reductions and as a means to achieve a more outcome-oriented program. Privatization introduces the element of competition, a proven means of establishing true cost as well as achieving significant cost reduction.

1471 (PNNL–10945) **Fiscal year 1995 laboratory scale studies of Cs elution in Tank 8D-1 and sludge dissolution in tank 8D-2.** Sills, J.A.; Patello, G.K.; Roberts, J.S.; Wiemers, K.D.; Elmore, M.R.; Richmond, W.G.; Russell, R.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1996. 257p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96009900. Source: OSTI; NTIS; INIS; GPO Dep.

During Phase I of West Valley Demonstration project waste remediation, an estimated 95% of the zeolite currently in tank 8D-1 will be transferred to tank 8D-2, leaving behind residual Cs-loaded zeolite which will require treatment to remove the Cs. After phase I vitrification, tank 8D-2 will contain residual waste from PUREX and THOREX and spent Cs-loaded zeolite. The residual waste will require treatment. Oxalic acid has been proposed for eluting Cs from zeolite in tank 8D-1 and dissolving radionuclides in tank 8D-2. Laboratory tests were performed to determine optimum Cs elution and sludge dissolution conditions and to evaluate effects of multiple contacts, long-term contacts, presence of corrosion products, lack of agitation, temperature of tank contents, and oxalic acid concentration. Mild steel corrosion tests were also conducted.

1472 (PNNL–10946) **Value-based performance measures for Hanford Tank Waste Remedition System (TWRS) Program.** Keeney, R.L.; von Winterfeldt, D. Pacific Northwest Lab., Richland, WA (United States). Jan 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96006405. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation Systems (TWRS) Program is responsible for the safe storage, retrieval, treatment, and preparation for disposal of high-level waste currently stored in underground storage tanks at the Hanford site in Richland. The TWRS program has adopted a logical approach to decision making that is based on systems engineering and decision analysis (Westinghouse Hanford Company, 1995). This approach involves the explicit consideration of stakeholder values and an evaluation of the TWRS alternatives in terms of these values. Such evaluations need to be consistent across decisions. Thus, an effort was undertaken to develop a consistent, quantifiable set of measures that can be used by TVVRS to assess alternatives against the stakeholder values. The measures developed also met two additional requirements: 1) the number of measure should be relatively small; and 2) performance with respect to the measures should be relatively easy to estimate.

1473 (PNNL–10970) **Test for Fauske and Associates to perform tube propagation experiments with simulated Hanford tank wastes.** Carlson, C.D. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96006404. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan, prepared at Pacific Northwest National Laboratory for Westinghouse Hanford Company, provides guidance for performing tube propagation experiments on simulated Hanford tank wastes and on actual tank waste samples. Simulant compositions are defined and an experimental logic tree is provided for Fauske and Associates (FAI) to perform the experiments. From this guidance, methods and equipment for small-scale tube propagation experiments to be performed at the Hanford Site on actual tank samples will be developed. Propagation behavior of wastes will directly support the safety analysis (SARR) for the organic tanks. Tube propagation may be the definitive tool for determining the relative reactivity of the wastes contained in the Hanford tanks. FAI have performed tube propagation studies previously on simple two- and three-component surrogate mixtures. The simulant defined in this test plan more closely represents actual tank composition. Data will be used to support preparation of criteria for determining the relative safety of the organic bearing wastes.

1474 (PNNL–10970-Rev.1) **Test plan for Fauske and Associates to perform tube propagation experiments with simulated Hanford tank wastes.** Carlson, C.D. (Pacific Northwest National Lab., Richland, WA (United States)); Babad, H. Pacific Northwest Lab., Richland, WA (United States). May 1996. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010266. Source: OSTI; NTIS; INIS; GPO Dep.

This test plan, prepared at Pacific Northwest National Laboratory for Westinghouse Hanford Company, provides guidance for performing tube propagation experiments on simulated Hanford tank wastes and on actual tank waste samples. Simulant compositions are defined and an experimental logic tree is provided for Fauske and Associates (FAI) to perform the experiments. From this guidance, methods and equipment for small-scale tube propagation experiments to be performed at the Hanford Site on actual tank samples will be developed. Propagation behavior of wastes will directly support the safety analysis (SARR) for the organic tanks. Tube propagation may be the definitive tool for determining the relative reactivity of the wastes contained in the Hanford tanks. FAI have performed tube propagation studies previously on simple two- and three-component surrogate mixtures. The simulant defined in this test plan more closely represents actual tank composition. Data will be used to support preparation of criteria for determining the relative safety of the organic bearing wastes.

1475 (PNNL–10971) **TWRS privatization support project waste characterization database development.** Pacific Northwest National Lab., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Nov 1995. 331p. Sponsored by USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008765. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest National Laboratory requested support from ICF Kaiser Hanford Company in assembling radionuclide and chemical analyte sample data and inventory estimates for fourteen Hanford underground storage tanks: 241-AN-102, -104, -105, -106, and -107, 241-AP-102, -104, and -105, 241-AW-101, -103, and -105, 241 AZ-101 and -102; and 241-C-109. Sample data were assembled for sixteen radionuclides and thirty-five chemical analytes. The characterization data were provided to Pacific Northwest National Laboratory in support of the Tank Waste Remediation Services Privatization Support Project. The purpose of this report is to present the results and document the methodology used in preparing the waste characterization information data set to support the Tank Waste Remediation Services Privatization Support Project. This report describes the methodology used in assembling the waste characterization information and how that information was validated by a panel of independent technical reviewers. Also, contained in this report are the various data sets created: the master data set, a subset, and an unreviewed data set. The master data set contains waste composition information for Tanks 241-AN-102 and -107, 241-AP-102 and -105, 241-AW-101; and 241-AZ-101 and -102. The subset contains only the validated analytical sample data from the master data set. The unreviewed data set contains all collected but unreviewed sample data for Tanks 241-AN-104, -105, and -106; 241-AP-104; 241-AW-103 and-105; and 241-C-109. The methodology used to review the waste characterization information was found to be an accurate, useful way to separate the invalid or questionable data from the more reliable data. In the future, this methodology should be considered when validating waste characterization information.

1476 (PNNL–10971-Vol.1) **TWRS privatization support project waste characterization database development. Volume 1.** Brevick, C.H. (ICF Kaiser Hanford Co., Richland, WA (United States)). Pacific Northwest Lab., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Nov 1995. 328p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008928. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest National Laboratory requested support from ICF Kaiser Hanford Company in assembling radionuclide and chemical analyte sample data and inventory estimates for fourteen Hanford under-ground storage tanks: 241-AN-102, -104, -105, -106, and -107, 241-AP-102, -104, and -105; 241-AW-101, -103, and -105, 241-AZ-101 and-102; and 241-C-109. Sample data were assembled for sixteen radio nuclides and thirty five chemical analytes. The characterization data were provided to Pacific Northwest National Laboratory in support of the Tank Waste Remediation Services Privatization Support Project. The purpose of this report is to present the results and document the methodology used in preparing the waste characterization information data set to support the Tank Waste Remediation Services Privatization Support Project. This report describes the methodology used in assembling the waste characterization information and how that information was validated by a panel of independent technical reviewers. Also, contained in this report are the various data sets created., the master data set, a subset, and an unreviewed data set .

1477 (PNNL–10971-Vol.2) **TWRS privatization support project waste characterization database development. Volume 2.** Brevick, C.H. (ICF Kaiser Hanford Co., Richland, WA (United States)). Pacific Northwest Lab., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Nov 1995. 279p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008929. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This appendix contains the radionuclide and chemical analyte subset data tables. These data tables contain all of the validated waste characterization information collected for the TWRS Privatization Support Project.

1478 (PNNL–10974) **Characterization and process technology capabilities for Hanford tank waste disposal.** Buelt, J.L.; Weimer, W.C.; Schrempf, R.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008849. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the Pacific Northwest National Laboratory's (the Laboratory) capabilities in characterization and unit process and system testing that are available to support Hanford tank waste processing. This document is organized into two parts. The first section discusses the Laboratory's extensive experience in solving the difficult problems associated with the characterization of Hanford tank wastes, vitrified radioactive wastes, and other very highly radioactive and/or heterogeneous materials. The second section of this document discusses the Laboratory's radioactive capabilities and facilities for separations and waste form preparation/testing that can be used to Support Hanford tank waste processing design and operations.

1479 (PNNL–10976) **WVNS Tank Farm Process Support: Experimental evaluation of an inert gas (nitrogen) to mitigate external corrosion of high-level waste storage tanks.** Elmore, M.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96007092. Source: OSTI; NTIS; INIS; GPO Dep.

Corrosion of the carbon steel waste storage tanks at West Valley Nuclear Services continues to be of concern, especially as the planned duration of waste storage time increases and sludge washing operations are conducted. The external surfaces of Tanks 8D-1 and 8D-2 have been exposed for more than 10 years to water that has intruded into the tank vaults. Visual inspection of the external tank surfaces using a remote video camera has shown indications of heavy corrosion in localized areas on the tank walls. Tests on mild steel specimens under simulated tank vault conditions showed that corrosion is related to the availability of oxygen for the corrosion reactions; consequently, removing oxygen as one of the reactants should effectively eliminate corrosion. In terms of the waste tanks, excluding oxygen from the annular vault space, such as by continuous flushing with an inert gas, should substantially decrease corrosion of the external surfaces of the mild steel tanks (100% exclusion of oxygen is probably not practicable). Laboratory corrosion testing was conducted at Pacific Northwest National Laboratory to give a preliminary assessment of the ability of nitrogen-inerting to reduce steel corrosion. This report summarizes test results obtained after 18-month corrosion tests comparing "nitrogen-inerted" corrosion with "air-equilibrated" corrosion under simulated tank vault conditions.

1480 (PNNL–10978) **Gas generation from Tank 241-SY-103 waste.** Bryan, S.A.; King, C.M.; Pederson, L.R.; Forbes, S.V.; Sell, R.L. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96009073. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes progress made in evaluating mechanisms by which flammable gases are generated in Hanford double-shell tank wastes, based on the results of laboratory tests using actual waste from Tank 241-SY-103. The objective of this work is to establish the identity and stoichiometry of degradation products formed in actual tank wastes by thermal and radiolytic processes as a function of temperature. The focus of the gas generation tests on Tank 241-SY-103 samples is first the effect of temperature on gas generation (volume and composition). Secondly, gas generation from irradiation of Tank 241-SY-103 samples at the corresponding temperatures as the thermal-only treatments will be measured in the presence of an external radiation source (using a ^{137}Cs capsule). The organic content will be measured on a representative sample prior to gas generation experiments and again at the termination of heating and irradiation. The gas generation will be related to the extent of organic species consumption during heating. Described in this report are experimental methods used for producing and measuring gases generated at various temperatures from highly radioactive actual tank waste, and results of gas generation from Tank 241-SY-103 waste taken from its convective layer. The accurate measurement of gas generation rates from actual waste from highly radioactive waste tanks is needed to assess the potential for producing and storing flammable gases within the waste tanks. This report addresses the gas generation capacity of the waste from the convective layer of Tank 241-SY-103, a waste tank listed on the Flammable Gas Watch List due to its potential for flammable gas accumulation above the flammability limit.

1481 (PNNL–10980) **The incorporation of P, S, Cr, F, Cl, I, Mn, Ti, U, and Bi into simulated nuclear waste glasses: Literature study.** Langowski, M.H. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–T3C-95-111). Order Number DE96008426. Source: OSTI; NTIS; INIS; GPO Dep.

Waste currently stored on the Hanford Reservation in underground tanks will be into High Level Waste (HLW) and Low Level Waste (LLW). The HLW melter will high-level and transuranic wastes to a vitrified form for disposal in a geological repository. The LLW melter will vitrify the low-level waste which is mainly a sodium solution. Characterization of the tank wastes is still in progress, and the pretreatment processes are still under development Apart from tank-to-tank variations, the feed delivered to the HLW melter will be subject to process control variability which consists of blending and pretreating the waste. The challenge is then to develop glass formulation models which can produce durable and processable glass compositions for all potential vitrification feed compositions and processing conditions. The work under HLW glass formulation is to study and model glass and melt pro functions of glass composition and temperature. The properties of interest include viscosity, electrical conductivity, liquidus temperature, crystallization, immiscibility durability. It is these properties that determine the glass processability and ac waste glass. Apart from composition, some properties, such as viscosity are affected by temperature. The processing temperature may vary from 1050°C to 1550°C dependent upon the melter type. The glass will also experience a temperature profile upon cooling. The purpose of this letter report is to assess the expected vitrification feed compositions for critical components with the greatest potential impact on waste loading for double shell tank (DST) and single shell tank (SST) wastes. The basis for critical component selection is identified along with the planned approach for evaluation. The proposed experimental work is a crucial part of model development and verification.

1482 (PNNL–10981) **Hanford Waste Vitrification Plant hydrogen generation.** King, R.B. (and others); King, A.D. Jr.; Bhattacharyya, N.K. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 71p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PHTD–K0959). Order Number DE96008427. Source: OSTI; NTIS; INIS; GPO Dep.

The most promising method for the disposal of highly radioactive nuclear wastes is a vitrification process in which the wastes are incorporated into borosilicate glass logs, the logs are sealed into welded stainless steel canisters, and the canisters are buried in suitably protected burial sites for disposal. The purpose of the research supported by the Hanford Waste Vitrification Plant (HWVP) project of the Department of Energy through Battelle Pacific Northwest Laboratory (PNL) and summarized in this report was to gain a basic understanding of the hydrogen generation process and to predict the rate and amount of hydrogen generation during the treatment of HWVP feed simulants with formic acid. The objectives of the study were to determine the key feed components and process variables which enhance or inhibit the.production of hydrogen. Information on the kinetics and stoichiometry of relevant formic acid reactions were sought to provide a basis for viable mechanistic proposals. The chemical reactions were characterized through the production and consumption of the key gaseous products such as H_2. CO_2, N_20, NO, and NH_3. For this mason this research program relied heavily on analyses of the gases produced and consumed during reactions of the HWVP feed simulants with formic acid under various conditions. Such analyses, used gas chromatographic equipment and expertise at the University of Georgia for the separation and determination of H_2, CO, CO_2, N_2, N_2O and NO.

1483 (PNNL–10982) **Hanford waste vitrification plant hydrogen generation study: Preliminary evaluation of alternatives to formic acid.** King, R.B.; Bhattacharyya, N.K.; Kumar, V. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C94-03-02R). Order Number DE96008857. Source: OSTI; NTIS; INIS; GPO Dep.

Oxalic, glyoxylic, glycolic, malonic, pyruvic, lactic, levulinic, and citric acids as well as glycine have been evaluated as possible substitutes for formic acid in the preparation of feed for the Hanford waste vitrification plant using a nonradioactive feed stimulant UGA-12M1 containing substantial amounts of aluminum and iron oxides as well as nitrate and nitrite at 90C in the presence of hydrated rhodium trichloride. Unlike formic acid none of these carboxylic acids liberate hydrogen under these conditions and only malonic and citric acids form ammonia. Glyoxylic, glycolic, malonic, pyruvic, lactic, levulinic, and citric acids all appear to have significant reducing properties under the reaction conditions of interest as indicated by the observation of appreciable amounts of N_2O as a reduction product of,nitrite or, less likely, nitrate at 90C. Glyoxylic, pyruvic, and malonic acids all appear to be unstable towards decarboxylation at 90C in the presence of $Al(OH)_3$. Among the carboxylic acids investigated in this study the α-hydroxycarboxylic acids glycolic and lactic acids appear to be the most interesting potential substitutes for formic acid in the feed preparation for the vitrification plant because of their failure to produce hydrogen or ammonia or to undergo decarboxylation under the reaction conditions although they exhibit some reducing properties in feed stimulant experiments.

1484 (PNNL–10984) **PNL vitrification technology development project high-waste loaded high-level waste glasses for high-temperature melter: Letter report.** Kim, D.; Hrma, P.R. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008177. Source: OSTI; NTIS; INIS; GPO Dep.

For vitrification of high-level wastes (HLW) at the Hanford Site, a Joule-heated overflow type melter with bottom draining capability and capable of operating at temperatures up to 1500°C is being developed. The original proposed Hanford Waste Vitrification Plant (HWVP) melter used a 1150°C processing temperature and was tested using glasses with up to 28 wt% waste oxide loading for NCAW (Neutralized Current Acid Waste). The goal of the high-temperature melter (HTM) is the volume reduction of the final product and increase of the waste processing rate by processing high-waste loaded glasses at higher temperatures. This would dramatically decrease waste disposal and processing costs. The aim of glass development for the HTM is to determine compositions and melting temperatures for processible and acceptable glasses with a high waste loading. Glass property/composition models for viscosity and liquidus temperature developed in the Glass Envelope Definition (GED) study were used. The results of glass formulation and experimental testing are presented for NCAW and DST/SST (Double-Shell Tank/Single-Shell Tank) Blend waste. Although the purpose of this report was to summarize the glass development study with Blend waste only, the results with NCAW were needed because glass development with Blend waste was based on the results from the glass development study with NCAW.

1485 (PNNL–10986) **The effect of chromium oxide on the properties of simulated nuclear waste glasses.** Vojtech, O. (and others); Sussmilch, J.; Urbanec, Z. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 344p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-01V). Order Number DE96008339. Source: OSTI; NTIS; INIS; GPO Dep.

A study of the effect of chromium on the properties of selected glasses was performed in the frame of a Contract between Battelle, Pacific Northwest Laboratories and Nuclear Research Institute, ReZ. In the period from July 1994 to June 1995 two borosilicate glasses of special composition were prepared according to the PNL procedure and their physical and structural characteristics of glasses were studied. This Final Report contains a vast documentation on the properties of all glasses studied. For the preparation of the respective technology more detailed study of physicochemical properties and crystallinity of investigated systems would be desirable.

1486 (PNNL–10987) **Effect of composition and temperature on the properties of High-Level Waste (HLW) glasses melting above 1200°C (Draft).** Vienna, J.D. (and others); Hrma, P.R.; Schweiger, M.J. Pacific Northwest National Lab., Richland, WA (United States). Feb 1996. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008204. Source: OSTI; NTIS; INIS; GPO Dep.

Increasing the melting temperature of HLW glass allows an increase of waste loading (thus reducing product volume) and the production of more durable glasses at a faster melting rate. However, HLW glasses that melt at high temperatures differ in composition from glasses formulated for low temperature (~1150°C). Consequently, the composition of high-temperature glasses falls in a region previously not well tested or understood. This report represents a preliminary study of property/composition relationships of high-temperature Hanford HLW glasses using a one-component-at-a-time change approach. A test matrix has been designed to explore a composition region expected for high-temperature high-waste loading HLW glasses to be produced at Hanford. This matrix was designed by varying several key components (SiO_2, B_2O_3, Na_2O, Li_2O, Fe_2O_3, Al_2O_3, ZrO_2, Bi_2O_3, P_2O_5, UO_2, TiO_2, Cr_2O_3, and others) starting from a glass based on a Hanford HLW all-blend waste. Glasses were fabricated and tested for viscosity, glass transition temperature, electrical conductivity, crystallinity, liquidus temperature, and PCT release. The effect of individual components on glass properties was assessed using first- and second- order empirical models. The first-order component effects were compared with those from low-temperature HLW glasses.

1487 (PNNL–10988) **Feed specification for the double-shell tank/single shell tank waste blend for high-level waste vitrification process and melter testing.** Tracey, E.M.; Merz, M.D.; Patello, G.K.; Wiemers, K.D. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008007. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Level Waste (HLW) Vitrification Program is developing technology for the Department of Energy to immobilize high-level and transuranic waste as glass for permanent disposal. In support of the program, Pacific Northwest Laboratory (PNL) is conducting laboratory-scale melter feed preparation studies and HLW melter testing which require a simulated HLW feed. The simulant HLW feed represents a blend of the waste from 177 single shell and double shell tanks. The waste blend composition is based on normalized track radionuclide components (TRAC), historical tank data, and assumptions on the pretreatment of the waste. The HLW simulant feed specification for the waste blend composition provides direction for the preparation of laboratory-scale and large-scale HLW blend simulant to be used in melter feed preparation studies and melter testing.

1488 (PNNL–10989) **Annual progress report to Battelle Pacific Northwest National Laboratories on prediction of phase separation of simulated nuclear waste glasses.** Sung, Y.M.; Tomozawa, M. Pacific Northwest National Lab., Richland, WA (United States). Feb 1996. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-01GG). Order Number DE96008726. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this research is to predict the immiscibility boundaries of multi-component borosilicate glasses, on which many nuclear waste glass compositions are based. The method used is similar to the prediction method of immiscibility boundaries of multi-component silicate glass systems successfully made earlier and is based upon the superposition of immiscibility boundaries of simple systems using an appropriate parameter. This method is possible because many immiscibility boundaries have similar shapes and can be scaled by a parameter. In the alkali and alkaline earth binary silicate systems, for example, the critical temperature and compositions were scaled using the Debye-Hueckel theory. In the present study on borosilicate systems, first, immiscibility boundaries of various binary alkali and alkaline borate glass systems (e.g. BaO-B_2O_3) were examined and their critical temperatures were evaluated in terms of Debye-Hueckel theory. The mixing effects of two alkali and alkaline-earth borate systems on the critical temperature were also explored. Next immiscibility boundaries of ternary borosilicate glasses (e.g. Na_2O-SiO_2-B_2O_3, K_2O-SiO_2-B_2O_3, Rb_2O-SiO_2-B_2O_3, and Cs_2O-SiO_2-B_2O_3) were examined. Their mixing effects are currently under investigation.

1489 (PNNL–10991) **Dry-out and low temperature calcination of DST/SST waste blend high temperature melter feed.** Smith, H.D.; Tracey, E.M. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008199. Source: OSTI; NTIS; !NIS; GPO Dep.

The FY1994 DST/SST blend was prepared in accordance with the DST/SST blend feed specification. The laboratory preparation steps and observations were compared with an existing experience base to verify the acceptability of the feed specification for simulant make-up. The most significant test results included a variety of features. Ferrocyanide breaks down to NH_3 plus formate, during the low-temperature calcining phase of the tests. Ferrocyanide displayed no redox reactivity with the nitrates and nitrites contained in the slurry in the absence of sugar. Sugar displays a redox reaction with the nitrates and nitrites in the blend similar to the redox. reaction observed in the LLW feed simulant. Boiling of a free flowing slurry occurs at temperatures below about 120°C. When about 45% of the total water loss has occurred, the feed slurry congeals and continues to lose water, shrinking and developing shrinkage cracks. Water stops coming off between 350°C and 400°C. Slurry shear strength and viscosity strongly increase as the weight percent solids increases from 20 wt% to 45 wt%. The 45 wt% solids corresponds to approximately a 40 % water loss. The principle beat sensitivity for this material is the exothermic reaction which is activated when the temperature exceeds about 250°C. The breakdown of ferrocyanide to ammonia and formate under strongly basic conditions may begin at temperatures less than 100°C, but the rate increased strongly with increasing temperature and appeared to be completed in the time of our tests. Differential thermal analysis (DTA) results on feed slurry without and with ferrocyanide showed only endothermic behavior. This is consistent with the dry out and low temperature calcine studies which did not indicate any exothermic behavior for the feed slurry with and without ferrocyanide.

1490 (PNNL–10992) **Evaluation of high-level waste vitrification feed preparation chemistry for an NCAW simulant, FY 1994: Alternate flowsheets (DRAFT).** Smith, H.D.; Merz, M.D.; Wiemers, K.D.; Smith, G.L. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008179. Source: OSTI; NTIS; INIS; GPO Dep.

High-level radioactive waste stored in tanks at the U.S. Department of Energy's (DOE's) Hanford Site will be pretreated to concentrate radioactive constituents and fed to the vitrification plant A flowsheet for feed preparation within the vitrification plant (based on the Hanford Waste Vitrification Plant (HWVP) design) called for HCOOH addition during the feed preparation step to adjust rheology and glass redox conditions. However, the potential for generating H_2 and NH_3 during treatment of high-level waste (HLW) with HCOOH was identified at Pacific Northwest Laboratory (PNL). Studies at the University of Georgia, under contract with Savannah River Technology Center (SRTC) and PNL, have verified the catalytic role of noble metals (Pd, Rh, Ru), present in the waste, in the generation of H_2 and NH_3. Both laboratory-scale and pilot-scale studies at SRTC have documented the H_2 and NH_3 generation phenomenal Because H_2 and NH_3 may create hazardous conditions in the vessel vapor space and offgas system of a vitrification plant, reducing the H_2 generation rate and the NH_3 generation to the lowest possible levels consistent with desired melter feed characteristics is important. The Fiscal Year 1993 and 1994 studies were conducted with simulated (non-radioactive), pre-treated neutralized current acid waste (NCAW). Neutralized current acid waste is a high-level waste originating from the plutonium/uranium extraction (PUREX) plant that has been partially denitrated with sugar, neutralized with NaOH, and is presently stored in double-shell tanks. The non-radioactive simulant used for the present study includes all of the trace components found in the waste, or substitutes a chemically similar element for radioactive or very toxic species. The composition and simulant preparation steps were chosen to best simulate the chemical processing characteristics of the actual waste.

1491 (PNNL–10996) **Minor component study for simulated high-level nuclear waste glasses (Draft).** Li, H.; Langowskim, M.H.; Hrma, P.R.; Schweiger, M.J.; Vienna, J.D.; Smith, D.E. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–T3C-95-125). Order Number DE96008249. Source: OSTI; NTIS; INIS; GPO Dep.

Hanford Site single-shell tank (SSI) and double-shell tank (DSI) wastes are planned to be separated into low activity (or low-level waste, LLW) and high activity (or high-level waste, HLW) fractions, and to be vitrified for disposal. Formulation of HLW glass must comply with glass processibility and durability requirements, including constraints on melt viscosity, electrical conductivity, liquidus temperature, tendency for phase segregation on the molten glass surface, and chemical durability of the final waste form. A wide variety of HLW compositions are expected to be vitrified. In addition these wastes will likely vary in composition from current estimates. High concentrations of certain troublesome components, such as sulfate, phosphate, and chrome, raise concerns about their potential hinderance to the waste vitrification process. For example, phosphate segregation in the cold cap (the layer of feed on top of the glass melt) in a Joule-heated melter may inhibit the melting process (Bunnell, 1988). This has been reported during a pilot-scale ceramic melter run, PSCM-19, (Perez, 1985). Molten salt segregation of either sulfate or chromate is also hazardous to the waste vitrification process. Excessive (Cr, Fe, Mn, Ni) spinel crystal formation in molten glass can also be detrimental to melter operation.

1492 (PNNL–11007) **Recycle Waste Collection Tank (RWCT) simulant testing in the PVTD feed preparation system.** Abrigo, G.P.; Daume, J.T.; Halstead, S.D.; Myers, R.L.; Beckette, M.R.; Freeman, C.J.; Hatchell, B.K. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 232p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–K101-C94-04-14E). Order Number DE96008350. Source: OSTI; NTIS; INIS; GPO Dep.

(This is part of the radwaste vitrification program at Hanford.) RWCT was to routinely receive final canister decontamination sand blast frit and rinse water, Decontamination Waste Treatment Tank bottoms, and melter off-gas Submerged Bed Scrubber filter cake. In order to address the design needs of the RWCT system to meet performance levels, the PNL Vitrification Technology (PVTD) program used the Feed Preparation Test System (FPTS) to evaluate its equipment and performance for a simulant of RWCT slurry. (FPTS is an adaptation of the Defense Waste Processing Facility feed preparation system and represents the initially proposed Hanford Waste Vitrification Plant feed preparation system designed by Fluor-Daniel, Inc.) The following were determined: mixing performance, pump priming, pump performance, simulant flow characterization, evaporator and condenser performance, and ammonia dispersion. The RWCT test had two runs, one with and one without tank baffles.

1493 (PNNL–11010) **Vitrification of noble metals containing NCAW simulant with an engineering scale melter (ESM): Campaign report.** Grunewald, W.; Roth, G.; Tobie, W.; Weisenburger, S.; Weiss, K.; Elliott, M.; Eyler, L.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 306p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PHTD–K967). Order Number DE96008349. Source: OSTI; NTIS; INIS; GPO Dep.

ESM has been designed as a 10th-scale model of the DWPF-type melter, currently the reference melter for nitrification of Hanford double shell tankwaste. ESM and related equipment have been integrated to the existing mockup vitrification plant VA-WAK at KfK. On June 2-July 10, 1992, a shakedown test using 2.61 m^3 of NCAW (neutralized current acid waste) simulant without noble metals was performed. On July 11-Aug. 30, 1992, 14.23 m^3 of the same simulant with nominal concentrations of Ru, Rh, and Pd were vitrified. Objective was to investigate the behavior of such a melter with respect to discharge of noble metals with routine glass pouring via glass overflow. Results indicate an accumulation of noble metals in the bottom area of the flat-bottomed ESM. About 65 wt% of the noble metals fed to the melter could be drained out, whereas 35 wt% accumulated in the melter, based on analysis of glass samples from glass pouring stream in to the canisters. After the melter was drained at the end of the campaign through a bottom drain valve, glass samples were taken from the residual bottom layer. The samples had significantly increased noble metals content (factor of 20-45 to target loading). They showed also a significant decrease of the specific electric resistance compared to bulk glass (factor of 10). A decrease of 10- 15% of the resistance between he power electrodes could be seen at the run end, but the total amount of noble metals accumulated was not yet sufficient enough to disturb the Joule heating of the glass tank severely.

1494 (PNNL–11013) **Evaluation of Phase II glass formulations for vitrification of Hanford Site low-level waste.** Feng, X. (and others); Hrma, P.R.; Schweiger, M.J. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–T3B-95-206). Order Number DE96008235. Source: OSTI; NTIS; INIS; GPO Dep.

A vendor glass formulation study was carried out at Pacific Northwest Laboratory (PNL), supporting the Phase I and Phase II melter vendor testing activities for Westinghouse Hanford Company. This study is built upon the LLW glass optimization effort that will be described in a separate report. For Phase I vendor melter testing, six glass formulations were developed at PNL and additional were developed by Phase I vendors. All the doses were characterized in terms of viscosity and chemical durability by the 7-day Product Consistency Test. Twelve Phase II glass formulations (see Tables 3.5 and 3.6) were developed to accommodate 2.5 wt% P_2O_5 and 1.0 wt% SO_3 without significant processing problems. These levels of P_2O_5 and SO_3 are expected to be the highest possible concentrations from Hanford Site LLW streams at 25 wt% waste loading in glass. The Phase H compositions formulated were 6 to 23 times more durable than the environmental assessment (EA) glass. They melt within the temperature range of 1160° to 1410°C to suit different melting technologies. The composition types include boron-free for volatilization sensitive melters; boron-containing glasses for cold-cap melters; Zr-containing, glasses for enhanced long-term durability; and Fe-containing glasses for reducing melting temperature and melt volatility while maintaining chemical durability.

1495 (PNNL–11015) **Compilation of information on melter modeling.** Eyler, L.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-03-01C1-Pt.A). Order Number DE96008259. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of the task described in this report is to compile information on modeling capabilities for the High-Temperature Melter and the Cold Crucible Melter and issue a modeling capabilities letter report summarizing existing modeling capabilities. The report is to include strategy recommendations for future modeling efforts to support the High Level Waste (HLW) melter development.

1496 (PNNL–11016) **Hanford high-level waste melter system evaluation data packages.** Elliott, M.L.; Shafer, P.J.; Lamar, D.A.; Merrill, R.A.; Grunewald, W.; Roth, G.; Tobie, W. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 365p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-03-01C4). Order Number DE96008348. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System is selecting a reference melter system for the Hanford High-Level Waste vitrification plant. A melter evaluation was conducted in FY 1994 to narrow down the long list of potential melter technologies to a few for testing. A formal evaluation was performed by a Melter Selection Working Group (MSWG), which met in June and August 1994. At the June meeting, MSWG evaluated 15 technologies and selected six for more thorough evaluation at the Aug. meeting. All 6 were variations of joule-heated or induction-heated melters. Between the June and August meetings, Hanford site staff and consultants compiled data packages for each of the six melter technologies as well as variants of the baseline technologies. Information was solicited from melter candidate vendors to supplement existing information. This document contains the data packages compiled to provide background information to MSWG in support of the evaluation of the six technologies. (A separate evaluation was performed by Fluor Daniel, Inc. to identify balance of plant impacts if a given melter system was selected.)

1497 (PNNL–11018) **Letter report: Cold crucible melter assessment.** Elliott, M.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C94-04-20B). Order Number DE96008351. Source: OSTI; NTIS; INIS; GPO Dep.

One of the activities of the PNL Vitrification Technology Development (PVTD) Project is to assist the Tank Waste Remediation Systems (TWRS) Program in determining which melter systems should be performance tested for potential implementation in the high-level waste (HLW) vitrification plant. The Richland Operations Office (RL) has recommended that the Cold Crucible Melter (CCM) be evaluated as a candidate "next generation" melter. As a result, the CCM System Evaluation cost account was established under the PVTD Project so that the CCM could be initially assessed on a high-priority basis. This letter report summarizes a brief initial review and assessment of the CCM. Using the recommendations made in this document, Westinghouse Hanford Company (WHC) and RL will make a decision regarding the urgency of performance testing the CCM. If the decision is favorable, a subcontract will be negotiated for performance testing of a CCM using Hanford HLW simulants in a pilot-scale facility. Because of the aggressive nature of the schedule, the CCM evaluation was not rigorous. The evaluation consisted of a literature review and interviews with proponents of the technology during a recent trip to France. This letter report summarizes the evaluation and makes recommendations regarding further work in this area.

1498 (PNNL–11021) **Initial ACTR retrieval technology evaluation test material recommendations.** Powell, M.R. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010133. Source: OSTI; NTIS; INIS; GPO Dep.

Millions of gallons of radiaoctive waste are contained in underground storage tanks at Hanford (SE Washington). Techniques for retrieving much of this waste from the storage tanks have been developed. Current baseline approach is to use sluice jets for single-shell tanks and mixer pumps for double-shell tanks. The Acquire Commercial Technology for Retrieval (ACTR) effort was initiated to identify potential improvements in or alternatives to the baseline waste retrieval methods. Communications with a variety of vendors are underway to identify improved methods that can be implemented at Hanford with little or no additional development. Commercially available retrieval methods will be evaluated by a combination of testing and system-level cost estimation. Current progress toward developing waste simulants for testing ACTR candidate methods is reported; the simulants are designed to model 4 different types of tank waste. Simulant recipes are given for wet sludge, hardpan/dried sludge,hard saltcake, and soft saltcake. Comparisons of the waste and simulant properties are documented in this report.

1499 (PNNL–11029) **Evaluation of HWVP feed preparation chemistry for an NCAW simulant – Fiscal Year 1991: Evaluation of offgas generation, reductant requirements and thermal stability: Technical report.** Wiemers, K.D.; Langowski, M.H.; Powell, M.R.; Larson, D.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008181. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Waste Vitrification Plant (HWVP) is being designed for the Department of Energy to immobilize pretreated radioactive high-level waste and transuranic waste as glass for permanent disposal. Laboratory studies were conducted to characterize HWVP slurry chemistry during selected processing steps, using pretreated Neutralized Current Acid Waste (NCAW) simulant. Laboratory tests were designed to provide bases for determining the potential for hazardous gas generation, making chemical adjustments for glass redox control, and assessing the potential for rapid exothermic reactions of dried NCAW slurry. Offgas generation rates and the total moles of gas released as a function of selected pretreated NCAW components and process variables were measured. An emphasis was placed on identifying conditions that initiate significant H_2 generation. Glass redox measurements, using $Fe^{+2}/\Sigma Fe$ as an indicator of the glass oxidation state, were made to develop guidelines for HCOOH addition. Thermal analyses of dried NCAW simulant were conducted to assess the potential of a rapid uncontrollable exothermic reaction in the chemical processing cell tanks.

1500 (PNNL–11033) **HWVP submerged bed scrubber waste treatment by ion exchange at high pH.** Bray, L.A.; Carson, K.J.; Elovich, R.J.; Eakin, D.E. Pacific Northwest National Lab., Richland, WA (United States). Mar 1996. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008203. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Waste Vitrification Plant (HWVP) is expected to produce aqueous waste streams that will require further processing for cesium, strontium, and transuranic (TRU) removal prior to incorporation into grout. Fluor Daniel, Inc. has recommended that zeolite be added to these waste streams for adsorption of cesium (Cs) and strontium (Sr) following pH adjustment by sodium hydroxide (NAOH) addition. Filtration will then used to remove the TRU elements associated with the process solids and the zeolite containing the Cs and Sr.

1501 (PNNL–11036) **OWL models update and use for TWRS strategy development.** Hoza, M. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-04A). Order Number DE96008335. Source: OSTI; NTIS; INIS; GPO Dep.

High Level Waste (HLW) at Hanford will be converted to a borosilicate glass for disposal. The glass will need to meet both processability and durability restrictions. The processability conditions will ensure that the glass has properties (viscosity, electrical conductivity, and liquidus temperature) within ranges known to be acceptable for the vitrification process. Durability restrictions will ensure that the resultant glass will meet quantitative criteria for disposal in a repository. An experimental program, the Composition Variation Study (CVS), is developing property models which correlate physical properties to glass compositions. Property models have been developed for the viscosity, electrical conductivity and liquidus temperature of the glass melt, and durability of the glass. The property models are described in the above report. Bounds on property values, limits on the composition of individual components in the glass, and other restrictions are also published in the report.

1502 (PNNL–11037) **Development of models and software for liquidus temperatures of glasses of HWVP products. Final report.** Hrma, P.R. (and others); Vienna, J.D.; Pelton, A.D. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008205. Source: OSTI; NTIS; INIS; GPO Dep.

In an earlier report [92 Pel] was described the development of software and thermodynamic databases for the calculation of liquidus temperatures of glasses of HWVP products containing the components SiO_2-B_2O_3-Na_2O-Li_2O-CaO-MgO-Fe_2O_3-Al_2O_3-ZrO_2-"others". The software package developed at that time consisted of the EQUILIB program of the F*A*C*T computer system with special input/output routines. Since then, Battelle has purchased the entire F*A*C*T computer system, and this fully replaces the earlier package. Furthermore, with the entire F*A*C*T system, additional calculations can be performed such as calculations at fixed O_2, SO_2 etc. pressures, or graphing of output. Furthermore, the public F*A*C*T database of over 5000 gaseous species and condensed phases is now accessible. The private databases for the glass and crystalline phases were developed for Battelle by optimization of thermodynamic and phase diagram data. That is, all available data for 2- and 3-component sub-systems of the 9-component oxide system were collected, and parameters of model equations for the thermodynamic properties were found which best reproduce all the data. For representing the thermodynamic properties of the glass as a function of composition and temperature, the modified quasichemical model was used. This model was described in the earlier report [92 Pel] along with all the optimizations. With the model, it was possible to predict the thermodynamic properties of the 9-component glass, and thereby to calculate liquidus temperatures. Liquidus temperatures measured by Battelle for 123 CVS glass compositions were used to test the model and to refine the model by the addition of further parameters.

1503 (PNNL–11039) **A summary report on feed preparation offgas and glass redox data for Hanford waste vitrification plant: Letter report.** Merz, M.D. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PHTD–C93-03-02L). Order Number DE96008423. Source: OSTI; NTIS; INIS; GPO Dep.

Tests to evaluate feed processing options for the Hanford Waste Vitrification Plant (HWVP) were conducted by a number of investigators, and considerable data were acquired for tests of different scale, including recent full-scale tests. In this report, a comparison was made of the characteristics of feed preparation observed in tests of scale ranging from 57 ml to full-scale of 28,000 liters. These tests included Pacific Northwest Laboratory (PNL) laboratory-scale tests, Kernforschungszentrums Karlsruhe (KfK) melter feed preparation, Research Scale Melter (RSM) feed preparation, Integrated DWPF Melter System (IDMS) feed preparation, Slurry Integrated Performance Testing (SIPT) feed preparation, and formic acid addition to Hanford Neutralized Current Acid Waste (NCAW) care samples.' The data presented herein were drawn mainly from draft reports and include system characteristics such as slurry volume and depth, sweep gas flow rate, headspace, and heating and stirring characteristics. Operating conditions such as acid feed rate, temperature, starting pH, final pH, quantities and type of frit, nitrite, nitrate, and carbonate concentrations, noble metal content, and waste oxide loading were tabulated. Offgas data for CO_2, NO_x, N_2O, NO_2, H_2 and NH_3 were tabulated on a common basis. Observation and non-observation of other species were also noted.

1504 (PNNL–11040) **HWVP NCAW melter feed rheology FY 1993 testing and analyses: Letter report.** Smith, P.A. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 197p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008182. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Waste Vitrification Plant (HWVP) program has been established to immobilize selected Hanford nuclear wastes before shipment to a geologic repository. The HWVP program is directed by the U.S. Department of Energy (DOE). The Pacific Northwest Laboratory (PNL) provides waste processing and vitrification technology to assist the design effort. The focus of this letter report is melter feed rheology, Process/Product Development, which is part of the Task in the PNL HWVP Technology Development (PHTD) Project. Specifically, the melter feed must be transported to the liquid fed ceramic melter (LFCM) to ensure

HWVP operability and the manufacture of an immobilized waste form. The objective of the PHTD Project slurry flow technology development is to understand and correlate dilute and concentrated waste, formatted waste, waste with recycle addition, and melter feed transport properties. The objectives of the work described in this document were to examine frit effects and several processing conditions on melter feed rheology. The investigated conditions included boiling time, pH, noble metal containing melter feed, solids loading, and aging time. The results of these experiments contribute to the understanding of melter feed rheology. This document is organized in eight sections. This section provides the introductory remarks, followed by Section 2.0 that contains conclusions and recommendations. Section 3.0 reviews the scientific principles, and Section 4.0 details the experimental methods. The results and discussion and the review of related rheology data are in Sections 5.0 and 6.0, respectively. Section 7.0, an analysis of NCAW melter feed rheology data, provides an overall review of melter feed with FY 91 frit. References are included in Section 8.0. This letter report satisfies contractor milestone PHTD C93-03.02E, as described in the FY 1993 Pacific Northwest Hanford Laboratory Waste Plant Technology Development (PHTD) Project Work Plan.

1505 (PNNL–11042) **Compilation of information on modeling of inductively heated cold crucible melters.** Lessor, D.L. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008033. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this communication, Phase B of a two-part report, is to present information on modeling capabilities for inductively heated cold crucible melters, a concept applicable to waste immobilization. Inductively heated melters are those in which heat is generated using coils around, rather than electrodes within, the material to be heated. Cold crucible or skull melters are those in which the melted material is confined within unmelted material of the same composition. This phase of the report complements and supplements Phase A by Loren Eyler, specifically by giving additional information on modeling capabilities for the inductively heated melter concept. Eyler discussed electrically heated melter modeling capabilities, emphasizing heating by electrodes within the melt or on crucible walls. Eyler also discussed requirements and resources for the computational fluid dynamics, heat flow, radiation effects, and boundary conditions in melter modeling; the reader is referred to Eyler's discussion of these. This report is intended for use in the High Level Waste (HLW) melter program at Hanford. We sought any modeling capabilities useful to the HLW program, whether through contracted research, code license for operation by Department of Energy laboratories, or existing codes and modeling expertise within DOE.

1506 (PNNL–11043) **Offgas characterization from the radioactive NCAW core sample (102-AZ-C1) and simulant during HWVP feed preparation testing: Letter report.** Langowski, M.H.; Morrey, E.V.; Tingey, J.M.; Beckette, M.R. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PHTD–C93-03-08A). Order Number DE96008425. Source: OSTI; NTIS; INIS; GPO Dep.

The primary objective of the Radioactive Process/Product Laboratory Testing (RPPLT) is to provide preliminary confirmation that the nonradioactive waste feed stimulant recipe is adequate for addressing the testing needs of design, safety, waste form qualification (WFO), and permitting of the Hanford Waste Vitrification Plant HWVP). The information contained In this letter report specifically addresses offgas production during the formating, digestion, and recycle addition of the third Neutralized Current Acid Waste (NCAW) core sample and core stimulant. Testing was conducted using a laboratory-scale version of the HWVP flowsheet.

1507 (PNNL–11045) **Detailed design data package: 3.1a-Film cooler pressure drop data; Item 3.2a - SBS packing selection; Item 3.2b, 3.2c - Pressure drop data for SBS distribution plate; and Item 3.2e - SBS distribution plate and liquid risers. PHTD pilot-scale melter testing system cost account milesonte 1.2.2.04.15A.** Whyatt, G.A.; Anderson, L.D.; Evans, J. II. National Renewable Energy Lab., Golden, CO (United States). Mar 1996. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008201. Source: OSTI; NTIS; INIS; GPO Dep.

This data package transmits information collected on the Liquid-Fed Ceramic Melter (LFCM) offgas system prior to melter feeding operations. Injection of steam to the melter plenum was used to simulate feeding of the melter. Steam surge cases were studied under steady-state surge conditions. Dynamic surges will be examined under data needs. The Fluor data needs included two blank tables requesting specific information for data needs 3.1 and 3.2. These tables are provided in Tables S.1 and S.2 below with the requested information filled in.

1508 (PNNL–11050) **Technical Note: Updated durability/composition relationships for Hanford high-level waste glasses.** Piepel, G.F.; Hartley, S.A.; Redgate, P.E. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–T3C-95-126). Order Number DE96008856. Source: OSTI; NTIS; INIS; GPO Dep.

This technical note presents empirical models developed in FYI 995 to predict durability as functions of glass composition. Models are presented for normalized releases of B, Li, Na, and Si from the 7-day Product Consistency Test (PCT) applied to quenched and canister centerline cooled (CCC) glasses as well as from the 28-day Materials Characterization Center-1 (MCC-1) test applied to quenched glasses. Models are presented for Composition Variation Study (CVS) data from low temperature melter (LTM) studies (Hrma, Piepel, et al. 1994) and high temperature melter (HTM) studies (Vienna et al. 1995). The data used for modeling in this technical note are listed in Appendix A.

1509 (PNNL–11051) **PNL vitrification technology development project glass formulation strategy for LLW vitrification.** Kim, D.; Hrma, P.R.; Westsik, J.H. Jr. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-01AD). Order Number DE96008859. Source: OSTI; NTIS; INIS; GPO Dep.

This Glass Formulation Strategy describes development approaches to optimize glass compositions for Hanford's low-level waste vitrification between now and the projected low-level waste facility start-up in 2005. The objectives of the glass formulation task are to develop optimized glass compositions with satisfactory long-term durability, acceptable processing characteristics, adequate flexibility to handle waste variations, maximize waste loading to practical limits, and to develop methodology to respond to further waste variations.

1510 (PNNL–11054) **Report for Westinghouse Hanford Company: Makeup procedures and characterization data for modified DSSF and modified remaining inventory simulated tank waste.** Lokken, R.O. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (PVTD–C95-02-03D). Order Number DE96008858. Source: OSTI; NTIS; INIS; GPO Dep.

The majority of defense wastes generated from reprocessing spent reactor fuel at Hanford are stored in underground Double-Shell Tanks (DST) and in older Single-Shell Tanks (SST). The Tank Waste Remediation System (TWRS) Program has the responsibility of safely managing and immobilizing these tank wastes for disposal. A reference process flowsheet is being developed that includes waste retrieval, pretreatment, and vitrification. Melter technologies for vitrifying low-level tank wastes are being evaluated by Westinghouse Hanford Company. Chemical simulants are being used in the technology testing. For the first phase of low-level waste (LLW) vitrification simulant development, two waste stream compositions were investigated. The first waste simulant was based on the analyses of six tanks of double-shell slurry feed (DSSF) waste and on the projected composition of the wastes exiting the pretreatment operations. A simulant normalized to 6 M sodium was based on the anticipated chemical concentrations after ion exchange and initial separations. The same simulant concentrated to 10 M sodium would represent a waste that had been concentrated by evaporation to reduce the overall volume. The second LLW simulant, referred to as the remaining inventory (RI), included wastes not included in the DSSF tanks and the projected LLW fraction of single-shell tank wastes.

1511 (PNNL–11067) **Final technical report: Atmospheric emission analysis for the Hanford Waste Vitrification plant.** Andrews, G.L.; Rhoads, K.C. Pacific Northwest Lab., Richland, WA (United States). Mar 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (HWVP–89-IVR0010101C). Order Number DE96008428. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an assessment of chemical and radiological effluents that are expected to be released to the atmosphere from the Hanford Waste Vitrification Plant (HWVP). The report is divided into two sections. In the first section, the impacts of carbon monoxide (CO) and nitrogen oxides as NO_2 have been estimated for areas within the Hanford Site boundary. A description of the dispersion model used to estimate CO and NO_2 average concentrations and Hanford Site meteorological data has been included in this section. In the second section, calculations were performed to estimate the potential radiation doses to a maximally exposed off-site individual. The model used to estimate the horizontal and vertical dispersion of radionuclides is also discussed.

1512 (PNNL–11068) **Potential enhancements to addressing programmatic risk in the tank waste remediation system (TWRS) program.** Brothers, A.; Fassbender, L.; Bilyard, G.; Levine, L. Pacific Northwest Lab., Richland, WA (United States). Apr 1996. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010454. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest National Laboratory (PNNL) conducted a Tank Waste Remediation System (TWRS) Risk Management methodology development task. The objective of this task was to develop risk management methodology focused on (1) the use of programmatic risk information in making TWRS architecture selection decisions and (2) the identification/evaluation/selection of TWRS risk-handling actions. Methods for incorporating programmatic risk/uncertainty estimates into trade studies are provided for engineers/analysts. Methods for identifying, evaluating, and selecting risk-handling actions are provided for managers. The guidance provided in this report is designed to help decision-makers make difficult judgments. Current approaches to architecture selection decisions and identification/evaluation/selection of risk-handling actions are summarized. Three categories of sources of programmatic risk (parametric, external, and organizational) are examined. Multiple analytical approaches are presented to enhance the current alternative generation and analysis (AGA) and risk-handling procedures. Appendix A describes some commercially available risk management software tools and Appendix B provides a brief introduction to quantification of risk attitudes. The report provides three levels of analysis for enhancing the AGA Procedure: (1) qualitative discussion coupled with estimated uncertainty ranges for scores in the alternatives-by-criteria matrix; (2) formal elicitation of probability distributions for the alternative scores; and (3) a formal, more structured, comprehensive risk analysis. A framework is also presented for using the AGA programmatic risk analysis results in making better decisions. The report also presents two levels of analysis for evaluation and selection of risk-handling actions: (1) qualitative analysis and judgmental rankings of alternative actions, and (2) Simple Multi-Attribute Rating Technique (SMART).

1513 (PNNL–11089) **The chemistry of sludge washing and caustic leaching processes for selected Hanford tank wastes.** Rapko, B.M.; Blanchard, D.L.; Colton, N.G.; Felmy, A.R.; Liu, J.; Lumetta, G.J. Pacific Northwest National Lab., Richland, WA (United States). Mar 1996. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96009074. Source: OSTI; NTIS; INIS; GPO Dep.

A broad-based study on washing and caustic leaching of Hanford tank sludges was performed in FY 1995 to gain a better understanding of the basic chemical processes that underlie this process. This approach involved testing of the baseline sludge washing and caustic leaching method on several Hanford tank sludges, and characterization of the solids both before and after testing by electron microscopy, X-ray diffraction, and X-ray absorption spectroscopy. A thermodynamically based model was employed to help understand the factors involved in individual specie distribution in the various stages of the sludge washing and caustic leaching treatment. The behavior of the important chemical and radiochemical components throughout the testing is summarized and reviewed in this report.

1514 (PNNL–11091) **Tanks Focus Area FY 1996 Site Needs Assessment.** Pacific Northwest National Lab., Richland, WA (United States). Mar 1996. 174p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008987. Source: OSTI; NTIS; INIS; GPO Dep.

The Tanks Focus Area's (TFA's) mission is to manage an integrated technology development program that results in the application of technology to safely and efficiently accomplish tank waste remediation across the US Department of

Energy (DOE) complex. The TFA uses a systematic process for developing its annual program that draws from the tanks technology development needs expressed by four DOE tank waste sites–Hanford, Idaho, Oak Ridge, and Savannah River Sites. The process is iterative and involves four steps: (1) identify and validate tank technology needs at these four sites, (2) define a technical program that responds to these needs, (3) select specific tasks and schedules that accomplish program objectives, and (4) develop integrated teams to carry out selected tasks. This document describes the first of these four steps: identification of sites' tank technology needs. This step concentrates solely on needs identification, collection, and validation. Funding requirements and specific scope of responsive technical activities are not considered until later steps in program definition. This year, the collection and validation of site needs were accomplished through written input from the Site Technology Coordination Groups (STCGs). The TFA recognizes the importance of a continuing solid partnership with the sites through the STCG and DOE as well as contractor users and, therefore, ensured site participation and close coordination throughout the process.

1515 (PNNL–11098) **Comparison of simulants to actual neutralized current acid waste: Process and product testing of three NCAW core samples from Tanks 101-AZ and 102-AZ.** Morrey, E.V.; Tingey, J.M. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 275p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008029. Source: OSTI; NTIS; INIS; GPO Dep.

A vitrification plant is planned to process the high-level waste (HLW) solids from Hanford Site tanks into canistered glass logs for disposal in a national repository. Programs have been established within the Pacific Northwest Laboratory Vitrification Technology Development (PVTD) Project to test and model simulated waste to support design, feed processability, operations, permitting, safety, and waste-form qualification. Parallel testing with actual radioactive waste is being performed on a laboratory-scale to confirm the validity of using simulants and glass property models developed from simulants. Laboratory-scale testing has been completed on three radioactive core samples from tanks 101-AZ and 102-AZ containing neutralized current acid waste (NCAW), which is one of the first waste types to be processed in the high-level waste vitrification plant under a privatization scenario. Properties of the radioactive waste measured during process and product testing were compared to simulant properties and model predictions to confirm the validity of simulant and glass property models work. This report includes results from the three NCAW core samples, comparable results from slurry and glass simulants, and comparisons to glass property model predictions.

1516 (PNNL–11120) **Comparison of organic and inorganic ion exchangers for removal of cesium and strontium from simulated and actual Hanford 241-AW-101 DSSF tank waste.** Brown, G.N. (and others); Bray, L.A.; Carlson, C.D. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011468. Source: OSTI; NTIS; INIS; GPO Dep.

A number of organic and inorganic exchangers are being developed and evaluated for cesium removal from Hanford tank wastes. The exchangers of interest that are investigated in this work include powdered (IONSIV® IE-910; referred to as IE-910) and engineered (IONSIV® IE-911; referred to as IE-911) forms of the crystalline silico-titanate (CST) inorganic sorbent developed by Sandia National Laboratories (SNL)/Texas A and M and prepared by UOP; a phenol-formaldehyde (CS-100) resin developed by Rohm and Haas; a resorcinol-formaldehyde (R-F) polymer developed at the Westinghouse Savannah River Company (WSRC) and produced by Boulder Scientific; an inorganic zeolite exchanger produced by UOP (IONSIV® TIE-96; referred to as TIE-96); an inorganic sodium titanate produced by Allied Signal/Texas A and M (NaTi); and a macrocyclic organic resin developed and produced by IBC Advanced Technologies (SuperLig® 644; referred to as SL-644). Several of these materials are still under development and may not be in the optimal form. The work described in this report involves the direct comparison of the ion exchange materials for the pretreatment of actual and simulated Hanford tank waste. Data on the performance of all of the exchangers with simulated and actual double shell slurry feed (DSSF) is included. The DSSF waste is a mixture of the supernate from tanks 101-AW (70%), 106-AP (20%) and 102-AP (10%). The comparative parameters include radionuclide removal efficiency under a variety of conditions and material properties (e.g., bed density and percent removable water). Cesium and strontium distribution (K_d), lambda ($\lambda = K_d \times \rho_b$), and decontamination factors (DF) are compared as a function of exchanger contact duration, solution composition (Na and Cs concentration), exchanger/waste phase ratio, and multiple sequential contacts.

1517 (PNNL–11122) **Cesium ion exchange using actual waste: Column size considerations.** Brooks, K.P. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011239. Source: OSTI; NTIS; INIS; GPO Dep.

It is presently planned to remove cesium from Hanford tank waste supernates and sludge wash solutions using ion exchange. To support the development of a cesium ion exchange process, laboratory experiments produced column breakthrough curves using wastes simulants in 200 mL columns. To verify the validity of the simulant tests, column runs with actual supernatants are being planned. The purpose of these actual waste tests is two-fold. First, the tests will verify that use of the simulant accurately reflects the equilibrium and rate behavior of the resin compared to actual wastes. Batch tests and column tests will be used to compare equilibrium behaviors and rate behaviors, respectively. Second, the tests will assist in clarifying the negative interactions between the actual waste and the ion exchange resin, which cannot be effectively tested with simulant. Such interactions include organic fouling of the resin and salt precipitation in the column. These effects may affect the shape of the column breakthrough curve. The reduction in column size also may change the shape of the curve, making the individual effects even more difficult to sort out. To simplify the evaluation, the changes due to column size must be either understood or eliminated. This report describes the determination of the column size for actual waste testing that best minimizes the effect of scale-down. This evaluation will provide a theoretical basis for the dimensions of the column. Experimental testing is still required before the final decision can be made. This evaluation will be confined to the study of CS-100 and R-F resins with NCAW simulant and to a limited extent DSSF waste simulant. Only the cesium loading phase has been considered.

1518 (PNNL–11127) **Glass formulation for phase 1 high-level waste vitrification.** Vienna, J.D.; Hrma, P.R. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011467. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is to provide potential glass formulations for prospective Phase 1 High-Level Waste (HLW) vitrification at Hanford. The results reported here will be used to aid in developing a Phase 1 HLW vitrification request for proposal (RFP) and facilitate the evaluation of ensuing proposals. The following factors were considered in the glass formulation effort: impact on total glass volume of requiring the vendor to process each of the tank compositions independently versus as a blend; effects of imposing typical values of B_2O_3 content and waste loading in HLW borosilicate glasses as restrictions on the vendors (according to WAPS 1995, the typical values are 5–10 wt% B_2O_3 and 20–40 wt% waste oxide loading); impacts of restricting the processing temperature to 1,150 C on eventual glass volume; and effects of caustic washing on any of the selected tank wastes relative to glass volume.

1519 (PNNL–11133) **Mechanisms of stability of armored bubbles: FY 1995 progress report.** Rossen, W.R.; Das, S.K. Pacific Northwest Lab., Richland, WA (United States). Apr 1996. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010453. Source: OSTI; NTIS; INIS; GPO Dep.

Experimental and theoretical studies of stabilization of liquid films between bubbles were undertaken as part of an effort to model gas release in waste tanks at the Hanford nuclear reservation. Synthetic Hanford waste created here showed solids accumulation at bubble surfaces and some stabilization of bubbles in a froth upon sparging with nitrogen. Dilational interfacial rheological measurements indicate increasing hydrophobicity with increasing EDTA concentration in the wastes. There is greater dilational elasticity of the interface with solid particles present on the interface. Theoretical modeling of a 2D liquid film between bubbles containing one row of solid particles suggests that in 3D such a film would be unstable unless the solids all touch. This hints at a possible mechanism for bubble stabilization, if it can be argued that slowly evolving interfaces, as bubbles grow toward each other in the sludge, have solids closely packed, but that rapid expansion of gas during a rollover event forces the films to expand without additional solids.

1520 (PNNL–11146) **Defining waste acceptance criteria for the Hanford Replacement Cross-Site Transfer System.** Hudson, J.D. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010132. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a methodology for defining waste acceptance criteria for the Hanford Replacement Cross-Site Transfer System (RCSTS). This methodology includes characterization, transport analysis, and control. A framework is described for each of these functions. A tool was developed for performing the calculations associated with the transport analysis. This tool, a worksheet that is available in formats acceptable for a variety of PC spreadsheet programs, enables a comparison of the pressure required to transport a given slurry at a rate that particulate suspension is maintained to the pressure drop available from the RCSTS.

1521 (PNNL–11169) **Utility and infrastructure needs for private tank waste processing.** Reynolds, B.A. Pacific Northwest Lab., Richland, WA (United States). May 1996. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (WHC-SD-WM-DSD–002). Order Number DE96011223. Source: OSTI; NTIS; INIS; GPO Dep.

This document supports the development of the Draft TWRS Privatization RFP. The document provides summaries of a wide variety of utility infrastructure and support services that are available at the Hanford Site. The needs of the privatization contractors are estimated and compared to the existing infrastructure. Recommendations are presented on the preferred and alternate routes of supplying the identifies requirements.

1522 (PNNL–11186) **Comparison of vapor sampling system (VSS) and in situ vapor sampling (ISVS) methods on Tanks C-107, BY-108, and S-102.** Huckaby, J.L. (and others); Edwards, J.A.; Evans, J.C. Pacific Northwest National Lab., Richland, WA (United States). May 1996. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011527. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this report is to evaluate the equivalency of two methods used to sample nonradioactive gases and vapors in the Hanford Site high-level waste tank headspaces. In addition to the comparison of the two sampling methods, the effects of an in-line fine particle filter on sampling results are also examined to determine whether results are adversely affected by its presence. This report discusses data from a January 1996 sampling.

1523 (PNNL–11211) **Ferrocyanide safety project ferrocyanide aging studies. Final report.** Lilga, M.A. (and others); Hallen, R.T.; Alderson, E.V. Pacific Northwest Lab., Richland, WA (United States). Jun 1996. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96013208. Source: OSTI; NTIS; INIS; GPO Dep.

This final report gives the results of the work conducted by Pacific Northwest National Laboratory (PNNL) from FY 1992 to FY 1996 on the Ferrocyanide Aging Studies, part of the Ferrocyanide Safety Project. The Ferrocyanide Safety Project was initiated as a result of concern raised about the safe storage of ferrocyanide waste intermixed with oxidants, such as nitrate and nitrite salts, in Hanford Site single-shell tanks (SSTs). In the laboratory, such mixtures can be made to undergo uncontrolled or explosive reactions by heating dry reagents to over 200°C. In 1987, an Environmental Impact Statement (EIS), published by the U.S. Department of Energy (DOE), Final Environmental Impact Statement, Disposal of Hanford Defense High-Level Transuranic and Tank Waste, Hanford Site, Richland, Washington, included an environmental impact analysis of potential explosions involving ferrocyanide-nitrate mixtures. The EIS postulated that an explosion could occur during mechanical retrieval of saltcake or sludge from a ferrocyanide waste tank, and concluded that this worst-case accident could create enough energy to release radioactive material to the atmosphere through ventilation openings, exposing persons offsite to a short-term radiation dose of approximately 200 mrem. Later, in a separate study (1990), the General Accounting Office postulated a worst-case accident of one to two orders of magnitude greater than that postulated in the DOE EIS. The uncertainties regarding the safety envelope of the Hanford Site ferrocyanide waste tanks led to the declaration of the Ferrocyanide Unreviewed Safety Question (USQ) in October 1990.

1524 (PNNL–11212) **Hydrogen and oxygen concentrations in IXCs: A compilation.** Liljegren, L.M.; Terrones, G.T.; Melethil, P.K. Pacific Northwest National Lab., Richland, WA (United States). Jun 1996. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96012242. Source: OSTI; NTIS; INIS; GPO Dep.

This paper contains four reports and two internal letters that address the estimation of hydrogen and oxygen concentrations in ion exchange columns that treat the water of the K-East and K-West Basins at Hanford. The concern is the flammability of this mixture of gases and planning for safe transport during decommissioning. A transient will occur when the hydrogen filter is temporarily blocked by a sandbag. Analyses are provided for steady-state, transients, and for both wet and dry resins.

1525 (PNNL–11222) **Probability of ignition of reactive wastes by rotary sampling drills.** Heasler, P.G. Pacific Northwest Lab., Richland, WA (United States). Jun 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96013198. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling with a rotary drill could potentially cause a fire in some Hanford tanks. If the rotary drill experiences a failure while in fuel-rich, dry waste, the waste could be ignited by the hot drill bit. For the saltcake tanks subject to this hazard, this report presents a methodology for calculating the probabilities of fire due to core drill failure. The methodology utilizes sampling data from tank characterization studies to determine the amount of reactive waste in the tanks.

1526 (PNNL–11233) **Oxidative dissolution of chromium from Hanford Tank sludges under alkaline conditions.** Rapko, B.M.; Lumetta, G.J.; Wagner, M.J. Pacific Northwest Lab., Richland, WA (United States). Jul 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96013204. Source: OSTI; NTIS; INIS; GPO Dep.

Because of the expected high cost of vitrifying and disposing of high-level waste at the U.S. Department of Energy's Hanford Site, pretreatment processes are being developed to reduce the anticipated volume of borosilicate glass. Sludge washing and caustic leaching, the baseline sludge pretreatment process, is expected to leach out a substantial portion of the ^{137}Cs, possibly other radionuclides, and a significant portion of such major nonradionuclides as Al or P. The decontaminated solution will be routed to the low-level waste stream, where it will be immobilized in a glass matrix. The leached solids, which will contain the transuranic elements and ^{90}Sr, will be handled as high-level waste. Previous studies indicate that poor removal of chromium in the +3 oxidation state [Cr(III)] occurs during baseline pretreatment. Because the concentration of Cr allowed in high level waste glass is low, a relatively small amount of Cr in the sludge can have a relatively large impact on the volume of high level waste glass produced. For this reason, additional leach steps to remove Cr would be desirable, and oxidative alkaline leaching has been proposed as a simple addition to the baseline sludge pretreatment. This report describes small-scale screening tests on the oxidative alkaline leaching of Cr performed with actual Hanford tank sludges.

1527 (PNNL–11237) **Evaluation of the potential for significant ammonia releases from Hanford waste tanks.** Palmer, B.J.; Anderson, C.M.; Chen, G.; Cuta, J.M.; Ferryman, T.A.; Terrones, G. Pacific Northwest Lab., Richland, WA (United States). Jul 1996. 148p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96013494. Source: OSTI; NTIS; INIS; GPO Dep.

Ammonia is ubiquitous as a component of the waste stored in the Hanford Site single-shell tanks (SSTs) and double-shell tanks (DSTs). Because ammonia is both flammable and toxic, concerns have been raised about the amount of ammonia stored in the tanks and the possible mechanisms by which it could be released from the waste into the head space inside the tanks as well as into the surrounding atmosphere. Ammonia is a safety issue for three reasons. As already mentioned, ammonia is a flammable gas and may contribute to a flammability hazard either directly, if it reaches a high enough concentration in the tank head space, or by contributing to the flammability of other flammable gases such as hydrogen (LANL 1994). Ammonia is also toxic and at relatively low concentrations presents a hazard to human health. The level at which ammonia is considered Immediately Dangerous to Life or Health (IDLH) is 300 ppm (WHC 1993, 1995). Ammonia concentrations at or above this level have been measured inside the head space in a number of SSTs. Finally, unlike hydrogen and nitrous oxide, ammonia is highly soluble in aqueous solutions, and large amounts of ammonia can be stored in the waste as dissolved gas. Because of its high solubility, ammonia behaves in a qualitatively different manner from hydrogen or other insoluble gases. A broader range of scenarios must be considered in modeling ammonia storage and release.

1528 (PNNL–11247) **Mechanisms of gas generation from simulated SY tank farm wastes: FY 1995 progress report.** Barefield, E.K.; Boatright, D.; Deshpande, A.; Doctorovich, F.; Liotta, C.L.; Neumann, H.M.; Seymore, S. Pacific Northwest Lab., Richland, WA (United States). Jul 1996. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96014096. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this work is to develop a better understanding of the mechanism of formation of flammable gases in the thermal decomposition of metal complexants such as HEDTA and sodium glycolate in simulated SY tank farm waste mixtures. This report summarizes the results of work done at the Georgia Institute of Technology in fiscal year 1995. Topics discussed are (1) long-term studies of the decomposition of HEDTA in simulated waste mixtures under an argon atmosphere at 90 and 120°C, including time profiles for disappearance of HEDTA and appearance of products and the quantitative analysis of the kinetic behavior; (2) considerations of hydroxylamine as an intermediate in the production of nitrogen containing gases by HEDTA decomposition; (3) some thoughts on the revision of the global mechanism for thermal decomposition of HEDTA under argon; (4) preliminary long-term studies of the decomposition of HEDTA in simulated waste under an oxygen atmosphere at 120°C; (5) estimation of the amount of NH_3 in the gas phase above HEDTA reaction mixtures; and (6) further, examination of the interaction of aluminum with nitrite ion using ^{27}Al NMR spectroscopy. Section 2 of this report describes the work conducted over the last three years at GIT. Section 3 contains a discussion of the kinetic behavior of HEDTA under argon; Section 4 discusses the role of hydroxylamine. Thermal decomposition of HEDTA to ED3A is the subject of Section 5, and decomposition of HEDTA in simulated waste mixtures under oxygen is covered in Section 6. In Section 7 we estimate ammonia in the gas phase; the role of aluminum is discussed in Section 8.

1529 (SAND–93-1000) **Data report on the Waste Isolation Pilot Plant Small-Scale Seal Performance Test, Series F grouting experiment.** Ahrens, E.H. (Sandia National Labs., Albuquerque, NM (United States)); Dale, T.F.; Van Pelt, R.S. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 341p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010871. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

SSSPT-F was designed to evaluate sealing materials at WIPP. It demonstrated: (1) the ability to practically and consistently produce ultrafine cementitious grout at the grouting site, (2) successful, consistent, and efficient injection and permeation of the grout into fractured rock at the repository horizon, (3) ability of the grout to penetrate and seal microfractures, (4) procedures and equipment used to inject the grout. Also techniques to assess the effectiveness of the grout in reducing the gas transmissivity of the fractured rock were evaluated. These included gas-flow/tracer testing, post-grout coring, pre- and post-grout downhole televiewer logging, slab displacement measurements, and increased loading on jacks during grout injection. Pre- and post-grout diamond drill core was obtained for use in ongoing evaluations of grouting effectiveness, degradation, and compatibility. Diamond drill equipment invented for this test successfully prevented drill cuttings from plugging fractures in grout injection holes.

1530 (SAND–93-1378) **An introduction to the mechanics of performance assessment using examples of calculations done for the Waste Isolation Pilot Plant between 1990 and 1992.** Rechard, R.P. Sandia National Labs., Albuquerque, NM (United States). Oct 1995. 301p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004113. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides an overview of the process used to assess the performance of the Waste Isolation Pilot Plant (WIPP), a proposed repository for transuranic wastes that is located in southeastern New Mexico. The quantitative metrics used in the performance-assessment (PA) process are those put forward in the Environmental Protection Agency's Environmental Standards for the Management and Disposal of Spent Nuclear Fuel, High-Level and Transuranic Radioactive flasks (40 CFR 191). Much has been written about the individual building blocks that comprise the foundation of PA theory and practice, and that WIPP literature is well cited herein. However, the present approach is to provide an accurate, well documented overview of the process, from the perspective of the mechanical steps used to perform the actual PA calculations. Specifically, the preliminary stochastic simulations that comprise the WIPP PAs of 1990, 1991. and 1992 are summarized.

1531 (SAND–93-1986) **Coupled multiphase flow and closure analysis of repository response to waste-generated gas at the Waste Isolation Pilot Plant (WIPP).** Freeze, G.A. (INTERA Inc., Austin, TX (United States)); Larson, K.W.; Davies, P.B. Sandia Labs., Livermore, CA (United States). Oct 1995. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004541. Source: OSTI; NTIS; INIS; GPO Dep.

A long-term assessment of the Waste Isolation Pilot Plant (WIPP) repository performance must consider the impact of gas generation resulting from the corrosion and microbial degradation of the emplaced waste. A multiphase fluid flow code, TOUGH2/EOS8, was adapted to model the processes of gas generation, disposal room creep closure, and multiphase (brine and gas) fluid flow, as well as the coupling between the three processes. System response to gas generation was simulated with a single, isolated disposal room surrounded by homogeneous halite containing two anhydrite interbeds, one above and one below the room. The interbeds were assumed to have flow connections to the room through high-permeability, excavation-induced fractures. System behavior was evaluated by tracking four performance measures: (1) peak room pressure; (2) maximum brine volume in the room; (3) total mass of gas expelled from the room; and (4) the maximum gas migration distance in an interbed. Baseline simulations used current best estimates of system parameters, selected through an evaluation of available data, to predict system response to gas generation under best-estimate conditions. Sensitivity simulations quantified the effects of parameter uncertainty by evaluating the change in the performance measures in response to parameter variations. In the sensitivity simulations, a single parameter value was varied to its minimum and maximum values, representative of the extreme expected values, with all other parameters held at best-estimate values. Sensitivity simulations identified the following parameters as important to gas expulsion and migration away from a disposal room: interbed porosity; interbed permeability; gas-generation potential; halite permeability; and interbed threshold pressure. Simulations also showed that the inclusion of interbed fracturing and a disturbed rock zone had a significant impact on system performance.

1532 (SAND–94-0251) **A summary of methods for approximating salt creep and disposal room closure in numerical models of multiphase flow.** Freeze, G.A. (INTERA, Inc., Albuquerque, NM (United States)); Larson, K.W.; Davies, P.B. Sandia National Labs., Albuquerque, NM (United States). Oct 1995. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004115. Source: OSTI; NTIS; INIS; GPO Dep.

Eight alternative methods for approximating salt creep and disposal room closure in a multiphase flow model of the Waste Isolation Pilot Plant (WIPP) were implemented and evaluated: Three fixed-room geometries three porosity functions and two fluid-phase-salt methods. The pressure-time-porosity line interpolation method is the method used in current WIPP Performance Assessment calculations. The room closure approximation methods were calibrated against a series of room closure simulations performed using a creep closure code, SANCHO. The fixed-room geometries did not incorporate a direct coupling between room void volume and room pressure. The two porosity function methods that utilized moles of gas as an independent parameter for closure coupling. The capillary backstress method was unable to accurately simulate conditions of re-closure of the room. Two methods were found to be accurate enough to approximate the effects of room closure; the boundary backstress method and pressure-time-porosity line interpolation. The boundary backstress method is a more reliable indicator of system behavior due to a theoretical basis for modeling salt deformation as a viscous process. It is a complex method and a detailed calibration process is required. The pressure lines method is thought to be less reliable because the results were skewed towards SANCHO results in simulations where the sequence of gas generation was significantly different from the SANCHO gas-generation rate histories used for closure calibration. This limitation in the pressure lines method is most pronounced at higher gas-generation rates and is relatively insignificant at lower gas-generation rates. Due to its relative simplicity, the pressure lines method is easier to implement in multiphase flow codes and simulations have a shorter execution time.

1533 (SAND–94-0890) **A sensitivity analysis of the WIPP disposal room model: Phase 1.** Labreche, D.A. (RE/SPEC, Inc., Albuquerque, NM (United States)); Beikmann, M.A.; Osnes, J.D.; Butcher, B.M. Sandia National Labs., Albuquerque, NM (United States). Jul 1995. 321p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95016749. Source: OSTI; NTIS; INIS; GPO Dep.

The WIPP Disposal Room Model (DRM) is a numerical model with three major components constitutive models of TRU waste, crushed salt backfill, and intact halite – and several secondary components, including air gap elements, slidelines, and assumptions on symmetry and geometry. A sensitivity analysis of the Disposal Room Model was initiated on two of the three major components (waste and backfill models) and on several secondary components as a group. The immediate goal of this component sensitivity analysis (Phase I) was to sort (rank) model parameters in terms of their relative importance to model response so that a Monte Carlo analysis on a reduced set of DRM parameters could be performed under Phase II. The goal of the Phase II analysis will be to develop a probabilistic definition of a disposal room porosity surface (porosity, gas volume, time) that could be used in WIPP Performance Assessment analyses. This report documents a literature survey which quantifies the relative importance of the secondary room components to room closure, a differential analysis of the creep consolidation model and definition of a follow-up Monte Carlo analysis of the model, and an analysis and refitting of the waste component data on which a volumetric plasticity model of TRU drum waste is based. A summary, evaluation of progress, and recommendations for future work conclude the report.

1534 (SAND–94-0991) **Tracing early breccia pipe studies, Waste Isolation Pilot Plant, southeastern New Mexico: A study of the documentation available and decision-making during the early years of WIPP.** Power, D.W. (HC 12, Anthony, TX (United States)). Sandia National Labs., Albuquerque, NM (United States). Jan 1996. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004946. Source: OSTI; NTIS; INIS; GPO Dep.

Breccia pipes in southeastern New Mexico are local dissolution-collapse features that formed over the Capitan reef more than 500,000 years ago. During early site studies for the Waste Isolation Pilot Plant (WIPP), the threat to isolation by these features was undetermined. Geophysical techniques, drilling, and field mapping were used beginning in 1976 to study breccia pipes. None were found at the WIPP site, and they are considered unlikely to be a significant threat even if undetected. WIPP documents related to breccia pipe studies were assembled, inspected, and analyzed, partly to present a history of these studies. The main objective is to assess how well the record reflects the purposes, results, and conclusions of the studies from concept to decision-making. The main record source was the Sandia WIPP Central File (SWCF). Early records (about 1975 to 1977) are very limited, however, about details of objectives and plans predating any investigation. Drilling programs from about 1977 were covered by a broadly standardized statement of work, field operations plan, drilling history, and basic data report. Generally standardized procedures for peer, management, and quality assurance review were developed during this time. Agencies such as the USGS conducted projects according to internal standards. Records of detailed actions for individual programs may not be available, though a variety of such records were found in the SWCF. A complete written record cannot be reconstructed. With persistence, a professional geologist can follow individual programs, relate data to objectives (even if implied), and determine how conclusions were used in decision-making. 83 refs.

1535 (SAND–94-1376) **WIPP Benchmark calculations with the large strain SPECTROM codes.** Callahan, G.D. (RE/SPEC, Inc., Rapid City, SD (United States)); DeVries, K.L. Sandia National Labs., Albuquerque, NM (United States); RE/SPEC, Inc., Rapid City, SD (United States). Aug 1995. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95016954. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides calculational results from the updated Lagrangian structural finite-element programs SPECTROM-32 and SPECTROM-333 for the purpose of qualifying these codes to perform analyses of structural situations in the Waste Isolation Pilot Plant (WIPP). Results are presented for the Second WIPP Benchmark (Benchmark II) Problems and for a simplified heated room problem used in a parallel design calculation study. The Benchmark II problems consist of an isothermal room problem and a heated room problem. The stratigraphy involves 27 distinct geologic layers including ten clay seams of which four are modeled as frictionless sliding interfaces. The analyses of the Benchmark II problems consider a 10-year simulation period. The evaluation of nine structural codes used in the Benchmark II problems shows that inclusion of finite-strain effects is not as significant as observed for the simplified heated room problem, and a variety of finite-strain and small-strain formulations produced similar results. The simplified heated room problem provides stratigraphic complexity equivalent to the Benchmark II problems but neglects sliding along the clay seams. The simplified heated problem does, however, provide a calculational check case where the small strain-formulation produced room closures about 20 percent greater than those obtained using finite-strain formulations. A discussion is given of each of the solved problems, and the computational results are compared with available published results. In general, the results of the two SPECTROM large strain codes compare favorably with results from other codes used to solve the problems.

1536 (SAND–94-1495) **Variability in properties of Salado Mass Concrete.** Wakeley, L.D. (US Army Engineer Waterways Experiment Station, Vicksburg, MS (United States)); Harrington, P.T.; Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). Aug 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95016731. Source: OSTI; NTIS; INIS; GPO Dep.

Salado Mass Concrete (SMC) has been developed for use as a seal component in the Waste Isolation Pilot Plant. This concrete is intended to be mixed from pre-bagged materials, have an initial slump of 10 in., and remain pumpable and placeable for two hours after mixing. It is a mass concrete because it will be placed in monoliths large enough that the heat generated during cement hydration has the potential to cause thermal expansion and subsequent cracking, a phenomenon to avoid in the seal system. This report describes effects on concrete properties of changes in ratio of water to cement, batch size, and variations in characteristics of different lots of individual components of the concrete. The research demonstrates that the concrete can be prepared from laboratory-batched or pre-bagged dry materials in batches from 1.5 ft^3 to 5.0 yd^3, with no chemical admixtures other than the sodium chloride added to improve bonding with the host rock, at a water-to-cement ratio ranging from 0.36 to 0.42. All batches prepared according to established procedures had adequate workability for at least 1.5 hours, and achieved or exceeded the target compressive strength of 4500 psi at 180 days after casting. Portland cement and fly ash from different lots or sources did not have a measurable effect on concrete properties, but variations in a shrinkage-compensating cement used as a component of the concrete did appear to affect workability. A low initial temperature and the water-reducing and set-retarding functions of the salt are critical to meeting target properties.

1537 (SAND–94-2268C) **Application of Latin hypercube sampling to RADTRAN 4 truck accident risk sensitivity analysis.** Mills, G.S.; Neuhauser, K.S.; Kanipe, F.L. Sandia National Labs., Albuquerque, NM (United States). [1994]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–1: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE95006817. Source: OSTI; NTIS; INIS; GPO Dep.

The sensitivity of calculated dose estimates to various RADTRAN 4 inputs is an available output for incident-free analysis because the defining equations are linear and sensitivity to each variable can be calculated in closed mathematical form. However, the necessary linearity is not characteristic of the equations used in calculation of accident dose risk, making a similar tabulation of sensitivity for RADTRAN 4 accident analysis impossible. Therefore, a study of sensitivity of accident risk results to variation of input parameters was performed using representative routes, isotopic inventories, and packagings. It was determined that, of the approximately two dozen RADTRAN 4 input parameters pertinent to accident analysis, only a subset of five or six has significant influence on typical analyses or is subject to random uncertainties. These five or six variables were selected as candidates for Latin Hypercube Sampling applications. To make the effect of input uncertainties on calculated accident risk more explicit, distributions and limits were determined for two variables which had approximately proportional effects on calculated doses: Pasquill Category probability (PSPROB) and link population density (LPOPD). These distributions and limits were used as input parameters to Sandia's Latin Hypercube Sampling code to generate 50 sets of RADTRAN 4 input parameters used together with point estimates of other necessary inputs to calculate 50 observations of estimated accident dose risk.Tabulations of the RADTRAN 4 accident risk input variables and their influence on output plus illustrative examples of the LHS calculations, for truck transport situations that are typical of past experience, will be presented .

1538 (SAND–94-2274) **Actinide chemistry research supporting the Waste Isolation Pilot Plant (WIPP): FY94 results.** Novak, C.F. (ed.). Sandia National Labs., Albuquerque, NM (United States). Aug 1995. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95016768. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains six reports on actinide chemistry research supporting the Waste Isolation Pilot Plant (WIPP). These reports, completed in FY94, are relevant to the estimation of the potential dissolved actinide concentrations in WIPP brines under repository breach scenarios. Estimates of potential dissolved actinide concentrations are necessary for WIPP performance assessment calculations. The specific topics covered within this document are: the complexation of oxalate with Th(IV) and U(VI); the stability of Pu(VI) in one WIPP-specific brine environment both with and without carbonate present; the solubility of Nd(III) in a WIPP Salado brine surrogate as a function of hydrogen ion concentration; the steady-state dissolved plutonium concentrations in a synthetic WIPP Culebra brine surrogate; the development of a model for Nd(III) solubility and speciation in dilute to concentrated sodium carbonate and sodium bicarbonate solutions; and the development of a model for Np(V) solubility and speciation in dilute to concentrated sodium Perchlorate, sodium carbonate, and sodium chloride media.

1539 (SAND–94-2563/2) **Performance assessment of the direct disposal in unsaturated tuff or spent nuclear fuel and high-level waste owned by USDOE: Volume 2, Methodology and results.** Rechard, R.P. (ed.). Sandia National Labs., Albuquerque, NM (United States). Mar 1995. 679p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95011840. Source: OSTI; NTIS; INIS; GPO Dep.

This assessment studied the performance of high-level radioactive waste and spent nuclear fuel in a hypothetical repository in unsaturated tuff. The results of this 10-month study are intended to help guide the Office of Environment Management of the US Department of Energy (DOE) on how to prepare its wastes for eventual permanent disposal. The waste forms comprised spent fuel and high-level waste currently stored at the Idaho National Engineering Laboratory (INEL) and the Hanford reservations. About 700 metric tons heavy metal (MTHM) of the waste under study is stored at INEL, including graphite spent nuclear fuel, highly enriched uranium spent fuel, low enriched uranium spent fuel, and calcined high-level waste. About 2100 MTHM of weapons production fuel, currently stored on the Hanford reservation, was also included. The behavior of the waste was analyzed by waste form and also as a group of waste forms in the hypothetical tuff repository. When the waste forms were studied together, the repository was assumed also to contain about 9200 MTHM high-level waste in borosilicate glass from three DOE sites. The addition of the borosilicate glass, which has already been proposed as a final waste form, brought the total to about 12,000 MTHM.

1540 (SAND–94-2571) **Steam reforming as a method to treat Hanford underground storage tank (UST) wastes.** Miller, J.E. (and others); Kuehne, P.B. (eds.). Sandia National Labs., Albuquerque, NM (United States). Jul 1995. 72p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC04-94AL85000. Order Number DE95016460. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes a Sandia program that included partnerships with Lawrence Livermore National Laboratory and Synthetica Technologies, Inc. to design and test a steam reforming system for treating Hanford underground storage tank (UST) wastes. The benefits of steam reforming the wastes include the resolution of tank safety issues and improved radionuclide separations. Steam reforming destroys organic materials by first gasifying, then reacting them with high temperature steam. Tests indicate that up to 99% of the organics could be removed from the UST wastes by steam exposure. In addition, it was shown that nitrates in the wastes could be destroyed by steam exposure if they were first distributed as a thin layer on a surface. High purity alumina and nickel alloys were shown to be good candidates for materials to be used in the severe environment associated with steam reforming the highly alkaline, high nitrate content wastes. Work was performed on designing, building, and demonstrating components of a 0.5 gallon per minute (gpm) system suitable for radioactive waste treatment. Scale-up of the unit to 20 gpm was also considered and is feasible. Finally, process demonstrations conducted on non-radioactive waste surrogates were carried out, including a successful demonstration of the technology at the 0.1 gpm scale.

1541 (SAND–94-3069) **Computational implementation of a systems prioritization methodology for the Waste Isolation Pilot Plant: A preliminary example.** Helton, J.C. (Arizona State Univ., Tempe, AZ (United States). Dept. of Mathematics); Anderson, D.R.; Baker, B.L. Sandia National Labs., Albuquerque, NM (United States). Apr 1996. 343p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010892. Source: OSTI; NTIS; INIS; GPO Dep.

A systems prioritization methodology (SPM) is under development to provide guidance to the US DOE on experimental programs and design modifications to be supported in the development of a successful licensing application for the Waste Isolation Pilot Plant (WIPP) for the geologic disposal of transuranic (TRU) waste. The purpose of the SPM is to determine the probabilities that the implementation of different combinations of experimental programs and design modifications, referred to as activity sets, will lead to compliance. Appropriate tradeoffs between compliance probability, implementation cost and implementation time can then be made in the selection of the activity set to be supported in the development of a licensing application. Descriptions are given for the conceptual structure of the SPM and the manner in which this structure determines the computational implementation of an example SPM application. Due to the sophisticated structure of the SPM and the computational demands of many of its components, the overall computational structure must be organized carefully to provide the compliance probabilities for the large number of activity sets under consideration at an acceptable computational cost. Conceptually, the determination of each compliance probability is equivalent to a large numerical integration problem. 96 refs., 31 figs., 36 tabs.

1542 (SAND–94-3173) **Effect of explicit representation of detailed stratigraphy on brine and gas flow at the Waste Isolation Pilot Plant.** Christian-Frear, T.L. (Sandia National Labs., Albuquerque, NM (United States). Geohydrology Dept.); Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). Apr 1996. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010896. Source: OSTI; NTIS; INIS; GPO Dep.

Stratigraphic units of the Salado Formation at the Waste Isolation Pilot Plant (WIPP) disposal room horizon includes various layers of halite, polyhalitic halite, argillaceous halite, clay, and anhydrite. Current models, including those used in the WIPP Performance Assessment calculations, employ a "composite stratigraphy" approach in modeling. This study was initiated to evaluate the impact that an explicit representation of detailed stratigraphy around the repository may have on fluid flow compared to the simplified "composite stratigraphy" models currently employed. Sensitivity of model results to intrinsic permeability anisotropy, interbed fracturing, two-phase characteristic curves, and gas-generation rates were studied. The results of this study indicate that explicit representation of the stratigraphy maintains higher pressures and does not allow as much fluid to leave the disposal room as compared to the "composite stratigraphy" approach. However, the differences are relatively small. Gas migration distances are also different between the two approaches. However, for the two cases in which explicit layering results were considerably different than the composite model (anisotropic and vapor-limited), the gas-migration distances for both models were negligible. For the cases in which gas migration distances were considerable, van Genuchten/Parker and interbed fracture, the differences between the two models were fairly insignificant. Overall, this study suggests that explicit representation of the stratigraphy in the WIPP PA models is not required for the parameter variations modeled if "global quantities" (e.g., disposal room pressures, net brine and gas flux into and out of disposal rooms) are the only concern.

1543 (SAND–95-0186C) **Effects of Hanford tank simulant waste on plastic packaging to components.** Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DP00789. (CONF-951203–4: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96003069. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a chemical compatibility program for the evaluation of plastic packaging components which may be incorporated in packaging for transporting mixed waste forms. Consistent with the methodology outlined in this paper, we have performed the second phase of this experimental program to determine the effects of simulant Hanford Tank mixed wastes on packaging materials. This effort involved the comprehensive testing of five plastic liner materials in the aqueous mixed waste simulant. The testing protocol involved exposing the respective materials to ~1, 3, 6, and 40 kGy of gamma radiation followed by 7, 14, 28, 180 day exposures to the waste simulant at 18, 50, and 60°C. From the limited data analyses performed to date in this study, we have identified the fluorocarbon Kel-F™ as having the greatest chemical compatibility after having been exposed to 40 kGy gamma radiation followed by exposure to the Hanford Tank simulant mixed waste at 60°C. The most stricking observation from this study was the poor performance of Teflon under these conditions.

1544 (SAND–95-0329) **Formulation and computational aspects of plasticity and damage models with**

application to quasi-brittle materials. Chen, Z. (New Mexico Engineering Research Institute, Albuquerque, NM (United States)); Schreyer, H.L. Sandia National Labs., Albuquerque, NM (United States). Sep 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96001864. Source: OSTI; NTIS; GPO Dep.

The response of underground structures and transportation facilities under various external loadings and environments is critical for human safety as well as environmental protection. Since quasi-brittle materials such as concrete and rock are commonly used for underground construction, the constitutive modeling of these engineering materials, including post-limit behaviors, is one of the most important aspects in safety assessment. From experimental, theoretical, and computational points of view, this report considers the constitutive modeling of quasi-brittle materials in general and concentrates on concrete in particular. Based on the internal variable theory of thermodynamics, the general formulations of plasticity and damage models are given to simulate two distinct modes of microstructural changes, inelastic flow and degradation of material strength and stiffness, that identify the phenomenological nonlinear behaviors of quasi-brittle materials. The computational aspects of plasticity and damage models are explored with respect to their effects on structural analyses. Specific constitutive models are then developed in a systematic manner according to the degree of completeness. A comprehensive literature survey is made to provide the up-to-date information on prediction of structural failures, which can serve as a reference for future research.

1545 (SAND–95-1120) **Case studies of sealing methods and materials used in the salt and potash mining industries.** Eyermann, T.J. (RE/SPEC Inc., Rapid City, SD (United States)); Sambeek, L.L. Van; Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). Nov 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004950. Source: OSTI; NTIS; INIS; GPO Dep.

Sealing methods and materials currently used in salt and potash industries were surveyed to determine if systems analogous to the shaft seal design proposed for the Waste Isolation Pilot Plant (WIPP) exist. Emphasis was first given to concrete and then expanded to include other materials. Representative case studies could provide useful design, construction, and performance information for development of the WIPP shaft seal system design. This report contains a summary of engineering and construction details of various sealing methods used by mining industries for bulkheads and shaft liners. Industrial experience, as determined from site visits and literature reviews, provides few examples of bulkheads built in salt and potash mines for control of water. Sealing experiences representing site-specific conditions often have little engineering design to back up the methods employed and even less quantitative evaluation of seal performance. Cases examined include successes and failures, and both contribute to a database of experiences. Mass salt-saturated concrete placement under ground was accomplished under several varied conditions. Information derived from this database has been used to assess the performance of concrete as a seal material. Concrete appears to be a robust material with successes in several case studies. 42 refs.

1546 (SAND–95-1148C) **WIPP panel simulations with gas generation.** DeVries, K.L. (RE/SPEC, Inc., Rapid City, SD (United States)); Callahan, G.D.; Munson, D.E. Sandia National Labs., Livermore, CA (United States). [1996]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606115–1: 4. conference on the mechanical behavior of salt, Montreal (Canada), 17-18 Jun 1996). Order Number DE96007339. Source: OSTI; NTIS; INIS; GPO Dep.

An important issue in nuclear waste repository performance is the potential for fracture development resulting in pathways for release of radionuclides beyond the confines of the repository. A series of demonstration calculations using structural finite element analyses are presented here to examine the effect of internal gas generation on the response of a sealed repository. From the calculated stress fields, the most probable location for a fracture to develop was determined to be within the pillars interior to the repository for the range of parameter values considered. If a fracture interconnects the rooms and panels of the repository, fracture opening produces significant additional void volume to limit the excess gas pressure to less than 1.0 MPa above the overburden prêssure. Consequently, the potential for additional fracture development into the barrier pillar is greatly reduced, which provides further confidence that the waste will be contained within the repository.

1547 (SAND–95-1236) **Hanford coring bit temperature monitor development testing results report.** Rey, D. Sandia National Labs., Albuquerque, NM (United States). May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95014532. Source: OSTI; NTIS; INIS; GPO Dep.

Instrumentation which directly monitors the temperature of a coring bit used to retrieve core samples of high level nuclear waste stored in tanks at Hanford was developed at Sandia National Laboratories. Monitoring the temperature of the coring bit is desired to enhance the safety of the coring operations. A unique application of mature technologies was used to accomplish the measurement. This report documents the results of development testing performed at Sandia to assure the instrumentation will withstand the severe environments present in the waste tanks.

1548 (SAND–95-1240) **Petrographic and X-ray diffraction analyses of selected samples from Marker Bed 139 at the Waste Isolation Pilot Plant.** Fredrich, J.T. (Sandia National Labs., Albuquerque, NM (United States). Geomechanics Dept.); Zeuch, D.H. Sandia National Labs., Albuquerque, NM (United States). Apr 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010907. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) is located 660 m underground in the Salado Formation which consists of thick, horizontally bedded pure and impure salt and thin, laterally continuous clay and anhydrite interbeds. The Salado Two-Phase Flow Laboratory Program was established to provide site-specific-two-phase flow and other related rock properties to support performance assessment modeling of the WIPP repository. Owing to their potentially significant role in the hydrologic response of the repository, the program initially focused on the anhydrite interbeds, and in particular, on Marker Bed 139 (MB 139), which lies approximately 1 m below the planned waste storage rooms. This report synthesizes petrographic and X-ray powder diffraction studies performed to support the Salado Two-Phase Flow Laboratory Program. Experimental scoping activities in this area were performed in FY 1993 by three independent laboratories in order to: (1) quantify the mineral composition to support laboratory studies of hydrologic properties and facilitate correlation of transport properties with composition; (2) describe textures, including grain size; and (3) describe observed porosity. Samples from various depths were prepared from six 6-inch diameter cores which were obtained by drilling into the marker bed from the floor of two separate rooms. The petrographic analyses are augmented here with additional study of the original thin sections, and the pore structure observations are also examined in relation to an independent observational study of microcracks in Marker Bed 139 core samples performed in FY 1994 by the Geomechanics Department at Sandia National Laboratories.

1549 (SAND–95-1704C) **Brine release based on structural calculations of damage around an excavation at the Waste Isolation Pilot Plant (WIPP).** Munson, D.E. (Sandia National Labs., Albuquerque, NM (United States)); Jensen, A.L.; Webb, S.W.; DeVries, K.L. Sandia National Labs., Albuquerque, NM (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960619–3: 2. North American rock mechanics symposium: tools and techniques in rock mechanics, Montreal (Canada), 19-21 Jun 1996). Order Number DE96007344. Source: OSTI; NTIS; INIS; GPO Dep.

In a large in situ experimntal circular room, brine inflow was measured over 5 years. After correcting for evaporation losses into mine ventilation air, the measurements gave data for a period of nearly 3 years. Predicted brine accumulation based on a mechanical "snow plow" model of the volume swept by creep-induced damage as calculated with the Multimechanism Deformation Coupled Fracture model was found to agree with experiment. Calculation suggests the damage zone at 5 years effectively exends only some 0.7 m into the salt around the room. Also, because the mecahnical model of brine release gives an adequate explanation of the measured data, the hydrological process of brine flow appears to be rapid compared to the mechanical process of brine release.

1550 (SAND–95-1941) **Large-scale dynamic compaction demonstration using WIPP salt: Fielding and preliminary results.** Ahrens, E.H. (Sandia National Labs., Albuquerque, NM (United States). Nuclear Waste Technology Repository Isolation Systems); Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). Oct 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96005043. Source: OSTI; NTIS; INIS; GPO Dep.

Reconsolidation of crushed rock salt is a phenomenon of great interest to programs studying isolation of hazardous materials in natural salt geologic settings. Of particular interest is the potential for disaggregated salt to be restored to nearly an impermeable state. For example, reconsolidated crushed salt is proposed as a major shaft seal component for the Waste Isolation Pilot Plant (WIPP) Project. The concept for a permanent shaft seal component of the WIPP repository is to densely compact crushed salt in the four shafts; an effective seal will then be developed as the surrounding salt creeps into the shafts, further consolidating the crushed salt. Fundamental information on placement density and permeability is required to ensure attainment of the design function. The work reported here is the first large-scale compaction demonstration to provide information on initial salt properties applicable to design, construction, and performance expectations. The shaft seals must function for 10,000 years. Over this period a crushed salt mass will become less permeable as it is compressed by creep closure of salt surrounding the shaft. These facts preclude the possibility of conducting a full-scale, real-time field test. Because permanent seals taking advantage of salt reconsolidation have never been constructed, performance measurements have not been made on an appropriately large scale. An understanding of potential construction methods, achievable initial density and permeability, and performance of reconsolidated salt over time is required for seal design and performance assessment. This report discusses fielding and operations of a nearly full-scale dynamic compaction of mine-run WIPP salt, and presents preliminary density and in situ (in place) gas permeability results.

1551 (SAND–95-1998C) **Summary of the systems prioritization method (SPM) as a decision-aiding tool for the Waste Isolation Pilot Plant.** Boak, D.M. (Sandia National Labs., Albuquerque, NM (United States)); Prindle, N.H.; Lincoln, R.; Mendenhall, F.; Weiner, R.; Bills, R.A. Sandia National Labs., Albuquerque, NM (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–59-Summ.: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008256. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1994, the Department of Energy Carlsbad Area Office (DOE/CAO) implemented a performance-based planning method to assist in programmatic prioritization within the Waste Isolation Pilot Plant (WIPP) project with respect to applicable Environmental Protection Agency (EPA) long-term performance requirements stated in 40 CFR 191.13(a) and 40 CFR 268.6. This method, the Systems Prioritization Method (SPM), was designed by Sandia National Laboratories (SNL) to: (1) identify programmatic options (activities) and their costs and durations; (2) analyze potential combinations of activities in terms of predicted contribution to long-term performance; and (3) analyze cost, duration, and performance tradeoffs. SPM results were the basis for recommendations to DOE/CAO in May 1995 for prioritization within the WIPP project. This paper presents a summary of the SPM implementation, key results, and lessons learned.

1552 (SAND–95-2005C) **Complexation study of NpO_2^+ and UO_2^{2+} ions with several organic ligands in aqueous solutions of high ionic strength.** Borkowski, M. (Florida State Univ., Tallahassee, FL (United States)); Lis, S.; Choppin, G.R. Sandia National Labs., Albuquerque, NM (United States). 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950946–7: 5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere, Saint-Malo (France), 10-15 Sep 1995). Order Number DE95017641. Source: OSTI; NTIS; INIS; GPO Dep.

The acid dissociation constants, pK_a, and the stability constants for NpO_2^+ and UO_2^{2+} have been measured for certain organic ligands [acetate, α-hydroxyisobutyrate, lactate, ascorbate, oxalate, citrate, EDTA, 8-hydroxyquinoline, 1, 10-phenanthroline, and thenoyltrifluoroacetone] in 5 m (NaCl) ionic strength solution. The pK_a values were determined by potentiometry or spectrometry. These methods, as well as solvent extraction with ^{233}U and ^{237}Np radiotracers, were used to measure the stability constants of the 1:1 and 1:2 complexes of dioxo cations. These constants were used to estimate the concentrations required to result in 10 % competition with hydrolysis in the 5 m NaCl solution. Such estimates are of value in assessing the solubility from radioactive waste of AnO_2^+ and AnO_2^{2+} in brine solutions in contact with nuclear waste in a salt-bed repository.

1553 (SAND–95-2006C) **Variation of stability constants of thorium citrate complexes and of thorium hydrolysis constants with ionic strength.** Choppin, G.R. (Florida State Univ., Tallahassee, FL (United States)); Erten, H.N.; Xia, Y.X. Sandia National Labs., Albuquerque, NM (United States). 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Florida State University AH-5590. (CONF-950946–6: 5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere, Saint-Malo (France), 10-15 Sep 1995). Order Number DE95017642. Source: OSTI; NTIS; INIS; GPO Dep.

Citrate is among the organic anions that are expected to be present in the wastes planned for deposition in the Waste Isolation Pilot Plant repository. In this study, a solvent extraction method has been used to measure the stability constants of Thorium(IV)[Th(IV)] with citrate anions in aqueous solutions with (a) $NaClO_4$ and (b) NaCl as the background electrolytes. The ionic strengths were varied up to 5 m (NaCl) and 14 m ($NaClO_4$). The data from the $NaClO_4$ solutions at varying pH values were used to calculate the hydrolysis constants for formation of $Th(OH)^{3+}$ at the different ionic strengths.

1554 (SAND–95-2007C) **Complexation of Am(III) by oxalate in $NaClO_4$ media.** Choppin, G.R. (Florida State Univ., Tallahassee, FL (United States)); Chen, J.F. Sandia National Labs., Albuquerque, NM (United States). 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Florida State University AH-5590. (CONF-950946–5: 5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere, Saint-Malo (France), 10-15 Sep 1995). Order Number DE95017643. Source: OSTI; NTIS; INIS; GPO Dep.

The complexation of Am(III) by oxalate has been investigated in solutions of $NaClO_4$ up to 9.0 M ionic strength at 25°C. The dissociation constants of oxalic acid were determined by potentiometric titration, while the stability constants of the Am(III)-oxalate complexation were measured by the solvent extraction technique. A thermodynamic model was constructed to predict the apparent equilibrium constants at different ionic strengths by applying the Pitzer equation using parameters for the Na^+-HOx^-, Na^+-Ox^-, $AmOx^+$-ClO_4^-, and Na^+-$Am(Ox)_2^-$ interactions obtained by fitting the data.

1555 (SAND–95-2008C) **The experimental determination of the solubility product for NpO_2OH in NaCl solutions.** Roberts, K.E. (Lawrence Berkeley Lab., CA (United States)); Torretto, P.C.; Prussin, T. Sandia National Labs., Albuquerque, NM (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. NIH-Minority Biomedical Research Support; PRF Grant 26067-B3. (CONF-950946–4: 5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere, Saint-Malo (France), 10-15 Sep 1995). Order Number DE95017644. Source: OSTI; NTIS; INIS; GPO Dep.

The solubility of Np(V) was measured in NaCl solutions ranging from 0.30 to 5.6 molal at room temperature (~21 ± 2°C). Experiments were conducted from undersaturation and allowed to equilibrate in a CO_2-free environment for 37 days. The apparent solubility products varied with NaCl concentration and were between 10^{-9} and 10^{-8} $mol^2 \bullet L^{-2}$. Using the specific ion interaction theory (SIT), the log of the solubility product of NpO_2OH(am) at infinite dilution was found to be - 8.79 ± 0.12. The interaction coefficient, $\epsilon(NpO_2^+ - Cl^-)$, was found to be (0.08 ± 0.05).

1556 (SAND–95-2009C) **Thermodynamic modeling of neptunium(V)-acetate complexation in concentrated NaCl media.** Novak, C.F.; Borkowski, M.; Choppin, G.R. Sandia National Labs., Albuquerque, NM (United States). 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950946–2: 5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere, Saint-Malo (France), 10-15 Sep 1995). Order Number DE95017646. Source: OSTI; NTIS; INIS; GPO Dep.

The complexation of neptunium(V), Np(V), with the acetate anion, Ac^-, was measured in sodium chloride media to high concentration using an extraction technique. The data were interpreted using the thermodynamic formalism of Pitzer, which is valid to high electrolyte concentrations. A consistent model for the deprotonation constants of acetic acid in NaCl and $NaClO_4$ media was developed. For the concentrations of acetate expected in a waste repository, only the neutral complex NpO_2Ac(aq) was important in describing the interactions between the neptunyl ion and acetate. The thermodynamic stability constant log β^0_{101} for the reaction $NpO_2^+ + Ac^- \leftrightarrow NpO_2Ac$ was calculated to be 1.46±0.11. This weak complexing behavior between the neptunyl ion and acetate indicates that acetate will not significantly enhance dissolved Np(V) concentrations in ground waters associated with nuclear waste repositories that may contain acetate.

1557 (SAND–95-2015C) **The systems prioritization method (SPM) CD-ROM demonstration for Waste Management '96.** Harris, C.L. (Sandia National Labs., Albuquerque, NM (United States)); Boak, D.M.; Prindle, N.H.; Beyeler, W. Sandia National Labs., Albuquerque, NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–60: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008255. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1994, the Department of Energy Carlsbad Area Office (DOE/CAO) implemented a performance-based planning method to assist in prioritization within the Waste Isolation Pilot Plant (WIPP). Probabilistic performance calculations were required for the Systems Prioritization Method (SPM) and roughly 46,700 combinations of activities were analyzed, generating a large volume of information to be documented, analyzed, and communicated. A self-contained information management system consisting of a relational database on a 600-megabyte CD-ROM was built to meet this need. The CD-ROM was used to store performance assessment results, data analysis and visualization tools, information about the activities, electronic copies of 40 ILFR 191 and 40 CFR 268, technical reference papers, and the final SPM report. Copies of the CD-ROM were distributed to interested members of the public, WIPP participants, and the Environmental Protection Agency (EPA).

1558 (SAND-95-2017/1) **The second iteration of the Systems Prioritization Method: A systems prioritization and decision-aiding tool for the Waste Isolation Pilot Plant: Volume 1, Synopsis of method and results.** Prindle, N.H. (and others); Mendenhall, F.T.; Boak, D.M. Sandia National Labs., Albuquerque, NM (United States). May 1996. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96011056. Source: OSTI; NTIS; INIS; GPO Dep.

In March 1994, the US Department of Energy Carlsbad Area Office (DOE/CAO) embarked on an effort to design and implement a performance- based decision-aiding tool to provide an analytical basis for planning, prioritizing, and selecting programmatic options for the Waste Isolation Pilot Plant (WIPP). This tool, called Systems Prioritization Method (SPM) defines the most viable combinations of scientific investigations, engineered alternatives (EAs), and waste acceptance criteria (WAC) for supporting the final WIPP compliance application. The scope of SPM is restricted to selected portions of applicable Environmental Protection Agency (EPA) long-term performance regulations. SPM calculates the probabilities of certain sets of activities demonstrating compliance with various regulations. SPM provides results in the form of a decision matrix to identify cost-effective programmatic paths with a high probability of successfully demonstrating compliance.

1559 (SAND-95-2017/2) **The second iteration of the Systems Prioritization Method: A systems prioritization and decision-aiding tool for the Waste Isolation Pilot Plant: Volume 2, Summary of technical input and model implementation.** Prindle, N.H. (Sandia National Labs., Albuquerque, NM (United States)); Mendenhall, F.T.; Trauth, K.; Boak, D.M.; Beyeler, W.; Hora, S.; Rudeen, D. Sandia National Labs., Albuquerque, NM (United States). May 1996. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96011199. Source: OSTI; NTIS; INIS; GPO Dep.

The Systems Prioritization Method (SPM) is a decision-aiding tool developed by Sandia National Laboratories (SNL). SPM provides an analytical basis for supporting programmatic decisions for the Waste Isolation Pilot Plant (WIPP) to meet selected portions of the applicable US EPA long-term performance regulations. The first iteration of SPM (SPM-1), the prototype for SPM< was completed in 1994. It served as a benchmark and a test bed for developing the tools needed for the second iteration of SPM (SPM-2). SPM-2, completed in 1995, is intended for programmatic decision making. This is Volume II of the three-volume final report of the second iteration of the SPM. It describes the technical input and model implementation for SPM-2, and presents the SPM-2 technical baseline and the activities, activity outcomes, outcome probabilities, and the input parameters for SPM-2 analysis.

1560 (SAND-95-2017/3) **The second iteration of the Systems Prioritization Method: A systems prioritization and decision-aiding tool for the Waste Isolation Pilot Plant: Volume 3, Analysis for final programmatic recommendations.** Prindle, N.H. (and others); Boak, D.M.; Weiner, R.F. Sandia National Labs., Albuquerque, NM (United States). May 1996. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96011013. Source: OSTI; NTIS; INIS; GPO Dep.

Systems Prioritization Method (SPM) is a decision-aiding tool developed by Sandia National Laboratories for the US DOE Carlsbad Area Office (DOE/CAO). This tool provides an analytical basis for programmatic decision making for the Waste Isolation Pilot Plant (WIPP). SPM integrates decision-analysis techniques, performance,a nd risk-assessment tools, and advanced information technology. Potential outcomes of proposed activities and combination of activities are used to calculate a probability of demonstrating compliance (PDC) with selected regulations. The results are presented in a decision matrix showing cost, duration, and maximum PDC for all activities in a given cost and duration category. This is the third and final volume in the series which presents the analysis for final programmatic recommendations.

1561 (SAND-95-2082C) **Field and laboratory testing of seal materials proposed for the Waste Isolation Pilot Plant.** Knowles, M.K. (Sandia National Labs., Albuquerque, NM (United States)); Howard, C.L. Sandia National Labs., Albuquerque, NM (United States). 5 Feb 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212-49: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006478. Source: OSTI; NTIS; INIS; GPO Dep.

The Small Scale Seal Performance Tests (SSSPT) were a series of in situ tests designed to evaluate the feasibility of various materials for sealing purposes. Testing was initiated in 1985 and concluded in 1995. Materials selected for the SSSPT included salt-saturated concrete, a 50%/50% mixture of crushed salt and bentonite, bentonite, and crushed salt. This paper presents a summary of the SSSPT field program, results of the in situ testing, and a discussion of post-testing laboratory studies of salt-saturated concrete. Results of the SSSPT support the use of salt-saturated concrete, compacted bentonite clay, and compacted crushed salt as sealing materials for the WIPP.

1562 (SAND-95-2244C) **Using a multiphase flow code to model the coupled effects of repository consolidation and multiphase brine and gas flow at the Waste Isolation Pilot Plant.** Freeze, G.A. (INTERA Inc., Albuquerque, NM (United States)); Larson, K.W.; Davies, P.B.; Webb, S.W. Sandia National Labs., Albuquerque, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950828-22: 1995 National heat transfer conference, Portland, OR (United States), 5-9 Aug 1995). Order Number DE96000704. Source: OSTI; NTIS; INIS; GPO Dep.

Long-term repository assessment must consider the processes of (1) gas generation, (2) room closure and expansions due to salt creep, and (3) multiphase (brine and gas) fluid flow, as well as the complex coupling between these three processes. The mechanical creep closure code SANCHO was used to simulate the closure of a single, perfectly sealed disposal room filled with water and backfill. SANCHO uses constitutive models to describe salt creep, waste consolidation, and backfill consolidation, Five different gas-generation rate histories were simulated, differentiated by a rate multiplier, f, which ranged from 0.0 (no gas generation) to 1.0 (expected gas generation under brine-dominated conditions). The results of the SANCHO f-series simulations provide a relationship between gas generation, room closure, and room pressure for a perfectly sealed room. Several methods for coupling this relationship with multiphase fluid flow into and out of a room were examined. Two of the methods are described.

1563 (SAND–95-2571) **Probability, conditional probability and complementary cumulative distribution functions in performance assessment for radioactive waste disposal.** Helton, J.C. (Arizona State Univ., Tempe, AZ (United States)). Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010905. Source: OSTI; NTIS; INIS; GPO Dep.

A formal description of the structure of several recent performance assessments (PAs) for the Waste Isolation Pilot Plant (WIPP) is given in terms of the following three components: a probability space (S_{st}, S_{st}, p_{st}) for stochastic uncertainty, a probability space (S_{su}, S_{su}, p_{su}) for subjective uncertainty and a function (i.e., a random variable) defined on the product space associated with (S_{st}, S_{st}, p_{st}) and (S_{su}, S_{su}, p_{su}). The explicit recognition of the existence of these three components allows a careful description of the use of probability, conditional probability and complementary cumulative distribution functions within the WIPP PA. This usage is illustrated in the context of the U.S. Environmental Protection Agency's standard for the geologic disposal of radioactive waste (40 CFR 191, Subpart B). The paradigm described in this presentation can also be used to impose a logically consistent structure on PAs for other complex systems.

1564 (SAND–95-2660C) **Data qualification for the Waste Isolation Pilot Plant.** Brown, R.D. (Harbridge House, Inc., Washington, DC (United States)); Harper-Slaboszewicz, V.J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960421–26: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96008254. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Isolation Pilot Plant (WIPP) site near Carlsbad, New Mexico, has been the subject of scientific and engineering investigations for more than twenty years. Data from these investigations are now being used as part of the process to certify compliance of the WIPP with the governing regulations. Some of these data were collected prior to the development and implementation of the quality assurance (QA) standards that are now being applied in the WIPP compliance certification process, and are considered "existing data" within the current QA program. This paper discusses the process for qualification of existing data (QED) defined for the WIPP project, the implementation of that process, and some of the results. This process incorporates many lessons learned, and should be useful to others in the radioactive waste management system who are dealing with "existing data."

1565 (SAND–95-2983C) **Computational implementation of the multi-mechanism deformation coupled fracture model for salt.** Koteras, J.R.; Munson, D.E. Sandia National Labs., Albuquerque, NM (United States). 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960619–7: 2. North American rock mechanics symposium: tools and techniques in rock mechanics, Montreal (Canada), 19-21 Jun 1996). Order Number DE96010857. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Mechanism Deformation (M-D) model for creep in rock salt has been used in three-dimensional computations for the Waste Isolation Pilot Plant (WIPP), a potential waste, repository. These computational studies are relied upon to make key predictions about long-term behavior of the repository. Recently, the M-D model was extended to include creep-induced damage. The extended model, the Multi-Mechanism Deformation Coupled Fracture (MDCF) model, is considerably more complicated than the M-D model and required a different technology from that of the M-D model for a computational implementation.

1566 (SAND–95-3056C) **Use of probabilistic methods for analysis of cost and duration uncertainties in a decision analysis framework.** Boak, D.M.; Painton, L. Sandia National Labs., Albuquerque, NM (United States). 8 Dec 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960421–2: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96004301. Source: OSTI; NTIS; INIS; GPO Dep.

Probabilistic forecasting techniques have been used in many risk assessment and performance assessment applications on radioactive waste disposal projects such as Yucca Mountain and the Waste Isolation Pilot Plant (WIPP). Probabilistic techniques such as Monte Carlo and Latin Hypercube sampling methods are routinely used to treat uncertainties in physical parameters important in simulating radionuclide transport in a coupled geohydrologic system and assessing the ability of that system to comply with regulatory release limits. However, the use of probabilistic techniques in the treatment of uncertainties in the cost and duration of programmatic alternatives on risk and performance assessment projects is less common. Where significant uncertainties exist and where programmatic decisions must be made despite existing uncertainties, probabilistic techniques may yield important insights into decision options, especially when used in a decision analysis framework and when properly balanced with deterministic analyses. For relatively simple evaluations, these types of probabilistic evaluations can be made using personal computer-based software.

1567 (SAND–96-0178C) **Effects of simulant Hanford tank waste on plastic packaging components.** Nigrey, P.J.; Dickens, T.G. Sandia National Labs., Albuquerque, NM (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–34: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010548. Source: OSTI; NTIS; INIS; GPO Dep.

In this paper, the authors describe a chemical compatibility testing program for packaging components which might be used to transport mixed wastes. They mention the results of the screening phase of this program and then present the results of the second phase of this experimental program. This effort involved the comprehensive testing of five plastic liner materials in the aqueous mixed waste simulant. The testing protocol involved exposing the respective materials to ~ 140, 290, 570, and 3,670 krads of gamma radiation followed by 7, 14, 28, 180 day exposures to the waste simulant at 18, 50, and 60 C. From the data analysis performed to date in this study, they have identified the fluorocarbon Kel-F™ as having the greatest chemical compatibility after being exposed to gamma radiation followed by exposure to the Hanford Tank simulant mixed waste. The most striking observation from this study was the poor performance of Teflon under these conditions. The data obtained from this testing program will be available to packaging designers for the development of mixed waste packagings. The implications of the testing results on the selection of appropriate materials as packaging components are discussed.

1568 (SAND–96-0195C) **Ultrafine cement grout for sealing underground nuclear waste repositories.** Ahrens, E.H. (Sandia National Labs., Livermore, CA (United States)); Onofrei, M. Sandia National Labs., Livermore, CA (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960619–2: 2. North American rock mechanics symposium: tools and techniques in rock mechanics, Montreal (Canada), 19-21 Jun 1996). Order Number DE96007340. Source: OSTI; NTIS; INIS; GPO Dep.

Sealing fractures in nuclear waste repositories concerns all programs investigating deep burial as a means of disposal. Because the most likely mechanism for contaminant migration is by dissolution and movement through groundwater, sealing programs are seeking low-viscosity sealants that are chemically, mineralogically, and physically compatible with their host. This paper presents the results of collaborative work between Whitesell Laboratories, operated by Atomic Energy of Canada, Ltd., and Sandia National Laboratories; the work was undertaken in support of the Waste Isolation Pilot Plant (WIPP). This effort addresses the technology associated with long-term isolation of nuclear waste in a natural salt medium. The work presented is part of the plugging and sealing program, specifically the development and optimization of Ultrafine cementitious grout that can be injected to adequately lower excessive, strain-induced permeability in the Distributed Rock Zone (DRZ) surrounding underground excavations. Innovative equipment and procedures employed in the laboratory produced a usable cement-based grout whose particles are 90% smaller than 8 microns and average 4 microns. The process involved simultaneous wet pulverization and mixing. The grout was used for a successful in situ test underground at the WIPP. Injection of grout sealed microfractures as small as 8 microns and lowered the gas permeability of the DRZ by three orders of magnitude. Following the WIPP test, additional work produced an improved version of the grout containing particles 90% smaller than 6 microns and averaging 2 microns. This grout can be produced in the dry form at a competitive cost ready to mix.

1569 (SAND–96-0342C) **Using depleted uranium to shield vitrified high-level waste packages.** Yoshimura, H.R.; Gildea, P.D.; Bernard, E.A. Sandia National Labs., Albuquerque, NM (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951203–60: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96007424. Source: OSTI; NTIS; INIS; GPO Dep.

The underlying report for this paper evaluates options for using depleted uranium as shielding materials for transport systems for disposal of vitrified high-level waste (VHLW). In addition, economic analyses are presented to compare costs associated with these options to costs, associated with existing and proposed storage, transport, and diposal capabilities. A more detailed evaluation is provided elsewhere. (Yoshimura et al. 1995.)

1570 (SAND–96-0376C) **A constitutive model for representing coupled creep, fracture, and healing in rock salt.** Chan, K.S. (Southwest Research Inst., San Antonio, TX (United States)); Bodner, S.R.; Munson, D.E.; Fossum, A.F. Sandia National Labs., Albuquerque, NM (United States). [1996]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606115–2: 4. conference on the mechanical behavior of salt, Montreal (Canada), 17-18 Jun 1996). Order Number DE96006991. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a constitutive model for representing inelastic flow due to coupled creep, damage, and healing in rock salt is present in this paper. This model, referred to as Multimechanism Deformation Coupled Fracture model, has been formulated by considering individual mechanisms that include dislocation creep, shear damage, tensile damage, and damage healing. Applications of the model to representing the inelastic flow and fracture behavior of WIPP salt subjected to creep, quasi-static loading, and damage healing conditions are illustrated with comparisons of model calculations against experimental creep curves, stress-strain curves, strain recovery curves, time-to-rupture data, and fracture mechanism maps.

1571 (SAND–96-0435) **Hydraulic testing around Room Q: Evaluation of the effects of mining on the hydraulic properties of Salado Evaporites.** Domski, P.S. (INTERA, Inc., Albuquerque, NM (United States)); Upton, D.T.; Beauheim, R.L. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010653. Source: OSTI; NTIS; INIS; GPO Dep.

Room Q is a 109-m-long cylindrical excavation in the Salado Formation at the Waste Isolation Pilot Plant (WIPP) site. Fifteen boreholes were drilled and instrumented around Room Q so that tests could be conducted to determine the effects of room excavation on the hydraulic properties of the surrounding evaporate rocks. Pressure-buildup and pressure-pulse tests were conducted in all of the boreholes before Room Q was mined. The data sets from only eight of the boreholes are adequate for parameter estimation, and five of those are of poor quality. Constant-pressure flow tests and pressure-buildup tests were conducted after Room Q was mined, producing eleven interpretable data sets, including two of poor quality. Pre-mining transmissivities interpreted from the three good-quality data sets ranged from 1×10^{-15} to 5×10^{-14} m^2/s (permeability-thickness products of 2×10^{-22} to 9×10^{-21} m^3) for test intervals ranging in length from 0.85 to 1.37 m. Pre-mining average permeabilities, which can be considered representative of undisturbed, far-field conditions, were 6×10^{-20} and 8×10^{-20} m^2 for anhydrite, and 3×10^{-22} m^2 for halite. Post-mining transmissivities interpreted from the good-quality data sets ranged from 1×10^{-16} to 3×10^{-13} m^2/s (permeability-thickness products of 2×10^{-23} to 5×10^{-20} m^3). Post-mining average permeabilities for anhydrite ranged from 8×10^{-20} to 1×10^{-19} m^2. The changes in hydraulic properties and pore pressures that were observed can be attributed to one or a combination of three processes: stress reduction, changes in pore connectivity, and flow towards Room Q. The effects of the three processes cannot be individually quantified with the available data.

1572 (SAND–96-0791C) **Evaluation of constitutive models for crushed salt.** Callahan, G.D. (RE/SPEC, Inc., Rapid City, SD (United States)); Loken, M.C.; Hurtado, L.D.; Hansen, F.D. Sandia National Labs., Albuquerque, NM (United States). [1996]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606115–3: 4. conference on the mechanical behavior of salt, Montreal (Canada), 17-18 Jun 1996). Order Number DE96009175. Source: OSTI; NTIS; INIS; GPO Dep.

Three constitutive models are recommended as candidates for describing the deformation of crushed salt. These models are generalized to three-dimensional states of stress to include the effects of mean and deviatoric stress and modified to include effects of temperature, grain size, and moisture content. A database including hydrostatic consolidation and shear consolidation tests conducted on Waste Isolation Pilot Plant (WIPP) and southeastern New Mexico salt is used to determine material parameters for the models. To evaluate the capability of the models, parameter values obtained from fitting the complete database are used to predict the individual tests. Finite element calculations of a WIPP shaft with emplaced crushed salt demonstrate the model predictions.

1573 (SAND–96-0792C) **Large-scale dynamic compaction of natural salt.** Hansen, F.D.; Ahrens, E.H. Sandia National Labs., Albuquerque, NM (United States). [1996]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606115–4: 4. conference on the mechanical behavior of salt, Montreal (Canada), 17-18 Jun 1996). Order Number DE96010849. Source: OSTI; NTIS; INIS; GPO Dep.

A large-scale dynamic compaction demonstration of natural salt was successfully completed. About 40 m^3 of salt were compacted in three, 2-m lifts by dropping a 9,000-kg weight from a height of 15 m in a systematic pattern to achieve desired compaction energy. To enhance compaction, 1 wt% water was added to the relatively dry mine-run salt. The average compacted mass fractional density was 0.90 of natural intact salt, and in situ nitrogen permeabilities averaged $9X10^{-14}m^2$. This established viability of dynamic compacting for placing salt shaft seal components. The demonstration also provided compacted salt parameters needed for shaft seal system design and performance assessments of the Waste Isolation Pilot Plant.

1574 (SAND–96-0838C) **Properties of dynamically compacted WIPP salt.** Brodsky, N.S. (Sandia National Labs., Albuquerque, NM (United States)); Hansen, F.D.; Pfeifle, T.W. Sandia National Labs., Albuquerque, NM (United States). [1996]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606115–6: 4. conference on the mechanical behavior of salt, Montreal (Canada), 17-18 Jun 1996). Order Number DE96011715. Source: OSTI; NTIS; INIS; GPO Dep.

Dynamic compaction of mine-run salt is being investigated for the Waste Isolation Pilot Plant (WIPP), where compacted salt is being considered for repository sealing applications. One large-scale and two intermediate-scale dynamic compaction demonstrations were conducted. Initial fractional densities of the compacted salt range form 0.85 to 0.90, and permeabilities vary. Dynamically-compacted specimens were further consolidated in the laboratory by application of hydrostatic pressure. Permeability as a function of density was determined, and consolidation microprocesses were studied. Experimental results, in conjunction with modeling results, indicate that the compacted salt will function as a viable seal material.

1575 (SAND–96-0866) **Consideration of critically when directly disposing highly enriched spent nuclear fuel in unsaturated tuff: Bounding estimates.** Rechard, R.P.; Tierney, M.S.; Sanchez, L.C.; Martell, M.-A. Sandia National Labs., Albuquerque, NM (United States). May 1996. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96010373. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents one of 2 approaches (bounding calculations) which were used in a 1994 study to examine the possibility of a criticality in a repository. Bounding probabilities, although rough, point to the difficulty of creating conditions under which a critical mass could be assembled (container corrosion, separation of neutron absorbers from fissile material, collapse or precipitation of fissile material) and how significant the geochemical and hydrologic phenomena are. The study could not conceive of a mechanism consistent with conditions under which an atomic explosion could occur. Should a criticality occur in or near a container in the future, boundary consequence calculations showed that fissions from one critical event ($<10^{20}$ fissions, if similar to aqueous and metal accidents and experiments) are quite small compared to the amount of fissions represented by the spent fuel itself. If it is assumed that the containers necessary to hold the highly enriched spent fuel went critical once per day for 1 million years, creating an energy release of about 10^{20} fissions, the number of fissions equals about 10^{28}, which corresponds to only 1% of the fission inventory in a repository containing 70,000 metric tons of heavy metal, the expected size for the proposed repository at Yucca Mountain, Nevada.

1576 (SAND–96-0886) **Sandia WIPP calibration traceability.** Schuhen, M.D. (Sandia National Labs., Albuquerque, NM (United States)); Dean, T.A. Sandia National Labs., Albuquerque, NM (United States). May 1996. 214p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96011876. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the work performed to establish calibration traceability for the instrumentation used by Sandia National Laboratories at the Waste Isolation Pilot Plant (WIPP) during testing from 1980-1985. Identifying the calibration traceability is an important part of establishing a pedigree for the data and is part of the qualification of existing data. In general, the requirement states that the calibration of Measuring and Test equipment must have a valid relationship to nationally recognized standards or the basis for the calibration must be documented. Sandia recognized that just establishing calibration traceability would not necessarily mean that all QA requirements were met during the certification of test instrumentation. To address this concern, the assessment was expanded to include various activities.

1577 (SAND–96-1100C) **A shaft seal system for the Waste Isolation Pilot Plant.** Hansen, F.D. (Sandia National Labs., Albuquerque, NM (United States)); Ahrens, E.H.; Dennis, A.W.; Hurtado, L.D.; Knowles, M.K.; Tillerson, J.R.;

Thompson, T.W.; Galbraith, D. Sandia National Labs., Albuquerque, NM (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960804–35: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96011691. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the demonstration of compliance with federal regulations, a shaft seal system has been designed for the Waste Isolation Pilot Plant. The system completely fills the 650 m shafts with components consisting of the common engineering materials, each of which possesses low permeability, longevity, and can be constructed using available technology. Design investigations couple rock mechanics and fluid flow analysis and tests of these materials within the natural geological setting, and demonstrate the effectiveness of the design.

1578 (SAND–96-1921C) **Structural analysis in support of the waterborne transport of radioactive materials.** Ammerman, D.J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960706–30: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96013237. Source: OSTI; NTIS; INIS; GPO Dep.

The safety of the transportation of radioactive materials by road and rail has been well studied and documented. However, the safety of waterborne transportation has received much less attention. Recent highly visible waterborne transportation campaigns have led to DOE and IAEA to focus attention on the safety of this transportation mode. In response, Sandia National Laboratories is conducting a program to establish a method to determine the safety of these shipments. As part of that program the mechanics involved in ship-to-ship collisions are being evaluated to determine the loadings imparted to radioactive material transportation packages during these collisions. This paper will report on the results of these evaluations.

1579 (SAND–96-2011C) **Spent-fuel verification measurements using passive and active radiation techniques.** Ewing, R.I.; Seager, K.D. Sandia National Labs., Albuquerque, NM (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960767–22: 37. annual meeting of the Institute of Nuclear Materials Management, Naples, FL (United States), 28-31 Jul 1996). Order Number DE96013830. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an evolutionary development process that will lead to spent fuel measurements that directly measure fissile reactivity. First, the Fork measurement system has been used to verify the burnup of pressurized water reactor (PWR) spent-fuel assemblies at U.S. nuclear utilities. Fork measurements have demonstrated the utility of the passive Fork system to verify reactor records with a single 100-second measurement on each assembly. Second, an Advanced Fork system incorporating collimated gamma-ray spectroscopy has been designed to permit advanced calibration techniques that are independent of reactor burnup records and to allow rapid axial scanning of spent fuel assemblies. Third, an Active Fork system incorporating a neutron source to interrogate spent fuel is proposed to provide the capability to measure fissile reactivity, when compared to measurements on fresh fuel assemblies of the same design. The Advanced and Active Fork systems have wide applicability to spent fuel verification for PWR, boiling water reactor (BWR), and U.S. Department of Energy (DOE) spent fuel.

1580 (UCRL-ID–118561) **Review of sensors for the in situ chemical characterization of the Hanford underground storage tanks.** Kyle, K.R.; Mayes, E.L. Lawrence Livermore National Lab., CA (United States). 29 Jul 1994. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. Order Number DE95015026. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore National Laboratory (LLNL), in the Technical Task Plan (TTP) SF-2112-03 subtask 2, is responsible for the conceptual design of a Raman probe for inclusion in the in-tank cone penetrometer. As part of this task, LLNL is assigned the further responsibility of generating a report describing a review of sensor technologies other than Raman that can be incorporated in the in-tank cone penetrometer for the chemical analysis of the tank environment. These sensors would complement the capabilities of the Raman probe, and would give information on gaseous, liquid, and solid state species that are insensitive to Raman interrogation. This work is part of a joint effort involving several DOE laboratories for the design and development of in-tank cone penetrometer deployable systems for direct UST waste characterization at Westinghouse Hanford Company (WHC) under the auspices of the U.S. Department of Energy (DOE) Underground Storage Tank Integrated Demonstration (UST-ID).

1581 (UCRL-JC–122572) **Pitting corrosion of container materials in anticipated repository environments.** Roy, A.K.; McCright, R.D. Lawrence Livermore National Lab., CA (United States). Nov 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-91RW00134 ; W-7405-ENG-48. (CONF-960421–8: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96006314. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. HIGH-LEVEL RADIOACTIVE WASTES/underground disposal; CONTAINERS/pitting corrosion; CONTAINERS/design; STAINLESS STEELS/materials testing; YUCCA MOUNTAIN; CONTAINERS; DESIGN; MOISTURE; GROUND WATER; ELECTROCHEMICAL CORROSION

1582 (UCRL-JC–122875) **Tank leak detection using electrical resistance methods.** Ramirez, A.; Daily, W.; Binley, A.; LaBrecque, D. Lawrence Livermore National Lab., CA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-960477–4: 9. annual symposium on the application of geophysics to engineering and environmental problems, Denver, CO (United States), 15 Apr - 1 May 1996). Order Number DE96010700. Source: OSTI; NTIS; GPO Dep.

Large volumes of hazardous liquids and high-level radioactive wastes are stored worldwide in surface and underground tanks. Frequently these tanks are found to leak, thereby resulting in not only a loss of stored inventory, but in contamination to soils and groundwater. It is important to develop a reliable method of detecting leaks before large quantities are emitted into the environment surround the tanks. Two field experiments were performed to evaluate the performance of electrical resistance tomography (ERT) as a leak detection method under metal underground storage tanks (UST). This paper provides a summary of the field experiments performed under a 15 m diameter steel tank mockup located at the Hanford Reservation.

1583 (WHC-EP–0474-16) **Quarterly report on the Ferrocyanide Safety Program for the period ending, March 31, 1995.** Cash, R.J.; Meacham, J.E.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012969. Source: OSTI; NTIS; INIS; GPO Dep.

This quarterly report provides a status of the activities underway on the Ferrocyanide Safety Issue at the Hanford Site, including actions in response to Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 90-7 (FR 1990). In March 1991, a DNFSB implementation plan (Cash 1991) responding to the six parts of Recommendation 90-7 was prepared and sent to the DNFSB. A Ferrocyanide Safety Program Plan addressing the total Ferrocyanide Safety Program, including the six parts of DNFSB Recommendation 90-7, was released in October 1994 (DOE 1994b). Activities in the program plan are underway or have been completed, and the status of each is described in Sections 2.0 and 3.0 of this report.

1584 (WHC-EP–0474-17) **Quarterly report on the Ferrocyanide Safety Program for the period ending June 30, 1995.** Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017142. Source: OSTI; NTIS; INIS; GPO Dep.

This is the seventeenth quarterly report on the progress of activities addressing the Ferrocyanide Safety Issue associated with Hanford Site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six pans of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan (DOE 1994b), and this report follows the same format presented there. A summary of the key events occurring this quarter is presented.

1585 (WHC-EP–0474-18) **Quarterly report on the Ferrocyanide Safety Program for the period ending September 30, 1995.** Meacham, J.E.; Cash, R.J.; Dukelow, G.T. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003339. Source: OSTI; NTIS; INIS; GPO Dep.

This is the eighteenth quarterly report on the progress of activities addressing the Ferrocyanide Safety Issue associated with Hanford Site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six parts of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan (DOE 1994b), and this report follows the same format presented there. A summary of the key events occurring this quarter is presented in Section 1.2. More detailed discussions of progress are located in Sections 2.0 through 4.0.

1586 (WHC-EP–0474-19) **Quarterly report on the Ferrocyanide Safety Program for the period ending December 31, 1995.** Cash, R.J.; Meacham, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96009668. Source: OSTI; NTIS; GPO Dep.

This is the nineteenth quarterly report on the progress of activities addressing the Ferrocyanide Safety Issue associated with Hanford Site high-level radioactive waste tanks. Progress in the Ferrocyanide Safety Program is reviewed, including work addressing the six parts of Defense Nuclear Facilities Safety Board Recommendation 90-7 (FR 1990). All work activities are described in the revised program plan (DOE 1994b), and this report follows the same format presented there. A summary of the key events occurring this quarter is presented in Section 1.2. More detailed discussions of progress are located in Sections 2.0 through 4.0. 58 refs.

1587 (WHC-EP–0479-1) **Facility effluent monitoring plan for the tank farms facilities.** Bachand, D.D.; Crummel, G.M. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015658. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the US Department of Energy for any operations that involve hazardous materials and radioactive substances that could impact employee or public safety or the environment. This document is prepared using specific guidelines. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated as a minimum every three years.

1588 (WHC-EP–0600-Rev.1) **Status report on resolution of Waste Tank Safety Issues at the Hanford Site. Revision 1.** Dukelow, G.T. (Los Alamos Technical Associates, Inc., Kennewick, WA (United States)); Hanson, G.A. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). May 1995. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012985. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to provide and update the status of activities supporting the resolution of waste tank safety issues and system deficiencies at the Hanford Site. This report provides: (1) background information on safety issues and system deficiencies; (2) a description of the Tank Waste Remediation System and the process for managing safety issues and system deficiencies; (3) changes in safety issue description, prioritization, and schedules; and (4) a summary of the status, plans, order of magnitude, cost, and schedule for resolving safety issues and system deficiencies.

1589 (WHC-EP–0685) **Engineering evaluation of alternatives: Technologies for monitoring interstitial liquids in single-shell tanks.** Brevick, C.H. (ICF Kaiser Hanford Co., Richland, WA (United States)); Jenkins, C.E. Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Feb 1996. 152p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE96006825. Source: OSTI; NTIS; INIS; GPO Dep.

A global search of mature, emerging, and conceptual tank liquid monitoring technologies, along with a historical review of Hanford tank farm waste monitoring instrumentation, was conducted to identify methods for gauging the quantity of interstitial waste liquids contained in Hanford SSTs. Upon completion of the search, an initial screening of alternatives was conducted to identify candidates which might be capable of monitoring interstitial tank liquids. The nine candidate technologies that were selected, evaluated, and ranked are summarized. Hydrostatic tank gauging (HTG) is the technology generally recommended for gauging the quantity of process materials contained in Hanford SSTs. HTG is a mass-based technique that has the capability for continuous remote monitoring. HTG has the advantages of no moving parts, intrinsic safety, and potentially gauging a one-million gal tank with a precision of approximately ±500 pounds (i.e., ±62 gal of water or ±0.02 in. of level in a 75 ft diameter tank). HTG is relatively inexpensive and probe design, construction, testing, installation, and operation should be straightforward. HTG should be configured as part of a hybrid tank gauging system. A hybrid system employs two or more independent measurement systems which function in concert to provide redundancy, improved accuracy, and maximum information at minimum cost. An excellent hybrid system choice for monitoring interstitial liquids in SSTs might be the combination of HTG with thermal differential technology.

1590 (WHC-EP–0817) **Alkaline chemistry of transuranium elements and technetium and the treatment of alkaline radioactive wastes.** Delegard, C.H. (Westinghouse Hanford Co., Richland, WA (United States)); Peretrukhin, V.F.; Shilov, V.P.; Pikaev, A.K. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 172p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015769. Source: OSTI; NTIS; INIS; GPO Dep.

Goal of this survey is to generalize the known data on fundamental physical-chemical properties of TRUs and Tc, methods for their isolation, and to provide recommendations that will be useful for partitioning them from alkaline high-level wastes.

1591 (WHC-EP–0818) **Calcination/dissolution residue treatment.** Knight, R.C. (Westinghouse Hanford Co., Richland, WA (United States)); Creed, R.F.; Patello, G.K.; Hollenberg, G.W.; Buehler, M.F.; O'Rourke, S.M.; Visnapuu, A.; McLaughlin, D.F. Westinghouse Hanford Co., Richland, WA (United States). Sep 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013515. Source: OSTI; NTIS; INIS; GPO Dep.

Currently, high-level wastes are stored underground in steel-lined tanks at the Hanford site. Current plans call for the chemical pretreatment of these wastes before their immobilization in stable glass waste forms. One candidate pretreatment approach, calcination/dissolution, performs an alkaline fusion of the waste and creates a high-level/low-level partition based on the aqueous solubilities of the components of the product calcine. Literature and laboratory studies were conducted with the goal of finding a residue treatment technology that would decrease the quantity of high-level waste glass required following calcination/dissolution waste processing. Four elements, Fe, Ni, Bi, and U, postulated to be present in the high-level residue fraction were identified as being key to the quantity of high-level glass formed. Laboratory tests of the candidate technologies with simulant high-level residues showed reductive roasting followed by carbonyl volatilization to be successful in removing Fe, Ni, and Bi. Subsequent bench-scale tests on residues from calcination/dissolution processing of genuine Hanford Site tank waste showed Fe was separated with radioelement decontamination factors of 70 to 1,000 times with respect to total alpha activity. Thermodynamic analyses of the calcination of five typical Hanford Site tank waste compositions also were performed. The analyses showed sodium hydroxide to be the sole molten component in the waste calcine and emphasized the requirement for waste blending if fluid calcines are to be achieved. Other calcine phases identified in the thermodynamic analysis indicate the significant thermal reconstitution accomplished in calcination.

1592 (WHC-EP–0853-Rev.1-Vol.1) **DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan. Volume 1.** Gerber, E.W. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003261. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has developed an Integrated Program Plan (IPP) to address concerns identified in Defense Nuclear Facilities Safety Board Recommendation 94-1. The IPP describes the actions that DOE plans to implement at its various sites to convert excess fissile materials to forms or conditions suitable for safe interim storage. The baseline IPP was issued as DOE's Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 Implementation Plan (IP), which was transmitted to the DNFSB on February 28, 1995. The IPP is being further developed to include complex-wide requirements for research and development and a long-range facility requirements section. The planned additions to the baseline IPP are being developed based on a systems engineering approach that integrates facilities and capabilities at the various DOE sites and focuses on attaining safe interim storage with minimum safety risks and environmental impacts. Each affected DOE site has developed a Site Integrated Stabilization Management Plan (SISMP) to identify individual site plans to implement the DNFSB Recommendation 94-1 and to provide a basis for formulating planned additions to the IPP. The SISMPs were developed based on the objectives, requirements, and commitments identified in the baseline DNFSB Recommendation 94-1 IPP. The SISMPs will be periodically updated to reflect improved integration between DOE sites as identified during the IPP systems engineering evaluations.

1593 (WHC-EP–0853-Rev.1-Vol.2) **DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan. Volume 2.** Gerber, E.W. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003929. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Integrated Stabilization Management Plan (SISMP) was developed in support of the US Department of Energy's (DOE) Defense Nuclear Facilities Safety Board (DNFSB) Recommendation 94-1 Integrated Program Plan (IPP). Volume 1 of the SISMP identifies the technical scope and costs associated with Hanford Site plans to resolve concerns identified in DNFSB Recommendation 94-1.

Volume 2 of the SISMP provides the Resource Loaded Integrated Schedules for Spent Nuclear Fuel Project and Plutonium Finishing Plant activities identified in Volume 1 of the SISMP. Appendix A provides the schedules and progress curves related to spent nuclear fuel management. Appendix B provides the schedules and progress curves related to plutonium-bearing material management. Appendix C provides programmatic logic diagrams that were referenced in Volume 1 of the SISMP.

1594 (WHC-EP–0853-Vol.1) **DNFSB Recommendation 94-1 Hanford Site Integrated Stabilization Management Plan. Volume 1.** McCormack, R.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017151. Source: OSTI; NTIS; GPO Dep.

This document describes the plans of the Hanford Site for the safe interim storage of fissile materials. Currently, spent nuclear fuels reside in storage basins that have leaked in the past and are projected to leak in the future. Other problems in the basins include; sludge from decomposition, degraded cladding of fuel elements, and construction defects which make the basins seismically unsafe. This management plan describes the time and cost that it will take to implement a safe interim storage plan for the fissile materials.

1595 (WHC-EP–0856) **Tank waste remediation system operational scenario.** Johnson, M.E. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013573. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) mission is to store, treat, and immobilize highly radioactive Hanford waste (current and future tank waste and the strontium and cesium capsules) in an environmentally sound, safe, and cost-effective manner (DOE 1993). This operational scenario is a description of the facilities that are necessary to remediate the Hanford Site tank wastes. The TWRS Program is developing technologies, conducting engineering analyses, and preparing for design and construction of facilities necessary to remediate the Hanford Site tank wastes. An Environmental Impact Statement (EIS) is being prepared to evaluate proposed actions of the TWRS. This operational scenario is only one of many plausible scenarios that would result from the completion of TWRS technology development, engineering analyses, design and construction activities and the TWRS EIS. This operational scenario will be updated as the development of the TWRS proceeds and will be used as a benchmark by which to evaluate alternative scenarios.

1596 (WHC-EP–0861) **Status report for inactive miscellaneous underground storage tanks at Hanford Site 200 Areas.** Powers, T.B. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003336. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this status report is to summarize updated data and information from the FY 1994 strategy plan that is associated with inactive miscellaneous underground storage tanks (IMUSTs). Assumptions and processes to assess potential risks and operational concerns are documented in this report. Safety issue priorities are ranked based on a number of considerations. Sixty-three IMUSTs have been identified and placed on the official IMUST list. All the tanks are associated with past Hanford Site operations. Of the 63 tanks., 19 are catch tanks, 20 are vault tanks, 3 are neutralization tanks, 8 are settling tanks, 2 are solvent makeup tanks used to store hexone, 2 are flush tanks, 3 are decontamination tanks, 1 is a diverter station, 1 is a receiver tank, 1 is an experimental tank, and 3 are waste handling tanks. It is important to proactively deal with the risks Imposed by these 63 tanks, and at the same time not jeopardize the existing commitments and schedules for mitigating and resolving identified safety issues related to the 177 SSTs and DSTS. Access controls and signs have been placed on all but the three official IMUSTs added most recently. An accelerated effort to identify authorization documents and perform unreviewed safety question (USQ) screening has been completed. According to a set of criteria consistent with the safety screening data quality objective (DQO) process, 6 IMUSTs are ranked high related to the hydrogen generation potential safety Issue, 1 is ranked high related to the ferrocyanide potential safety issue, 6 are ranked high related to the flammability potential safety issue, and 25 are ranked high related to the vapor emissions potential safety issue.

1597 (WHC-EP–0862) **Recommended alternative for interim stabilization of Tank 241-C-103.** Dukelow, G.T. (Westinghouse Hanford Co., Richland, WA (United States)); Turner, D.A.; Grigsby, J.M. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011568. Source: OSTI; NTIS; INIS; GPO Dep.

The waste in tank 241-C-103 poses several health and safety risks and potential soil contamination caused by tank leaks. To minimize the risk of contaminating the soil beneath the tank, the pumpable waste liquids are planned to be removed by salt well pumping. In addition to aqueous liquids, this tank is unique because it also contains a layer of degraded PUREX solvent floating on the aqueous liquid. The following three options for removing and storing this separable phase organic solvent have been proposed and studied: transferring the organic solvent and pumpable aqueous liquids using existing salt well pumping equipment and procedures to a double-shell tank (DST) for storage; removing most of the organic solvent using a skimmer pump, then salt well pumping the remaining pumpable liquids to a different DST for storage; removing most of the organic solvent to an aboveground storage tank for eventual treatment or offsite transfer, and then salt well pumping the remaining pumpable liquids to a DST for interim storage. As a result of evaluating these three options and a no pumping option, the recommended action is to transfer both the organic solvent and pumpable aqueous liquid to a DST for storage using existing salt well pumping equipment. The evaluation considers the following criteria: public health and safety, worker safety, environmental compliance, engineering feasibility, and cost. The options compared these factors. Two key areas drove the selection of the recommended approach: the minimization of potential soil contamination from tank leaks caused the (interim stabilization by salt well pumping) options to be rated more highly than the no pumping option; and cost and implementation factors caused the transfer and storage to DST using existing tank farm salt well pumping equipment option to rate higher than the skimming options. Other factors have only a second order effect on the selection process. Evaluation results are described in this report.

1598 (WHC-EP–0870) **Acoustic imaging of underground storage tank wastes.** Mech, S.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96002791. Source: OSTI; NTIS; INIS; GPO Dep.

Acoustics is a potential tool to determine the properties of high level wastes stored in Underground Storage Tanks. Some acoustic properties were successfully measured by a limited demonstration conducted in 114-TX. This accomplishment provides the basis for expanded efforts to qualify techniques which depend on the acoustic properties of tank wastes. This work is being sponsored by the Department of Energy under the Office of Science and Technology. In FY-1994, limited Tank Waste Remediation Systems EM-30 support was available at Hanford and Los Alamos National Laboratory. The Massachusetts Institute of Technology (MIT) and Earth Resources Laboratory (ERL) were engaged for analysis support, and Elohi Geophysics, Inc. for seismic testing services. Westinghouse-Hanford Company provided the testing and training, supplied the special engineering and safety analysis equipment and procedures, and provided the trained operators for the actual tank operations. On 11/9/94, limited in-tank tests were successfully conducted in tank 114-TX. This stabilized Single Shell Tank was reported as containing 16.8 feet of waste, the lower 6.28 feet of which contained interstitial liquid. Testing was conducted over the lower 12 feet, between two Liquid Observation Wells thirty feet apart. The "quick-look" data was reviewed on-site by MIT and Elohi.

1599 (WHC-EP–0873) **Engineering evaluation of alternatives: Managing the assumed leak from single-shell Tank 241-T-101.** Brevick, C.H. (ICF Kaiser Hanford Co., Richland, WA (United States)); Jenkins, C. Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). Feb 1996. 240p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006826. Source: OSTI; NTIS; INIS; GPO Dep.

At mid-year 1992, the liquid level gage for Tank 241-T-101 indicated that 6,000 to 9,000 gal had leaked. Because of the liquid level anomaly, Tank 241-T-101 was declared an assumed leaker on October 4, 1992. SSTs liquid level gages have been historically unreliable. False readings can occur because of instrument failures, floating salt cake, and salt encrustation. Gages frequently self-correct and tanks show no indication of leak. Tank levels cannot be visually inspected and verified because of high radiation fields. The gage in Tank 241-T-101 has largely corrected itself since the mid-year 1992 reading. Therefore, doubt exists that a leak has occurred, or that the magnitude of the leak poses any immediate environmental threat. While reluctance exists to use valuable DST space unnecessarily, there is a large safety and economic incentive to prevent or mitigate release of tank liquid waste into the surrounding environment. During the assessment of the significance of the Tank 241-T-101 liquid level gage readings, Washington State Department of Ecology determined that Westinghouse Hanford Company was not in compliance with regulatory requirements, and directed transfer of the Tank 241-T-101 liquid contents into a DST. Meanwhile, DOE directed WHC to examine reasonable alternatives/options for safe interim management of Tank 241-T-101 wastes before taking action. The five alternatives that could be used to manage waste from a leaking SST are: (1) No-Action, (2) In-Tank Stabilization, (3) External Tank Stabilization, (4) Liquid Retrieval, and (5) Total Retrieval. The findings of these examinations are reported in this study.

1600 (WHC-EP–0876) **Ferrocyanide Safety Program: Analysis of postulated energetic reactions and resultant aerosol generation in Hanford Site Waste Tanks.** Postma, A.K. (G and P Consulting, Inc., Dallas, OR (United States)); Dickinson, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001606. Source: OSTI; NTIS; INIS; GPO Dep.

This report reviews work done to estimate the possible consequences of postulated energetic reactions in ferrocyanide waste stored in underground tanks at the Hanford Site. The issue of explosive reactions was raised in the 1987 Environmental Impact Statement (EIS), where a detonation-like explosion was postulated for the purpose of defining an upper bound on dose consequences for various disposal options. A review of the explosion scenario by the General Accounting Office (GAO) indicated that the aerosol generation and consequent radioactive doses projected for the explosion postulated in the EIS were understated by one to two orders of magnitude. The US DOE has sponsored an extensive study of the hazard posed by uncontrolled exothermic reactions in ferrocyanide waste, and results obtained during the past three years have allowed this hazard to be more realistically assessed. The objective of this report is to summarize the improved knowledge base that now indicates that explosive or vigorous chemical reactions are not credible in the ferrocyanide waste stored in underground tanks. This improved understanding supports the decision not to proceed with further analyses or predictions of the consequences of such an event or with aerosol tests in support of such predictions. 53 refs., 2 tabs.

1601 (WHC-EP–0882) **Calcination/dissolution chemistry development Fiscal year 1995.** Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001564. Source: OSTI; NTIS; INIS; GPO Dep.

The task "IPC Liaison and Chemistry of Thermal Reconstitution" is a $300,000 program that was conducted in Fiscal Year (FY) 1995 with U.S. Department of Energy (DOE) Office of Research and Development (EM-53) Efficient Separations and Processing Crosscutting Program supported under technical task plan (TTP) RL4-3-20-04. The principal investigator was Cal Delegard of the Westinghouse Hanford Company (WHC). The task encompassed the following two subtasks related to the chemistry of alkaline Hanford Site tank waste: (1) Technical Liaison with the Institute of Physical Chemistry of the Russian Academy of Science (IPC/RAS) and its research into the chemistry of transuranic elements (TRU) and technetium (Tc) in alkaline media. (2) Laboratory investigation of the chemistry of calcination/dissolution (C/D) (or thermal reconstitution) as an alternative to the present reference Hanford Site tank waste pretreatment flowsheet, Enhanced Sludge Washing (ESW). This report fulfills the milestone for the C/D subtask to "Provide End-of-Year Report on C/D Laboratory Test Results" due 30 September 1995. A companion report, fulfilling the milestone to provide an end-of-year report on the IPC/RAS liaison, also has been prepared.

1602 (WHC-EP–0893) **Hanford Site radioactive hazardous materials packaging directory.** McCarthy, T.L.

Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005124. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site Radioactive Hazardous Materials Packaging Directory (RHMPD) provides information concerning packagings owned or routinely leased by Westinghouse Hanford Company (WHC) for offsite shipments or onsite transfers of hazardous materials. Specific information is provided for selected packagings including the following: general description; approval documents/specifications (Certificates of Compliance and Safety Analysis Reports for Packaging); technical information (drawing numbers and dimensions); approved contents; areas of operation; and general information. Packaging Operations & Development (PO&D) maintains the RHMPD and may be contacted for additional information or assistance in obtaining referenced documentation or assistance concerning packaging selection, availability, and usage.

1603 (WHC-MR-0506) **Glass science tutorial: Lecture No. 7, Waste glass technology for Hanford.** Kruger, A.A. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 496p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015783. Source: OSTI; NTIS; INIS; GPO Dep.

Includes many view graphs.

This paper presents the details of the waste glass tutorial session that was held to promote knowledge of waste glass technology and how this can be used at the Hanford Reservation. Topics discussed include: glass properties; statistical approach to glass development; processing properties of nuclear waste glass; glass composition and the effects of composition on durability; model comparisons of free energy of hydration; LLW glass structure; glass crystallization; amorphous phase separation; corrosion of refractories and electrodes in waste glass melters; and glass formulation for maximum waste loading.

1604 (WHC-SA-2592) **Combustion and fuel loading characteristics of Hanford Site transuranic solid waste.** Greenhalgh, W.O.; Olson, W.W. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9506150-8: 2. annual Department of Energy defense programs packaging workshop, San Francisco, CA (United States), 12-15 Jun 1995). Order Number DE95017149. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Site has been used for the storage of solid waste including transuranic and low-level mixed wastes. The storage and handling of solid waste presents some fire safety questions because most of the solid waste contains combustible components. This report addresses the composition, average fuel loading, and some general observations about performance of steel-drummed solid waste in fire situations.

1605 (WHC-SA-2616) **A parametric study of double-shell tank response to internal high-frequency pressure loading.** Baliga, R. (ADVENT Engineering Services, Inc., San Ramon, CA (United States)); Choi, K.; Shulman, J.S.; Strehlow, J.P.; Abatt, G. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950740-40: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95008787. Source: OSTI; NTIS; INIS; GPO Dep.

The double-shell waste tank 241SY101 (SY101) is a 3,785,400-liter tank used to store radioactive waste at the Hanford Site near Richland, Washington. The tank waste has formed two layers of sludge in the tank; a convective and a nonconvective layer. Ongoing reactions in the waste cause a buildup of hydrogen molecules that become trapped within the nonconvective layer of the waste. Various means of preventing the buildup of hydrogen molecules in the nonconvective layer have been investigated, including the use of a sonic probe that would transmit high-frequency acoustic pressure waves into the nonconvective layer of the waste. During the operation of the sonic probe, the pressure waves transmitted from the probe induce pressure time history loading on the inside surface of the primary tank. For low-frequency fluid-structure interaction loads, such as those associated with seismic events, the convective and impulsive effects of the waste-filled tank are well documented. However, for high-frequency loading, such as that associated with acoustic pressure waves, interactions between the waste and the primary tank are not understood. The pressure time history is represented by a harmonic function with a frequency range between 30 and 100 Hz. Structural analyses of the double-shell tank have been performed that address the tank's response to the sonic probe acoustic pressure loads. This paper addresses the variations in the tank response as a function of percent waste mass considered to be effective in the dynamic excitation of the tank. It also compares results predicted by analyses that discretely model the liquid waste and presents recommendations for the simplified effective mass approach. Also considered in the parametric study is the effect of damping on the tank response for the same pressure loading.

1606 (WHC-SA-2623) **Tank waste remediation system: An update.** Alumkal, W.T.; Babad, H.; Dunford, G.L.; Honeyman, J.O.; Wodrich, D.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216-151: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE95013487. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's Hanford Site, located in southeastern Washington State, contains the largest amount and the most diverse collection of highly radioactive waste in the US. High-level radioactive waste has been stored at the Hanford Site in large, underground tanks since 1944. Approximately 217,000 M^3 (57 Mgal) of caustic liquids, slurries, saltcakes, and sludges have accumulated in 177 tanks. In addition, significant amounts of ^{90}Sr and ^{137}Cs were removed from the tank waste, converted to salts, doubly encapsulated in metal containers, and stored in water basins. The Tank Waste Remediation System Program was established by the US Department of Energy in 1991 to safely manage and immobilize these wastes in anticipation of permanent disposal of the high-level waste fraction in a geologic repository. Since 1991, significant progress has been made in resolving waste tank safety issues, upgrading Tank Farm facilities and operations, and developing a new strategy for retrieving, treating, and immobilizing the waste for disposal.

1607 (WHC-SA-2649) **External pressure limitations for 0-15 PSI storage tanks.** Dib, M.W. (ICF Kaiser Hanford

Co., Richland, WA (United States)); Shrivastava, H.P. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950740–103: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE96009110. Source: OSTI; NTIS; INIS; GPO Dep.

The US DOE plans to construct a number of underground high-level radioactive waste storage tanks at the Hanford Site near Richland, Washington. The underground tanks consist of two main concentric cylindrical structures. The primary carbon-steel tank contains the liquid waste, and the secondary concrete structure serves as a redundant barrier to confine the radioactive fluid in the event of failure of the primary tank. This paper evaluates the design adequacy of the cylindrical walls under the partial vacuum condition and determines the allowable negative pressure for the bottom plate. Failure by buckling is not the governing mode of failure for the dome because of its anchored configuration.

1608 (WHC-SA–2737) **Stress evaluation of the primary tank of a double-shell underground storage tank facility.** Atalay, M.B. (ICF Kaiser Engineers, Inc., Oakland, CA (United States)); Stine, M.D.; Farnworth, S.K. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950740–52: Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference, Honolulu, HI (United States), 23-27 Jul 1995). Order Number DE95012565. Source: OSTI; NTIS; INIS; GPO Dep.

A facility called the Multi-Function Waste Tank Facility (MWTF) is being designed at the Department of Energy's Hanford site. The MWTF is expected to be completed in 1998 and will consist of six underground double-shell waste storage tanks and associated systems. These tanks will provide safe and environmentally acceptable storage capacity to handle waste generated during single-shell and double-shell tank safety mitigation and remediation activities. This paper summarizes the analysis and qualification of the primary tank structure of the MWTF, as performed by ICF Kaiser Hanford during the latter phase of Title 1 (Preliminary) design. Both computer finite element analysis (FEA) and hand calculations methods based on the so-called Tank Seismic Experts Panel (TSEP) Guidelines were used to perform the analysis and evaluation. Based on the evaluations summarized in this paper, it is concluded that the primary tank structure of the MWTF satisfies the project design requirements. In addition, the hand calculations performed using the methodologies provided in the TSEP Guidelines demonstrate that, except for slosh height, the capacities exceed the demand. The design accounts for the adverse effect of the excessive slosh height demand, i.e., inadequate freeboard, by increasing the hydrodynamic wall and roof pressures appropriately, and designing the tank for such increased pressures.

1609 (WHC-SA–2748) **Criticality safety of high-level tank waste.** Rogers, C.A. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9509100–16: 5. international conference on nuclear criticality safety, Albuquerque, NM (United States), 17-22 Sep 1995). Order Number DE95013721. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive waste containing low concentrations of fissile isotopes is stored in underground storage tanks on the Hanford Site in Washington State. The goal of criticality safety is to ensure that this waste remains subcritical into the indefinite future without supervision. A large ratio of solids to plutonium provides an effective way of ensuring a low plutonium concentration. Since the first waste discharge, a program of audits and appraisals has ensured that operations are conducted according to limits and controls applied to them. In addition, a program of surveillance and characterization maintains watch over waste after discharge.

1610 (WHC-SA–2758) **Nuclear waste management and criticality safety.** Vail, T.S. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950601–24: Annual meeting of the American Nuclear Society (ANS), Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95014315. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1945 waste streams containing radioactive isotopes have been discharged to underground storage tanks on the Hanford Site in Washington State. At least 49 different waste streams containing low concentrations of ^{235}U and ^{239}Pu have been transferred to tank farm facilities. Optimizing tank space, combined with the variability of operations, results in a complex waste matrix that is difficult to characterize. Characterizing tank waste is difficult because of its relative inaccessibility inside the storage tanks and because of the large degree of uncertainty in the composition and distribution of components. Nuclear criticality safety controls are based on precise configurations that are conservative when used to represent the waste environment. However, the safety philosophy governing waste storage requires that the waste be controlled and monitored, and the margin of safety be quantified.

1611 (WHC-SA–2768) **Laboratory waste minimization during the operation startup phase.** Morrison, J.A. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9505111–2: 11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress, Knoxville, TN (United States), 16-18 May 1995). Order Number DE95013574. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Sampling and Characterization Facility (WSCF) Laboratory was opened for occupancy in October, 1994. It is the first of its kind on the Hanford Site, a low level lab located in an area of high level radiological material. The mission of the facility is to analyze process samples from two on-line effluent treatment plants. One of these plants is operating and the other is due to begin operations by the end of 1995. The VSCF also performs air sampling analysis for routine radiological surveillance filter papers drawn from around the Hanford Site. Because this type of laboratory had not been in operation before, there was only speculation about the types and amounts of waste that would be generated. The laboratory personnel assigned to WSCF were assembled from existing labs on the Hanford Site and from outside the Hanford Site community. For some, it was a first time experience working on a site where a twenty mile drive is sometimes required to visit another building. For others, it was a change in the way business is conducted using state-of-the-art equipment, a new building, and a chance to approach issues as a team from the beginning. It is how this team came together and the issues that were discussed, sometimes uncomfortably, that lead to the current success. The outcome of this process is discussed in this paper.

1612 (WHC-SA–2777) **Introduction to Radcalc: A computer program to calculate the radiolytic production of hydrogen gas from radioactive wastes in packages.** Green, J.R. (and others); Hillesland, K.E.; Field, J.G. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9506150–5: 2. annual Department of Energy defense programs packaging workshop, San Francisco, CA (United States), 12-15 Jun 1995). Order Number DE95012839. Source: OSTI; NTIS; INIS; GPO Dep.

A calculational technique for quantifying the concentration of hydrogen generated by radiolysis in sealed radioactive waste containers was developed in a U.S. Department of Energy (DOE) study conducted by EG&G Idaho, Inc., and the Electric Power Research Institute (EPRI) TMI-2 Technology Transfer Office. The study resulted in report GEND-041, entitled "A Calculational Technique to Predict Combustible Gas Generation in Sealed Radioactive Waste Containers". The study also resulted in a presentation to the U.S. Nuclear Regulatory Commission (NRC) which gained acceptance of the methodology for use in ensuring compliance with NRC IE Information Notice No. 84-72 (NRC 1984) concerning the generation of hydrogen within packages. NRC IE Information Notice No. 84-72: "Clarification of Conditions for Waste Shipments Subject to Hydrogen Gas Generation" applies to any package containing water and/or organic substances that could radiolytically generate combustible gases. EPRI developed a simple computer program in a spreadsheet format utilizing GEND-041 calculational methodology to predict hydrogen gas concentrations in low-level radioactive wastes containers termed Radcalc. The computer code was extensively benchmarked against TMI-2 (Three Mile Island) EPICOR II resin bed measurements. The benchmarking showed that the model developed predicted hydrogen gas concentrations within 20% of the measured concentrations. Radcalc for Windows was developed using the same calculational methodology. The code is written in Microsoft Visual C++ 2.0 and includes a Microsoft Windows compatible menu-driven front end. In addition to hydrogen gas concentration calculations, Radcalc for Windows also provides transportation and packaging information such as pressure buildup, total activity, decay heat, fissile activity, TRU activity, and transportation classifications.

1613 (WHC-SA–2794) **CRPE: Cesium Return Program Experience FY 1995.** Clements, E.P. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203–39: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005191. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1945, the chemical reprocessing of irradiated nuclear fuels in the Hanford Chemical Separation areas has resulted in the generation of significant volumes of high-level, liquid, radioactive, by-product materials. However, because these materials were recognized to have beneficial uses, their disposal was delayed. To investigate the possibilities, the By-product Utilization Program (BUP) was initiated. The program mission was to develop a means for the application of radioactive-fission products for the benefit of society. Cs capsules were fabricated and distributed to private irradiation facilities for beneficial product sterilization. In June of 1988, a small leak developed in one of the Cs capsules at a private irradiator facility that is located in Decatur, Georgia. This leak prompted DOE to remove these capsules and to re-evaluate the BUP with the irradiator facilities that were currently using Cs capsules. As a result of this evaluation, a recall was issued to require that all remaining Cs capsules be returned to Hanford for safe management and storage pending final capsule disposition. The WHC completed the return of 309 capsules from a private irradiation facility, located in Northglenn, Colorado, to the Hanford Reservation. The DOE is also planning to remove 25 Cs capsules from a small, private irradiator facility located in Lynchburg, Virginia. This small irradiator facility is currently operational and uses the capsules for the underwater irradiation of wood-flooring products. This report discusses transportation-related activities that WHC has researched, developed, implemented, and is currently managing to ensure the safe and efficient movement of Cs-137 back to the Hanford Reservation.

1614 (WHC-SA–2795) **Radcalc: A computer program to calculate the radiolytic production of hydrogen gas from radioactive wastes in packages.** Green, J.R.; Schwarz, R.A.; Hillesland, K.E.; Roetman, V.E.; Field, J.G. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203–40: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005193. Source: OSTI; NTIS; INIS; GPO Dep.

Radcalc for Windows' is a menu-driven Microsoft2 Windows-compatible computer code that calculates the radiolytic production of hydrogen gas in high- and low-level radioactive waste. In addition, the code also determines US Department of Transportation (DOT) transportation classifications, calculates the activities of parent and daughter isotopes for a specified period of time, calculates decay heat, and calculates pressure buildup from the production of hydrogen gas in a given package geometry. Radcalc for Windows was developed by Packaging Engineering, Transportation and Packaging, Westinghouse Hanford Company, Richland, Washington, for the US Department of Energy (DOE). It is available from Packaging Engineering and is issued with a user's manual and a technical manual. The code has been verified and validated.

1615 (WHC-SA–2862) **Vitrification technology for Hanford Site tank waste.** Weber, E.T.; Calmus, R.B.; Wilson, C.N. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950401–35: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE96009909. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Hanford Site has an inventory of 217,000 m^3 of nuclear waste stored in 177 underground tanks. The DOE, the US Environmental Protection Agency, and the Washington State Department of Ecology have agreed that most of the Hanford Site tank waste will be immobilized by vitrification before final disposal. This will be accomplished by separating the tank waste into high- and low-level fractions. Capabilities for high-capacity vitrification are being assessed and developed for each waste fraction. This paper provides an overview of the program for selecting preferred high-level waste melter and feed processing technologies for use in Hanford Site tank waste processing.

1616 (WHC-SA-2894) **FTIR fiber optic methods for the analysis of Hanford Site waste.** Rebagay, T.V. (and others); Cash, R.J.; Dodd, D.A. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9506234--1: 1995 Bio-Rad users meeting, Boston, MA (United States), 20-22 Jun 1995). Order Number DE95015739. Source: OSTI; NTIS; INIS; GPO Dep.

Sampling and chemical characterization of mixed high-level waste stored in underground tanks at the Hanford Site is currently in progress. Waste tank safety concerns have provided impetus to analyze this waste. A major safety issue is the possibility of significant concentrations of fuel (ferrocyanide and/or organic compounds) in contact with oxidizers (nitrates and nitrites). It is postulated that under dry conditions and elevated temperatures, ferrocyanide- and/or organic-bearing wastes could undergo rapid exothermic reactions. To maintain the tanks in a safe condition, data are needed on the moisture and fuel concentrations in the waste. Because of the highly radioactive nature of the waste, non-radioactive waste simulants mimicking actual waste are used to provide an initial basis for identifying realistic waste tank safety concerns. Emphasis has been placed on the use of new or existing Fourier transform infrared (FTIR)-based systems with potential for field or tank deployment to perform in situ remote waste characterization. Near-infrared diffuse reflectance and mid-infrared attenuated total reflectance fiber optic probes coupled to a Bio-Rad FTS 60A spectrometry system have been evaluated. The near-infrared diffuse reflectance fiber probe system has also been used for preliminary screening of the moisture content and chemical composition of actual Hanford Site waste tank waste core samples. The attributes of this method for analyzing actual radioactive waste are discussed.

1617 (WHC-SA-2933-FP) **Hot cell remote nuclear scanning of tank core samples.** Beck, M.A. (Westinghouse Hanford Co., Richland, WA (United States)); Blewett, G.R.; Troyer, G.L.; Keele, B.D.; Addleman, R.S. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212--53: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006882. Source: OSTI; NTIS; INIS; GPO Dep.

A Westinghouse Hanford Company (WHC)-designed remote measurement system has been constructed for gamma and beta isotopic characterization of Hanford Site high-level waste tank core sample materials in a hot cell. A small, collimated, planar CdZnTe detector is used for gamma-ray spectroscopy. Spectral resolution of 2% full-width-at-maximum at 662 kiloelectronvolts (keV) has been obtained remotely using risetime compensation and limited pulse shape discrimination (PSD). Isotopic measurement of high-energy beta emitters was accomplished with a ruggedly made, deeply depleted, surface barrier silicon detector. The primary function of the remote nuclear screening system is to provide a fast, qualitative stratigraphic assessment (with isotopic information) of high-level radioactive material. Both gamma spectroscopy and beta measurements have been performed on actual core segments. Differences in radionuclide content, which correspond with color or texture variations, have been seen in constant cross section core samples, although for many samples the activity variation can be ascribed to geometry and/or mass factors. Discussion of the design, implementation, results and potential benefits will be presented.

1618 (WHC-SA-2942) **Soil structure interaction analysis of buried tank subjected to vertical excitations.** Wong, C.K. (ICF Kaiser Engineers, Inc., Oakland, CA (United States)); Stine, M.; Wagenblast, G.; Farnworth, S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9511128--10: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96002795. Source: OSTI; NTIS; INIS; GPO Dep.

Underground High Level Waste Storage Tanks are subjected to strigent seismic requirements At some DOE sites, many existing waste storage tanks are of the double-shell tank design. In this configuration, the concrete outer structure acts as the vault and provides secondary confinement for the primary steel waste storage tank. To ensure the safety of the design and a good understanding of the seismic response of the concrete confinement structure, seismic analysis, including the effects of Soil-Structure Interaction (SSI), is generally performed with special purpose SSI computer analysis programs. Generally, the seismic SSI response due to vertical excitation is considered to be secondary to those of the horizontal excitation. In this paper, a detailed evaluation of the SSI response due to vertical excitation is presented and is shown to merit equal consideration relative to the horizontal excitation. The geometry and relative dimensions (i.e. flexibility) of the structure can have significant influence on the vertical seismic SSI response in local region(s) of the concrete structure.

1619 (WHC-SA-2952) **Characterization of Hanford N Reactor spent fuel and K Basin sludges.** Makenas, B.J.; Omberg, R.P.; Trimble, D.J.; Baker, R.B. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212--81: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009104. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization is in progress for the N Reactor fuel stored in the Hanford K Basins. These activities' support the strategy for removal of fuel from the basins and storage of fuel in a dry condition at an area remote from the Columbia River. This strategy currently consists of placing fuel in a Multi-Canister Overpack (MCO), drying the fuel while it resides in the MCO and conditioning some portion of the fuel to reduce its chemical reactivity. Characterization includes the examination of fuel, canisters, and associated sludge. It consists firstly of in-basin activities such as visual examination, sludge depth measurements, and sampling of gas and liquid in canisters. Secondly characterization ecompasses the examination of samples of fuel and sludge which have been removed from the basins and shipped to laboratories. This paper presents observations made in the basins during the most recent attempts to ship samples from the basins and data obtained in the laboratory hotcells.

1620 (WHC-SA–2962-FP) **Organic reactivity analysis in Hanford single-shell tanks: Experimental and modeling basis for an expanded safety criterion.** Fauske, H. (Fauske and Associates, Inc. (United States)); Grigsby, J.M.; Turner, D.A.; Babad, H.; Meacham, J.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212–61: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006378. Source: OSTI; NTIS; INIS; GPO Dep.

De-spite demonstrated safe storage in terms of chemical stability of the Hanford high level waste for many decades, including decreasing waste temperatures and continuing aging of chemicals to less energetic states, concerns continue relative to assurance of long-term safe storage. Review of potential chemical safety hazards has been of particular recent interest in response to serious incidents within the Nuclear Weapons Complexes in the former Soviet Union (the 1957 Kyshtym and the 1993 Tomsk-7 incidents). Based upon an evaluation of the extensive new information and understanding that have developed over the last few years, it is concluded that the Hanford waste is stored safely and that concerns related to potential chemical safety hazards are not warranted. Spontaneous bulk runaway reactions of the Kyshtym incident type and other potential condensed-phase propagating reactions can be ruled out by assuring appropriate tank operating controls are in place and by limiting tank intrusive activities. This paper summarizes the technical basis for this position.

1621 (WHC-SA–2966-FP) **Understanding waste phenomenology to reduce the amount of sampling and analysis required to resolve Hanford waste tank safety issues.** Meacham, J.E.; Babad, H. Westinghouse Hanford Co., Richland, WA (United States). Feb 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212–63: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006887. Source: OSTI; NTIS; INIS; GPO Dep.

Safety issues associated with Hanford Site waste tanks arose because of inadequate safety analyses and high levels of uncertainty over the release of radioactivity resulting from condensed phase exothermic chemical reactions (organic solvent fires, organic complexant-nitrate reactions, and ferrocyanide-nitrate reactions). The approach to resolving the Organic Complexant, Organic Solvent, and Ferrocyanide safety issues has changed considerably since 1990. The approach formerly utilized core sampling and extensive analysis of the samples with the expectation the data would provide insight into the hazard. This resulted in high costs and the generation of a large amount of data that was of limited value in resolving the safety issues. The new approach relies on an understanding of the hazard phenomenology to focus sampling and analysis on those analytes that are key to ensuring safe storage of the waste.

1622 (WHC-SA–2968-FP) **High-level core sample x-ray imaging at the Hanford Site.** Weber, J.R.; Keve, J.K. Westinghouse Savannah River Co., Aiken, SC (United States). Oct 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951091–2: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96001856. Source: OSTI; NTIS; INIS; GPO Dep.

Waste tank sampling of radioactive high-level waste is required for continued operations, waste characterization, and site safety. Hanford Site tank farms consist of 28 double-shell and 149 single-shell underground storage tanks. The single shell tanks are out-of-service an no longer receive liquid waste. Core samples of salt cake and sludge waste are remotely obtained using truck-mounted, core drill platforms. Samples are recovered from tanks through a 2.25 inch (in.) drill pipe in 26-in. steel tubes, 1.5 in. diameter. Drilling parameters vary with different waste types. Because sample recovery has been marginal an inadequate at times, a system was needed to provide drill truck operators with "real-time feedback" about the physical condition of the sample and the percent recovery, prior to making nuclear assay measurements and characterizations at the analytical laboratory. The Westinghouse Hanford Company conducted proof-of-principal radiographic testing to verify the feasibility of a proposed imaging system. Tests were conducted using an iridium 192 radiography source to determine the effects of high radiation on image quality. The tests concluded that samplers with a dose rate in excess of 5000 R/hr could be imaged with only a slight loss of image quality and samples less than 1000 R/hr have virtually no effect on image quality. The Mobile Core Sample X-Ray Examination System, a portable vendor-engineered assembly, has components uniquely configured to produce a real-time radiographic system suitable for safely examining radioactive tank core segments collected at the Hanford Site. The radiographic region of interest extends from the bottom (valve) of the sampler upward 19 to 20 in. The purpose of the Mobile Core Sample X-Ray Examination System is to examine the physical contents of core samples after removal from the tank and prior to placement in an onsite transfer cask.

1623 (WHC-SA–2990-FP) **Selection of replacement material for the failed surface level gauge wire in Hanford waste tanks.** Anantatmula, R.P. (Westinghouse Hanford Co., Richland, WA (United States)); Pitman, S.G.; Lund, A.L. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960389–6: CORROSION '96: National Association of Corrosion Engineers (NACE) conference, Denver, CO (United States), 24-29 Mar 1996). Order Number DE96005228. Source: OSTI; NTIS; INIS; GPO Dep.

Surface level gauges fabricated from AISI Type 316 stainless steel (316) wire failed after only a few weeks of operation in underground storage tanks at the Hanford Site. The wire failure was determined to be due to chloride ion assisted corrosion of the 316 wire. Radiation-induced breakdown of the polyvinyl chloride (PVC) riser liners is suspected to be the primary source of the chloride ions. An extensive literature search followed by expert concurrence was undertaken to select a replacement material for the wire. Platinum (Pt)–20 % Iridium (Ir) alloy was selected as the replacement material from tile candidate materials, P-20% Ir, Pt-1O% Rhodium (Rh), Pt-20%Rh and Hastelloy

C-22. The selection was made on the basis of the alloy's immunity towards acidic and basic environments as well as its adequate tensile properties in the fully annealed state.

1624 (WHC-SA-3010-FP) **Hanford double shell tank corrosion monitoring instrument tree prototype.** Nelson, J.L.; Edgemon, G.L.; Ohl, P.C. Westinghouse Hanford Co., Richland, WA (United States). Nov 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960389-3: CORROSION '96: National Association of Corrosion Engineers (NACE) conference, Denver, CO (United States), 24-29 Mar 1996). Order Number DE96005517. Source: OSTI; NTIS; INIS; GPO Dep.

High-level nuclear wastes at the Hanford site are stored underground in carbon steel double-shell and single-shell tanks (DSTs and SSTs). The installation of a prototype corrosion monitoring instrument tree into DST 241-A-101 was completed in December 1995. The instrument tree has the ability to detect and discriminate between uniform corrosion, pitting, and stress corrosion cracking (SCC) through the use of electrochemical noise measurements and a unique stressed element, three-electrode probe. The tree itself is constructed of AISI 304L stainless steel (UNS S30403), with probes in the vapor space, vapor/liquid interface and liquid. Successful development of these trees will allow their application to single shell tanks and the transfer of technology to other US Department of Energy (DOE) sites. Keywords: Hanford, radioactive waste, high-level waste tanks, electrochemical noise, probes, double-shell tanks, single-shell tanks, corrosion.

1625 (WHC-SA-3016) **Detection of localized and general corrosion of mild steel in simulated defense nuclear waste solutions using electrochemical noise analysis.** Edgemon, G.L. (Westinghouse Hanford Co., Richland, WA (United States)); Ohl, P.C.; Bell, G.E.C.; Wilson, D.F. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960389-2: CORROSION '96: National Association of Corrosion Engineers (NACE) conference, Denver, CO (United States), 24-29 Mar 1996). Order Number DE96005200. Source: OSTI; NTIS; INIS; GPO Dep.

Underground waste tanks fabricated from mild steel store more than 60 million gallons of radioactive waste from 50 years of weapons production. Leaks are suspected in a significant number of tanks. The probable modes of corrosion failures are reported to be localized corrosion (e.g. nitrate stress corrosion cracking and pitting). The use of electrochemical noise (EN) for the monitoring and detection of localized corrosion processes has received considerable attention and application over the last several years. Proof of principle laboratory tests were conducted to verify the capability of EN evaluation to detect localized corrosion and to compare the predictions of general corrosion obtained from EN with those derived from other sources. Simple, prefabricated flat and U-bend specimens of steel alloys A516-Grade 60 (UNS K02100) and A537-CL 1 (UNS K02400) were immersed in temperature controlled simulated waste solutions. The simulated waste solution was either 5M $NaNO_3$ with 0.3M NaOH at 90 C or 11M $NaNO_3$ with 0.15M NaOH at 95 C. The electrochemical noise activity from the specimens was monitored and recorded for periods ranging between 140 and 240 hours. At the end of each test period, the specimens were metallographically examined to correlated EN data with corrosion damage.

1626 (WHC-SA-3023-FP) **Hanford waste tank cone penetrometer.** Seda, R.Y. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960272-1: 8. annual Society of Hispanic Professional Engineers national technical and career conference, Seattle, WA (United States), 15-17 Feb 1996). Order Number DE96005516. Source: OSTI; NTIS; INIS; GPO Dep.

A new tool is being developed to characterize tank waste at the Hanford Reservation. This tool, known as the cone penetrometer, is capable of obtaining chemical and physical properties in situ. For the past 50 years, this tool has been used extensively in soil applications and now has been modified for usage in Hanford Underground Storage tanks. These modifications include development of new "waste" data models as well as hardware design changes to accommodate the hazardous and radioactive environment of the tanks. The modified cone penetrometer is scheduled to be deployed at Hanford by Fall 1996. At Hanford, the cone penetrometer will be used as an instrumented pipe which measures chemical and physical properties as it pushes through tank waste. Physical data, such as tank waste stratification and mechanical properties, is obtained through three sensors measuring tip pressure, sleeve friction and pore pressure. Chemical data, such as chemical speciation, is measured using a Raman spectroscopy sensor. The sensor package contains other instrumentation as well, including a tip and side temperature sensor, tank bottom detection and an inclinometer. Once the cone penetrometer has reached the bottom of the tank, a moisture probe will be inserted into the pipe. This probe is used to measure waste moisture content, water level, waste surface moisture and tank temperature. This paper discusses the development of this new measurement system. Data from the cone penetrometer will aid in the selection of sampling tools, waste tank retrieval process, and addressing various tank safety issues. This paper will explore various waste models as well as the challenges associated with tank environment.

1627 (WHC-SA-3025-FP) **Assuring safe interim storage of Hanford high-level tank wastes.** Bacon, R.F. (and others); Babad, H.; Lerch, R.E. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212-64: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006888. Source: OSTI; NTIS; INIS; GPO Dep.

The federal government established the Hanford Site in South-Eastern Washington near the City of Richland in 1943 to produce plutonium for national defense purposes. The Hanford Site occupies approximately 1,450 square kilometers (560 square miles) of land North of the City of Richland. The production mission ended in 1988, transforming the Hanford Site mission to waste management, environmental restoration, and waste disposal. Thus the primary site mission has shifted from production to the management and disposal of radioactive, hazardous, and mixed waste that exist at the Hanford Site. This paper describes the focus and challenges facing the Tank Waste Remediation System (TWRS) Program related to the dual and parallel missions of interim safe storage and disposal of the tank associated waste. These wastes are presently stored in 2.08E+05 liters (55,000) to 4.16E+06 liters (1,100,000) gallon low-carbon steel tanks. There are 149 single- and 28 double-shell radioactive underground storage tanks, as well as approximately 40 inactive miscellaneous underground storage tanks. In addition, the TWRS mission includes the storage and disposal of the inventory of 1,929 cesium and strontium capsules created as part of waste management efforts. Tank waste was a by-product of producing plutonium and other defense related materials. From 1944 through 1990, four (4) different major chemical processing facilities at the Hanford Site processed irradiated (spent) fuel from defense reactors to separate and recover plutonium for weapons production. As new and improved processes were developed over the last 50 years, the processing efficiency improved and the waste compositions sent to the tanks for storage changed both chemically and radiologically. The earliest separation processes (e.g., bismuth phosphate coprecipitation) carried out in T Plant (1944-1956) and B Plant (1945-1952) recovered only plutonium.

1628 (WHC-SA-3029-FP) **Characterization of Hanford waste and the role of historic modeling.** Simpson, B.C. (Westinghouse Hanford Co., Richland, WA (United States)); Eberlein, S.J.; Brown, T.M.; Brevick, C.H.; Angew, S.F. Westinghouse Hanford Co., Richland, WA (United States). Feb 1996. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212-55: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006881. Source: OSTI; NTIS; INIS; GPO Dep.

The tank waste characterization process is an integral part of the overall effort to identify, quantify and control the hazards associated with radioactive wastes stored in underground tanks at the Hanford Reservation. Characterization of the current waste tank contents through the use of waste sampling is only partly effective. The historic records must be exploited as much as possible. A model generates an estimate of the current contents of each tank, built up from the estimated volumes of each of the defined waste components. The model combines the best estimate of the waste stream composition for each of the major waste generating processes. All available waste transfer records were compiled and integrated to track waste tank fill history. The behavior of the waste materials in the tanks was modeled, based on general scientific principles augmented with specific measurement data. Sample analysis results were not used directly to generate any of the tank contents estimates, but were used to determine the values of variable parameters such as the solubility. By considering all available information first (including historical model estimates, surveillance data, and past sample analysis results), future sampling resources and other characterization efforts can best be spent on tanks that will provide the largest returns of information.

1629 (WHC-SA-3036-FP) **Progress on the Hanford K basins spent nuclear fuel project.** Culley, G.E. (and others); Fulton, J.C.; Gerber, E.W. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212-62: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006889. Source: OSTI; NTIS; INIS; GPO Dep.

This paper highlights progress made during the last year toward removing the Department of Energy's (DOE) approximately, 2,100 metric tons of metallic spent nuclear fuel from the two outdated K Basins at the Hanford Site and placing it in safe, economical interim dry storage. In the past year, the Spent Nuclear Fuel (SNF) Project has engaged in an evolutionary process involving the customer, regulatory bodies, and the public that has resulted in a quicker, cheaper, and safer strategy for accomplishing that goal. Development and implementation of the Integrated Process Strategy for K Basins Fuel is as much a case study of modern project and business management within the regulatory system as it is a technical achievement. A year ago, the SNF Project developed the K Basins Path Forward that, beginning in December 1998, would move the spent nuclear fuel currently stored in the K Basins to a new Staging and Storage Facility by December 2000. The second stage of this $960 million two-stage plan would complete the project by conditioning the metallic fuel and placing it in interim dry storage by 2006. In accepting this plan, the DOE established goals that the fuel removal schedule be accelerated by a year, that fuel conditioning be closely coupled with fuel removal, and that the cost be reduced by at least $300 million. The SNF Project conducted coordinated engineering and technology studies over a three-month period that established the technical framework needed to design and construct facilities, and implement processes compatible with these goals. The result was the Integrated Process Strategy for K Basins Fuel. This strategy accomplishes the goals set forth by the DOE by beginning fuel removal a year earlier in December 1997, completing it by December 1999, beginning conditioning within six months of starting fuel removal, and accomplishes it for $340 million less than the previous Path Forward plan.

1630 (WHC-SA-3037-FP) **The regulatory approach for spent nuclear storage and conditioning facility: The Hanford example.** Sellers, E.D. (USDOE Richland Operations Office, WA (United States)); Mooers, G.C. III; Daschke, K.D.; Driggers, S.A.; Timmins, D.C. Westinghouse Hanford Co., Richland, WA (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960212-54: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006879. Source: OSTI; NTIS; INIS; GPO Dep.

Hearings held before the House Subcommittee on Energy and Mineral Resources in March 1994, requested that officials of federal agencies and other experts explore options for providing regulatory oversight of the US Department of Energy (DOE) facilities and operations. On January, 25, 1995, the DOE, supported by the White House Office of Environmental Quality and the Office of Management and Budget, formally initiated an Advisory Committee on External Regulation of DOE Nuclear Safety. In concert with this initiative and public opinion, the DOE Richland Operations Office has initiated the K Basin Spent Nuclear Fuel Project – Regulatory Policy. The DOE has established a program to move the spent nuclear fuel presently stored in the K Basins to a new storage facility located in the 200 East Area of the Hanford Site. New facilities will be designed and constructed for safe conditioning and interim storage of the fuel. In implementing this Policy, DOE endeavors to achieve in these new facilities "nuclear safety equivalency" to comparable US Nuclear Regulatory Commission (NRC)-licensed facilities. The DOE has established this Policy to take a proactive approach to better align its facilities to the requirements of the

NRC, anticipating the future possibility of external regulation. The Policy, supplemented by other DOE rules and directives, form the foundation of an enhanced regulatory, program that will be implemented through the DOE K Basin Spent Nuclear Fuel Project (the Project).

1631 (WHC-SA–3075) **Hydrogen gettering the overpressure gas from highly radioactive liquids.** Riley, D.L. (Walla Walla Coll., College Place, WA (United States). School of Engineering); McCoy, J.C.; Schicker, J.R. Westinghouse Hanford Co., Richland, WA (United States). Apr 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960706–8: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96009892. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation of current inventories of high-activity radioactive liquid waste (HALW) requires transportation of Type-B quantities of radioactive material, possibly up to several hundred liters. However, the only currently certified packaging is limited to quantities of 50 ml (0.01 gal) quantities of Type-B radioactive liquid. Efforts are under way to recertify the existing packaging to allow the shipment of up to 4 L (1.1 gal) of Type-B quantities of HALW, but significantly larger packaging could be needed in the future. Scoping studies and preliminary designs have identified the feasibility of retrofitting an insert into existing casks, allowing the transport of up to 380 L (100 gal) of HALW. However, the insert design and ultimate certification strategy depend heavily on the gas-generating attributes of the HALW. A non-vented containment vessel filled with HALW, in the absence of any gas-mitigation technologies, poses a deflagration threat and, therefore, gas generation, specifically hydrogen generation, must be reliably controlled during all phases of transportation. Two techniques are available to mitigate hydrogen accumulation: recombiners and getters. Getters have an advantage over recombiners in that oxides are not required to react with the hydrogen. A test plan was developed to evaluate three forms of getter material in the presence of both simulated HALW and the gases that are produced by the HALW. These tests demonstrated that getters can react with hydrogen in the presence of simulated waste and in the presence of several other gases generated by the HALW, such as nitrogen, ammonia, nitrous oxide, and carbon monoxide. Although the use of such a gettering system has been shown to be technically feasible, only a preliminary design for its use has been completed. No further development is planned until the requirement for bulk transport of Type-B quantities of HALW is more thoroughly defined.

1632 (WHC-SD-534-CSWD–005-Rev.2) **242-A Control System device logic software documentation. Revision 2.** Berger, J.F. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013342. Source: OSTI; NTIS; INIS; GPO Dep.

A Distributive Process Control system was purchased by Project B-534. This computer-based control system, called the Monitor and Control System (MCS), was installed in the 242-A Evaporator located in the 200 East Area. The purpose of the MCS is to monitor and control the Evaporator and Monitor a number of alarms and other signals from various Tank Farm facilities. Applications software for the MCS was developed by the Waste Treatment System Engineering Group of Westinghouse. This document describes the Device Logic for this system.

1633 (WHC-SD-SNF-DP–001) **Data compilation report: Gas and liquid samples from K West Basin fuel storage canisters.** Trimble, D.J. Westinghouse Hanford Co., Richland, WA (United States). 18 May 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013329. Source: OSTI; NTIS; INIS; GPO Dep.

Forty-one gas and liquid samples were taken from spent fuel storage canisters in the K West Basin during a March 1995 sampling campaign. (Spent fuel from the N Reactor is stored in sealed canisters at the bottom of the K West Basin.) A description of the sampling process, gamma energy analysis data, and quantitative gas mass spectroscopy data are documented. This documentation does not include data analysis.

1634 (WHC-SD-SNF-SP–001) **Westinghouse Hanford Company recommended strategy for K Basin sludge disposition.** Alderman, C.J. Westinghouse Hanford Co., Richland, WA (United States). 1 May 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012570. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to present the recommended strategy for removal of sludges from the K Basins. This document ties sludge removal activities to the plan for the K Basin spent nuclear fuel (SNF) described in WHC-EP-0830, Hanford Spent Nuclear Fuel Project Recommended Path Forward and is consistent with follow-on direction provided in February 1995. Solutions and processes for resolving sludge removal technical and management issues to meet accelerated K Basin deactivation objectives are described. The following outlines the major elements of the recommendation: (1) manage all sludges as SNF while in the K Basins; (2) once loose sludges are collected and removed from the facilities, manage them as radioactive or mixed waste consistent with the upcoming characterization results, the preferred sludge path forward alternative sends sludges to the Tank Waste Remediation System (TWRS) and/or the Hanford Solid Waste Disposal as appropriate; (3) continue to manage sludge within the fuel canisters at the time they are loaded into the multi-canister overpacks as SNF.

1635 (WHC-SD-SQA-CSA–20395) **Acceptability of Bettis Laboratories waste shipment to WHC solid waste.** McDonald, K.M. Westinghouse Hanford Co., Richland, WA (United States). 20 Apr 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011651. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate a potential discrepancy between the Solid Waste Management (SWM) Criticality Prevention Specifications and a proposed waste receipt from Bettis Laboratories. This analysis resolves an apparent discrepancy between two different requirements of the Central Waste Complex and 200 Area Low-Level Burial Grounds Criticality Prevention Specifications (CPS-SW-149-00002 and CPS-SW-149-00003 respectively). The analysis is being performed to enable Solid Waste Management to accept a specific package from Bettis Laboratories. This package meets the requirements of section 2.1.1 in that the total fissile content of the drum is less than 200g and the waste occupies greater than 20% of the container volume.

The package may not appear, however, to meet the requirements of section 2.1.5 for maximum enrichment of uranium bearing waste, as will be described below. Based on this analysis for this specific package, the waste is shown to be critically safe under all conditions for which the 55-gallon drums (17C, 17H, or UN1A2) specification applies. This package can be accepted under the 55-gallon drum limitations on fissile quantity. No change to the CPS is required.

1636 (WHC-SD-W030-ATP-001) **Acceptance test procedure for cathodic protection, rectifier 31.** Clifton, F.T. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011680. Source: OSTI; NTIS; INIS; GPO Dep.

Acceptance test procedure for Project W-030 Cathodic Protection Installation, 241-AY and 241-AZ Tank Farm Ventilation Upgrade.

1637 (WHC-SD-W030-ATP-002) **Acceptance test procedure for cathodic protection, rectifier 41.** Clifton, F.T. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011681. Source: OSTI; NTIS; INIS; GPO Dep.

Acceptance test procedure for Project W-030 Cathodic Protection Installation, 241-AY and 241-AZ Tank Farm Ventilation Upgrade.

1638 (WHC-SD-W030-ATP-003) **Acceptance Test Procedure for Cathodic Protection, Rectifier 11.** Clifton, F.T. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011634. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure for Project W-030 Cathodic Protection Installation, 241-AY and 241-AZ Tank Farm Ventilation Upgrade, has been prepared to demonstrate that the cathodic protection system functions as required by project criteria.

1639 (WHC-SD-W058-TA-001) **Replacement of the cross-site transfer system liquid waste transport alternatives evaluation, Project W-058.** Vo, D.V.; Epperson, E.M. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012951. Source: OSTI; NTIS; INIS; GPO Dep.

This document examines high-/low-level radioactive liquid waste transport alternatives. Radioactive liquid waste will be transported from the 200 West Area to the 200 East Area and within the 200 East Areas for safe storage and disposal. The radioactive waste transport alternatives are the Aboveground Transport System (French LR-56 Cask System [3,800 L (1,000 gal)]), 19,000-L (5,000-gal) trailer tanker system, 75,700-L (20,000-gal) rail tanker system and Underground Transport System (buried pipe [unlimited transfer volume capability]). The evaluation focused on the following areas: initial project cost, operational cost, secondary waste generation, radiation exposure, and final decommissioning. The evaluation was based on the near term (1995 to 2005) estimated volume of 49.509 million L (13.063 million gal) and long term (1995 to 2028) estimated volume of 757.1 million L (200 million gal). The conclusion showed that the buried pipe (Underground Transport System) resulted in the lowest overall total cost for near and long term, the trailer container resulted in the highest total cost for near and long term, and the French truck was operationally impractical and cost prohibitive.

1640 (WHC-SD-W079-ES-001-Rev.3) **Hot sample archiving. Revision 3.** McVey, C.B. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013883. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Study revision evaluated the alternatives to provide tank waste characterization analytical samples for a time period as recommended by the Tank Waste Remediation Systems Program. The recommendation of storing 40 ml segment samples for a period of approximately 18 months (6 months past the approval date of the Tank Characterization Report) and then composite the core segment material in 125 ml containers for a period of five years. The study considers storage at 222-S facility. It was determined that the critical storage problem was in the hot cell area. The 40 ml sample container has enough material for approximately 3 times the required amount for a complete laboratory re-analysis. The final result is that 222-S can meet the sample archive storage requirements. During the 100% capture rate the capacity is exceeded in the hot cell area, but quick, inexpensive options are available to meet the requirements.

1641 (WHC-SD-W164-ATP-001) **Fire alarm system acceptance test procedure for Project W-164, Sample Equipment Cleaning Facility.** McKenna, P.J. Westinghouse Hanford Co., Richland, WA (United States). 17 Apr 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010941. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Fire Protection System functions as required by project criteria. The test results will be issued as an acceptance test report (ATR) after all testing is complete. Components that are covered by this procedure are the fire alarm control system, power transfer to battery backup, switching circuits, alarm input devices, and battery capacity and recharge capability. Bldg 6268 is part of the Effluent Treatment and Laboratory Project.

1642 (WHC-SD-W211-FDC-001-Rev.1) **Functional design criteria, Project W-211, Initial Tank Retrieval Systems. Revision 1.** Rieck, C.A. Westinghouse Hanford Co., Richland, WA (United States). 7 Feb 1995. 161p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95007197. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the technical baseline for retrieval of waste from ten double-shell tanks in the SY, AN, AP, AW, AY, and AZ tank farms. In order to retrieve waste from these tanks, systems are needed to mix the sludge with the supernate and pump the waste mixture from the tank. For 101-SY, the existing mitigation pump will be used to mix the waste and Project W-211 will provide for waste removal. The retrieval scope for the other nine tanks includes both the waste mixing and removal functions.

1643 (WHC-SD-W236A-ER-013) **Concrete material characterization reinforced concrete tank structure Multi-Function Waste Tank Facility.** Winkel, B.V. Westinghouse Hanford Co., Richland, WA (United States). 3 Mar 1995. 92p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008864. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to document the Multi-Function Waste Tank Facility (MWTF) Project position on the concrete mechanical properties needed to perform design/analysis calculations for the MWTF secondary concrete structure. This report provides a position on MWTF concrete properties for the Title 1 and Title 2 calculations. The scope of the report is limited to mechanical properties and does not include the thermophysical properties of concrete needed to perform heat transfer calculations. In the 1970's, a comprehensive series of tests were performed at Construction Technology Laboratories (CTL) on two different Hanford concrete mix designs. Statistical correlations of the CTL data were later generated by Pacific Northwest Laboratories (PNL). These test results and property correlations have been utilized in various design/analysis efforts of Hanford waste tanks. However, due to changes in the concrete design mix and the lower range of MWTF operating temperatures, plus uncertainties in the CTL data and PNL correlations, it was prudent to evaluate the CTL data base and PNL correlations, relative to the MWTF application, and develop a defendable position. The CTL test program for Hanford concrete involved two different mix designs: a 3 kip/in^2 mix and a 4.5 kip/in^2 mix. The proposed 28-day design strength for the MWTF tanks is 5 kip/in^2. In addition to this design strength difference, there are also differences between the CTL and MWTF mix design details. Also of interest, are the appropriate application of the MWTF concrete properties in performing calculations demonstrating ACI Code compliance. Mix design details and ACI Code issues are addressed in Sections 3.0 and 5.0, respectively. The CTL test program and PNL data correlations focused on a temperature range of 250 to 450 F. The temperature range of interest for the MWTF tank concrete application is 70 to 200 F.

1644 (WHC-SD-W236A-ER–018-Rev.1) **MWTF, material selection for insulating/supporting pad letter report. Revision 1.** Stine, M.D. Westinghouse Hanford Co., Richland, WA (United States). 25 Apr 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010939. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF) consists of six 1.1 6 million on underground double-shell waste storage tanks and associated systems. Four of the tanks will be located approximately 2,000 feet west of the western boundary of the 200-East Area of the Hanford Site; two tanks will be located in the southeast corner of the 200-West Area. These tanks will provide storage of mixed hazardous waste. Revision 0 of this report was completed in July of 1993. Since that time, the design of the tanks has changed to using carbon steel for the primary tank and secondary liner in lieu of stainless steel. This means that the primary tank will require postweld heat treatment (PWHT) at a temperature of 1100°F. In addition, scoping calculations of the temperature distributions in the supporting pad indicate that pad insulating properties have a significant effect on the temperatures experienced by the piping embedded in the pad and the concrete foundation slab during PWHT. Each double-shell tank will be comprised of two main structures: an outer structure made of reinforced concrete and lined with a carbon steel secondary liner, and an inner primary storage tank that is a completely enclosed carbon steel ASME Section III vessel. An annular space will separate the carbon steel secondary liner from the primary storage tank. An insulating/supporting pad will be placed between the bottom of the secondary liner and the bottom of the primary storage tank. The existing double-shell tanks at the Hanford Site were constructed with an insulating castable refractory material at this location. This refractory material was used to protect the tank foundation from the high temperatures produced during the PWHT operation for the carbon steel primary storage tanks. This letter report provides the basis for material selection for the insulating/supporting pad to be used on this project.

1645 (WHC-SD-W236A-ER–021-Rev.1) **Multi-Function Waste Tank Facility phase out basis. Revision 1.** Awadalla, N.G. Westinghouse Hanford Co., Richland, WA (United States). 20 Apr 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011544. Source: OSTI; NTIS; INIS; GPO Dep.

Additional double-shell tank storage capacity is not needed until FY 2004 or later. The waste volume in the current baseline program can be managed within the existing tank capacity. However, this requires implementation of some risk management actions and significant investment in software and hardware to accomplish the actions necessary to maximize use of existing storage tank space."

1646 (WHC-SD-W236A-ER–022) **Using tank 107-AN caustic addition for confirmation of mixing scale relationship.** Chang, S.C. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012792. Source: OSTI; NTIS; INIS; GPO Dep.

A subscale jet mixing program was carried out in two scale tanks to extend the basis of previous subscale tests to include in-tank geometry associated with tank AN-107. The laboratory data will be correlated with the data to be collected in the upcoming tank AN-107 mixing and caustic addition test. The objective is to verify the scaling relationship used in the MWTF mixer design.

1647 (WHC-SD-W236A-ES–012) **Multi-function waste tank facility path forward engineering analysis technical task 3.3, single-shell tank liquid contents.** Brown, R.G.; Mattichak, R.W. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011639. Source: OSTI; NTIS; INIS; GPO Dep.

Results are reported on actions taken to determine the quantity of liquid wastes in the single shell tanks that still need stabilization, and to determine the amount of flush water needed to support the stabilization effort.

1648 (WHC-SD-W236A-ES–013) **Passive versus active mitigation cost analysis.** Parazin, R.J.; Galbraith, J.D. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011675. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this task is to assess the impact of mitigation alternatives for Tanks 241-SY-101 and 241-SY-103 on the Project W-236A Multi-Function Waste Tank Facility. This assessment and other related tasks are part of an Action Plan Path Forward prepared by the Tank Waste Remediation System (TWRS) Life Extension and Transition Program. Task 3.7 of the Action Plan for Project W-236A MWTF analyzed the comparative cost/risk of two hydrogen gas mitigation alternatives (active versus passive) to recommend the most appropriate course of action to resolve the hydrogen gas safety issue. The qualitative success of active mitigation has been demonstrated through Tank 241-SY-101 testing. Passive mitigation has not been demonstrated but will be validated by laboratory test work performed under Task 3.1 of the Action Plan. It is assumed for this assessment that the uncertainties associated with the performance of either alternative is comparable. Determining alternative specific performance measures beyond those noted are not in the scope of this effort.

1649 (WHC-SD-W236A-ES–014) **Multi-function Waste Tank Facility path forward engineering analysis – Technical Task 3.6, Estimate of operational risk in 200 West Area.** Coles, G.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 201p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012566. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-0236A has been proposed to provide additional waste tank storage in the 200 East and 200 West Areas. This project would construct two new waste tanks in the 200 West Area and four new tanks in the 200 East Area, and a related project (Project W-058) would construct a new cross-site line. These projects are intended to ensure sufficient space and flexibility for continued tank farm operations, including tank waste remediation and management of unforeseen contingencies. The objective of this operational risk assessment is to support determination of the adequacy of the free-volume capacity provided by Projects W-036A and W-058 and to determine related impacts. The scope of the assessment is the 200 West Area only and covers the time period from the present to the year 2005. Two different time periods were analyzed because the new cross-site tie line will not be available until 1999. The following are key insights: success of 200 West Area tank farm operations is highly correlated to the success of the cross-site transfer line and the ability of the 200 East Area to receive waste from 200 West; there is a high likelihood of a leak on a complexed single-shell tank in the next 4 years (sampling pending); there is a strong likelihood, in the next 4 years, that some combination of tank leaks, facility upsets, and cross-site line failure will require more free tank space than is currently available in Tank 241-SY-102; in the next 4 to 10 years, there is a strong likelihood that a combination of a cross-site line failure and the need to accommodate some unscheduled waste volume will require more free tank space than is presently available in Tank 241-SY-102; the inherent uncertainty in volume projections is in the range of 3 million gallons; new million-gallon tanks increase the ability to manage contingencies and unplanned events.

1650 (WHC-SD-W236A-ES–015) **Waste segregation analysis for salt well pumping in the 200 W Area – Task 3.4.** Reynolds, D.A. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011676. Source: OSTI; NTIS; INIS; GPO Dep.

There is an estimated 7 million liters (1.9 million gallons) of potentially complexed waste that need to be pumped from single-shell tanks (SST) in the 200 West Area. This represents up to 40% of the salt well liquor that needs to be pumped in the 200 West Area. There are three double-shell (DST) tanks in the 241-SY tank farm in the 200 West Area. Tank 241-SY-101 is full and not usable. Tank 241-SY-102 has a transuranic (TRU) sludge in the bottom. Current rules prohibit mixing complexed waste with TRU waste. Tank 241-SY-103 has three major problems. First, 241-SY-103 is on the Flammable Watch list. Second, adding waste to tank 241-SY-103 has the potential for an episodic release of hydrogen gas. Third, 241-SY-103 will not hold all of the potentially complexed waste from the SSTs. This document looks at more details regarding the salt well pumping of the 200 West Area tank farm. Some options are considered but it is beyond the scope of this document to provide an in-depth study necessary to provide a defensible solution to the complexed waste problem.

1651 (WHC-SD-W236A-PHA–001-Rev.1) **Hazard and operability study of the multi-function Waste Tank Facility. Revision 1.** Hughes, M.E. Westinghouse Hanford Co., Richland, WA (United States). 15 May 1995. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013335. Source: OSTI; NTIS; INIS; GPO Dep.

The Multi-Function Waste Tank Facility (MWTF) East site will be constructed on the west side of the 200E area and the MWTF West site will be constructed in the SW quadrant of the 200W site in the Hanford Area. This is a description of facility hazards that site personnel or the general public could potentially be exposed to during operation. A list of preliminary Design Basis Accidents was developed.

1652 (WHC-SD-W236A-QAPP–001-Rev.2) **Multi-Function Waste Tank Facility Quality Assurance Program Plan, Project W-236A. Revision 2.** Hall, L.R. Westinghouse Hanford Co., Richland, WA (United States). 30 May 1995. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014424. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Quality Assurance (QA) program for the Multi-Function Waste Tank Facility (MWTF) Project. The purpose of this QA program is to control project activities in such a manner as to achieve the mission of the MWTF Project in a safe and reliable manner. The QA program for the MWTF Project is founded on DOE Order 5700.6C, Quality Assurance, and implemented through the use of ASME NQA-1, Quality Assurance Program Requirements for Nuclear Facilities (ASME 1989 with addenda la-1989, lb-1991 and lc-1992). This document describes the program and planned actions which the Westinghouse Hanford Company (WHC) will implement to demonstrate and ensure that the project meets the requirements of DOE Order 5700.6C through the interpretive guidance of ASME NQA-1.

1653 (WHC-SD-W236A-RPT–010) **A human factors engineering evaluation of the Multi-Function Waste Tank Facility. Final report.** Donohoo, D.T. (Pacific Northwest Lab., Richland, WA (United States)); Sarver, T.L. Westinghouse Hanford Co., Richland, WA (United States). 5 Jun 1995. 191p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015787. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the methods and results of a human factors engineering (HFE) review conducted on the Multi-Function Waste Tank Facility (MWTF), Westinghouse Hanford Company (WHC) Project 236A, to be constructed at the U.S. Department of Energy (DOE) facility at Hanford, Washington. This HFE analysis of the MWTF was initiated by WHC to assess how well the current facility and equipment design satisfies the needs of its operations and maintenance staff and other potential occupants, and to identify areas of the design that could benefit from improving the human interfaces at the facility. Safe and effective operations, including maintenance, is a primary goal for the MWTF. Realization of this goal requires that the MWTF facility, equipment, and operations be designed in a manner that is consistent with the abilities and limitations of its operating personnel. As a consequence, HFE principles should be applied to the MWTF design, construction, its operating procedures, and its training. The HFE review was focused on the 200-West Area facility as the design is further along than that of the 200-East Area. The review captured, to the greatest extent feasible at this stage of design, all aspects of the facility activities and included the major topics generally associated with HFE (e.g., communication, working environment). Lessons learned from the review of the 200 West facility will be extrapolated to the 200-East Area, as well as generalized to the Hanford Site.

1654 (WHC-SD-W236A-TI–020) **Position paper: Seismic design criteria.** Farnworth, S.K. Westinghouse Hanford Co., Richland, WA (United States). 22 May 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013338. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to document the seismic design criteria to be used on the Title 11 design of the underground double-shell waste storage tanks and appurtenant facilities of the Multi-Function Waste Tank Facility (MWTF) project, and to provide the history and methodologies for determining the recommended Design Basis Earthquake (DBE) Peak Ground Acceleration (PGA) anchors for site-specific seismic response spectra curves. Response spectra curves for use in design are provided in Appendix A.

1655 (WHC-SD-W236A-TS–001) **Project W-236A multi-function waste tank facility waste feed projections.** Larrick, A.P. Westinghouse Hanford Co., Richland, WA (United States). 22 Dec 1994. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95006597. Source: OSTI; NTIS; INIS; GPO Dep.

A review of Hanford Underground Waste Storage Tank Chemistry, coupled with planned remediation actions and retrieval sequences was conducted in order to predict the chemistry of the waste to be stored in the MWTF tanks. All projected waste solutions to be transferred to the MWTF tanks were found to be in compliance with current tank chemistry specifications; therefore, the waste and the tank materials of construction are expected to be compatible.

1656 (WHC-SD-W252-FHA–001) **WHC-SD-W252-FHA-001, Rev. 0: Preliminary fire hazard analysis for Phase II Liquid Effluent Treatment and Disposal Facility, Project W-252.** Barilo, N.F. Westinghouse Hanford Co., Richland, WA (United States). 11 May 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013889. Source: OSTI; NTIS; INIS; GPO Dep.

A Fire Hazards Analysis was performed to assess the risk from fire and other related perils and the capability of the facility to withstand these hazards. This analysis will be used to support design of the facility.

1657 (WHC-SD-W320-FHA–001) **Fire hazard analysis for Project W-320 Tank 241-C-106 waste retrieval.** Conner, J.C. Westinghouse Hanford Co., Richland, WA (United States). 12 Sep 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050097. Source: OSTI; NTIS; INIS; GPO Dep.

This Fire Hazards Analysis (FHA) for Project W-320, 'Tank 241-C-106 Waste Retrieval' addresses fire hazards or fire related concerns in accordance with DOE 5480.7A (DOE 1998), resulting from or related to the processes and equipment to be installed or modified under Project W-320 to ensure that there are no undue fire hazards to site personnel and the public; the potential for the occurrence of a fire is minimized, process control and safety systems are not damaged by fire or related perils; and property damage from fire and related perils does not exceed an acceptable level.

1658 (WHC-SD-W320-SUP–002) **Project W-320 ALARA Plan.** Harty, W.M. Westinghouse Hanford Co., Richland, WA (United States). 6 Jun 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014421. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document establishes the As Low As Reasonable Achievable (ALARA) Plan to be followed during Sluicing Project W-320 design and construction activities to minimize personnel exposure to radiation and hazardous materials.

1659 (WHC-SD-W379-QAPP–001) **Quality Assurance Program Plan for Project W-379: Spent Nuclear Fuels Canister Storage Building Projec.** Duncan, D.W. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050092. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Quality Assurance Program Plan (QAPP) for the Spent Nuclear Fuels (SNF) Canister Storage Building (CSB) Project. The purpose of this QAPP is to control project activities ensuring achievement of the project mission in a safe, consistent and reliable manner.

1660 (WHC-SD-W430-FDC–001) **Functional design criteria SY tank farm cathodic protection, 95G-EWW-430.** Edgemon, G.L. Westinghouse Hanford Co., Richland, WA (United States). 13 Apr 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012794. Source: OSTI; NTIS; INIS; GPO Dep.

Functional Design Criteria (FDC) for Project W-430 describing cathodic protection system completion in 241-SY tank farm.

1661 (WHC-SD-WM-ANAL–020-Rev.2) **PUREX Plant waste analysis plan. Revision 2.** Villalobos, C.N. Westinghouse Hanford Co., Richland, WA (United States). 10 Apr 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011662. Source: OSTI; NTIS; INIS; GPO Dep.

A Washington Administrative Code 173-303-300 requires that a facility develop and follow a written waste analysis plan which describes the procedures that will be followed to ensure that its dangerous wastes are managed properly. This document covers the activities at the PUREX Plant to characterize the designate waste that is generated within the plant, stored in Tanks F18, U3/U4, and managed through elementary neutralization in Tank 31.

1662 (WHC-SD-WM-AP–036) **Acceptance criteria for non-destructive examination of double-shell tanks.** Jensen, C.E. Westinghouse Hanford Co., Richland, WA

(United States). Sep 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050098. Source: OSTI; NTIS; INIS; GPO Dep.

This supporting document provides requirements for acceptance of relevant indications found during non-destructive examination of double-shell tanks (DSTs) at Hanford 200 areas. Requirements for evaluation of relevant indications are provided to determine acceptability of continued safe operation of the DSTs. Areas of the DSTs considered include the tank wall vapor space, liquid-vapor interface, wetted tank wall, sludge-liquid interface, and the knuckle region.

1663 (WHC-SD-WM-ATP–125) **241-SY-101 Pump Decon System Acceptance Test Procedure.** Talachy, S.A.; Cleveland, K.J. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010574. Source: OSTI; NTIS; INIS; GPO Dep.

The SY-101 Pump Decon System has components that consist of the water filter skid to assembly operation, the pump pit flooding system, and the system set up using air blow the water out of the decon hose. The Acceptance Test Procedure (ATP) consists of four parts. The first part will calibrate water and flow meters. The second part will determine the pressure loss on the water traveling through the filter skid at various flow rates. The third part will determine the length of time it takes to drain 1350 gallons of water out of a tank through 300 feet of discharge hose. The fourth part will verify that the calculated air volume and pressure in an air receiver is adequate to blow all the water out of a 2 inch diameter water hose.

1664 (WHC-SD-WM-ATP–128) **Operator coil monitoring Acceptance Test Procedure.** Erhart, M.F. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013362. Source: OSTI; NTIS; INIS; GPO Dep.

The readiness of the Data Acquisition and Control System (DACS) to provide monitoring and control of the Programmable Logic Controller (PLC) abort coils from the Master and RSS stations will be systematically tested during performance of this procedure. It should be noted that these are not physical abort coils but software coils controlled by the software's ladder logic. The readiness of the DACS to properly interface with the ENRAF wire level gauge installed in the SY-101 storage tank will also be tested. During this test, a verification of all abort coil indications will be conducted at the DACS Development Facility in the 306E Building by injecting an input signal for each DACS sensor that has an associated abort coil until the abort coil actuates, and then ensuring that the status of the abort coil indicated at the Master and RSS stations is correct. Each abort coil will also be tested to ensure that the "ENABLE" and "DISABLE" controls from the Master and RSS stations function correctly, and only with the use of proper passwords.

1665 (WHC-SD-WM-ATP–128-Rev.1) **Operator coil monitoring acceptance test procedure.** Erhart, M.F. Westinghouse Hanford Co., Richland, WA (United States). 5 Jun 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014423. Source: OSTI; NTIS; GPO Dep.

The readiness of the Data Acquisition and Control System (DACS) to provide monitoring and control of the Programmable Logic Controller (PLC) abort coils from the Master and RSS stations will be systematically tested during performance of this procedure. It should be noted that these are not physical abort coils but software coils controlled by the software's ladder logic. The readiness of the DACS to properly interface with the ENRAF wire level gauge installed in the SY101 storage tank will also be tested. During this test, a verification of all abort coil indications will be conducted at the DACS Development Facility in the 306E Building by injecting an input signal for each DACS sensor that has an associated abort coil until the abort coil actuates, and then ensuring that the status of the abort coil indicated at the Master and RSS stations correct. Each abort coil will also be tested to ensure that the "ENABLE" and "DISABLE" controls from the Master and RSS stations function correctly, and only with the use of proper passwords.

1666 (WHC-SD-WM-ATP–132) **In situ vapor sampling system test procedure.** Deford, D.K. Westinghouse Hanford Co., Richland, WA (United States). 19 Jun 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016327. Source: OSTI; NTIS; INIS; GPO Dep.

This test procedure verifies the adequacy of the improved in situ vapor sampling system designed for sampling of vapors in underground radioactive waste storage tanks.

1667 (WHC-SD-WM-ATP–134) **Acceptance Test Procedure: SY101 air pallet system.** Koons, B.M. Westinghouse Hanford Co., Richland, WA (United States). 30 May 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014318. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test procedure is to verify that the system(s) procured to load the SY-101 Mitigation Test Pump package fulfills its functional requirements. It will also help determine the man dose expected due to handling of the package during the actual event. The scope of this procedure focuses on the ability of the air pallets and container saddles to carry the container package from the new 100 foot concrete pad into 2403-WD where it will be stored awaiting final disposition. This test attempts to simulate the actual event of depositing the SY-101 hydrogen mitigation test pump into the 2403-WD building. However, at the time of testing road modifications required to drive the 100 ton trailer into CWC were not performed. Therefore a flatbed trailer will be use to transport the container to CWC. The time required to off load the container from the 100 ton trailer will be recorded for man dose evaluation on location. The cranes used for this test will also be different than the actual event. This is not considered to be an issue due to minimal effects on man dose.

1668 (WHC-SD-WM-ATR–090) **Standard-B auto grab sampler hydrogen monitoring system, Acceptance Test Report.** Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 18 May 1995. 799p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013364. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-369, Watch List Tank Hydrogen Monitors, installed a Standard-C Hydrogen Monitoring System (SHMS) on the Flammable gas waste tank AN-104. General Support Projects (8K510) was support by Test Engineering (7CH30) in the performance of the Acceptance Test Procedures

(ATP) to qualify the SHMS cabinets on the waste tank. The ATP's performance was controlled by Tank Farm work package. This completed ATP is transmitted by EDT-601748 as an Acceptance Test Report (ATR) in accordance with WHC-6-1, EP 4.2 and EP 1.12.

1669 (WHC-SD-WM-ATR–096) **Standard-C hydrogen monitoring system. Acceptance test report.** Lott, D.T. Westinghouse Hanford Co., Richland, WA (United States). 17 May 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013332. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-369, Watch List Tank Hydrogen Monitors, installed a Standard-C Hydrogen Monitoring System (SHMS) on Flammable Gas Watch List waste tank 104-AN. This document is the acceptance test report for the acceptance testing of the SHMS.

1670 (WHC-SD-WM-ATR–127) **Acceptance test report for the ultra high pressure bore head for use in the self-installing liquid observation well.** Hertelendy, N.A. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015777. Source: OSTI; NTIS; INIS; GPO Dep.

In order to monitor and characterize waste stored in single-shell tanks, liquid observation wells (LOWs) have been installed to permit periodic insertion of instrumentation probes to evaluate the waste's cross-sections characteristics.

1671 (WHC-SD-WM-ATR–129) **Void fraction instrument software, Version 1,2, Acceptance test report.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 9 May 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013328. Source: OSTI; NTIS; INIS; GPO Dep.

This provides the report for the void fraction instrument acceptance test software Version 1.2. The void fraction will collect data that will be used to calculate the quantity of gas trapped in waste tanks.

1672 (WHC-SD-WM-ATR–130) **Viscometer software, Version 1.1, Acceptance test report.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 9 May 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013327. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents results of the acceptance test for the software that was developed to operate the viscometer, which is the instrument that will collect ball rheometry data for Tank 101-SY.

1673 (WHC-SD-WM-ATR–135) **Test report - 241-AN-274 Caustic Pump Control Building.** Paintner, G.P. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050101. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report documents the test results of test procedure WHC-SD-WM-ATP-135 'Acceptance Test Procedure for the 241-AN- 274 Caustic Pump Control Building.' The objective of the test was to verify that the 241-AN-274 Caustic Pump Control Building functions properly based on design specifications per applicable H-2-85573 drawings and associated ECN's. The objective of the test was met.

1674 (WHC-SD-WM-CSCM–028) **Computer software configuration management plan for the 241-AY and 241-AZ tank farm MICON automation system.** Teats, M.C. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011688. Source: OSTI; NTIS; INIS; GPO Dep.

Software configuration items pertaining to the process control systems, of the ventilation systems of the tank farms, are identified and configuration controls are defined.

1675 (WHC-SD-WM-CSCM–032) **Software Configuration Management Plan for sample trucks no. 2, 3, and 4 alarm & control logic.** Akers, J.C.; Dowell, J.L. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050102. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the methods for configuration control of the sample truck alarm and control logic. Responsibility for documentation change control and custody are described.

1676 (WHC-SD-WM-CSRS–023-Rev.1) **Master equipment list – Phase 1. Revision 1.** Jech, J.B. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011667. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to define the system requirements for the Master Equipment List (MEL) Phase 1 project. The intended audience for this document includes Data Automation Engineering (DAE), Configuration Management Improvement and Control Engineering (CMI and CE), Data Administration Council (DAC), and Tank Waste Remedial System (TWRS) personnel. The intent of Phase 1 is to develop a user-friendly system to support the immediate needs of the TWRS labeling program. Phase 1 will provide CMI and CE the ability to administrate, distribute, and maintain key information generated by the labeling program. CMI and CE is assigning new Equipment Identification Numbers (EINs) to selected equipment in Tank Farms per the TWRS Data Standard "Tank Farm Equipment Identification Number". The MEL Phase 1 system will be a multi-user system available through the HLAN network. It will provide basic functions such as view, query, and report, edit, data entry, password access control, administration and change control. The scope of Phase 1 data will encompass all Tank Farm Equipment identified by the labeling program. The data will consist of fields from the labeling program's working database, relational key references and pointers, safety class information, and field verification data.

1677 (WHC-SD-WM-CSRS–025) **Process control computer software requirements and specifications for the 241-AY and 241-AZ tank farm MICON automation system.** Teats, M.C. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011687. Source: OSTI; NTIS; INIS; GPO Dep.

Software requirements and specifications for the AY/AZ MICON distributed control system for the tank farm ventilation systems are provided.

1678 (WHC-SD-WM-CSRS–026) **Solid Waste Information Tracking System (SWITS), Backlog Waste Modifications, Software Requirements Specification**

(SRS). Clark, R.E. (USDOE Richland Operations Office, WA (United States)). USDOE Richland Operations Office, WA (United States); Boeing Computer Services Co., Richland, WA (United States). 5 May 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012798. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this document is to define the system requirements necessary to improve computer support for the WHC backlog waste business process through enhancements to the backlog waste function of the SWITS system. This SRS document covers enhancements to the SWITS system to support changes to the existing Backlog Waste screens including new data elements, label changes, and new pop-up screens. The pop-ups will allow the user to flag the processes that a waste container must have performed on it, and will provide history tracking of changes to data. A new screen will also be provided allowing Acceptable Services to perform mass updates to specific data in Backlog Waste table. The SWITS Backlog Waste enhancements in this document will support the project goals in WHC-SD-WM-003 and its Revision 1 (Radioactive Solid Waste Tracking System Conceptual Definition) for the control, tracing, and inventory management of waste as the packages are generated and moved through final disposal (cradle-to-grave).

1679 (WHC-SD-WM-DA–148) **Structural evaluation of mixer pump installed in Tank 241-AN-107 for caustic addition project.** Leshikar, G.A. Westinghouse Hanford Co., Richland, WA (United States). 16 Jun 1995. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015790. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the structural analysis and evaluation of a mixer pump and caustic addition system to be used in Tank 107-AN. This pump will be installed in the central pump pit of this double- shell tank for the purpose of bringing the hydroxide ion concentration into compliance with Tank Farm operating specifications.

1680 (WHC-SD-WM-DA–189) **Design analysis supporting 101-SY Water Decon System.** Cleveland, K.J. Westinghouse Hanford Co., Richland, WA (United States). 5 Sep 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050105. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the results of stress analysis and component sizing for the 101-SY mitigation pump, Water Decon System. Calculations included are a stress analysis of the High Pressure Manifold, the threaded connection on the Yoke Water Connector and a sizing of an air receiver tank.

1681 (WHC-SD-WM-DA–196) **Structural analysis of 241C106 contingency chiller design.** Graves, C.E.; Coverdell, B.L.; Nawarynsky, D.A.; Rensink, G.E. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1995. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014422. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the Tank 24lCl06 leak contingency plan, a chiller coil is to be installed on the existing HEPA-filtered air inlet unit. A natural phenomenon-hazard analysis per SDC 4.1, Standard Architectural-Civil Design Criteria, Design Loads for Facilities, Revision 12, was performed on several components of the design using both hand calculations and COSMOS/M computer models. The design meets SOC 4.1 requirements for safety class 3 equipment.

1682 (WHC-SD-WM-DP–081-Rev.1) **Aqueous sample from B-Plant, Tank 9-1. Revision 1.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 18 May 1995. 263p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013333. Source: OSTI; NTIS; INIS; GPO Dep.

Eight liquid samples were received from B-Plant Tank 9-1 in four lots of two samples each, for inorganic and organic analysis. This is the final report for the sampling and analysis effort; included are summary tables of the analytical and quality control data as well as all raw data. The analyses include pH, OH, inductively coupled plasma spectrography, ion chromatograph, total organic carbon, total inorganic carbon, and differential scanning calorimetry. Included are copies of the chain of custody and request for special analysis forms.

1683 (WHC-SD-WM-DP–103) **60-day safety screen results for tank 241-BY-106, rotary mode, cores 64 and 65.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 1 May 1995. 211p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011632. Source: OSTI; NTIS; INIS; GPO Dep.

Core samples 64 and 65 from tank BY-106, obtained by rotary-mode core sampling, were received by the 222-S Laboratories. Differential scanning calorimetry and thermogravimetric analysis were carried out.

1684 (WHC-SD-WM-DP–104) **45-Day safety screen results for Tank 241-BY-103, auger samples 95-AUG-012 and 95-AUG-013.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 21 Apr 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011448. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from tank 241-BY-103 (BY-103) were received by the 222-S Laboratories and underwent safety screening analysis, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. Analytical results for the TGA analyses for both samples were less than the safety screening notification limit. Since notification is made if the sample is analyzed at less than 17% water, notification was made on April 20, 1995. Although the sample results were below this limit, no secondary analyses were required or performed. Included in this report are the primary safety screening results obtained from the analyses and copies of all DSC and TGA raw data scans as requested per the TCP. Photographs of the auger samples were taken during extrusion and, although not included in this report, are available. Tank BY-103 is on the ferrocyanide Watch List.

1685 (WHC-SD-WM-DP–105) **45-Day safety screen results for Tank 241-B-112, auger samples 95-AUG-014 and 95-AUG-015.** Conner, J.M. Westinghouse Hanford Co., Richland, WA (United States). 1 May 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011653. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from Tank 241-B-112 (B-112) were received in the 222-S Laboratories and underwent safety screening analyses, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. All results for all analyses (DSC, TGA, and total alpha) were within the safety screening notification limits specified in the Tank Characterization Plan (TCP). No notification nor secondary analyses were required. Tank B-112 is not part of any of the four Watch Lists.

1686 (WHC-SD-WM-DP–106) **Fourty-five day safety screen results for Tank 241-C-107, push mode, cores 68 and 69.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 8 May 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012800. Source: OSTI; NTIS; INIS; GPO Dep.

Reported are the safety-screening analytes required by the C-107 tank characterization plan. Also included are copies of the differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) scans. Two core samples from tank C-107, obtained by the push-mode core sampling method, were received, extruded, and analyzed by the 222-S Laboratories. Drainable liquid was analyzed at the segment level for a separable organic layer, energetics by DSC, and percent water by TGA. Sludge samples were analyzed at the half-segment level by DSC, TGA, and for total alpha activity. No safety-screening notification limits were exceeded on any samples.

1687 (WHC-SD-WM-DP–107) **45-Day safety screen results for Tank 241-U-201, push mode, cores 70, 73 and 74.** Sathyanarayana, P. Westinghouse Hanford Co., Richland, WA (United States). 4 May 1995. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012568. Source: OSTI; NTIS; INIS; GPO Dep.

Three core samples, each having two segments, from Tank 241-U-201 (U-201) were received by the 222-S Laboratories. Safety screening analysis, such as differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity were conducted on Core 70, Segment 1 and 2 and on Core 73, Segment 1 and 2. Core 74, Segment 1 and 2 were taken to test rotary bit in push mode sampling. No analysis was requested on Core 74, Segment 1 and 2. Analytical results for the TGA analyses for Core 70, Segment 1, Upper half solid sample was less than the safety screening notification limit of 17 percent water. Notification was made on April 27, 1995. No exotherm was associated with this sample. Analytical results are presented in Tables 1 to 4, with the applicable notification limits shaded.

1688 (WHC-SD-WM-DP–108) **45-Day safety screen results for tank 241-C-105, push mode, cores 72 and 76.** Sasaki, L.M. Westinghouse Hanford Co., Richland, WA (United States). 3 May 1995. 127p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012834. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a report of the analytical results for samples collected between March 14 and March 22, 1995 from the radioactive wastes in Tank 241-C-105 at the Hanford Reservation. Core samples were collected from the solid wastes in the tank and underwent safety screening analyses including differential scanning calorimetry, thermogravimetric analysis, and total alpha analysis.

1689 (WHC-SD-WM-DP–109) **45-Day safety screen results for tank 241-U-203, push mode, cores 79 and 80.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012837. Source: OSTI; NTIS; INIS; GPO Dep.

Two one-segment core samples from tank 241-U-203 (U-203) were received by the 222-S Laboratories and underwent safety screening analysis, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. In addition to the safety screening requirements, inductively coupled plasma (ICP) spectrographic analysis for lithium was performed to determine the extent of hydrostatic head fluid contamination during the sampling event. No notification limits were exceeded for these analyses.

1690 (WHC-SD-WM-DP–110) **45-Day safety screen results for tank 241-U-202, push mode, cores 75 and 78.** Jo, J. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 106p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012833. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a report of the analytical results for samples collected from the radioactive wastes in Tank 241-U-202 at the Hanford Reservation. Core samples were collected from the solid wastes in the tank and underwent safety screening analyses including differential scanning calorimetry, thermogravimetric analysis, and total alpha analysis. Results indicate that no safety screening notification limits were exceeded.

1691 (WHC-SD-WM-DP–111) **45-Day safety screen results for Tank 241-C-101, auger sample 95-AUG-019.** Sasaki, L.M. Westinghouse Hanford Co., Richland, WA (United States). 11 May 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012586. Source: OSTI; NTIS; INIS; GPO Dep.

One auger sample from Tank 241-C-101 was received by the 222-S Laboratory and underwent safety screening analyses–differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha analysis–in accordance with the tank characterization plan. Analytical results for the TGA on the crust sample (the uppermost portion of the auger sample) (sample number S95T000823) were less than the safety screening notification limit of 17 weight percent water. Verbal and written notifications were made on May 3, 1995. No exotherms were observed in the DSC analyses and the total alpha results were well below the safety screening notification limit. This report includes the primary safety screening results obtained from the analyses and copies of all DSC and TGA raw data scans as requested per the TCP. Although not included in this report, a photograph of the extruded sample was taken and is available. This report also includes bulk density measurements required by Characterization Plant Engineering. Additional analyses (pH, total organic carbon, and total inorganic carbon) are being performed on the drainable liquid at the request of Characterization Process Control; these analyses will be reported at a later date in a final report for this auger sample. Tank C-101 is not part of any of the four Watch Lists.

1692 (WHC-SD-WM-DP–112) **45-day safety screen results and final report for Tank 241-C-203, Auger samples 95 AUG-020 and 95-AUG-021.** Conner, J.M. Westinghouse Hanford Co., Richland, WA (United States). 18 May 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013365. Source: OSTI; NTIS; INIS; GPO Dep.

This document serves as the 45-day report deliverable for the tank C-203 auger samples collected on April 5, 1995 (samples 95-AUG-20 and 95-AUG-021). As no secondary analyses were required and no other analyses have been requested, this document also serves as the final report for C-203 auger sampling. Each sample was received, extruded, and analyzed by the 222-S Laboratories in accordance with the Tank Characterization Plan (TCP) referenced below. Included in this report are the primary safety screening results (DSC, TGA, and alpha) and density results. The worklists and raw data are included in this report. Photographs of the auger samples were taken during extrusion and, although not included in this report, are available.

1693 (WHC-SD-WM-DP-113) **45-day safety screen results for tank 241-U-204, push mode, cores 81 and 82.** Bell, K.E. Westinghouse Hanford Co., Richland, WA (United States). 17 May 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013346. Source: OSTI; NTIS; INIS; GPO Dep.

This is the 45-Day report for the fiscal year 1995 tank 241-U-204 (U-204) push-mode characterization effort. Included are a summary of analytical results and copies of the differential scanning calorimetry (DSC) and thermogravimetric analysis (TGA) scans. Core samples 81 and 82 from tank U-204, obtained by the push-mode core sampling method, were received by the 222-S Laboratories. Each core consisted of only one segment. Both core samples and the field blank were extruded, subsampled, and analyzed in accordance with Reference 1. Drainable liquids and the field blank were analyzed at the segment level for energetics by DSC, percent water by TGA, and total organic carbon (TOC) by furnace oxidation. In addition, the presence or absence of any separable, presumably organic, layer in drainable liquid samples was noted and none was observed. The solids were analyzed directly at the half segment level for energetics by DSC, percent water by TGA, and TOC by persulfate oxidation. Total alpha activity was determined on fusion digestions of the sludge subsamples. No immediate notifications were necessary on samples from cores 81 or 82.

1694 (WHC-SD-WM-DP-114) **60-day safety screen results and final report for tank 241-C-111, auger samples 95-Aug-002, 95-Aug-003, 95-Aug-016, and 95-Aug-017.** Rice, A.D. Westinghouse Hanford Co., Richland, WA (United States). 30 May 1995. 280p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014307. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the auger sampling events for underground waste tank C-111. The samples were shipped to the 222-S laboratories were they underwent safety screening analysis and primary ferricyanide analysis. The samples were analyzed for alpha total, total organic carbon, cyanide, Ni, moisture, and temperature differentials. The results of this analysis are presented in this document.

1695 (WHC-SD-WM-DP-115) **45-day safety screen results for tank 241-C-204, auger samples 95-Aug-022 and 95-Aug-023.** Conner, J.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Aug 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016330. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from tank 241-C-204 (C-204) were received at the 222-S Laboratories and underwent safety screening analysis, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. The three samples submitted to energetics determination by DSC exceeded the notification limit. As required by the Tank Characterization Plan, the appropriate notifications were made within 24 hours of official confirmation that the limit was exceeded. Secondary analyses have been initiated. Results from secondary analyses will be included in a revision to this report.

1696 (WHC-SD-WM-DP-116) **45-Day safety screen results for Tank 241-C-201, Auger samples 95-AUG-025 and 95-AUG-026.** Schreiber, R.D. Westinghouse Hanford Co., Richland, WA (United States). 15 Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015782. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from tank 241-C-201 (C-201) were received by the 222-S Laboratories and underwent safety screening analysis, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. Analytical results for the DSC analyses of both samples exceeded the notification limit of 481 J/g (dry weight basis). As well, the TGA analyses for both samples were less than the safety screening notification limit (notification is made if the sample is analyzed at less than 17 percent water). Notification of both of these occurrences was made on May,15, 1995, and secondary analysis of total organic carbon (TOC) was initiated. These TOC analysis results are also included in this report.

1697 (WHC-SD-WM-DP-130) **Equipment sizing calculations for the Extensive Separations Alternative engineering data package.** Jansen, G. Jr. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 383p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010945. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains results of Raytheon/BNFL calculations for equipment selection and sizing for the Extensive Separations Alternative to be evaluated in the TWRS- (Tank Waste Remediation System) Environmental Impact Statement. This report contains: an equipment list for the extensive separations/HLW Facility; calculation of equipment sizing for HLW vitrification system; calculation for centrifuge selection; calculation of equipment sizing for fractionator, absorbers, reboiler, and condenser; calculation of equipment sizing for ion exchange columns; calculation of equipment sizing for tanks; calculation of equipment sizing for bulk, preparation, and feed cold chemical tanks; calculation of equipment sizing for evaporators, condensers, tanks, decanters, and filters; calculation of equipment sizing for organics destruction system; and calculation of LLW facility throughput and equipment sizes.

1698 (WHC-SD-WM-DP-132) **45-day safety screen results and final report for tank 241-C-202, auger samples 95-Aug-026 and 95-Aug-027.** Baldwin, J.H. Westinghouse Hanford Co., Richland, WA (United States). 19 Jun 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016329. Source: OSTI; NTIS; INIS; GPO Dep.

Two auger samples from tank 241-C-202 (C-202) were received at the 222-S Laboratories and underwent safety screening analysis, consisting of differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and total alpha activity. Two samples were submitted for energetics determination by DSC. Within the triplicate analyses of each sample, one of the results for energetics exceeded the notification limit. The sample and duplicate analyses for both augers exceeded the notification limit for TGA. As required by the Tank Characterization Plan, the appropriate notifications were made within 24 hours of official confirmation that the limits were violated.

1699 (WHC-SD-WM-DP-133) **45-Day safety screen results and final report for Tank 241-SX-113, Auger samples 94-AUG-028 and 95-AUG-029.** Sasaki, L.M. Westinghouse Hanford Co., Richland, WA (United States). 22 Jun 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015779. Source: OSTI; NTIS; INIS; GPO Dep.

This document serves as the 45-day report deliverable for tank 241-SX-113 auger samples collected on May 9 and 10, 1995. The samples were extruded, and analyzed by the 222-S Laboratory. Laboratory procedures completed include: differential scanning calorimetry; thermogravimetric analysis; and total alpha analysis. This report incudes the primary safety screening results obtained from the analyses. As the final report, the following are also included: chains of custody; the extrusion logbook; sample preparation data; and total alpha analysis raw data.

1700 (WHC-SD-WM-DQO-001-Rev.1) **Data quality objectives for tank farms waste compatibility program. Revision 1.** Fowler, K.D. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010927. Source: OSTI; NTIS; INIS; GPO Dep.

Waste compatibility within the Tank Waste Remediation System (TWRS) double-shell tank farms at the Hanford Site is implemented via the Tank Farms Waste Transfer Compatibility Program, WHC-SD-WM-OCD-015. This DQO for waste compatibility includes a statement of the transfer problem(s), identification of safety and operations related decision elements relevant to waste transfers, a list of the data inputs to these decisions, a description of the transfers covered, and quantitative decision rules for the safety decisions.

1701 (WHC-SD-WM-DQO-002-Rev.1) **Data quality objectives for generic in-tank health and safety vapor issue resolution. Revision 1.** Osborne, J.W. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012797. Source: OSTI; NTIS; INIS; GPO Dep.

Data Quality Objectives (DQOs) for generic waste storage tank vapor and gas sampling were developed in facilitated meetings and a stakeholder review session, using the most recent US EPA DQO guidelines. These meetings elicited DQOs for two major vapor problem areas: flammability and toxicity. This is a summary of the outputs of the planning team for each of the 7 steps of the DQO process.

1702 (WHC-SD-WM-DQO-004-Rev.1) **Flammable gas tank safety program: Data requirements for core sample analysis developed through the Data Quality Objectives (DQO) process. Revision 1.** McDuffie, N.G.; LeClair, M.D. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011674. Source: OSTI; NTIS; INIS; GPO Dep.

This document represents the application of the Data Quality Objectives (DQO) process to the Flammable Gas Tank Safety Issue at the Hanford Site. The product of this effort is a list of data required from tank core sample analysis to support resolution of this issue.

1703 (WHC-SD-WM-DQO-006-Rev.1) **Data quality objective to support resolution of the organic fuel rich tank safety issue.** Buckley, L.L. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011633. Source: OSTI; NTIS; INIS; GPO Dep.

During years of Hanford process history, large quantities of complexants used in waste management operations as well as an unknown quantity of degradation products of the solvents used in fuel reprocessing and metal recovery were added to man of the 149 single-shell tanks. These waste tanks also contain a presumed stoichiometric excess of sodium nitrate/nitrite oxidizers, sufficient to exothermically oxidize the organic compounds if suitably initiated. This DQO identifies the questions that must be answered to appropriately disposition organic watchlist tanks, identifies a strategy to deal with false positive or negative judgements associated with analytical uncertainty, and list the analytes of concern to support dealing with organic watchlist concerns. Uncertainties associated with both assay limitations and matrix effects complicate selection of analytes. This results in requiring at least two independent measures of potential fuel reactivity.

1704 (WHC-SD-WM-DQO-007-Rev.1) **Data requirements for the Ferrocyanide Safety Issue developed through the data quality objectives process. Revision 1.** Meacham, J.E.; Cash, R.J. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012787. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the requirements for obtaining tank characterization information to support resolution of the Ferrocyanide Safety Issue at the Hanford Site by applying the data quality objectives (DQO) process. A strategy describing the overall approach to safe storage and disposal of the waste in the ferrocyanide tanks identifies the problems and decisions that require characterization data. The DQO process is applied to each decision or group of related decisions to specify data requirements.

1705 (WHC-SD-WM-DQO-018) **Historical model evaluation data requirements.** Simpson, B.C.; McCain, D.J. Westinghouse Hanford Co., Richland, WA (United States). 8 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012827. Source: OSTI; NTIS; INIS; GPO Dep.

Several studies about tank waste contents have been published using historical records of tank transactions and various analytical measurements. While these records offer a wealth of information, the results are questionable until error estimates associated with the results can be established. However, they do provide a direction for investigation. Two principal observations from the studies are: (1) Large quantities of individual waste types from the various separations processes were widely distributed throughout the tank farms, and (2) The compositions of many of these waste types are quite distinct from one another. A key assumption associated with these observations is that the effects of time and location on the tank wastes are either nominal or not discernable. Since each waste type has a distinct composition, it would benefit all programs to better quantify that composition, and establish an uncertainty for each element of that composition. Various process, disposal, or other decisions could then be made based on current information reducing the need for extended sampling and analysis.

1706 (WHC-SD-WM-DR-013) **Description of waste pretreatment and interfacing systems dynamic simulation model.** Garbrick, D.J.; Zimmerman, B.D. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 116p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016333. Source: OSTI; NTIS; INIS; GPO Dep.

The Waste Pretreatment and Interfacing Systems Dynamic Simulation Model was created to investigate the required pretreatment facility processing rates for both high level and low level waste so that the vitrification of tank waste can be completed according to the milestones defined in the Tri-Party Agreement (TPA). In order to achieve this objective, the processes upstream and downstream of the pretreatment facilities must also be included. The simulation model starts with retrieval of tank waste and ends with vitrification for both low level and high level wastes. This report describes the results of three simulation cases: one based on suggested average facility processing rates, one with facility rates determined so that approximately 6 new DSTs are required, and one with facility rates determined so that approximately no new DSTs are required. It appears, based on the simulation results, that reasonable facility processing rates can be selected so that no new DSTs are required by the TWRS program. However, this conclusion must be viewed with respect to the modeling assumptions, described in detail in the report. Also included in the report, in an appendix, are results of two sensitivity cases: one with glass plant water recycle steams recycled versus not recycled, and one employing the TPA SST retrieval schedule versus a more uniform SST retrieval schedule. Both recycling and retrieval schedule appear to have a significant impact on overall tank usage.

1707 (WHC-SD-WM-DTR-040) **Report of scouting study on precipitation of strontium, plutonium, and americium from Hanford complexant concentrate waste.** Herting, D.L. Westinghouse Hanford Co., Richland, WA (United States). 5 Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050111. Source: OSTI; NTIS; INIS; GPO Dep.

A laboratory scouting test was conducted of precipitation methods for reducing the solubility of radionuclides in complexant concentrate (CC) waste solution. The results show that addition of strontium nitrate solution is effective in reducing the liquid phase activity of 90Sr (Strontium) in CC waste from tank 107-AN by 94% when the total strontium concentration is adjusted to 0.1 M. Addition of ferric nitrate solution effective in reducing the 241Am (Americium) activity in CC waste by 96% under the conditions described in the report. Ferric nitrate was also marginally effective in reducing the solubility of 239/240Pu (Plutonium) in CC waste

1708 (WHC-SD-WM-ER-029-Rev.21) **Operational waste volume projection.** Koreski, G.M.; Strode, J.N. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 86p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050112. Source: OSTI; NTIS; INIS; GPO Dep.

Waste receipts to the double-shell tank system are analyzed and wastes through the year 2015 are projected based on generation trends of the past 12 months. A computer simulation of site operations is performed, which results in projections of tank fill schedules, tank transfers, evaporator operations, tank retrieval, and aging waste tank usage. This projection incorporates current budget planning and the clean-up schedule of the tri-party agreement. Assumptions are current as of June 1995.

1709 (WHC-SD-WM-ER-314) **Supporting document for the Southeast Quadrant historical tank content estimate report for AN-Tank Farm. Vols. I and II.** Brevick, C.H.; Gaddis, L.A.; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 1262p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050006. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 East and West Areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in- tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as Waste Status and Transaction Record Summary, Tank Layer Model, Supernatant Mixing Model, Defined Waste Types, and Inventory Estimates which generate these tank content estimates, are also given in this report.

1710 (WHC-SD-WM-ER-315) **Supporting document for the Southeast quadrant historical tank content estimate report for AP-tank farm. Volume 1 and 2.** Brevick, C.H, Gaddis, L.A; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1995. 1648p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050005. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 East and West Areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as Waste Status and Transaction Record Summary, Tank Layer Model, Supernatant Mixing Model, Defined Waste Types, and Inventory Estimates which generate these tank content estimates, are also given in this report.

1711 (WHC-SD-WM-ER-316) **Supporting Document for the Southeast Quadrant Historical Tank Content Estimate Report for AW-Tank Farm - Volume I and II.** Brevick, C.H.; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 1473p. Sponsored by USDOE, Washington, DC (United States). DOE

Contract AC06-87RL10930. Order Number DE96050113. Source: OSTI; NTIS; INIS; GPO Dep.

Historical tank content estimate of the southeast quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 east and west areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as waste status and transaction record summary, tank layer model, supernatant mixing model, defined waste types, and inventory estimates which generate these tank content estimates, are also given in this report

1712 (WHC-SD-WM-ER-317) **Supporting document for the southeast quadrant historical tank content estimate report for AY-tank farm.** Brevick, C.H.; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1995. 517p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050114. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 East and West Areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as Waste Status and Transaction Record Summary, Tank Layer Model, Supernatant Mixing Model, Defined Waste Types, and Inventory Estimates which generate these tank content estimates, are also given in this report

1713 (WHC-SD-WM-ER-318) **Supporting document for the southeast quadrant historical tank content estimate report for AZ-tank farm (Volume 1 and 2).** Brevick, C.H.; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States). 13 Sep 1995. 1289p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050115. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 East and West Areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as Waste Status and Transaction Record Summary, Tank Layer Model, Supernatant Mixing Model, Defined Waste Types, and Inventory Estimates which generate these tank content estimates, are also given in this report

1714 (WHC-SD-WM-ER-319) **Supporting document for the Southeast Quadrant historical tank content estimate report for SY-tank farm.** Brevick, C.H. (Westinghouse Hanford Co., Richland, WA (United States)); Gaddis, L.A.; Consort, S.D. Westinghouse Hanford Co., Richland, WA (United States); ICF Kaiser Hanford Co., Richland, WA (United States). [1995]. 1011p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050216. Source: OSTI; NTIS; INIS; GPO Dep.

Historical Tank Content Estimate of the Southeast Quadrant provides historical evaluations on a tank by tank basis of the radioactive mixed wastes stored in the underground double-shell tanks of the Hanford 200 East and West Areas. This report summarizes historical information such as waste history, temperature profiles, psychrometric data, tank integrity, inventory estimates and tank level history on a tank by tank basis. Tank Farm aerial photos and in-tank photos of each tank are provided. A brief description of instrumentation methods used for waste tank surveillance are included. Components of the data management effort, such as Waste Status and Transaction Record Summary, Tank Layer Model, Supernatant Mixing Model, Defined Waste Types, and Inventory Estimates which generate these tank content estimates, are also given in this report.

1715 (WHC-SD-WM-ER-350) **Historical tank content estimate for the southeast quadrant of the Hanford 200 Areas.** ICF Kaiser Hanford Co., Richland, WA (United States). Jun 1995. 310p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015546. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides historical evaluations of the radioactive and mixed waste stored in the Hanford site underground double-shell tanks. A Historical Tank Content Estimate has been developed by reviewing the process histories, waste transfer data, and available physical and chemical characterization data from various Department of Energy and Department of Defense contractors. The historical data will supplement information that is currently being gathered from core sampling. Historical waste transfer and level data, tank physical information, temperature data, and sampling data have been compiled for this report and supporting documents.

1716 (WHC-SD-WM-ER-366) **Tank characterization report for Double-Shell Tank 241-SY-102.** DiCenso, A.T. (Los Alamos Technical Associates, Inc., NM (United States)); Amato, L.C.; Winters, W.I. Westinghouse Hanford Co., Richland, WA (United States). 9 Jun 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014306. Source: OSTI; NTIS; INIS; GPO Dep.

This tank characterization report presents an overview of Double-Shell Tank 241-SY-102 (hereafter, Tank 241-SY-102) and its waste contents. It provides estimated concentrations and inventories for the waste components based on the latest sampling and analysis activities and background tank information. This report describes the results of three sampling events. The first core sample was taken in October 1988. The tank supernate and sludge were next core sampled in February and March of 1990 (Tingey and Sasaki 1995). A grab sample of the supernate was taken in March of 1994. Tank 241-SY-102 is in active service and can be expected to have additional transfers to and from the tank that will alter the composition of the waste. The concentration and inventory estimates reported in this document no longer reflect the exact composition of the waste but represent the best estimates based on the most recent and available data. This report supports the requirements of the Hanford Federal Facility Agreement and Consent Order Milestone M-44-08 (Ecology, EPA, DOE 1994).

1717 (WHC-SD-WM-ER–400-Vol.1) **Tank waste source term inventory validation. Volume 1. Letter report.** Brevick, C.H.; Gaddis, L.A.; Johnson, E.D. ICF Kaiser Hanford Co., Richland, WA (United States). 28 Apr 1995. 505p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012488. Source: OSTI; NTIS; INIS; GPO Dep.

The sample data for selection of 11 radionuclides and 24 chemical analytes were extracted from six separate sample data sets, were arranged in a tabular format and were plotted on scatter plots for all of the 149 single-shell tanks, the 24 double-shell tanks and the four aging waste tanks. The solid and liquid sample data was placed in separate tables and plots. The sample data and plots were compiled from the following data sets: characterization raw sample data, recent core samples, D. Braun data base, Wastren (Van Vleet) data base, TRAC and HTCE inventories. This document is Volume I of the Letter Report entitled Tank Waste Source Term Inventory Validation.

1718 (WHC-SD-WM-ER–400-Vol.2) **Tank waste source term inventory validation. Volume II. Letter report.** ICF Kaiser Hanford Co., Richland, WA (United States). Apr 1995. 880p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012489. Source: OSTI; NTIS; INIS; GPO Dep.

This document comprises Volume II of the Letter Report entitled Tank Waste Source Term Inventory Validation. This volume contains Appendix C, Radionuclide Tables, and Appendix D, Chemical Analyte Tables. The sample data for selection of 11 radionuclides and 24 chemical analytes were extracted from six separate sample data sets, were arranged in a tabular format and were plotted on scatter plots for all of the 149 single-shell tanks, the 24 double-shell tanks and the four aging waste tanks. The solid and liquid sample data was placed in separate tables and plots. The sample data and plots were compiled from the following data sets: characterization raw sample data, recent core samples, D. Braun data base, Wastren (Van Vleet) data base, TRAC and HTCE inventories.

1719 (WHC-SD-WM-ER–418) **Tank 241-BY-104 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012592. Source: OSTI; NTIS; INIS; GPO Dep.

Tank BY-104 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank BY-104 using the vapor sampling system (VSS) on June 24, 1994 by WHC Sampling and Mobile Laboratories. Air from the tank BY-104 headspace was withdrawn via a heated sampling probe mounted in riser 10A, and transferred via heated tubing to the VSS sampling manifold. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 46 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 10 trip blanks provided by the laboratories.

1720 (WHC-SD-WM-ER–418-Rev.1) **Tank 241-BY-104 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013567. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-104 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-104 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1721 (WHC-SD-WM-ER–418-Rev.2) **Tank 241-BY-104 headspace gas and vapor characterization results for samples collected in April 1994 and June 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050116. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1722 (WHC-SD-WM-ER–419) **Tank 241-BY-105 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012591. Source: OSTI; NTIS; INIS; GPO Dep.

Tank BY-105 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank BY-105 is on the Ferrocyanide Watch List. Samples were collected from Tank BY-105 using the vapor sampling system (VSS) on July 7, 1994 by WHC Sampling and Mobile Laboratories. The tank headspace temperature was determined to be 26 C. Air from the Tank BY-105 headspace was withdrawn via a heated sampling probe mounted in riser 10A, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 65 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 46 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 10 trip blanks provided by the laboratories.

1723 (WHC-SD-WM-ER–419-Rev.1) **Tank 241-BY-105 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013566. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-105 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-105 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1724 (WHC-SD-WM-ER–419-Rev.2) **Tank 241-BY-105 Headspace Gas and Vapor Characterization Results for Samples Collected in May 1994 and July 1994. Revision 2.** Huckaby, J.L. (Pacific Northwest Lab., Washington, DC (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050117. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1725 (WHC-SD-WM-ER–420) **Tank 241-BY-106 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012571. Source: OSTI; NTIS; INIS; GPO Dep.

Tank BY-106 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank BY-106 is on the Ferrocyanide Watch List. Samples were collected from Tank BY-106 using the vapor sampling system (VSS) on July 8, 1994 by WHC Sampling and Mobile Laboratories. The tank headspace temperature was determined to be 27 C. Air from the Tank BY-106 headspace was withdrawn via a heated sampling probe mounted in riser 10B, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 65 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 46 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 10 trip blanks provided by the laboratories.

1726 (WHC-SD-WM-ER–420-Rev.1) **Tank 241-BY-106 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013595. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-106 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-106 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1727 (WHC-SD-WM-ER–420-Rev.2) **Tank 241-BY-106 headspace gas and vapor characterization results for samples collected in May 1994 and July 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050118. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1728 (WHC-SD-WM-ER–421) **Tank 241-BY-107 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012831. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-107 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues". Tank 241-BY-107 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution".

1729 (WHC-SD-WM-ER–421-Rev.1) **Tank 241-BY-107 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013594. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-107 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-107 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1730 (WHC-SD-WM-ER–421-Rev.2) **Tank 241-BY-107 headspace gas and vapor characterization results for samples collected in March 1994 and October 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050217. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1731 (WHC-SD-WM-ER–422) **Tank 241-BY-108 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012585. Source: OSTI; NTIS; INIS; GPO Dep.

Tank BY-108 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank BY-108 is on the Ferrocyanide Watch List. Samples were collected from Tank BY-108 using the vapor sampling system (VSS) on october 27, 1994 by WHC Sampling and Mobile Laboratories. The tank headspace temperature was determined to be 25.7 C. Air from the Tank BY-108 headspace was withdrawn via a 7.9 m-long heated sampling probe mounted in riser 1, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 50 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, and Pacific Northwest Laboratories. The 40 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks and 2 field blanks that accompanied the samples.

1732 (WHC-SD-WM-ER–422-Rev.1) **Tank 241-BY-108 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014304. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-108 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues" (Osborne and Huckaby 1994). Tank 241-BY-108 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution (Osborne et al., 1994).

1733 (WHC-SD-WM-ER–423) **Tank 241-C-108 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012832. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-108 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in Program Plan for the Resolution of Tank Vapor Issues (Osborne and Huckaby 1994). Tank 241-C-108 was vapor sampled in accordance with Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution (Osborne et al., 1994).

1734 (WHC-SD-WM-ER–423-Rev.1) **Tank 241-C-108 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013569. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-108 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-C-108 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1735 (WHC-SD-WM-ER–423-Rev.2) **Tank 241-C-108 headspace gas and vapor characterization results for samples collected in July 1993 and August 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050120. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1736 (WHC-SD-WM-ER–424) **Tank 241-C-109 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012830. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-109. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1737 (WHC-SD-WM-ER–424-Rev.1) **Tank 241-C-109 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013561. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank C-109. The drivers and objectives of the waste tank headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports.

1738 (WHC-SD-WM-ER–424-Rev.2) **Tank 241-C-109 headspace gas and vapor characterization results for samples collected in August 1994. Revision 2.** Huckaby, J.L. (Pacific Northwest Lab., Washington, DC (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050121. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1739 (WHC-SD-WM-ER–425) **Tank 241-C-111 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012593. Source: OSTI; NTIS; INIS; GPO Dep.

Tank C-111 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Results presented here represent the best available data on the headspace constituents of Tank C-111. Almost all of the data in this report was obtained from samples collected on September 13, 1994.Data from 2 other sets of samples, collected on August 10, 1993 and June 20, 1994, are in generally good agreement with the more recent data. The tank headspace temperature was determined to be 27 C. Air from the Tank C-111 headspace was withdrawn via a 7.9 m-long heated sampling probe mounted in riser 6, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 50 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 39 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks provided by the laboratories. Tank C-111 is a single shell tank which received first-cycle decontamination waste from B Plant and was later used as a settling tank.

1740 (WHC-SD-WM-ER–425-Rev.1) **Tank 241-C-111 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013559. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-111. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1741 (WHC-SD-WM-ER–425-Rev.2) **Tank 241-C-111 headspace gas and vapor characterization results for samples collected in August 1993 and September 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050122. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1742 (WHC-SD-WM-ER–426) **Tank 241-C-112 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012594. Source: OSTI; NTIS; INIS; GPO Dep.

Tank C-112 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank C-112 is a single-shell tank which received first-cycle decontamination waste from B Plant and was later used as a settling tank. Samples were collected from Tank C-112 using the vapor sampling system (VSS) on August 11, 1994 by WHC Sampling and Mobile Laboratories. The tank headspace temperature was determined to be 28 C. Air from the Tank C-112 headspace was withdrawn via a 7.9 m-long heated sampling probe mounted in riser 4, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 50 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 39 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks and 2 field blanks provided by the laboratories.

1743 (WHC-SD-WM-ER–426-Rev.1) **Tank 241-C-112 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Pacific Northwest Lab., Richland, WA (United States). 31 May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013565. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-112 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-C-112 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1744 (WHC-SD-WM-ER–426-Rev.2) **Tank 241-C-112 headspace gas and vapor characterization results for samples collected in June 1994 and August 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050218. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1745 (WHC-SD-WM-ER–427) **Tank 241-C-106 process test report.** Bander, T.J. Westinghouse Hanford Co., Richland, WA (United States). 30 May 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014316. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates the thermal hydraulic behavior of tank C-106 during and following the process test conducted from March 10, 1994 to June 15, 1994. During and following the process test the thermocouples on the thermocouple tree in riser No. 14 began to indicate significantly higher temperatures in the sludge than the low temperatures typically observed at this location. The thermocouples on the thermocouple tree in riser No. 8 during this same time period indicated temperature variations consistent with normal seasonal effects. This report summarizes the analyses conducted to understand the phenomena that caused the temperature history at riser No. 14.

1746 (WHC-SD-WM-ER–428) **Tank 241-BY-103 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012824. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-103 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-103 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1747 (WHC-SD-WM-ER–428-Rev.2) **Tank 241-BY-103 headspace gas and vapor characterization results for samples collected in May 1994 and November 1994.** Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050123. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1748 (WHC-SD-WM-ER–429) **Tank 241-BY-110 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012595. Source: OSTI; NTIS; INIS; GPO Dep.

Tank BY-110 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. Tank BY-110 is on the Ferrocyanide Watch List. Samples were collected from Tank BY-110 using the vapor sampling system (VSS) on November 11, 1994 by WHC Sampling and Mobile Laboratories. The tank headspace temperature was determined to be 27 C. Air from the Tank BY-110 headspace was withdrawn via a 7.9 m-long heated sampling probe mounted in riser 12B, and transferred via heated tubing to the VSS sampling manifold. All heated zones of the VSS were maintained at approximately 50 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, and Pacific Northwest Laboratories. The 40 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks and 2 field blanks that accompanied the samples.

1749 (WHC-SD-WM-ER–429-Rev.1) **Tank 241-BY-110 vapor sampling and analysis tank characterization report. Revision 1.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013907. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-BY-110. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to the tank farm workers due to fugitive emissions from the tank.

1750 (WHC-SD-WM-ER–429-Rev.2) **Tank 241-BY-110 Headspace Gas and Vapor Characterization Results for Samples Collected in November 1994. Revision 2.** Huckaby, J.L. (Pacific Northwest Lab., Washington, DC (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050124. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1751 (WHC-SD-WM-ER–430) **Waste tank headspace gas and vapor characterization reference guide.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012823. Source: OSTI; NTIS; INIS; GPO Dep.

This document is to serve as a reference guide for gas and vapor sample results presented in tank characterization reports. It describes sampling equipment, devices, and protocols, and sample collection and analysis methods common to all vapor samples.

1752 (WHC-SD-WM-ER–432) **Evaluation of remaining life of the double-shell tank waste systems.** Schwenk, E.B. Westinghouse Hanford Co., Richland, WA (United States). 4 May 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012789. Source: OSTI; NTIS; INIS; GPO Dep.

A remaining life assessment of the DSTs (double-shell tanks) and their associated waste transfer lines, for continued operation over the next 10 years, was favorable. The DST assessment was based on definition of significant loads, evaluation of data for possible material degradation and geometric changes and evaluation of structural analyses. The piping assessment was based primarily on service experience.

1753 (WHC-SD-WM-ER-436) **Dropping of mixing pump in Tank 102-AP.** Jimenez, R.F. Westinghouse Hanford Co., Richland, WA (United States). 2 Jun 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016334. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is to examine dropping of the mixing pump in Tank 102-AP during its removal poses the risk of causing a leak in the tank bottom with attendant potential for public exposure from the leak. The purpose of this investigation is to examine the potential for causing such a leak (i.e., estimated frequency of leak occurrence); to qualitatively estimate leak magnitude if its is a credible event; and, finally to compare the worker hazard, in the installation of an impact limiter (should it be required), to that which the public might incur if a leak is manifest in the tank bottom. The ultimate goal of the study is, of course, to assess the need for installation of an impact limiter.

1754 (WHC-SD-WM-ER-437) **Removal of mixing pump in tank 102-AP – pump drop onto central pit.** Jimenez, R.F. Westinghouse Hanford Co., Richland, WA (United States). 20 Jun 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015785. Source: OSTI; NTIS; INIS; GPO Dep.

The mixing pump, if dropped in the pump pit following its removal from the tank, is incapable of compromising the tank structure either locally or in a structural displacement mode to an extent which might allow dispersion of the contents. A drop from 10 ft above the pit floor (considered the maximum credible height) of a pump which is considered perfectly rigid does not approach the required perforation velocity. The velocity required to perforate requires a drop height which is physically impossible to attain with existing cranes. An analysis of the location of the deposition of the strain energy required to match the pump's impact kinetic energy, the results of which are shown in Table 2, verifies that there is no credible chance for compromise of the tank roof by such a drop.

1755 (WHC-SD-WM-ER-438) **Tank 241-B-103 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013896. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-B-103. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1756 (WHC-SD-WM-ER-438-Rev.1) **Tank 241-B-103 headspace gas and vapor characterization results for samples collected in February 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050125. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1757 (WHC-SD-WM-ER-439) **Tank 241-BX-104 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013897. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-BX-104. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1758 (WHC-SD-WM-ER-439-Rev.1) **Tank 241-BX-104 headspace gas and vapor characterization results for samples collected in December 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050126. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1759 (WHC-SD-WM-ER-440) **Tank 241-BY-111 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013572. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-111 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-111 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1760 (WHC-SD-WM-ER-440-Rev.1) **Tank 241-BY-111 headspace gas and vapor characterization results for samples collected in May 1994 and November 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050127. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1761 (WHC-SD-WM-ER–441) **Tank 241-BY-112 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013571. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-BY-112 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-BY-112 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1762 (WHC-SD-WM-ER–441-Rev.1) **Tank 241-BY-112 headspace gas and vapor characterization results for samples collected in November 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050135. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1763 (WHC-SD-WM-ER–442) **Tank 241-C-104 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013597. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-C-104 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-C-104 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1764 (WHC-SD-WM-ER–442-Rev.1) **Tank 241-C-104 headspace gas and vapor characterization results for samples collected in March 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050137. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1765 (WHC-SD-WM-ER–443) **Tank 241-C-105 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012136. Source: OSTI; INIS; NTIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-105. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1766 (WHC-SD-WM-ER–443-Rev.1) **Tank 241-C-105 headspace gas and vapor characterization results for samples collected in February 1994. Revision 1.** Huckaby, J.L. (Pacific Northwest Lab., Washington, DC (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050140. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1767 (WHC-SD-WM-ER–444) **Tank 241-C-106 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013230. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-106. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1768 (WHC-SD-WM-ER–444-Rev.1) **Tank 241-C-106 headspace gas and vapor characterization results for samples collected in February 1994.** Hackaby, J.L. (Pacific Northwest Lab., Washington, DC (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050141. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1769 (WHC-SD-WM-ER-445) **Tank 241-C-107 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015155. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-107. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1770 (WHC-SD-WM-ER-445-Rev.1) **Tank 241-C-107 headspace gas and vapor characterization results for samples collected in September 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050143. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1771 (WHC-SD-WM-ER-446) **Tank 241-S-102 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013596. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-S-102 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-S-102 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution. "

1772 (WHC-SD-WM-ER-446-Rev.1) **Tank 241-S-102 headspace gas and vapor characterization results for samples collected in March 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050145. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1773 (WHC-SD-WM-ER-447) **Tank 241-T-107 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013895. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-T-107. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1774 (WHC-SD-WM-ER-447-REV1) **Tank 241-T-107 Headspace Gas and Vapor Characterization Results for Samples Collected in January 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050149. Source: OSTI; NTIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1775 (WHC-SD-WM-ER-448) **Tank 241-TX-105 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013568. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-TX-105 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-TX-105 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1776 (WHC-SD-WM-ER-448-REV1) **Tank 241-TX-105 headspace gas and vapor characterization results for samples collected in December 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050151. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1777 (WHC-SD-WM-ER-449) **Tank 241-TX-118 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013570. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-TX-118 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-TX-118 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1778 (WHC-SD-WM-ER–449-Rev.1) **Tank 241-TX-118 headspace gas and vapor characterization results for samples collected in September 1994 and December 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050153. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1779 (WHC-SD-WM-ER–450) **Tank 241-U-106 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013911. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-U-106. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1780 (WHC-SD-WM-ER–450-REV1) **Tank 241-U-106 headspace gas and vapor characterization results for samples collected in March 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050155. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories

1781 (WHC-SD-WM-ER–451) **Tank 241-U-107 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013578. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-U-107 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-U-107 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1782 (WHC-SD-WM-ER–451-Rev.1) **Tank 241-U-107 headspace gas and vapor characterization results for samples collected in February 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050158. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1783 (WHC-SD-WM-ER–452) **Tank 241-U-111 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013577. Source: OSTI; NTIS; INIS; GPO Dep.

Tank 241-U-111 headspace gas and vapor samples were collected and analyzed to help determine the potential risks to tank farm workers due to fugitive emissions from the tank. The drivers and objectives of waste tank headspace sampling and analysis are discussed in "Program Plan for the Resolution of Tank Vapor Issues." Tank 241-U-111 was vapor sampled in accordance with "Data Quality Objectives for Generic In-Tank Health and Safety Issue Resolution."

1784 (WHC-SD-WM-ER–452-Rev.1) **Tank 241-U-111 headspace gas and vapor characterization results for samples collected in February 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050160. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1785 (WHC-SD-WM-ER–458) **Tank 241-C-101 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013881. Source: OSTI; NTIS; INIS; GPO Dep.

Tank C-101 headspace gas and vapor samples were collected and analyzed to help determine the potential risks of fugitive emissions to tank farm workers. Gas and vapor samples from the Tank C-101 headspace were collected on July 7, 1994 using the in situ sampling (ISS) method, and again on September 1, 1994 using the more robust vapor sampling system (VSS). Gas and vapor concentrations in

Tank C-101 are influenced by its connections to other tanks and its ventilation pathways. At issue is whether the organic vapors in Tank C-101 are from the waste in that tank, or from Tanks C-102 or C-103. Tank C-103 is on the Organic Watch List; the other two are not. Air from the Tank C-101 headspace was withdrawn via a 7.9-m long heated sampling probe mounted in riser 8, and transferred via heated tubing to the VSS sampling manifold. The tank headspace temperature was determined to be 34.0 C, and all heated zones of the VSS were maintained at approximately 50 C. Sampling media were prepared and analyzed by WHC, Oak Ridge National Laboratories, Pacific Northwest Laboratories, and Oregon Graduate Institute of Science and Technology through a contract with Sandia National Laboratories. The 39 tank air samples and 2 ambient air control samples collected are listed in Table X-1 by analytical laboratory. Table X-1 also lists the 14 trip blanks and 2 field blanks provided by the laboratories.

1786 (WHC-SD-WM-ER–458-Rev.1) **Tank 241-C-101 headspace gas and vapor characterization results for samples collected in September 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050162. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1787 (WHC-SD-WM-ER–459) **Tank 241-C-102 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Douglas United Nuclear, Inc., Richland, WA (United States). 31 May 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013562. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-102. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1788 (WHC-SD-WM-ER–459-Rev.1) **Tank 241-C-102 headspace gas and vapor characterization results for samples collected in August 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050164. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1789 (WHC-SD-WM-ER–460) **Tank 241-SX-106 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013903. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-SX-106. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1790 (WHC-SD-WM-ER–460-Rev.1) **Tank 241-SX-106 headspace gas and vapor characterization results for samples collected in March 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050166. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1791 (WHC-SD-WM-ER–461) **Tank 241-TY-101 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013902. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-TY-101. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1792 (WHC-SD-WM-ER–461-Rev.1) **Tank 241-TY-101 headspace gas and vapor characterization results for samples collected in August 1994 and April 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050168. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1793 (WHC-SD-WM-ER–462) **Tank 241-TY-103 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013898. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-TY-103. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1794 (WHC-SD-WM-ER–462-Rev.1) **Tank 241-TY-103 headspace gas and vapor characterization results for samples collected in August 1994 and April 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050172. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1795 (WHC-SD-WM-ER–463) **Tank 241-TY-104 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013560. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-TY-104. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedures that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1796 (WHC-SD-WM-ER–463-Rev.1) **Tank 241-TY-104 headspace gas and vapor characterization results for samples collected in April 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050174. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1797 (WHC-SD-WM-ER–464) **Tank 241-C-110 vapor sampling and analysis tank characterization report.** Huckaby, J.L. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013894. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-C-110. The drivers and objectives of the headspace vapor sampling and analysis were in accordance with procedure that were presented in other reports. The vapor and headspace gas samples were collected and analyzed to determine the potential risks to tank farm workers due to fugitive emissions from the tank.

1798 (WHC-SD-WM-ER–464-Rev.1) **Tank 241-C-110 headspace gas and vapor characterization results for samples collected in August 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050176. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1799 (WHC-SD-WM-ER–495) **Tank 241-C-106 thermal hydraulic analysis to establish the cooling liquid at a minimum level.** Bander, T.J. (Westinghouse Hanford Co., Richland, WA (United States)); Thurgood, M.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050179. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the computer simulations used to evaluate whether tank 241-C-106 can be operated at new lower operating liquid levels without significant reduction in th heat removal capability of the tank ventilation system. It is concluded that if the tank is operated with the liquid level between 72 and 74 in. the evaporation of the tank will be similar to what it is for the current operating level of 75 to 79 in. Analyses predict that for both operating limits voids will form during the summer months and disappear during the winter months. The waste temperatures for both operating limits will be close to the same. Installation of a chiller can maintain the highest waste temperatures below the saturation temperature (i.e., no voids will form) year round provided 67% of the original pool surface area is maintained for evaporation

1800 (WHC-SD-WM-ER–503) **Tank characterization report for single-shell tank 241-C-108.** Sederburg, J.P. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 130p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050184. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the information on the historical uses, present status, and the sampling and analysis results of waste stored in tank 241-C-108.

1801 (WHC-SD-WM-ER–505) **Tank 241-A-101 headspace gas and vapor characterization results for samples collected in June 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050186. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1802 (WHC-SD-WM-ER–506) **Tank 241-AX-102 headspace gas and vapor characterization results for samples collected in June 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050189. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1803 (WHC-SD-WM-ER–507) **Tank 241-S-111 headspace gas and vapor characterization results for samples collected in March 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050192. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1804 (WHC-SD-WM-ER–508) **Tank 241-SX-103 headspace gas and vapor characterization results for samples collected in March 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050197. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1805 (WHC-SD-WM-ER–509) **Tank 241-T-111 headspace gas and vapor characterization results for samples collected in January 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050198. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1806 (WHC-SD-WM-ER–511) **Tank 241-U-105 headspace gas and vapor characterization results for samples collected in February 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050200. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1807 (WHC-SD-WM-ER–512) **Tank 241-U-203 headspace gas and vapor characterization results for samples collected in August 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050201. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1808 (WHC-SD-WM-ER–513) **Tank 241-U-204 headspace gas and vapor characterization results for samples collected in August 1995.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050202. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1809 (WHC-SD-WM-ER–514) **Headspace gas and vapor characterization summary for the 43 vapor program suspect tanks.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050128. Source: OSTI; NTIS; INIS; GPO Dep.

During the time period between February 1994 and September 1995, Westinghouse Hanford Company (WHC) sampled the waste tank headspace of 43 single-shell tanks for a variety of gaseous and/or volatile and semi-volatile compounds. This report summarizes the results of analyses of those sampling activities with respect to both the Priority 1 Safety Issues and relative to the detection in the headspace of significant concentrations of target analytes relating to worker breathing space consideration as recommended by the Pacific Northwest Laboratory (PNL) Toxicology Review Panel. The information contained in the data tables was abstracted from the vapor sampling and analysis tank characterization reports. Selected results are tabulated and summarized. Sampling equipment and methods, as well as sample analyses, are briefly described.

Vapor sampling of passively ventilated single-shell tanks (tanks C-105, C-106, and SX-106 were sampled and are actively ventilated) has served to highlight or confirm tank headspace conditions associated with both priority 1 safety issues and supports source term analysis associated with protecting worker health and safety from noxious vapors

1810 (WHC-SD-WM-ER–519) **Ferrocyanide safety program: Final report on adiabatic calorimetry and tube propagation tests with synthetic ferrocyanide materials.** Fauske, H.F. (Fauske and Associates, Inc. (United States)); Meacham, J.E.; Cash, R.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050203. Source: OSTI; NTIS; INIS; GPO Dep.

Based on Fauske and Associates, Inc. Reactive System Screening Tool tests, the onset or initiation temperature for a ferrocyanide-nitrate propagating reaction is about 250 degrees Celcius. This is at about 200 degrees Celcius higher than current waste temperatures in the highest temperature ferrocyanide tanks. Furthermore, for current ambient waste temperatures, the tube propagation tests show that a ferrocyanide concentration of 15.5 wt% or more is required to sustain a propagation reaction in the complete absence of free water. Ignoring the presence of free water, this finding rules out propagating reactions for all the Hanford flowsheet materials with the exception of the ferrocyanide waste produced by the original In Farm flowsheet

1811 (WHC-SD-WM-ES–317) **Identification of Radioactive Pilot-Plant test requirements.** Powell, W.J.; Riebling, E.F. Westinghouse Hanford Co., Richland, WA (United States). 9 May 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015786. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive Pilot-Plant testing needs and alternatives are evaluated for enhanced Sludge Washing and High and Low-Level Vitrification efforts. Also investigated was instrument and equipment testing needs associated with the vitrification and retrieval process. The scope of this document is to record the existing March 1994 letter report for future use. A structured Kepner-Trego™ decision analysis process was used to assist analysis of the testing needs. This analysis provided various combinations of laboratory and radioactive (hot) and cold pilot testing options associated with the above need areas. Recommendations for testing requirements were made.

1812 (WHC-SD-WM-ES–321) **In-tank processes for destruction of organic complexants and removal of selected radionuclides.** Schulz, W.W.; Kupfer, M.J.; McKeon, M.M. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011673. Source: OSTI; NTIS; INIS; GPO Dep.

This report establishes the need and technical feasibility for using in-tank pretreatment processes for destruction of organic complexants and removal of ^{90}Sr, transuranic (TRU) elements, and ^{99}Tc from double-shell tank (DST) liquid wastes. Neither ^{90}Sr nor $^{99}T_c$have to be removed from any DST solution to obtain vitrified product containing less than the Nuclear Regulatory Commission (NRC) criteria for Class C commercial low-level waste (LLW). To meet the NRC criterion for Class C LLW, TRU elements must be removed from liquid wastes in three (possibly five) DSTs. No ^{90}Sr will have to be removed from any solution for the total vitrified waste from both DSTs and single-shell tanks to meet a goal of <7 MCi of radionuclides and a NRC ruling for Hanford Site Incidental Waste. Guidance from ALARA principles and the TWRS Environmental Impact Statement may dictate additional removal of radionuclides from DST supernatant liquids. Scavenging processes involving precipitation of strontium phosphate and/or hydrated iron oxide effectively remove ^{90}Sr and/or TRU elements from actual DST wastes including complexant concentrate (CC) wastes. Destruction of organic complexants is not required for these scavenging processes to reduce the ^{90}Sr and/or TRU element concentrations of DST waste solutions to or below the NRC criteria for Class C commercial LLW. However, substantially smaller amounts of scavenging agents would be required for removal of ^{90}Sr and TRU elements from CC waste if organic complexants were destroyed. Low concentrations of added $Sr(NO_3)_2$ and $Fe(NO_3)_3$ are desirable to minimize the volume of HLW glass.

1813 (WHC-SD-WM-ES–325) **Pre-1970 transuranic solid waste at the Hanford Site.** Greenhalgh, W.O. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015784. Source: OSTI; NTIS; INIS; GPO Dep.

The document is based on a search of pre-1970 Hanford Solid Waste Records. The available data indicates seven out of thirty-one solid waste burial sites used for pre-1970 waste appear to be Transuranic (TRU). A burial site defined to be TRU contains >100 nCi/gm Transuranic nuclides.

1814 (WHC-SD-WM-ES–331) **Identification of potential transuranic waste tanks at the Hanford Site.** Colburn, R.P. Westinghouse Hanford Co., Richland, WA (United States). 5 May 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012567. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to identify potential transuranic (TRU) material among the Hanford Site tank wastes for possible disposal at the Waste Isolation Pilot Plant (WIPP) as an alternative to disposal in the high-level waste (HLW) repository. Identification of such material is the initial task in a trade study suggested in WHC-EP-0786, Tank Waste Remediation System Decisions and Risk Assessment (Johnson 1994). The scope of this document is limited to the identification of those tanks that might be segregated from the HLW for disposal as TRU, and the bases for that selection. It is assumed that the tank waste will be washed to remove soluble inert material for disposal as low-level waste (LLW), and the washed residual solids will be vitrified for disposal. The actual recommendation of a disposal strategy for these materials will require a detailed cost/benefit analysis and is beyond the scope of this document.

1815 (WHC-SD-WM-ES–337) **Cost benefit and risk assessment for selected tank waste process testing alternatives.** Gasper, K.A. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Foster-Wheeler Environmental Corp., Richland, WA (United States). 22 May 1995. 644p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013837. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has established the Tank Waste Remediation System (TWRS) program to safely manage wastes currently stored in underground tank at the Hanford Site. A TWRS testing and development strategy was recently developed to define long-range TWRS testing plans. The testing and development strategy considered four alternatives. The primary variable in the alternatives is the level of pilot-scale testing involving actual waste. This study evaluates the cost benefit and risks associated with the four alternatives. Four types of risk were evaluated: programmatic schedule risk, process mishap risk, worker risk, and public health risk. The structure of this report is as follows: Section 1 introduces the report subject; Section 2 describes the test strategy alternative evaluation; Section 3 describes the approach used in this study to assess risk and cost benefit; Section 4 describes the assessment methodologies for costs and risks; Section 5 describes the bases and assumptions used to estimate the costs and risks; Section 6 presents the detailed costs and risks; and Section 7 describes the results of the cost benefit analysis and presents conclusions.

1816 (WHC-SD-WM-ES–343) **Moisture monitoring and control system engineering study.** Carpenter, K.E.; Fadeff, J.G. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012588. Source: OSTI; NTIS; INIS; GPO Dep.

During the past 50 years, a wide variety of chemical compounds have been placed in the 149 single-shell tanks (SSTS) on the Hanford Site. A concern relating to chemical stability, chemical control, and safe storage of the waste is the potential for propagating reactions as a result of ferrocyanide-oxidizer and organic-oxidizer concentrations in the SSTS. Propagating reactions in fuel-nitrate mixtures are precluded if the amounts of fuel and moisture present in the waste are within specified limits. Because most credible ignition sources occur near the waste surface, the main emphasis of this study is toward monitoring and controlling moisture in the top 14 cm (5.5 in.) of waste. The purpose of this engineering study is to recommend a moisture monitoring and control system for use in SSTs containing sludge and saltcake. This study includes recommendations for: (1) monitoring and controlling moisture in SSTs; (2) the fundamental design criteria for a moisture monitoring and control system; and (3) criteria for the deployment of a moisture monitoring and control system in hanford Site SSTs. To support system recommendations, technical bases for selecting and using a moisture monitoring and control system are presented. Key functional requirements and a conceptual design are included to enhance system development and establish design criteria.

1817 (WHC-SD-WM-ES–345) **Development and determination of a single-shell tank interim stabilization pumping strategy.** Garvin, L.J.; Kujak, S.K. ICF Kaiser Hanford Co., Richland, WA (United States). 12 Jun 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015819. Source: OSTI; NTIS; INIS; GPO Dep.

This activity plan addresses the technique and steps involved in simulating a riser installation in the dome of a single-shell waste storage tank by the used of a rotary drill rig. This simulation will provide information to avoid potential inadequacies in planning and field efforts in a nonradiological environment. Personnel can be trained in a nonradiological environmental while perfecting techniques for drilling and installing risers. It is essential that field equipment and installation procedures be perfected before the installation of risers in SSTs occurs. Time spent installing the actual risers in the SSTs will be minimized, aiding in safety of personnel and conformance to ALARA principles.

1818 (WHC-SD-WM-ES–346) **Flammable gas tank safety program: Technical basis for gas analysis and monitoring.** Sherwood, D.J. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050204. Source: OSTI; NTIS; INIS; GPO Dep.

Flammable gases generated in radioactive liquids. Twenty-five high level radioactive liquid waste storage tanks located underground at the Hanford Site are on a Flammable Gas Watch List because they contain waste which tends to retain the gases generated in it until rather large quantities are available for sudden release to the tank head space; if a tank is full it has little dome space, and a flammable concentration of gases could be produced–even if the tank is ventilated. If the waste has no tendency to retain gas generated in it then a continual flammable gas concentration in the tank dome space is established by the gas production rate and the tank ventilation rate (or breathing rate for unventilated tanks); this is also a potential problem for Flammable Gas Watch List tanks, and perhaps other Hanford tanks too. All Flammable Gas Watch List tanks will be fitted with Standard Hydorgen Monitoring Systems so that their behavior can be observed. In some cases, such as tank 241-SY-101, the data gathered from such observations will indicate that tank conditions need to be mitigated so that gas release events are either eliminated or rendered harmless. For example, a mixer pump was installed in tank 241-SY-101; operating the pump stirs the waste, replacing the large gas release events with small releases of gas that are kept below twenty-five percent of the lower flammability limit by the ventilation system. The concentration of hydrogen measured in Hanford waste tanks is greater than that of any other flammable gas. Hydrogen levels measured with a Standard Hydrogen Monitoring System in excess of 0.6 volume percent will cause Westinghouse Hanford Company to consider actions which will decrease the amount of flammable gas in the tank

1819 (WHC-SD-WM-ES–348) **Alternatives for high-level waste forms, containers, and container processing systems.** Crawford, T.W. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1995. 166p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050205. Source: OSTI; NTIS; INIS; GPO Dep.

This study evaluates alternatives for high-level waste forms, containers, container processing systems, and onsite interim storage. Glass waste forms considered are cullet, marbles, gems, and monolithic glass. Small and large containers configured with several combinations of overpack confinement and shield casks are evaluated for these waste forms. Onsite interim storage concepts including canister storage building, bore holes, and storage pad were configured with various glass forms and canister alternatives. All favorable options include the monolithic glass production process as the waste form. Of the favorable options the unshielded 4- and 7-canister overpack options have the greatest technical assurance associated with their design concepts due to their process packaging and storage methods. These canisters are 0.68 m and 0.54 m in diameter respectively and 4.57 m tall. Life-cycle costs are not a discriminating factor in most cases, varying typically less than 15 percent.

1820 (WHC-SD-WM-ETP–109) **Pump strongback redesign, pump storage, PM procedures.** Leshikar, G.A.; Desantis, N. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010594. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan describes the requirement for the fabrication of the safety latch, pump PM procedures and spare parts acquisitions.

1821 (WHC-SD-WM-ETP–152) **Engineering Task Plan for Tank 241-C-106 contingency chiller definitive design.** Rensink, G.E.; Kriskovich, J.R. Westinghouse Hanford Co., Richland, WA (United States). 22 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013363. Source: OSTI; NTIS; INIS; GPO Dep.

This document identifies the scope, cost, schedule and responsible organizations for completing a design of a contingency ventilation inlet air cooling system for Tank 241-C-106. The air cooling system, described in Rensink (1995), consists of a chiller, cooling coils, and supporting equipment that, when installed will be capable of assuring that the waste temperatures in Tank 241-C-106 are maintained within acceptable limits for safe storage. The effort described herein is scheduled for completion by May 31, 1995 to support Performance Based Incentive (PBI) Milestone SI-2x.

1822 (WHC-SD-WM-ETP–153) **Double-shell tank waste system assessment status and schedule.** Walter, E.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015776. Source: OSTI; NTIS; INIS; GPO Dep.

The integrated program for completing the integrity assessments of the dangerous waste tank systems managed by the Tank Waste Remediation System (TWRS) Division of Westinghouse Hanford Company is presented in the Tank Waste Remediation System Tank System Integrity Assessments Program Plan, WHC-SD-AP017, Rev. 1. The program plan identified the assessment requirements and the general scope to which these requirements applied. Some of these assessment requirements have been met and others are either in process of completion or scheduled to be worked. To define the boundary of the double-shell tank (DST) system and the boundaries of the DST system components (or system parts) for the purpose of performing integrity assessment activities; To identify the planned activities to meet the assessment requirements for each component; Provide the status of the assessment activities; and Project a five year assessment activity schedule.

1823 (WHC-SD-WM-EV–110) **Permitting plan for the high level waste vitrification plant.** Tollefson, K.S. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050208. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the regulatory requirements and describes alternative strategies for obtaining permits and approvals for the High Level Waste Vitrification Plant.

1824 (WHC-SD-WM-FHA–012) **Fire hazards analysis for the 241-AN-107 mixer pump installation and caustic addition.** Sepahpur, J.B. Westinghouse Hanford Co., Richland, WA (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010925. Source: OSTI; NTIS; INIS; GPO Dep.

This Fire Hazards Analysis (FHA) is intended to provide a comprehensive assessment of the risks from fire and fire related perils for the Tank 107AN mixer pump installation and caustic addition project at the Department of Energy (DOE) Hanford Site. The scope of this FHA is limited to a review of the hazards associated with the structures, systems and components for the caustic addition process. The fire hazards associated with the balance of tank farm "AN" are not within the scope of this FHA. This FHA addresses fire protection and life safety issues to demonstrate compliance with DOE Orders 5480.7A and 6430.1A to assure an acceptable level of protection for the facility occupants, the public and the environment are being provided.

1825 (WHC-SD-WM-FRD–018) **Functional design criteria for the retained gas sampler system.** Wootan, D.W. Westinghouse Hanford Co., Richland, WA (United States). 12 Apr 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011449. Source: OSTI; NTIS; INIS; GPO Dep.

A Retained Gas Sampler System (RGSS) is being developed to capture and analyze waste samples from Hanford Flammable Gas Watch List Tanks to determine both the quantity and composition of gases retained in the waste. The RGSS consists of three main components: the Sampler, Extractor, and Extruder. This report describes the functional criteria for the design of the RGSS components. The RGSS Sampler is based on the WHC Universal Sampler design with modifications to eliminate gas leakage. The primary function of the Sampler is to capture a representative waste sample from a tank and transport the sample with minimal loss of gas content from the tank to the laboratory. The function of the Extruder is to transfer the waste sample from the Sampler to the Extractor. The function of the Extractor is to separate the gases from the liquids and solids, measure the relative volume of gas to determine the void fraction, and remove and analyze the gas constituents.

1826 (WHC-SD-WM-FRD–021) **Functions and requirements for Hanford single-shell tank leakage detection and monitoring.** Cruse, J.M.; Ohl, P.C. Westinghouse Hanford Co., Richland, WA (United States). 19 Apr 1995. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011506. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the initial functions and requirements for leakage detection and monitoring applicable to past and potential future leakage from the Hanford Site's 149 single-shell high-level waste tanks. This mission is a part of the overall mission of the Westinghouse Hanford Company Tank Waste Remediation System division to remediate the tank waste in a safe and acceptable manner. Systems engineering principles are being applied to this effort. This document reflects the an initial step in the systems engineering approach to decompose the mission into primary functions and requirements. The document is considered approximately 30% complete relative to the effort required to produce a final version that can be used to support demonstration and/or procurement of technologies. The functions and requirements in this document apply to detection and monitoring of below ground leaks from SST containment boundaries and the resulting soil contamination. Leakage detection and monitoring is invoked in the TWRS Program in three fourth level functions: (1) Store Waste, (2) Retrieve Waste, and (3) Disposition Excess Facilities (as identified in DOE/RL-92-60 Rev. 1, Tank Waste Remediation System Functions and Requirements).

1827 (WHC-SD-WM-OCD-015-Rev.1) **Tank Farm Waste Transfer Compatibility Program.** Fowler, K.D. Westinghouse Hanford Co., Richland, WA (United States). 24 Apr 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011504. Source: OSTI; NTIS; INIS; GPO Dep.

The compatibility program described in this document formalizes the process for determining waste compatibility. Goal is to ensure that sufficient controls are in place to prevent the formation of incompatible mixtures during future operations, could possibly result in an unreviewed safety question. Waste transfer decision rules are presented as a process for assessing compatibility of wastes or waste mixtures. The process involves characterizing the waste comparing waste characteristics with the criteria, resolving potential incompatibilities, and documenting the process.

1828 (WHC-SD-WM-OTP-174) **Operability test procedure for rotary mode core sampling system #3.** Farris, T.R.; Jarecki, T.D. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011664. Source: OSTI; NTIS; INIS; GPO Dep.

This document gives instructions for the Operability Testing of the Rotary Mode Core Sampling (RMCS) System No. 3. This document is based on the Operability Test Procedure for RMCS system No. 2 because the basic design is the same for all three systems. Modifications have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system. Operability testing of the Rotary Mode Core Sampling System No. 3, will verify that functional and operational requirements have been met. Testing will be completed in two phases. The first phase of testing (section 7) will involve operating the truck equipment to demonstrate its capabilities. The second phase of testing (section 8) will take repeated samples in a simulated operation environment. These tests will be conducted at the "Rock Slinger" test site located just south of U-Plant in the 200 West Area. Tests will be done in a simulated tank farm environment. All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions. Systems will be assembled and arranged in a manner similar to that expected in the field.

1829 (WHC-SD-WM-OTP-175) **Operability test procedure for rotary mode core sampling system #4.** Farris, T.R.; Jarecki, T.D. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011666. Source: OSTI; NTIS; INIS; GPO Dep.

This document gives instructions for the Operability Testing of the Rotary Mode Core Sampling (RMCS) System No. 4. This document is based on the Operability Test Procedure for RMCS system No. 2 because the basic design is the same for all three systems. Modifications have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system. Operability testing of the Rotary Mode Core Sampling System No. 4 will verify that functional and operational requirements have been met. Testing will be completed in two phases. The first phase of testing (section 7) will involve operating the truck equipment to demonstrate its capabilities. The second phase of testing (section 8) will take repeated samples in a simulated operation environment. These tests will be conducted at the "Rock Slinger" test site located just south of U-Plant in the 200 West Area. Tests will be done in a simulated tank farm environment. All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions. Systems will be assembled and arranged in a manner similar to that expected in the field.

1830 (WHC-SD-WM-OTP-176) **Operability test procedure for the Rotary Mode Core Sampling System Exhausters 3 and 4.** WSaldo, E.J. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013563. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a procedure for performing operability testing of the Rotary Mode Core Sampling System Exhausters 3 & 4. Upon completion of testing activities an operability testing report will be issued.

1831 (WHC-SD-WM-OTP-177) **Contaminated liquid drain system operability test.** Meloy, R.T. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011661. Source: OSTI; NTIS; INIS; GPO Dep.

This plan provides for starting and testing of the liquid waste storage, tanks with their associated instrumentation, load-out pump, piping, and newly installed remote sampling and recirculation pipe. Instrumentation and control circuits will be proven and samples will be taken to demonstrate adequate sampling. The system will be operated under direction of the test engineer to establish a more thorough understanding of its performance under various conditions.

1832 (WHC-SD-WM-OTP-181) **Acceptance/operational test procedure 103-AN tank camera purge system and 103-AN video camera system.** Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). 5 Sep 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050212. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance/Operational Test Procedure will document the satisfactory operation of the 103-AN Camera Purge Control System and 103-AN Video Camera System

1833 (WHC-SD-WM-OTP-182) **Acceptance/operational test procedure 104-AN tank camera purge System and 104-AN video camera system.** Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050129. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance/Operational Test Procedure will document the satisfactory operation of the 104-AN Camera Purge Control System and 104-AN Video Camera System

1834 (WHC-SD-WM-OTP–183) **Acceptance/operational test procedure 105-AN tank camera purge system and 105-AN video camera system.** Castleberry, J.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050130. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance/Operational Test Procedure will document the satisfactory operation of the 105-AN Camera Purge Control System and 105-AN Video Camera System

1835 (WHC-SD-WM-OTP–189) **Operational test procedure for SY tank farm replacement exhauster unit.** McClees, J. Westinghouse Hanford Co., Richland, WA (United States). 26 Sep 1995. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050131. Source: OSTI; NTIS; INIS; GPO Dep.

This operational test procedure will verify that the remaining functions not tested per WHC-SD-WM-ATP-080, or components disturbed during final installation, as well as interfaces with other tank farm equipment and remote monitoring stations are operating correctly.

1836 (WHC-SD-WM-OTR–158) **ATR/OTR-SY Tank Camera Purge System and in Tank Color Video Imaging System.** Werry, S.M. Westinghouse Hanford Co., Richland, WA (United States). 6 Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015778. Source: OSTI; NTIS; INIS; GPO Dep.

This procedure will document the satisfactory operation of the 101-SY tank Camera Purge System (CPS) and 101-SY in tank Color Camera Video Imaging System (CCVIS). Included in the CPRS is the nitrogen purging system safety interlock which shuts down all the color video imaging system electronics within the 101-SY tank vapor space during loss of nitrogen purge pressure.

1837 (WHC-SD-WM-PLN–100) **Waste shipment engineering data management plan.** Marquez, D.L. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012836. Source: OSTI; NTIS; INIS; GPO Dep.

This plan documents current data management practices and future data management improvements for TWRS Waste Shipment Engineering.

1838 (WHC-SD-WM-QAPP–009-Rev.2) **242-A Evaporator quality assurance plan. Revision 2.** Basra, T.S. Westinghouse Hanford Co., Richland, WA (United States). 4 May 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012575. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this quality assurance project plan (Plan) is to provide requirements for activities pertaining to sampling, shipping, and analyses associated with candidate feed tank samples for the 242-A Evaporator project. The purpose of the 242-A Evaporator project is to reduce the volume of aqueous waste in the Double Shell Tank (DST) System and will result in considerable savings to the disposal of mixed waste. The 242-A Evaporator feed stream originates from DSTs identified as candidate feed tanks. The 242-A Evaporator reduces the volume of aqueous waste contained in DSTs by boiling off water and sending the condensate (called process condensate) to the Liquid Effluent Retention Facility (LEPF) storage basin where it is stored prior to treatment in the Effluent Treatment Facility (ETF). The objective of this quality assurance project plan is to provide the planning, implementation, and assessment of sample collection and analysis, data issuance, and validation activities for the candidate feed tanks.

1839 (WHC-SD-WM-RPT–110) **Vapor and gas sampling of single-shell tank 241-C-108 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050132. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the August 5, 1994, sampling of SST 241-C-108 using the vapor sampling system.

1840 (WHC-SD-WM-RPT–111) **Vapor and gas sampling of single-shell tank 241-C-109 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050133. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data from the August 10, 1994, sampling of SST 241-C-109 using the vapor sampling system.

1841 (WHC-SD-WM-RPT–112) **Vapor and gas sampling of single-shell tank 241-C-112 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050134. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the August 11, 1994, sampling of SST 241-C-112 using the vapor sampling system.

1842 (WHC-SD-WM-RPT–113) **Vapor and gas sampling of single-shell tank 241-BX-104 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050136. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the December 30, 1994, sampling of SST 241-BX-104 using the vapor sampling system.

1843 (WHC-SD-WM-RPT–114) **Vapor and gas sampling of single-shell tank 241-TX-118 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050138. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the December 16, 1994, sampling of SST 241-TX-118 using the vapor sampling system.

1844 (WHC-SD-WM-RPT–115) **Vapor and Gas Sampling of Single-Shell Tank 241-TX-105 Using the Vapor Sampling System.** Caprio, G.S. Westinghouse Hanford

Co., Richland, WA (United States). 20 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050139. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the December 20, 1994, sampling of SST 241-TX-105 using the vapor sampling system.

1845 (WHC-SD-WM-RPT–119) **Vapor and gas sampling of single-shell tank 241-C-111 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050142. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the September 21, 1995, sampling of SST 241-C-111 using the vapor sampling system.

1846 (WHC-SD-WM-RPT–120) **Vapor and gas sampling of single-shell tank 241-BY-107 using the Vapor Sampling System.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050144. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the October 26, 1994, sampling of SST 241-BY-107 using the Vapor Sampling System.

1847 (WHC-SD-WM-RPT–121) **Vapor and gas sampling of single-shell tank 241-BY-108 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050146. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the October 27, 1994, sampling of SST 241-BY-108 using the vapor sampling system.

1848 (WHC-SD-WM-RPT–122) **Vapor and gas sampling of single-shell tank 241-BY-103 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 25 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050147. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the November 1, 1994, sampling of SST 241-BY-103 using the vapor sampling system.

1849 (WHC-SD-WM-RPT–123) **Vapor and gas sampling of single-shell tank 241-BY-110 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 19 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050148. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the November 11, 1994, sampling of SST 241-BY-110 using the vapor sampling system.

1850 (WHC-SD-WM-RPT–124) **Vapor and gas sampling of single-shell tank 241-BY-111 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 7 Sep 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050150. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the November 16, 1994, sampling of SST 241-BY-111 Using the Vapor Sampling System.

1851 (WHC-SD-WM-RPT–125) **Vapor and gas sampling of single-shell tank 241-BY-112 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050152. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data from the November 18, 1994, sampling of SST 241-BY-112 using the vapor sampling system.

1852 (WHC-SD-WM-RPT–130) **Vapor and gas sampling of single-shell tank 241-T-107 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 7 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050154. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the January 18, 1995, sampling of SST 241-T-107 Using the Vapor Sampling System.

1853 (WHC-SD-WM-RPT–131) **Vapor and gas sampling of Single-Shell Tank 241-T-111 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050156. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the January 20, 1995, sampling of SST 241-T-111 using the vapor sampling system.

1854 (WHC-SD-WM-RPT–133) **Vapor and gas sampling of single-shell tank 241-B-103 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050157. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the February 8, 1995, sampling of SST 241-B-103 using the vapor sampling system.

1855 (WHC-SD-WM-RPT–142) **Vapor and gas sampling of single-shell tank 241-S-102 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 7 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050159. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the March 14, 1995, sampling of SST 241-S-102 Using the Vapor Sampling System.

1856 (WHC-SD-WM-RPT–143) **Vapor and gas sampling of single-shell tank 241-S-111 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 15 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050161. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the March 21, 1995, sampling of SST 241-S-111 using the vapor sampling system.

1857 (WHC-SD-WM-RPT–144) **Vapor and gas sampling of single-shell tank 241-SX-103 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 22 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050163. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the March 23, 1995, sampling of SST 241-SX-103 using the vapor sampling system.

1858 (WHC-SD-WM-RPT–145) **Vapor and gas sampling of single-shell tank 241-SX-106 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050165. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the March 24, 1995, sampling of SST 241-SX-106 using the vapor sampling system.

1859 (WHC-SD-WM-RPT–146) **Vapor and gas sampling of single-shell tank 241-TY-101 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050167. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data from the April 6, 1995, sampling of SST 241-TY-101 using the vapor sampling system.

1860 (WHC-SD-WM-RPT–147) **Vapor and gas sampling of single-shell tank 241-TY-103 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). 20 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050169. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data from the April 11, 1995, sampling of SST 241-TY-103 using the vapor sampling system.

1861 (WHC-SD-WM-RPT–152) **Vapor and gas sampling of Single-Shell Tank 241-U-107 using the Vapor Sampling System.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050175. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the February 17, 1995, sampling of SST 241-U-107 using the Vapor Sampling System.

1862 (WHC-SD-WM-RPT–153) **Vapor and gas sampling of Single-Shell Tank 241-U-111 using the vapor sampling system.** Caprio, G.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050177. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents sampling data resulting from the February 28, 1995, sampling of SST 241-U-111 using the vapor sampling system.

1863 (WHC-SD-WM-RPT–190) **Tank waste remediation system heat stress control program report, 1995.** Carls, D.R. Westinghouse Hanford Co., Richland, WA (United States). 28 Sep 1995. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050180. Source: OSTI; NTIS; INIS; GPO Dep.

Protecting employees from heat stress within tank farms during the summer months is challenging. Work constraints typically experienced in tank farms complicate the measures taken to protect employees from heat stress. TWRS-Industrial Hygiene (IH) has endeavored to control heat stress injuries by anticipating, recognizing, evaluating and controlling the factors which lead or contribute to heat stress in Tank Farms. The TWRS Heat Stress Control Program covers such areas as: employee and PIC training, communication of daily heat stress alerts to tank farm personnel, setting work/rest regimens, and the use of engineering and personal protective controls when applicable. The program has increased worker awareness of heat stress and prevention, established provisions for worker rest periods, increased drinking water availability to help ensure worker hydration, and allowed for the increased use of other protective controls to combat heat stress. The TWRS Heat Stress Control Program is the cornerstone for controlling heat stress among tank farm employees. The program has made great strides since it's inception during the summer of 1994. Some improvements can still be made to enhance the program for the summer of 1996, such as: (1) procurement and use of personal heat stress monitoring equipment to ensure appropriate application of administrative controls, (2) decrease the need for use of containment tents and anti-contamination clothing, and (3) providing a wider variety of engineering and personal protective controls for heat stress prevention

1864 (WHC-SD-WM-RPT–191) **Summary of FY-95 NIR moisture measurement development and implementation activities.** Reich, F.R.; Rebagay, T.V.; Dodd, D.A.; Lopez, T.; Watts, J.K. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 76p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050181. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the work completed in FY-95 in preparing an NIR moisture probe for early hot cell deployment. This work was completed by a team from WHC's Process Analytical Labs and Tank Technology Projects organizations and was funded by EM-50 office of Technology Development and EM-30's Tank Waste Remediation Systems Programs.

1865 (WHC-SD-WM-SARR–031-Rev.1) **Safety analysis for push-mode and rotary-mode core sampling. Rev. 1.** Milliken, N.J.; Geschke, G.R. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 107p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015587. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the basis for core sampling operations that will be performed in hazardous and radioactive waste tanks at the Hanford site. The document covers both push- and rotary-mode core sampling. Hazards are identified and evaluated, consequences are calculated, and controls to mitigate or prevent accidents are developed.

1866 (WHC-SD-WM-SARR–032) **Accelerated safety analyses structural analyses Phase 2 ACI code evaluations of the maximum loads in the concrete dome, haunch & upper wall of double-shell waste storage tanks.** Scott, M.A. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 1314p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Source: OSTI.

Structural analysis of the double-shell tanks utilizing the Accelerated Safety Analysis-Phase 1 (WHC-SD-WM-DA-150) models was completed to verify the current double-shell tank analysis of record (WHC-SD-WM-ANAL-33, 34 and 35) for the maximum load combination. The stresses resulting from the maximum load combination determined from the Phase I sensitivity studies were compared to the stresses in the analysis of record and to the tanks' structural capacity. The maximum load combinations for the DSTs were comparable to those in the analysis of record and will not exceed American Concrete Institute Code allowable limits in the dome, haunch and upper wall for normal loading. The normal loading includes the soil overburden, uniform and concentrated live loads and elevated temperatures as limited by the Interim Operational Safety Requirements for standard and aging waste double-shell tanks. The generic accelerated safety analysis double shell tank model was used to evaluate the maximum loading determined from the Phase I load sensitivity study. The evaluation, as requested, concentrated on the structural capacity of the upper portions of the double-shell tank secondary concrete structure, which resists the overburden loads.

1867 (WHC-SD-WM-SD–020) **Tank Waste Remediation System High-Level Waste Melter Vitrification System Development and Testing Strategy.** Calmus, R.B. Westinghouse Hanford Co., Richland, WA (United States). 16 Feb 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008786. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the general strategy for developing and testing the performance of candidate high-level waste melter systems and establishing the basis for selecting the preferred melter system for the high-level waste vitrification plant.

1868 (WHC-SD-WM-SDP–010) **Software Development Plan for the 241-AY and 241-AZ Tank Farm MICON automation system.** Teats, M.C. Westinghouse Hanford Co., Richland, WA (United States). 28 Apr 1995. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012796. Source: OSTI; NTIS; INIS; GPO Dep.

Project W-030 will install a new tank ventilation system for the aging 241-AY and 241-AZ tank farm facilities. Controls for this system will be provided by a MICON distributed control system. This document defines the plan, deliverables, and schedule to develop software for the control system.

1869 (WHC-SD-WM-SDS–005) **System design specification for rotary mode core sample trucks No. 2, 3, and 4 programmable logic controller.** Dowell, J.L.; Akers, J.C. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050183. Source: OSTI; NTIS; INIS; GPO Dep.

The system this document describes controls several functions of the Core Sample Truck(s) used to obtain nuclear waste samples from various underground storage tanks at Hanford. The system will monitor the sampling process and provide alarms and other feedback to insure the sampling process is performed within the prescribed operating envelope. The intended audience for this document is anyone associated with rotary or push mode core sampling. This document describes the Alarm and Control logic installed on Rotary Mode Core Sample Trucks (RMCST) #2, 3, and 4. It is intended to define the particular requirements of the RMCST alarm and control operation (not defined elsewhere) sufficiently for detailed design to implement on a Programmable Logic Controller (PLC).

1870 (WHC-SD-WM-SP–004-Rev.1) **Tank safety screening data quality objective. Revision 1.** Hunt, J.W. Westinghouse Hanford Co., Richland, WA (United States). 27 Apr 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011669. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Safety Screening Data Quality Objective (DQO) will be used to classify 149 single shell tanks and 28 double shell tanks containing high-level radioactive waste into safety categories for safety issues dealing with the presence of ferrocyanide, organics, flammable gases, and criticality. Decision rules used to classify a tank as "safe" or "not safe" are presented. Primary and secondary decision variables used for safety status classification are discussed. The number and type of samples required are presented. A tabular identification of each analyte to be measured to support the safety classification, the analytical method to be used, the type of sample, the decision threshold for each analyte that would, if violated, place the tank on the safety issue watch list, and the assumed (desired) analytical uncertainty are provided. This is a living document that should be evaluated for updates on a semiannual basis. Evaluation areas consist of: identification of tanks that have been added or deleted from the specific safety issue watch lists, changes in primary and secondary decision variables, changes in decision rules used for the safety status classification, and changes in analytical requirements. This document directly supports all safety issue specific DQOs and additional characterization DQO efforts associated with pretreatment and retrieval. Additionally, information obtained during implementation can assist in resolving assumptions for revised safety strategies, and in addition, obtaining information which will support the determination of error tolerances, confidence levels, and optimization schemes for later revised safety strategy documentation.

1871 (WHC-SD-WM-SP–006-Rev.1) **Testing and development strategy for the tank waste remediation system.** Reddick, G.W. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012829. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a strategy for performing radioactive (hot) and nonradioactive testing to support processing tank waste. It evaluates the need for hot pilot plant(s) to support pretreatment and other processing functions and presents a strategy for performing hot test work. A strategy also is provided for nonradioactive process and equipment testing. The testing strategy supports design, construction, startup, and operation of Tank Waste Remediation System (TWRS) facilities.

1872 (WHC-SD-WM-SP–009) **Evaluation of alternative chemical additives for high-level waste vitrification**

feed preparation processing. Seymour, R.G. Westinghouse Hanford Co., Richland, WA (United States). 7 Jun 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015818. Source: OSTI; NTIS; INIS; GPO Dep.

During the development of the feed processing flowsheet for the Defense Waste Processing Facility (DWPF) at the Savannah River Site (SRS), research had shown that use of formic acid (HCOOH) could accomplish several processing objectives with one chemical addition. These objectives included the decomposition of tetraphenylborate, chemical reduction of mercury, production of acceptable rheological properties in the feed slurry, and controlling the oxidation state of the glass melt pool. However, the DEPF research had not shown that some vitrification slurry feeds had a tendency to evolve hydrogen (H_2) and ammonia (NH_3) as the result of catalytic decomposition of CHOOH with noble metals (rhodium, ruthenium, palladium) in the feed. Testing conducted at Pacific Northwest Laboratory and later at the Savannah River Technical Center showed that the H_2 and NH_3 could evolve at appreciable rates and quantities. The explosive nature of H_2 and NH_3 (as ammonium nitrate) warranted significant mitigation control and redesign of both facilities. At the time the explosive gas evolution was discovered, the DWPF was already under construction and an immediate hardware fix in tandem with flowsheet changes was necessary. However, the Hanford Waste Vitrification Plant (HWVP) was in the design phase and could afford to take time to investigate flowsheet manipulations that could solve the problem, rather than a hardware fix. Thus, the HWVP began to investigate alternatives to using HCOOH in the vitrification process. This document describes the selection, evaluation criteria, and strategy used to evaluate the performance of the alternative chemical additives to CHOOH. The status of the evaluation is also discussed.

1873 (WHC-SD-WM-TA–162) **Double-Shell Tank Retrieval Allowable Heel Trade Analysis.** Grams, W.H. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050185. Source: OSTI; NTIS; INIS; GPO Dep.

This Double-Shell Tank Retrieval Allowable Heel Trade Analysis evaluates the effects a remaining heel has on subsequent waste storage requirements after initial retrieval. The information contained in this analysis will be used as a basis to identify crucial double-shell tank (DST) retrieval system design and performance requirements for continued storage of waste in DSTs. The information presented in this analysis is summarized by the DST initial retrieval and reuse strategy. The strategy is based on the waste compatibility and consolidation requirements that are governed by the remaining heel after initial retrieval

1874 (WHC-SD-WM-TI–640) **Double shell tanks plutonium inventory assessment.** Tusler, L.A. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014319. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides an evaluation that establishes plutonium inventory estimates for all DSTs based on known tank history information, the DST plutonium inventory tracking system, tank characterization measurements, tank transfer records, and estimated average concentration values for the various types of waste. These estimates use data through December 31, 1994, and give plutonium estimates as of January 1, 1995. The plutonium inventory values for the DSTs are given in Section 31. The plutonium inventory estimate is 224 kg for the DSTs and 854 kg for the SSTs for a total of 1078 kg. This value compares favorably with the total plutonium inventory value of 981 kg obtained from the total plutonium production minus plutonium recovery analysis estimates.

1875 (WHC-SD-WM-TI–684) **Waste characterization of the 101-SY hydrogen mitigation mixing pump shipping container.** Gedeon, S.R. Westinghouse Hanford Co., Richland, WA (United States). 19 May 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013347. Source: OSTI; NTIS; INIS; GPO Dep.

The Hydrogen Mitigation Mixing Pump (HMMP) in Tank 241-SY-101 will need to be removed at some point. At that time, the HMMP will be placed in a shipping container and transferred to a designated onsite location depending on waste classification. This report shows how the radioactive material content of shipping container will be determined. Once the radioactive material loading is known, the waste classification of the container may be determined in accordance with established procedures.

1876 (WHC-SD-WM-TI–690) **Waste volume reduction factors for potential 242-A evaporator feed.** Sederburg, J.P. Westinghouse Hanford Co., Richland, WA (United States). 4 May 1995. 94p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012790. Source: OSTI; NTIS; INIS; GPO Dep.

Double-shell tank (DST) storage space requirements have been shown to be highly dependent on the end point of 242-A operations. Consequences to the DST of various waste volumes, and concentrations, are evaluated. Only waste streams that are currently planned to be stored in the DST system before the year 2004 are discussed. As of January 1, 1995, approximately 27-million L (7.2-million gal) of dilute wastes are stored in the DSTs available for evaporator processing. Waste streams planned to be transferred to the DSTs before December 31, 2004, are identified. The DST volume for storing slurry from these wastes is presented in this document. At a final slurry specific gravity of -1.35, 22.5-million L (5.93-million gal) of DST space would be needed on December 31, 2004, to store the product from evaporator processing of these feedstocks. The expected volume needed if the resultant slurry were concentrated to the traditional double-shell slurry feed (DSSF) phase boundary (a specific gravity of ~1.5) would be 17.7-million L (4.67-million gal). An additional 4.8-million L (1.26-million gal) is therefore needed if these wastes are concentrated to a specific gravity of 1.35 instead of the DSSF limit.

1877 (WHC-SD-WM-TI–691) **Strategy for resolution of the Flammable Gas Safety Issue.** Johnson, G.D. Westinghouse Hanford Co., Richland, WA (United States). 25 Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011507. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide the general strategy for resolution of the flammable gas safety issue; it is not a detailed description of program activities. budgets and schedules. Details of the program activities have been issued (Johnson and Sherwood, 1994) and the information pertaining to budgets is provided in the FY 1995-1997 Multi-Year Work Plan for Tank Waste Remediation System

(TWRS) (Program Element 1.1.1.2.02.). The key element in this strategy is to provide an understanding of the behavior of each of the Flammable Gas Watch List tanks. While a review of historical information does provide some insight, it is necessary to gather current information about the gases, behavior and nature of the waste,. and about the control systems that maintain and monitor the waste. Analysis of this information will enable TWRS to determine the best approach to place any tank in a safe condition, if it is found to be in an unsafe state.

1878 (WHC-SD-WM-TI–696) **296-B-10 stack monitoring and sampling system annual system assessment report.** Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). 26 Apr 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011665. Source: OSTI; NTIS; INIS; GPO Dep.

B Plant Administration Manual, requires an annual system assessment to evaluate and report the present condition of the sampling and monitoring system associated with stack 296-B-10 at B Plant. The ventilation system of WESF (Waste Encapsulation and Storage Facility) is designed to provide airflow patterns so that air movement throughout the building is from areas of lesser radioactivity to areas of greater radioactivity. All potentially contaminated areas are maintained at a negative pressure with respect to the atmosphere so that air flows into the building at all times. The exhaust discharging through the 296-B-10 stack is continuously monitored and sampled using a sampling and monitoring probe assembly located approximately 17.4 meters (57 feet) above the base of the stack. The probe assembly consists of 5 nozzles for the sampling probe and 2 nozzles to monitor the flow. The sampling and monitoring system associated with Stack 296-B-10 is functional and performing satisfactorily.

1879 (WHC-SD-WM-TI–702) **Chloride removal from vitrification offgas.** Slaathaug, E.J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Fluor Daniel, Inc., Irvine, CA (United States). 1 Jun 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015585. Source: OSTI; NTIS; INIS; GPO Dep.

This study identified and investigated techniques of selectively purging chlorides from the low-level waste (LLW) vitrification process with the purge stream acceptable for burial on the Hanford Site. Chlorides will be present in high concentration in several individual feeds to the LLW Vitrification Plant. The chlorides are highly volatile in combustion type melters and are readily absorbed by wet scrubbing of the melter offgas. The Tank Waste Remediation System (TWRS) process flow sheets show that the resulting chloride rich scrub solution is recycled back to the melter. The chlorides must be purged from the recycle loop to prevent the buildup of excessively high chloride concentrations.

1880 (WHC-SD-WM-TI–705) **Solid waste handling.** Parazin, R.J. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014305. Source: OSTI; NTIS; INIS; GPO Dep.

This study presents estimates of the solid radioactive waste quantities that will be generated in the Separations, Low-Level Waste Vitrification and High-Level Waste Vitrification facilities, collectively called the Tank Waste Remediation System Treatment Complex, over the life of these facilities. This study then considers previous estimates from other 200 Area generators and compares alternative methods of handling (segregation, packaging, assaying, shipping, etc.).

1881 (WHC-SD-WM-TI–706) **Remote connector development study.** Parazin, R.J. Fluor Daniel, Inc., Irvine, CA (United States). May 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014317. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium-uranium extraction (PUREX) connectors, the most common connectors used at the Hanford site, offer a certain level of flexibility in pipe routing, process system configuration, and remote equipment/instrument replacement. However, these desirable features have inherent shortcomings like leakage, high pressure drop through the right angle bends, and a limited range of available pipe diameters that can be connect by them. Costs for construction, maintenance, and operation of PUREX connectors seem to be very high. The PUREX connector designs include a 90° bend in each connector. This increases the pressure drop and erosion effects. Thus, each jumper requires at least two 90° bends. PUREX connectors have not been practically used beyond 100 (4 in.) inner diameter. This study represents the results of a survey on the use of remote pipe-connection systems in US and foreign plants. This study also describes the interdependence between connectors, remote handling equipment, and the necessary skills of the operators.

1882 (WHC-SD-WM-TI–711) **Remediation and cleanout levels for Hanford site single-shell tanks.** Boothe, G.F. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 126p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050188. Source: OSTI; NTIS; INIS; GPO Dep.

The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1994), requires the retrieval of 99 percent of the Hanford Site single-shell tank (SST) waste. Retrieval of the waste requires the completion of saltwell pumping and then the sluicing of all 149 tanks, at a cost of over $3 billion. The retrieved waste is to be processed and vitrified for ultimate disposal as glass. This document shows that the intent of the Tri-Party Agreement can be met by sluicing the waste from only 86 tanks, after the completion of saltwell pumping. This partial retrieval option will result in a cost savings of over $600 million in construction and operation alone, and will significantly reduce the volume of glass requiring disposal

1883 (WHC-SD-WM-TI–713) **Development of in-structure design spectra for dome mounted equipment on underground waste storage tanks at the Hanford Site.** Julyk, L.J. (ICF Kaiser Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050214. Source: OSTI; NTIS; INIS; GPO Dep.

In-structure response spectra for dome mounted equipment on underground waste storage tanks at the Hanford Site are developed on the basis of recent soil-structure-interaction analyses. Recommended design spectra are provided for various locations on the tank dome.

1884 (WHC-SD-WM-TI–719) **Preliminary engineering evaluation of heat and digest treatment for in-tank removal of radionuclides from complexed waste.** Klem, M.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050215. Source: OSTI; NTIS; INIS; GPO Dep.

This report uses laboratory data from low temperature-ambient pressure digestion of actual complexed supernatant to evaluate digestion as a pretreatment method for waste in double-shell tanks 241-AN-102, 241-AN-107 and 241-AY-101. Digestion time requirements were developed at 100 degrees celsius to remove organic and meet NRC Class C criterion for TRU elements and NRC Class B criterion for 90Sr. The incidental waste ruling will establish the need for removal of 90Sr. Digestion pretreatment precipitates non radioactive metal ions and produces additional high-level waste solids and canisters of high level glass. This report estimates the amount of additional high-level waste produced and preliminary capital and operating costs for in-tank digestion of waste. An overview of alternative in-tank treatment methods is included

1885 (WHC-SD-WM-TP–325) **Tank 241-SX-115 tank characterization plan.** Sasaki, L.M. Westinghouse Hanford Co., Richland, WA (United States). 24 Apr 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012835. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Project, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-SX-115.

1886 (WHC-SD-WM-TP–328) **Test plan for phase II of the Retained Gas Sampler system.** Hey, B.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Jun 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015742. Source: OSTI; NTIS; INIS; GPO Dep.

The Retained Gas Sampler (RGS) system is being developed to permit characterization of the gas phase component of waste tank core samples. Several laboratory experiments have been conducted which have affirmed the proof-of-principle for separating the gas phase materials from waste tank material in a quantitative manner. However, experiments conducted thus far have dealt only with representative materials and simulated hardware mock-ups. This test plan deals with the operation and testing of actual devices in the hot cell environment. This test plan coves all aspects of the RGS system including: sampler load-in, extrusion, gas extraction, quantitative separation, sample collection, and quantitative analysis. Sample material used in this test plan will be waste tank simulants and will not be radioactive. The work environment, however, will be an operating hot cell facility and will have radioactive contaminated surfaces. Operation of the system will therefore require an official radiation work permit (RWP).

1887 (WHC-SD-WM-TP–339) **Tank 241-BX-103 tank characterization plan.** Bell, K.E. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 21 Apr 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011505. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for tank 241-BX-103.

1888 (WHC-SD-WM-TP–348) **Tank 241-S-107 tank characterization plan.** Jo, J. Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 6 Apr 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008950. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues (Conway 1993). The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will also be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process". This document satisfies that requirement for tank 241-S-107 (S-107) sampling activities. The report gives a summary of descriptive information available on Tank S-107. Included are the present status and physical description of the tank, its age, process history, and expected tank contents from previous sampling and analytical data. The different types of waste, by layer, for Tank S-107 will also be discussed. As of December 1994, Tank S-107 has been categorized as sound and was partially isolated in December 1982. It is a low-heat load tank and is awaiting stabilization. Tank S-107 is expected to contain two primary layers of waste. The bottom layer should contain a mixture of REDOX waste and REDOX cladding waste. The second layer contains S1 saltcake (waste generated from the 242-S evaporator/crystallizer from 1973 until 1976), and S2 salt slurry (waste generated from the 242-S evaporator-crystallizer from 1977 until 1980).

1889 (WHC-SD-WM-TP–350) **Tank 241-B-101 tank characterization plan.** Schreiber, R.D. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 28 Apr 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011668. Source: OSTI; NTIS; INIS; GPO Dep.

The Defense Nuclear Facilities Safety Board (DNFSB) has advised the US Department of Energy (DOE) to concentrate the near-term sampling and analysis activities on identification and resolution of safety issues (Conway 1993). The data quality objective (DQO) process was chosen as a tool to be used to identify the sampling and analytical needs for the resolution of safety issues. As a result, a revision in the Federal Facility Agreement and Consent Order (Tri-Party Agreement or TPA) milestone M-44 has been made, which states that "A Tank Characterization Plan (TCP) will be developed for each double-shell tank (DST) and single-shell tank (SST) using the DQO process". This document satisfies that requirement for tank 241-B-101 (B-101) sampling activities. Tank B-101 is identified as a low-heat load non-Watch List tank, and is classified as an assumed leaker. The tank is passively ventilated, interim stabilized, and intrusion prevention measures have been completed. As of January 31, 1995, approximately 428,000 liters of non-complexed waste was contained in the tank. Tank B-101 is expected to have two primary layers. A layer of saltcake waste generated from the 242-B evaporator, followed by a top layer of sludge composed of B-Plant high-level, B-Plant low-level, and unknown waste.

1890 (WHC-SD-WM-TP-353) **Tank 241-B-106 Tank Characterization Plan.** Conner, J.M. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 15 Jun 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015780. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the tank characterization plan for waste tank 241-B-106. Topics discussed include: data quality objectives, historical information and tank status.

1891 (WHC-SD-WM-TP-354) **Tank 241-B-203 tank characterization plan.** Jo, J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 16 May 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013366. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the tank characterization plan for waste tank 241-B-203. Topics discussed include: data quality objectives, historical information, and tank status.

1892 (WHC-SD-WM-TP-357) **Test plan for auger sampler improvements.** Francis, P.M. Westinghouse Hanford Co., Richland, WA (United States). 27 Apr 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011510. Source: OSTI; NTIS; INIS; GPO Dep.

At Westinghouse Hanford Company (WHC), one of the functions of the Tank Waste Remediation System (TWRS) division is sampling waste tanks to characterize their contents. The recovery performance of the auger sampler has proven inadequate in certain materials. The current auger configuration relies on cohesion and adhesion (properties dependent on sample media) to retain the sample. The media must maintain its form and stick to the auger flights to recover the sample. Recovery has been satisfactory when sampling in wastes with adequate adhesion and shear strength to overcome the forces of gravity and vibrations associated with retrieval. Multiple variations to the auger design will be tested to determine their ability to increase sample recovery and broaden the sampling capabilities. The designs will be tested in two different media, with the recoveries compared to that of a standard auger sampler. Each design modification will be developed and tested using the method described in this test plan.

1893 (WHC-SD-WM-TP-358) **Tank 241-A-102 tank characterization plan.** Jo, J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 16 May 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013368. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the tank characterization plan for waste tank 241-A-102. Topic discussed include: data quality objectives for sampling, safety screening, tank configuration, historical information, and tank status.

1894 (WHC-SD-WM-TRP-224) **Ignitability testing for core drilling system. Final report.** Cashdollar, K.L. (Bureau of Mines, Pittsburgh, PA (United States). Pittsburgh Research Center); Furno, A.; Green, G.M.; Thomas, R.A.; Witwer, K.S. Westinghouse Hanford Co., Richland, WA (United States); Bureau of Mines, Pittsburgh, PA (United States). Pittsburgh Research Center. 15 Jun 1995. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016332. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a study of the hazards of the inspection of nuclear waste material stored at the Hanford, WA site, the Department of Energy (DOE) and Westinghouse Hanford Company (WHC) have developed a core drilling system to sample the material in large waste storage tanks. In support of this work, the US Bureau of Mines has studied the probability of ignition while core drilling into simulated salt cake that was permeated with a flammable gas mixture. No ignitions were observed while core drilling into the saltcake with or without a purge gas and no ignitions were observed while drilling into a steel plate.

1895 (WHC-SD-WM-TSAP-002) **Tank 241-B-106 push mode core sampling and analysis plan.** Conner, J.M. Westinghouse Hanford Co., Richland, WA (United States). 15 Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015792. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling and analysis plan identifies characterization objectives pertaining to sample collection, laboratory analytical evaluation, and reporting requirements in accordance with the Tank Safety Screening Data Quality Objective. This quality objective is part of the tank characterization plan for tank 241-B-106. This report also identifies procedures and requirements for collecting and characterizing samples form tank 241-B-106 by the push mode core sampling method.

1896 (WHC-SD-WM-TSAP-003) **Tank 241-B-203 Push Mode Core Sampling and Analysis Plan.** Jo, J. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Los Alamos Technical Associates, Inc., Kennewick, WA (United States). 16 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013361. Source: OSTI; NTIS; INIS; GPO Dep.

This Sampling and Analysis Plan (SAP) will identify characterization objectives pertaining to sample collection, laboratory analytical evaluation, and reporting requirements in accordance with the Tank Safety Screening Data Quality Objective (Babad and Redus 1994). This Data Quality Objective (DQO) is described in the Tank Characterization Plan (Jo, 1995) for tank 241-B-203 (B-203). This SAP will also identify procedures and requirements for collecting and characterizing samples from tank B-203 by the core sampling method.

1897 (WHC-SD-WM-TSAP-004) **Tank 241-A-102 auger sampling and analysis plan.** Jo, J. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013367. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the Hanford waste tank characterization study for tank 241-A-102. The drivers and objectives of the auger sampling and analysis plan were in accordance with procedures that were presented in other reports.

1898 (WHC-SD-WM-TSAP–007) **Tank 241-SX-108 auger sampling and analysis plan.** Eggers, R.F. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050193. Source: OSTI; NTIS; INIS; GPO Dep.

This document outlines the plan for sampling and analysis of tank 241-SX-108.

1899 (WHC-SD-WM-TSAP–037-Rev.1) **Compatibility Grab Sampling and Analysis Plan.** Jones, J.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050194. Source: OSTI; NTIS; INIS; GPO Dep.

This document details the plan which serves as the contractual agreement between the Characterization Program, Sampling Operations, and WHC 222-S Laboratory. The scope of this plan is to provide guidance for the sampling and analysis of samples for waste compatibility purposes.

1900 (WHC-SD-WM-TSAP–040) **Tank 241-BY-104 rotary core sampling and analysis plan.** Benar, C.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Sep 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050195. Source: OSTI; NTIS; INIS; GPO Dep.

This document summarizes the plan for sampling and analysis of tank 241-BY-104

1901 (WHC-SD-WM-WP–299) **Work plan for the identification of techniques for in-situ sensing of layering/interfaces of Hanford high level waste tanks.** Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010926. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a plan that describes the activities in a task to conduct an industry survey to determine the existence of currently available hardware and/or concepts for anticipating and/or identifying layering/interfaces within the materials contained in large tanks located on the Hanford Site in Washington State.

1902 (WHC-SD-WM-WP–299-Rev.1) **Work plan for the identification of techniques for in-situ sensing of layering/interfaces of Hanford high level waste tank.** Vargo, G.F. Jr. Westinghouse Hanford Co., Richland, WA (United States). 16 Jun 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016328. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this work scope is to identify a specific potential technology/device/instrument/ideas that would provide the tank waste data. A method is needed for identifying layering and physical state within the large waste tanks at the Hanford site in Washington State. These interfaces and state changes can adversely impact sampling and characterization activities.

1903 (WHC-SD-WM-WP–303) **Half-liter supernatant sampler system engineering work plan.** Ritter, G.A. Westinghouse Hanford Co., Richland, WA (United States). 6 Jun 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014406. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Waste Remediation System (TWRS) pretreatment facility project W-236B, known as the Initial Pretreatment Module (IPM), requires samples of supernatants and sludges from 200 Area tank farms for planned hot testing work in support of IPM design. The IPM project has proposed the development of several new sampler systems. These systems include a 0.5-l supernatant sampler, 3-l and 25-l supernatant and sludge samplers, and a 4,000-l sampler system. The 0.5-l sampler will support IPM sampling needs in the 1 to 3 l range starting in late fiscal year 1995. This sampler is intended to be used in conjunction with the existing 100 ml bottle-on-a-string. The 3-l and 25-l systems will be based on the Savannah River Site's sampler system and will support IPM sampling needs in the 3 to 100 liter range. Most of the hot testing required for design of the IPM must be accomplished in the next 3 years. This work plan defines the tasks associated with the development of a 0.5-l sampler system. This system will be referred to as the Half-Liter Supernatant Sampler System (HLSSS). Specifically, this work plan will define the scope of work, identify organizational responsibilities, identify major technical requirements, describe configuration control and verification requirements, and provide estimated costs and schedule. The sampler system will be fully operational, including trained staff and operating procedures, upon completion of this task.

1904 (WHC-SD-WM-WP–311) **Work plan for defining a standard inventory estimate for wastes stored in Hanford site underground tanks.** Kupfer, M.J. Westinghouse Hanford Co., Richland, WA (United States). 29 Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050199. Source: OSTI; NTIS; INIS; GPO Dep.

This work plan addresses the methodology for defining a tank waste database that will provide a best basis estimate of waste characteristics for each underground storage tank. The resulting database is expected to be in place in a network accessible electronic form by September 1996.

1905 (WHC-SP–0858-Rev.4) **Maintenance implementation plan for the B Plant/WESF. Revision 4.** Tritt, S.E.; Lueck, B.H. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006830. Source: OSTI; NTIS; INIS; GPO Dep.

This Maintenance Implementation Plan (MIP) has been developed for maintenance functions associated with the B Plant/WESF (Waste Encapsulation Storage Facility) complex. The objective of this plan is to provide baseline information for establishing and identifying WHC conformance programs and policies applicable to implementation of DOE order 4330.4B guidelines. In addition, this maintenance plan identifies the actions necessary to develop a cost-effective and efficient maintenance program at B Plant/WESF. The B Plant WESF facility complex consists of three main facilities and several support structures located in the 200 East Area of the Hanford site. B Plant is a transition facility that is required to ensure safe storage and management of WESF (operating facility) cesium and strontium capsules. B Plant/ WESF also contains substantial radiological inventory from previous campaigns. There are no production activities at B Plant, but several of its operating systems are required to accomplish the current B Plant/WESF mission. B Plant/WESF are each considered a nuclear facility due to the storage of cesium and strontium capsules at WESF and the large radiological inventory from past processing.

1906 (WHC-SP–1004) **Ozone destruction of Hanford Site tank waste organics.** Colby, S.A. Westinghouse Hanford Co., Richland, WA (United States). Apr 1993. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001784. Source: OSTI; NTIS; INIS; GPO Dep.

Ozone processing is one of several technologies being developed to meet the intent of the Secretary of the US Department of Energy, Decision on the Programmatic Approach and Near-Term Actions for Management and Disposal of Hanford Tank Waste Decision Statement, dated December 20, 1991, which emphasizes the need to resolve tank safety issues by destroying or modifying the constituents (e.g., organics) that cause safety concerns. As a result, the major tank treatment objectives on the Hanford Site are to resolve the tank safety issues regarding organic compounds (and accompanying flammable gas generation), which all potentially can react to evolve heat and gases. This report contains scoping test results of an alkaline ozone oxidation process to destroy organic compounds found in the Hanford Site's radioactive waste storage tanks.

1907 (WHC-SP–1101-Rev.1-App.A) **Tank Waste Remediation System fiscal year 1996 multi-year program plan WBS 1.1. Revision 1, Appendix A.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96002804. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a compilation of data relating to the Tank Waste Remediation System Multi-Year Program. Topics discussed include: management systems; waste volume, transfer and evaporation management; transition of 200 East and West areas; ferricyanide, volatile organic vapor, and flammable gas management; waste characterization; retrieval from SSTs and DSTs; heat management; interim storage; low-level and high-level radioactive waste management; and tank farm closure.

1908 (WHC-SP–1101-Rev.1-Vol.1) **Tank Waste Remediation System fiscal year 1996 multi-year program plan WBS 1.1. Revision 1, Volume 1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96002803. Source: OSTI; NTIS; INIS; GPO Dep.

The 1995 Hanford Mission Plan specifically addresses the tank waste issue and clarifies the link with other initiatives, such as improving management practices and the Hanford Site Waste Minimization and Pollution Prevention Awareness Program Plan (DOE/RL-91-31). This document captures the results of decision making regarding the application of systems engineering at the Hanford Site, external involvement policy, and site end-state goals. Section 3.5 of the Hanford Mission Plan on Decisions and Directives provides an integrating discussion of the actions of the National Environmental Policy Act (NEPA), and DOE policy, guidance, and decisions associated with binding agreements such as the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement). Two significant components of the Hanford Mission Plan 1994 planning basis are (1) the decisions regarding the disposition of onsite material inventory, and the key programs and interfaces to accomplish this; and (2) the Program Interface Issues section, which identified issues that stretch across program boundaries.

1909 (WHC-SP–1104-Rev.1) **Spent Nuclear Fuel Project FY 1996 Multi-Year Program Plan WBS No. 1.4.1, Revision 1.** Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 220p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001636. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the Spent Nuclear Fuel (SNF) Project portion of the Hanford Strategic Plan for the Hanford Reservation in Richland, Washington. The SNF Project was established to evaluate and integrate the urgent risks associated with N-reactor fuel currently stored at the Hanford site in the K Basins, and to manage the transfer and disposition of other spent nuclear fuels currently stored on the Hanford site. An evaluation of alternatives for the expedited removal of spent fuels from the K Basin area was performed. Based on this study, a Recommended Path Forward for the K Basins was developed and proposed to the U.S. DOE.

1910 (WHC-SP–1142-Rev.1) **Westinghouse Hanford Company plan for certifying newly generated contact – handled transuranic waste. Revision 1.** Lipinski, R.M.; Backlund, E.G. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96002800. Source: OSTI; NTIS; INIS; GPO Dep.

All transuranic (TRU) waste generators are required by US Department of Energy (DOE) Order 5820.2A to package their TRU waste in order to comply wit the Waste Isolation Pilot Plant (WIPP) – Waste Acceptance Criteria (WAC) or keep non-certifiable containers segregated. The Westinghouse Hanford Company (WHC) Transuranic Waste Certification Plan was developed to ensure that TRU newly generated waste at WHC meets the DOE Order 5820.2A and the WHC-WAC which includes the State of Washington Department of Ecology – Washington Administrative Code (DOE-WAC). The metho used at WHC to package TRU waste are described in sufficient detail to meet the regulations. This document is organized to provide a brief overview of waste generation operations at WHC. The methods used to implement this plan are discussed briefly along with the responsibilities and authorities of applicable organizations. This plan describes how WHC complies with all applicable regulations and requirements set forth in the latest approved revision of WHC-EP-0063-4.

1911 (WHC-SP–1155) **Maintenance implementation plan for fuel supply shutdown.** Stephenson, R.L. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95016344. Source: OSTI; NTIS; INIS; GPO Dep.

This Maintenance Implementation Plan is written to satisfy the requirements of DOE Order 4330.4B, "MAINTENANCE MANAGEMENT PROGRAM", that specifies the general policy and objectives for the establishment of DOE controlled maintenance programs. These Programs provide for the management and performance of cost-effective maintenance and repair of Department of Energy (DOE) property, which includes facilities. A review of DOE Order 4330.4B, particularly Chapter II the nuclear portion, against existing WHC site programs and policies has provided assurance that most requirements of this order have already been implemented by existing WHC programs. Applicable requirements and guidelines of 4330.4B that are deficient or not implemented are presently being developed and implemented through WHC site policies and programs. Where no program is presently identified or being developed for 4330.4B requirements, responsibility for implementation has been assigned within this plan.

1912 (WHC-SP–1156) **Mid-year report: IPC liaison and chemistry of thermal reconstitution.** Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013513. Source: OSTI; NTIS; INIS; GPO Dep.

A program of investigation into the chemistry of alkaline Hanford Site tank waste is being conducted. The investigations have two main subtasks: liaison with the Institute of Physical Chemistry of the Russian Academy of Sciences and further laboratory testing of the chemistry of thermal reconstitution of Hanford Site tank waste. Progress to date includes: (1) a technical dialogue has been established with the Institute scientists; (2) editing of a technical literature review on the chemistry of the transuranic elements and technetium in alkaline media written by researchers at the Institute is complete; (3) four tasks from the Institute have been selected for support by the US Department of Energy; (4) technical information has been supplied to the Institute describing the composition of Hanford Site tank waste; (5) tests, using genuine waste from tank 104-S (a REDOX Process sludge), comparing the performance of thermal reconstitution with enhanced sludge washing show markedly improved dissolution of aluminum achieved by the thermal treatment; (6) a reduction/coprecipitation method was tested and shown to remove plutonium, solubilized by thermal treatment, rapidly and efficiently from solution; (7) technical chemistry support was provided to calciner kinetics tests at the University of Idaho; (8) tests to determine the speciation of plutonium and neptunium solubilized by thermal treatment show dissolved Pu(V) and Np(V) hydroxide complexes are produced, a Np(V) peroxide complex also was identified; (9) recently published data on Pu(IV) carbonate complexation in moderately alkaline (pH 12 to 13) solution led to reexamination of previous investigations of plutonium complexation in highly alkaline (3 to 5 molar NaOH) solutions.

1913 (WHC-SP–1177) **Westinghouse Hanford Company FY 1996 Materials Management Plan (MMP).** Higginson, M.C. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006822. Source: OSTI; NTIS; INIS; GPO Dep.

The safe and sound operation of facilities and the storage of nuclear material are top priorities within Hanford's environmental management, site restoration mission. The assumptions, plans and Special Nuclear Material (SNM) inventory summaries contained in this document were prepared for Department of Energy (DOE) use for interim and long- range planning. In accordance with Richland DOE field office (DOE-RL) direction, year-end inventory values were not projected over an 11 year period, as historically done in previous MMP documents. This decision was made since significant SNM movements to or from Hanford are not projected in the foreseeable future. Instead, the inventory summaries within this document reflect an "as of date" of June 30, 1995.

1914 (WHC-SP–1179) **Maintenance optimization plan for essential equipment reliability.** Steffen, D.H. Westinghouse Hanford Co., Richland, WA (United States). Feb 1996. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006836. Source: OSTI; NTIS; INIS; GPO Dep.

The Maintenance Optimization Plan (MOP) for Essential Equipment Reliability will furnish Tank Waste Remediation System (TWRS) management with a pro-active, forward-thinking process for maintaining essential structures, systems, and components (ESSC) at the Hanford Site tank farms in their designed condition, and to ensure optimum ESSC availability and reliability.

1915 (WSRC-MS–95-0294) **The effect of compositional parameters on the TCLP and PCT durability of environmental glasses.** Resce, J.L. (Clemson Univ., Clemson, SC (United States). Dept. of Environmental Systems Engineering); Overcamp, T.J.; Cicero, C.A.; Bickford, D.F. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9509266–1: Industrial and environmental chemistry special symposium, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96003084. Source: OSTI; NTIS; INIS; GPO Dep.

The relationship between glass composition and the chemical durability of environmental waste glass is very important for both the development of glass formulations and the prediction of glass durability for process control. The development of such a model is extremely difficult for several reasons. Firstly, chemical durability is dependent upon the type of leach test employed; the leach tests themselves being only crude approximations of actual environmental conditions or long term behavior. Secondly, devitrification or crystallinity can also play a major role in durability, but is much more difficult to quantify. Lastly, the development of any one model for all glass types is impractical because of the wide variety of wastestreams, the heterogeneity of the wastestreams, and the large variety of components within each wastestream. Several ongoing efforts have been directed toward this goal, but as yet, no model has been proven acceptable.

1916 (WSRC-MS–95-0370) **Influence of particulates on crossflow filter performance with tetraphenylborate precipitate.** Peterson, R.A.; Nash, C.A.; McCabe, D.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9511193–1: Annual American Institute of Chemical Engineers (AIChE) meeting, Gatlinburg, TN (United States), 12-17 Nov 1995). Order Number DE96006499. Source: OSTI; NTIS; INIS; GPO Dep.

The pretreatment of High Level Waste at the Savannah River Site, prior to vitrification, includes tetraphenylborate precipitation of cesium. Also, strontium and actinides are removed from solution by sorption on monosodium titanate. The resulting slurry is concentrated and washed using 0.4 micron stainless steel Mott filters in a crossflow assembly. The rate of filtrate production is governed by a number of parameters including the concentration of both soluble and insoluble solids present in the process stream. The major insoluble constituents in the process stream are tetraphenylborate solids. However, the presence of small quantities of monosodium titanate as well as sludge particulates, typically less than 10% of the total solids concentration, produces up to a 50% decline in the rate of filtrate production. The cake that develops during filtration is the primary resistance to flow of filtrate. In addition, experimental data indicate the filter cake is enriched in the insoluble solids relative to the bulk of the solution. The presence of these insoluble solids in the filter cake influences not only the overall filtrate flow rate, but also the mechanisms by which the filter cake is formed.

1917 (WSRC-MS--95-0371) **Rheology of Savannah River site tank 42 and tank 51 HLW radioactive sludges.** Ha, B.C.; Bibler, N.E. Westinghouse Savannah River Co., Aiken, SC (United States). 19 Jan 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212--36: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96060036. Source: OSTI; NTIS; INIS; GPO Dep.

Knowledge of the rheology of the radioactive sludge slurries at the Savannah River Site (SRS) is necessary in order to ensure that they can be retrieved from waste tanks and processed for final disposal. The high activity radioactive wastes stored as caustic slurries at SRS result from the neutralization of acid waste generated from production of nuclear defense materials. During storage, the wastes separate into a supernate layer and a sludge layer. In the Defense Waste Processing Facility (DWPF) at SRS, the radionuclides from the sludge and supernate will be immobilized into borosilicate glass for long term storage and eventual disposal. Before transferring the waste from a storage tank to the DWPF, a portion of the aluminum in the waste sludge will be dissolved and the sludge will be extensively washed to remove sodium. Tank 51 and Tank 42 radioactive sludges represent the first batch of HLW sludge to be processed in the DWPF. This paper presents results of rheology measurements of Tank 51 and Tank 42 at various solids concentrations. The rheologies of Tank 51 and Tank 42 radioactive slurries were measured remotely in the Shielded Cells Operations (SCO) at the Savannah River Technology Center (SRTC) using a modified Haake Rotovisco RV-12 with an M150 measuring drive unit and TI sensor system. Rheological properties of the Tank 51 and Tank 42 radioactive sludges were measured as a function of weight percent solids. The weight percent solids of Tank 42 sludge was 27, as received. Tank 51 sludge had already been washed. The weight percent solids were adjusted by dilution with water or by concentration through drying. At 12, 15, and 18 weight percent solids, the yield stresses of Tank 51 sludge were 5, 11, and 14 dynes/cm2, respectively. The apparent viscosities were 6, 10, and 12 centipoises at 300 sec-1 shear rate, respectively.

1918 (WSRC-MS--95-0397) **Overview of the Savannah River Site high level waste storage tank structural qualification program.** Mertz, G.E.; Houston, T.W.; Flanders, H.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9511128--25: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96009653. Source: OSTI; NTIS; INIS; GPO Dep.

The Savannah River Site currently has fifty one waste storage tanks, with approximately thirty-four million gallons of high level waste. These structures were constructed from the mid 1950s to the early 1980s under a variety of design criteria. These tanks are being requalified for natural phenomena hazards (NPH) loads associated with the NPH analysis of waste storage tanks; fluid-structure-soil interaction of tanks contained in underground vaults; structure to structure interaction; seismically induced settlement; and impact loads from seismic or tornado induced collapse of secondary structures.

1919 (WSRC-MS--95-0400) **Impedance function study for cylindrical tanks surrounded by an earthen embankment.** Houston, T.W.; Mertz, G.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9511128--22: 5. Department of Energy (DOE) natural phenomena hazards mitigation symposium, Denver, CO (United States), 13-17 Nov 1995). Order Number DE96006493. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) operates many which are used to store radioactive waste material. The original design of the tanks was often based on criteria which did not meet current seismic codes. As a result DOE is undertaking a comprehensive review of the adequacy of these structures to meet current seismic standards. This comprehensive review includes an evaluation of soil-structure interaction. One method available for performing soil structure interaction analyses of structures couples a discrete model of the structure to a lumped parameter model of the soil. This method requires the knowledge of the expected dynamic stiffness and damping functions of the rigid, massless structure resting on the soil. These are commonly referred to as the impedance functions. Lumped parameter analysis is cost effective for the surface and embedded structure cases where impedance functions are available in the literature. For a complex case with the structure located on the surface surrounded by an embankment, the impedance functions must be established prior to using a lumped parameter model approach. The present paper describes the development of horizontal impedance functions for the structure surrounded by an embankment which are developed using a finite element approach as implemented by SASSI. Impedance functions for vertical, torsional, and rocking degrees of freedom can be developed in a similar manner. These functions are easily incorporated into simple models which provide conceptual and physical insight to the response of structures. These models provide both a check of more sophisticated methods, and, due to their simplicity, permit assessment of a wide range of site and structural parameters that my affect the dynamic response of structural systems.

1920 (WSRC-MS--95-0421) **Operation of a bushing melter system designed for actinide vitrification.** Ramsey, W.G. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212--50: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006491. Source: OSTI; NTIS; INIS; GPO Dep.

The Westinghouse Savannah River Company is developing a melter system to vitrify actinide materials. The melter system will used to vitrify the americium and curium solution which is currently stored in one of the Savannah River Site's

(SRS) processing canyons. This solution is one of the materials designated by the Defense Nuclear Facilities Safety Board (DNFSB) to be dispositioned as part of the DNFSB recommendation 94-1. The Am/Cm solution contains an extremely large fraction (>2 kilograms of Cm and 10 kilograms of Am) of t he United States's total inventory of both elements. They have an estimated value on the order of one billion dollars - if they are processed through the DOE Isotope Sales program at the Oak Ridge National Laboratory. It is therefore deemed highly desirable to transfer the material to Oak Ridge in a form which can allow for recovery of the material. A commercial glass composition has been demonstrated to be compatible with up to 40 weight percent of the Am/Cm solution contents. This glass is also selectively attacked by nitric acid. This allows the actinide to be recovered by common separation processes.

1921 (WSRC-MS–95-0436) **CFD modeling of natural convection within dry spent nuclear fuel storage canisters.** Lee, S.Y. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960815–4: 31. national heat transfer conference, Houston, TX (United States), 3-6 Aug 1996). Order Number DE96009639. Source: OSTI; NTIS; INIS; GPO Dep.

One of the interim storage configurations being considered for aluminum-clad foreign research reactor fuel, such as the Material and Testing Reactor (MTR) design, is in a dry storage facility. To support design studies of storage options, a computational and experimental program was conducted at the Savannah River Site (SRS). The objective was to develop computational fluid dynamics (CFD) models which would be benchmarked using data obtained from a full scale heat transfer experiment conducted in the SRS Experimental Thermal Fluids Laboratory. The current work documents the CFD approach and presents comparison of results with experimental data. CFDS-FLOW3D (version 3.3) CFD code has been used to model the 3-dimensional convective velocity and temperature distributions within a single dry storage canister of MTR fuel elements. The analysis was made for the cases with $q''' = 100$ or 137 watts per MTR fuel element (equivalent to 25 or 35 kW/m^3) using different convective boundary conditions around the canister wall and different cooling gases (N_2 or He). For the present analysis, the Boussinesq approximation was used for the consideration of buoyancy-driven natural convection. Comparison of the CFD code can be used to predict reasonably accurate flow and thermal behavior of a typical foreign research reactor fuel stored in a dry storage facility.

1922 (WSRC-MS–95-0466) **Replacement inhibitors for high level waste tank cooling coils.** Wiersma, B.J.; Hsu, T.C. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960389–10: CORROSION '96: National Association of Corrosion Engineers (NACE) conference, Denver, CO (United States), 24-29 Mar 1996). Order Number DE96009617. Source: OSTI; NTIS; INIS; GPO Dep.

Sodium chromate has been an effective corrosion inhibitor for the cooling coil systems in Savannah river site (SRS) waste tanks for over 40 years. Due to age and operating history, cooling coils occasionally fail allowing chromated water to leak into the environment. The costs of reporting and cleaning up chromate spills became significant enough for SRS to consider alternate inhibitors. Confirmatory tests were performed to assess the effectiveness of three alternative corrosion inhibitor systems for the waste tank cooling water systems: (1) sodium molybdate (250 ppM as Mo)/sodium hydroxide (pH 10), (2) sodium molybdate (50 ppM as Mo)/sodium silicate (50 ppM as Si), and (3) sodium nitrite (500 ppM)/sodium hydroxide (0.01 M). The tests were conducted under stagnant conditions to simulate a worst-case scenario. The results showed that these inhibitors were as effective as chromate at minimizing general corrosion at solution temperatures between 30-70 °C. However, the initiation of localized attack in crevice regions, in solutions containing the alternative inhibitors at 70 °C, was observed. Also, for the nitrite and the molybdate systems to be effective, suitable biocide is needed. On the other hand, interval coupon tests showed that the molybdate inhibitor systems prevented significant propagation of the localized attack.

1923 (WSRC-MS–96-0119) **Heat transfer aspects of interim dry storage of aluminum-clad spent nuclear fuel.** Guerrero, H.N.; Eghbali, D.; Lee, S.Y.; Steeper, T.J. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9606116–49: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96011040. Source: OSTI; NTIS; INIS; GPO Dep.

The consequences of some special characteristics of aluminum-clad DOE spent nuclear fuel and special issues regarding DOE requirements on the heat transfer aspects of there interim dry storage are discussed. For the objective of future licensing of the dry storage facility, a spent fuel technology program is initiated to obtain prototypical data for benchmarking computer codes. This program consisted of separate effects tests on full scale mockup of a Materials Testing Reactor (MTR) spent fuel assembly and integral canister tests of a canister containing mockup fuel assembles in a wind tunnel. The effects of canister power, air flow velocity, type of fill gas, canister orientation and vacuum conditions were obtained. Comparisons of pretest predictions from candidate computational fluid dynamics codes with the test results were excellent.

1924 (WSRC-MS–96-0142) **Estimation of stresses near edges and corners in large spent fuel shipping containers.** Gupta, N.K. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960706–19: American Society of Mechanical Engineers (ASME) pressure vessels and piping conference, Montreal (Canada), 21-26 Jul 1996). Order Number DE96011039. Source: OSTI; NTIS; INIS; GPO Dep.

Spent fuel is transported in shipping containers which are lined with thick layers of lead to minimize radiation levels. The lead is poured in the space formed by the inner and outer steel walls of the container. This type of construction results in well defined edges and corners. Current regulations require detailed structural evaluation of these containers to meet the established guidelines. These regulations also require that any fatigue evaluation consider a stress concentration factor of 4 to 5 to determine the fatigue life of the shipping container. These containers develop large thermal stresses near edges and corners due to large differences in thermal coefficients of expansion between lead and steel. In this paper, the discontinuity formed by the welds in the edges and corners is treated as a groove and the existing formulations of deep grooves and notches are used to calculate a realistic value of the stress concentration factor.

1925 (WSRC-RP-94-1300) **Electrolytic Treatment of ICPP Sodium-Bearing Waste Simulant.** Hobbs, D.T. Westinghouse Savannah River Co., Aiken, SC (United States). 2 Feb 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060112. Source: OSTI; NTIS; GPO Dep.

Two proof-of-principle tests were conducted to determine if nitrate can be destroyed electrochemically in a simulated Idaho Chemical Processing Plant (ICPP) Sodium-Bearing waste. Both tests demonstrated the destruction of nitrate as well as the removal of other metals in the simulant. Metals removal is believed to be due to precipitation as a result of a change in the pH of the waste solution from strongly acidic to highly alkaline and reduction to a metal or metal oxide. Although gas evolution at the cathode was visible during each test, there were no visible signs of NO_x formation in either test.

1926 (WSRC-RP-96-76) **Annual Status Report for the F/H Area High Level Waste Tank Farms.** Hayes, C.R. (Westinghouse Savannah River Company, AIKEN, SC (United States)). Westinghouse Savannah River Co., Aiken, SC (United States). 14 Mar 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060048. Source: OSTI; NTIS; INIS; GPO Dep.

Section 1X.E.3 of the SRS Federal Facility Agreement requires the DOE to submit to EPA and SCDHEC, an annual report on the status of tanks being removed from service. Tanks that are slated for removal from service either do not meet secondary containment standards or have leak sites. The attached document is intended to meet this annual report requirement. An undated status of relevant portions of the Waste Removal Plan and Schedule is also included.

1927 (WSRC-TR-95-0019) **HLW flowsheet material balance for DWPF rad operation with Tank 51 sludge and ITP Cycle 1 precipitate.** Choi, A.S. Westinghouse Savannah River Co., Aiken, SC (United States). 19 Apr 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96004065. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the details of the Savannah River Plant Flowsheet for the Rad Operation with Tank Sludge and ITP Cycle 1 Precipitate. Topics discussed include: material balance; radiolysis chemistry of tank precipitates; algorithm for ESP washing; chemistry of hydrogen and ammonia generation in CPC; batch sizes for processing feed; and total throughput of a streams during one cycle of operation.

1928 (WSRC-TR-95-0122) **Prevention for possible microbiologically influenced corrosion (MIC) in RHLWE flush water system.** Hsu, T.C.; Jenkins, C.F. Westinghouse Savannah River Co., Aiken, SC (United States). 10 Jul 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002906. Source: OSTI; NTIS; INIS; GPO Dep.

This report is in response to the request to provide a recommendation for the prevention of possible microbiologically influenced corrosion (MIC) for the RHLWE (Replacement High-Level Waste Evaporator) flush water (FW) system. The recent occurrences of MIC at DWPF prompted HLWE to evaluate the possibility of MIC occurring in this 304L stainless steel RHLWE flush water system. Concern was heightened by the fact that the well water used and the other conditions at H-Tank Farm are similar to those at DWPF. However, only one known leak has occurred in the existing 304L evaporator flush water systems in either tank farm (in 1H system), and no MIC Corrosion has been confirmed in the tank farm area. The design of the RHLWE flush water system (completed long before the occurrence of MIC at DWPF) was modeled after the existing evaporator flush water systems and did not specifically include MIC prevention considerations. Therefore, MIC prevention was not specifically considered during the design phase of this flush water system. The system is presently being installed. After an extensive evaluation, a task team concluded that the best biocide to prevent the occurrence of MIC would be NaOH at fairly low concentration. Sodium hydroxide (NaOH) is optimal in this application, because of its effectiveness, low cost, and familiarity to the Operations personnel (see Appendix A). However, it is the opinion of the task group that application should be withheld until MIC corrosion is demonstrated in the system.

1929 (WSRC-TR-95-166) **Annual Radioactive Waste Tank Inspection Program 1994.** McNatt, F.G. Sr. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1995. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95017483. Source: OSTI; NTIS; INIS; GPO Dep.

Aqueous radioactive wastes from Savannah River Site (SRS) separations processes are contained in large underground carbon steel tanks. Inspections made during 1994 to evaluate these vessels and evaluations based on data accrued by inspections made since the tanks were constructed are the subject of this report.

1930 (WSRC-TR-95-0170) **Validation Analysis for the Calculation of a Turbulent Free Jet in Water Using CFDS-FLOW 3-D and FLUENT.** Dimenna, R.A.; Lee, S.Y. Westinghouse Savannah River Co., Aiken, SC (United States). May 1995. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060018. Source: OSTI; NTIS; INIS; GPO Dep.

The application of computational fluid dynamics methods to the analysis of mixing in the high level waste tanks at the Savannah River Site requires a demonstration that the computer codes can properly represent the behavior of fluids in the tanks. The motive force for mixing the tanks is a set of jet pumps taking suction from the tank fluid and discharging turbulent jets near the bottom of the tank. The work described here focuses on the free turbulent jet in water as the simplest case of jet behavior for which data could be found in the open literature. Calculations performed with both CFDS-FLOW3D and FLUENT were compared with data as well as classical jet theory. Results showed both codes agreed reasonably well with each other and with the data, but that results were sensitive to the computational mesh and, to a lesser degree, the selection of turbulence models.

1931 (WSRC-TR-95-0178) **Limits on Annulus Air Outages in Types 1, 2, and 3 Waste Tanks.** Wiersma, B.J.; Sindelar, R. L. Westinghouse Savannah River Co., Aiken, SC (United States). 12 Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060142. Source: OSTI; NTIS; INIS; GPO Dep.

An evaluation was performed on the impact of abnormal air flow conditions on the structural integrity of Types 1, 2, and 3 waste tanks. Warm, dry air in the annular space is necessary to preclude low temperature embrittlement and corrosive conditions for the carbon steel materials. For Type

1 and 2 tanks the annulus air system should be repaired within a month to minimize the potential for low temperature embrittlement and corrosive conditions, for Tanks 29-34, which are Type 3 tanks, it is recommended that the system be repaired within two months to minimize the potential for low temperature embrittlement. For all other Type 3 tanks repair of the system within six months is adequate to minimize general corrosion.

1932 (WSRC-TR–95-0195) **Thermal analysis modeling and simulation of spent nuclear fuel canister using CFDS-FLOW3D.** Lee, S.Y. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96003011. Source: OSTI; NTIS; INIS; GPO Dep.

The computational fluid dynamics (CFD) code CFDS-FLOW3D (version 3.3) has been utilized to model a three-dimensional thermal analysis of the spent nuclear fuel dry storage mockup test. The Experimental Thermal-Fluids (ETF) group obtained experimental data to benchmark computer codes for verifying the dry storage of aluminum-clad spent nu clear fuel. This report provides CFDS-FLOW3D detailed predictions and benchmark, against the test data. Close comparison of the computational results with the experimental data provide verification that the code can be used to predict reasonably accurate convective flow and thermal behavior of a typical foreign research reactor fuel, such as the Material and Testing Reactor (MTR) design tested, while stored in a dry storage facility.

1933 (WSRC-TR–95-0213) **Technical basis for a minimum hydroxide concentration in tanks containing dilute waste.** Zapp, P.E. Westinghouse Savannah River Co., Aiken, SC (United States). May 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001692. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory tests were performed to address the protection of waste tank steel from corrosion in situations of elevated temperatures up to 75 C (hot spots) in the sludge layer of Extended Sludge Processing (ESP) tanks. Coupon immersion tests were conducted at 75 C in two ESP simulants at four hydroxide (or pH) levels. The nitrite concentrations of the simulants were calculated from the ESP technical standards based on a temperature of 40 C. The results showed that a hydroxide concentration of at least 0.01 M prevented significant corrosion of the steel at the elevated temperature. This conclusion provides the technical basis for the revised minimum hydroxide concentration of 0.01 M in the draft WSRC 241-82H Control Room Process Requirements, for the ESP tanks.

1934 (WSRC-TR–95-0242) **H-Area/ITP safety analysis summary report for subsurface liquid waste transport.** Flach, G.P.; Radder, J.A. Westinghouse Savannah River Co., Aiken, SC (United States). May 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001661. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of analysis for this report is strictly limited to the subsurface release of liquid waste from the buried tanks in H-Area, following beyond Evaluation Basis Earthquake (EBE) events. Failure of these tanks is assumed and no assessments of tank structural integrity are made. The waste containment capability of the H-Area berms is examined, and the times for subsurface transport of liquid waste to the nearest surface water streams are determined. The H-Area tank farm berms are expected to remain intact following seismic events that do not produce liquefaction. The return frequency of an earthquake that produces onset of liquefaction is less than 1×10^{-5} per year. Berm damaging seismic events are defined to be earthquakes that are beyond the EBE, which has a return frequency of approximately 2×10^{-4} per year. As long as the berms remain intact, numerical analysis shows that any waste leaking from failed tanks will be contained by the berms with no liquid seeping out. Given a seismic event that causes waste to leak from the buried tanks but leaves the berms intact, the subsurface transport analysis shows that only a small fraction of waste will flow with the groundwater underlying H-Area. Best-estimate groundwater transit times between H-Area and surface water discharge points range from 45 to 85 years. Conservative estimates range from 10 to 15 years and also depend on location of the tank in question. Because the transport times are measured in tens of years, there is adequate time available to implement mitigation activities prior to any waste reaching the nearest surface water stream. Alternative mitigation planning is already underway to preclude this from becoming an issue.

1935 (WSRC-TR–95-0257) **Alternative inhibitors for the high level waste tank cooling water system.** Wiersma, B.J. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96013312. Source: OSTI; NTIS; INIS; GPO Dep.

Leaks in cooling water feed and supply lines at SRS have resulted in spills of several gallons of chromated water on the ground. The costs of excavating and disposing of the soil and reporting the spill to state and federal agencies became significant enough for Waste Management Operations to consider replacing sodium chromate with an alternate inhibitor. Confirmatory tests were performed to assess the effectiveness of three alternative corrosion inhibitors for the cooling water system: (1) sodium molybdate (250 ppm as Mo)/sodium hydroxide (pH 10); (2) sodium molybdate (50 ppm as Mo)/sodium silicate (50 ppm as Si); and (3) sodium nitrite (500 ppm)/sodium hydroxide (0.01 M). The tests were conducted under stagnant conditions to simulate a worst-case scenario. The results showed that these inhibitors were as effective as chromate at minimizing general corrosion at solution temperatures between 30–70 C. However, the initiation of localized attack in crevice regions, in solutions containing the alternative inhibitors at 70 C, was observed. The following recommendations for operations were made: (1) maintain the pH of the molybdate inhibitor systems above 10 or the pH of the nitrite inhibitor system above 12; (2) add a biocide to the cooling water to eliminate the possibility of microbial activity; (3) maintain cooling water flow to a majority of the coils in tanks with wastes at temperatures greater than 60 C; and (4) purge the cooling coils with fresh inhibitor solution once every three months. Provided these recommendations are implemented, all three alternative inhibitors should be adequate for use in the cooling water system. Furthermore, it is recommended that the changeover should occur gradually, i.e., one pumphouse at a time.

1936 (WSRC-TR–95-0265) **Alternative dispositioning methods for HEU spent nuclear fuel at the Savannah River Site.** Krupa, J.F.; McKibben, J.M.; Parks, P.B.; DuPont, M.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9507119–5: Summer national meeting of the American Institute of Chemical Engineers, Boston, MA (United States), 30 Jul - 2 Aug 1995). Order Number DE96001845. Source: OSTI; NTIS; INIS; GPO Dep.

The United States has a strong policy on prevention of the international spread of nuclear weapons. This policy was announced in Presidential Directive PDD-13 and summarized in a White House press release September 27, 1993. Two cornerstones of this policy are: seek to eliminate where possible the accumulation of stockpiles of highly- enriched uranium or plutonium; propose···prohibiting the production of highly-enriched uranium (HEU) or plutonium for nuclear explosives purposes or outside international safeguards. The Department of Energy is currently struggling to devise techniques that safely and efficiently dispose of spent nuclear fuel (SNF) while satisfying national non-proliferation policies. SRS plans and proposals for disposing of their SNF are safe and cost effective, and fully satisfy non-proliferation objectives.

1937 (WSRC-TR–95-0288) **Thermal analysis of the failed equipment storage vault system.** Jerrell, J.; Lee, S.Y.; Shadday, A. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96010050. Source: OSTI; NTIS; INIS; GPO Dep.

A storage facility for failed glass melters is required for radioactive operation of the Defense Waste Processing Facility (DWPF). It is currently proposed that the failed melters be stored in the Failed Equipment Storage Vaults (FESV's) in S area. The FESV's are underground reinforced concrete structures constructed in pairs, with adjacent vaults sharing a common wall. A failed melter is to be placed in a steel Melter Storage Box (MSB), sealed, and lowered into the vault. A concrete lid is then placed over the top of the FESV. Two melters will be placed within the FESV/MSB system, separated by the common wall. There is no forced ventilation within the vault so that the melter is passively cooled. Temperature profiles in the Failed Equipment Storage Vault Structures have been generated using the FLOW3D software to model heat conduction and convection within the FESV/MSB system. Due to complexities in modeling radiation with FLOW3D, P/THERMAL software has been used to model radiation using the conduction/convection temperature results from FLOW3D. The final conjugate model includes heat transfer by conduction, convection, and radiation to predict steady-state temperatures. Also, the FLOW3D software has been validated as required by the technical task request.

1938 (WSRC-TR–95-0306) **The long-term acceleration of waste glass corrosion: A preliminary review.** Kielpinski, A.L. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96006497. Source: OSTI; NTIS; INIS; GPO Dep.

Whereas a prior conception of glass dissolution assumed a relatively rapid initial dissolution which then slowed to a smaller, fairly constant longer-term rate, some recent work suggests that these two stages are followed by a third phase of dissolution, in which the dissolution rate is accelerated with respect to what had previously been thought of as the final long-term rate. The goals of the present study are to compile experimental data which may have a bearing on this phenomena, and to provide an initial assessment of these data. The Savannah River Technology Center (SRTC) is contracted to develop glass formulation models for vitrification of Hanford low-level waste (LLW), in support of the Hanford Tank Waste Remediation System Technology Development Program. The phenomenon of an increase in corrosion rate, following a period characterized by a low corrosion rate, has been observed by a number of researchers on a number of waste glass compositions. Despite inherent ambiguities arising from SA/V (glass surface area to solution volume ratio) and other effects, valid comparisons can be made in which accelerated corrosion was observed in one test, but not in another. Some glass compositions do not appear to attain a plateau region; it may be that the observation of continued, non-negligible corrosion in these glasses represents a passage from the initial rate to the accelerated rate. The long-term corrosion is a function of the interaction between the glass and its environment, including the leaching solution and the surrounding materials. Reaction path modeling and stability field considerations have been used with some success to predict the changes in corrosion rate over time, due to these interactions. The accelerated corrosion phenomenon highlights the need for such integrated corrosion modeling and the scenario-specific nature of a particular glass composition's durability.

1939 (WSRC-TR–95-0337) **Evaluation and ranking of the tank focus area solid liquid separation needs.** McCadbe, D.J. Westinghouse Savannah River Co., Aiken, SC (United States). 17 Aug 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96003475. Source: OSTI; NTIS; INIS; GPO Dep.

The Tank Focus Area (TFA) of the Department of Energy (DOE) Office of Environmental Restoration and Waste Management (EM) addresses remediation of liquid waste currently stored in underground tanks. Several baseline technologies for treatment of tank waste can be categorized into three types of solid liquid separation: (a) removal of radioactive species that have been absorbed or precipitated, (b) pretreatment for ion exchange, and (c) volume reduction of sludge and wash water. The solids formed from precipitation or absorption of radioactive ions require separation from the liquid phase to permit treatment of the liquid as Low Level Waste. Prior to ion exchange of radioactive ions, removal of insoluble solids is needed to prevent bed fouling and downstream contamination. Volume reduction of washed sludge solids would reduce the tank space required for interim storage. The scope of this document is to evaluate the solid/liquid separations needed to permit treatment of tank wastes to accomplish these goals. The document summarizes previous alkaline waste testing, with an emphasis on crossflow filtration, to-obtain a general understanding of the behavior of radioactive wastes on available equipment. The document also provides general information about filtration and a path forward for testing.

1940 (WSRC-TR–95-0386) **Functional overview of the Production Planning Model (ProdMod).** Gregory, M.V.; Paul, P.K. Westinghouse Savannah River Co., Aiken, SC (United States). Sep 1995. 123p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96010049. Source: OSTI; NTIS; INIS; GPO Dep.

The Production Planning Model (ProdMod) has been developed by SRTC for use by High Level Waste Program Management and High Level Waste Engineering as a fast running, integrated, comprehensive model of the entire SRS high level waste (HLW) complex. ProdMod can simulate the response of the HLW complex from its current state to the end of tank clean-up or to any intermediate point. The present document describes the initial release of ProdMod at the end of FY95: a model version that contains all the significant elements from the High-level Waste System Plan Revision 5 and is capable of running the simulation all the way to the postulated completion of waste removal. For the scenario represented by this release, that simulates approximately 70 years of operation of the HLW complex (out to FY2065). This initial release of ProdMod will serve as the immediate starting point for the modeling of the High-Level Waste System Plan Revision 6. Thus ProdMod is expected to be in a state of continuous change and improvement.the initial goal has been to generate a simulation of the processes of interest, with the emphasis on mass and volume balances tracked throughout the HLW complex. That has been accomplished. Future development will add a set of cost equations to the process equations and extend the model for use as a linear programming (optimization) application. The goal of this later phase will be to free the ProdMod user to some extent from the need to set up detailed simulation scenarios: the model will automatically make operational choices which minimize or maximize a given objective function. Appendix A contains the source code.

1941 (WSRC-TR--95-0470) **Use of Savannah River Site facilities for glass and ceramics.** Kuehn, N.H.; Duane, J.B.; McKibben, J.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-951259--8: Plutonium stabilization and immobilization workshop, Washington, DC (United States), 12-14 Dec 1995). Order Number DE96009646. Source: OSTI; NTIS; INIS; GPO Dep.

Existing structures and processing facilities at the Savannah River Site are being considered for immobilization of plutonium. The Defense Waste Processing Facility (DWPF) which has completed cold testing and is scheduled to begin radioactive operation later this year to vitrify High Level Waste (HLW) has been considered for vitrification of plutonium and a means to provide a radiation barrier for plutonium glass. Introduction of plutonium into the DWPF processing stream and incorporating the plutonium in the (HLW) glass matrix would require significant modifications and upgrades to the facility. These would impact the schedule for its primary mission which is to vitrify HLW stored in tanks at the Savannah River Site. This paper discusses three options that utilize the DWPF with significantly less impact on its primary mission. Two of the options place small cans of plutonium glass or ceramic matrices containing plutonium into a DWPF canister and then pour HLW glass around the cans to provide proliferation resistance. The processing of HLW glass is not affected by the cans. The third option uses a portion of the DWPF feed process and a new facility in S Area where DWPF is located. All of these options use the existing 221F Separations Canyon building for processing the plutonium feed material and preparing the plutonium glass or ceramic containing plutonium.

1942 (WSRC-TR--96-0166) **Annual radioactive waste tank inspection program: 1995.** McNatt, F.G. Sr. Westinghouse Savannah River Co., Aiken, SC (United States). 1 Apr 1996. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060063. Source: OSTI; NTIS; INIS; GPO Dep.

Aqueous radioactive wastes from Savannah River Site (SRS) separations processes are contained in large underground carbon steel tanks. Inspections made during 1995 to evaluate these vessels and evaluations based on data accrued by inspections performed since the tanks were constructed are the subject of this report

1943 (WSRC-TR--0400-Rev.1) **High level waste tank farm setpoint document. Revision 1.** Anthony, J.A. III. Westinghouse Savannah River Co., Aiken, SC (United States). 31 Jan 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95014726. Source: OSTI; NTIS; INIS; GPO Dep.

Revision 1 modifies Attachment I of this Technical Report as a result of a meeting which was held Friday, January 27, 1994 between Maintenance, Work Control, and Engineering to discuss report contents. Upon completion of the meeting, the Flow Chart was edited accordingly. Attachment 2 is modified for clerical reasons. Setpoints for nuclear safety-related instrumentation are required for actions determined by the design authorization basis. Minimum requirements need to be established for assuring that setpoints are established and held within specified limits. This document establishes the controlling methodology for changing setpoints of all classifications. The instrumentation under consideration involve the transfer, storage, and volume reduction of radioactive liquid waste in the F- and H-Area High-Level Radioactive Waste Tank Fanns. The setpoint document (Appendix 2) will encompass the PROCESS AREA listed in the Safety Analysis Report (SAR) (DSTSA-200-10 Sup 18) which includes the diversion box HDB-8 facility. In addition to the PROCESS AREAS listed in the SAR, Building 299-H and the Effluent Transfer Facility (ETF) are also included in the scope.

PLUTONIUM

Refer also to citation(s) 321, 355, 904, 924, 1147, 1874, 1941, 2008, 2158, 2195, 2196, 2201, 2598

1944 (ANL--95/31) **Treatment of plutonium-bearing solutions: A brief survey of the DOE complex.** Conner, C.; Chamberlain, D.B.; Chen, L.; Vandegrift, G.F. Argonne National Lab., IL (United States). Mar 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96005298. Source: OSTI; NTIS; INIS; GPO Dep.

With the abrupt shutdown of some DOE facilities, a significant volume of in-process material was left in place and still requires treatment for interim storage. Because the systems containing these process streams have deteriorated since shutdown, a portable system for treating the solutions may be useful. A brief survey was made of the DOE complex on the need for a portable treatment system to treat plutonium-bearing solutions. A survey was completed to determine (1) the compositions and volumes of solutions and heels present, (2) the methods that have been used to treat these solutions and heels in the past, and (3) the potential problems that exist in removing and treating these solutions. Based on the surveys and on the Defense Nuclear Facilities Safety Board Recommendation 94-1, design criteria for a portable treatment system were generated.

1945 (ANL/CMT/CP–84590). **Performance of high plutonium-containing glasses for the immobilization of surplus fissile materials.** Bates, J.K.; Emery, J.W.; Hoh, J.C.; Johnson, T.R. Argonne National Lab., IL (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950401–16: 97. annual meeting of the American Ceramic Society, Cincinnati, OH (United States), 30 Apr - 1 May 1995). Order Number DE95013773. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium from dismantled weapons is being evaluated for geological disposal. While a final waste form has not been chosen, borosilicate glass will be one of the waste forms to be evaluated. The reactivity of the reference blend glass containing the standard amount of Pu (~0.01 wt %) to be produced by the Defense Waste Processing Facility (DWPF) is compared to that of glasses made from the same nominal frit composition but doped with 2 and 7 wt % Pu, and also equal mole percentages of Gd_2O_3. The Gd is added to act as a neutron poison to address criticality concerns. The four different glasses have been reacted using the PCT-B method with a SA/V of 20,000 m^{-1} and the Argonne Vapor Hydration Test (VHT) method. Both test methods accelerate the reaction of the glass. PCT-B is used to determine the reactivity of the glass by analyzing the solution and reacted test components, while the VHT is used to evaluate the long-term reactivity of the glass and the distribution of Pu to secondary phases that will control the long-term reaction of the glass. The results of the tests with high levels of Pu are compared to those with the nominal levels to be produced in the standard DWPF glass.

1946 (ANL/CMT/CP–86185) **A portable concentrator for processing plutonium containing solutions.** Chamberlain, D.B. (and others); Conner, C.; Chen, L. Argonne National Lab., IL (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9509139–4: 7. ACS special symposium: emerging technologies in hazardous waste management, Atlanta, GA (United States), 17-20 Sep 1995). Order Number DE96002563. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a horizontal, compact agitated-film concentrator called a Rototherm, manufactured by Artisan Industries, Inc. which can be used to process aqueous solutions of radioactive wastes containing plutonium. The unit is designed to concentrate liquid streams to a high-solid content slurry.

1947 (ANL/CMT/CP–88453) **Application of spent fuel treatment technology to plutonium immobilization.** McPheeters, C.C; Ackerman, J.P.; Gay, E.C., Johnson, G.K. Argonne National Lab., IL (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9606116–19: Annual meeting of the American Nuclear Society (ANS), Reno, NV (United States), 16-20 Jun 1996). Order Number DE96009133. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the electrometallurgical treatment technology being developed at Argonne National Laboratory (ANL) is to convert certain spent nuclear fuels into waste forms that are suitable for disposal in a geological repository for nuclear waste. The spent fuels of interest are those that cannot be safely stored for a long time in their current condition, and those that cannot be qualified for repository disposal. This paper explores the possibility of applying this electrometallurgical treatment technology to immobilization of surplus fissile materials, primarily plutonium. Immobilization of surplus fissile materials by electrometallurgical treatment could be done in the same facilities, at the same time. and in the same equipment as the proposed treatment of the present inventory of spent nuclear fuel. The cost and schedule savings of this simultaneous treatment scheme would be significant.

1948 (CONF-951259–) **US Department of Energy Plutonium Stabilization and Immobilization Workshop, December 12-14, 1995: Final proceedings.** USDOE, Washington, DC (United States). May 1996. 474p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC01-93EW50512. From Plutonium stabilization and immobilization workshop; Washington, DC (United States); 12-14 Dec 1995. Order Number DE96011798. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the workshop was to foster communication within the technical community on issues surrounding stabilization and immobilization of the Department's surplus plutonium and plutonium- contaminated wastes. The workshop's objectives were to: build a common understanding of the performance, economics and maturity of stabilization and immobilization technologies; provide a system perspective on stabilization and immobilization technology options; and address the technical issues associated with technologies for stabilization and immobilization of surplus plutonium and plutonium- contaminated waste. The papers presented during this workshop have been indexed separately.

1949 (DOE/EA–1059) **Environmental Assessment Radioactive Source Recovery Program.** USDOE Los Alamos Area Office, NM (United States). 20 Dec 1995. 70p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96004641. Source: OSTI; NTIS; INIS; GPO Dep.

In a response to potential risks to public health and safety, the U.S. Department of Energy (DOE) is evaluating the recovery of sealed neutron sources under the Radioactive Source Recovery Program (RSRP). This proposed program would enhance the DOE's and the U.S. Nuclear Regulatory Commission's (NRC's) joint capabilities in the safe management of commercially held radioactive source materials. Currently there are no federal or commercial options for the recovery, storage, or disposal of sealed neutron sources. This Environmental Assessment (EA) analyzes the potential environmental impacts that would be expected to occur if the DOE were to implement a program for the receipt and recovery at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico, of unwanted and excess plutonium-beryllium (^{238}Pu-Be) and americium-beryllium (^{241}Am-Be) sealed neutron sources. About 1 kg (2.2 lb) plutonium and 3 kg (6.6 lb) americium would be recovered over a 15-year project. Personnel at LANL would receive neutron sources from companies, universities, source brokers, and government agencies across the country. These neutron sources would be temporarily stored in floor holes at the CMR Hot Cell Facility. Recovery reduces the neutron emissions from the source material and refers to a process by which: (1) the stainless steel cladding is removed from the neutron source material, (2) the mixture of the radioactive material (Pu-238 or Am-241) and beryllium that constitutes the neutron source material is chemically separated (recovered), and (3) the recovered Pu-238 or Am-241 is converted to an oxide form ($^{238}PuO_2$ or $^{241}AmO_2$). The proposed action would include placing the $^{238}PuO_2$ or $^{241}AmO_2$ in interim storage in a special nuclear material vault at the LANL Plutonium Facility.

1950 (DOE/EM–0279) **Plutonium focus area: Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Nuclear Materials Stabilization. Mar 1996. 46p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96008374. Source: OSTI; NTIS; INIS; GPO Dep.

To ensure research and development programs focus on the most pressing environmental restoration and waste management problems at the U.S. Department of Energy (DOE), the Assistant Secretary for the Office of Environmental Management (EM) established a working group in August 1993 to implement a new approach to research and technology development. As part of this approach, EM developed a management structure and principles that led to creation of specific focus areas. These organizations were designed to focus scientific and technical talent throughout DOE and the national scientific community on major environmental restoration and waste management problems facing DOE. The focus area approach provides the framework for inter-site cooperation and leveraging of resources on common problems. After the original establishment of five major focus areas within the Office of Technology Development (EM-50), the Nuclear Materials Stabilization Task Group (NMSTG, EM-66) followed EM-50's structure and chartered the Plutonium Focus Area (PFA). NMSTG's charter to the PFA, described in detail later in this book, plays a major role in meeting the EM-66 commitments to the Defense Nuclear Facilities Safety Board (DNFSB). The PFA is a new program for FY96 and as such, the primary focus of revision 0 of this Technology Summary is an introduction to the Focus Area; its history, development, and management structure, including summaries of selected technologies being developed. Revision 1 to the Plutonium Focus Area Technology Summary is slated to include details on all technologies being developed, and is currently planned for release in August 1996. The following report outlines the scope and mission of the Office of Environmental Management, EM-60, and EM-66 organizations as related to the PFA organizational structure.

1951 (DOE/EM–0297) **Plutonium focus area.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 117p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013519. Source: OSTI; NTIS; INIS; GPO Dep.

To ensure research and development programs focus on the most pressing environmental restoration and waste management problems at the U.S. Department of Energy (DOE), the Assistant Secretary for the Office of Environmental Management (EM) established a working group in August 1993 to implement a new approach to research and technology development. As part of this new approach, EM developed a management structure and principles that led to the creation of specific Focus Areas. These organizations were designed to focus the scientific and technical talent throughout DOE and the national scientific community on the major environmental restoration and waste management problems facing DOE. The Focus Area approach provides the framework for intersite cooperation and leveraging of resources on common problems. After the original establishment of five major Focus Areas within the Office of Technology Development (EM-50, now called the Office of Science and Technology), the Nuclear Materials Stabilization Task Group (EM-66) followed the structure already in place in EM-50 and chartered the Plutonium Focus Area (PFA). The following information outlines the scope and mission of the EM, EM-60, and EM-66 organizations as related to the PFA organizational structure.

1952 (DOE/SF/20948–T1) **Plutonium stabilization and packaging system.** BNFL, Inc., Richland, WA (United States). [1996]. 175p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-96SF20948. Order Number DE96009306. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the functional design of the Plutonium Stabilization and Packaging System (Pu SPS). The objective of this system is to stabilize and package plutonium metals and oxides of greater than 50% wt, as well as other selected isotopes, in accordance with the requirements of the DOE standard for safe storage of these materials for 50 years. This system will support completion of stabilization and packaging campaigns of the inventory at a number of affected sites before the year 2002. The package will be standard for all sites and will provide a minimum of two uncontaminated, organics free confinement barriers for the packaged material.

1953 (DOE/SF/20948–T2) **System design document for the plutonium stabilization and packaging system.** BNFL, Inc., Richland, WA (United States). 8 May 1996. 192p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-96SF20948. Order Number DE96009307. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this system is to stabilize and package plutonium metals and oxides of greater than 50% wt, as well as other selected isotopes, in accordance with the requirements for DOE standards for safe storage of these materials for 50 years. This document describes the highest level design information and user characteristics from an operational perspective. It provides guidance for developing procurement and installation specifications, interface requirements, and test plans.

1954 (DOE/SF/20948–T4) **System specification/system design document comment review: Plutonium Stabilization and Packaging System. Notes of conference.** BNFL, Inc., Denver, CO (United States). [1996]. 158p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-96SF20948. Order Number DE96012349. Source: OSTI; NTIS; INIS; GPO Dep.

A meeting was held between DOE personnel and the BNFL team to review the proposed resolutions to DOE comments on the initial issue of the system specification and system design document for the Plutonium Stabilization and Packaging System. The objectives of this project are to design, fabricate, install, and start up a glovebox system for the safe repackaging of plutonium oxide and metal, with a requirement of a 50-year storage period. The areas discussed at the meeting were: nitrogen in can; moisture instrumentation; glovebox atmosphere; can marking-bar coding; weld quality; NFPA-101 references; inner can swabbing; ultimate storage environment; throughput; convenience can screw-top design; furnace/trays; authorization basis; compactor safety; schedule for DOE review actions; fire protection; criticality safety; applicable standards; approach to MC and A; homogeneous oxide; resistance welder power; and tray overfill. Revised resolutions were drafted and are presented.

1955 (DOE/SF/20948–T5) **Health and Safety Management Plan for the Plutonium Stabilization and Packaging System.** BNFL, Inc., Denver, CO (United States). 4 Jun 1996. 34p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC03-96SF20948. Order Number DE96012348. Source: OSTI; NTIS; INIS; GPO Dep.

This Health and Safety Management Plan (HSMP) presents safety and health policies and a project health and safety organizational structure designed to minimize potential risks of harm to personnel performing activities associated with Plutonium Stabilization and Packaging System (Pu SPS). The objectives of the Pu SPS are to design, fabricate, install, and startup of a glovebox system for the safe repackaging of plutonium oxides and metals, with a requirement of a 50-year storage period. This HSMP is intended as an initial project health and safety submittal as part of a three phase effort to address health and safety issues related to personnel working the Pu SPS project. Phase 1 includes this HSMP and sets up the basic approach to health and safety on the project and addresses health and safety issues related to the engineering and design effort. Phase 2 will include the Site Specific Construction health and Safety Plan (SSCHSP). Phase 3 will include an additional addendum to this HSMP and address health and safety issues associated with the start up and on-site test phase of the project. This initial submittal of the HSMP is intended to address those activities anticipated to be performed during phase 1 of the project. This HSMP is intended to be a living document which shall be modified as information regarding the individual tasks associated with the project becomes available. These modifications will be in the form of addenda to be submitted prior to the initiation of each phase of the project. For additional work authorized under this project this HSMP will be modified as described in section 1.4.

1956 (DOE/SF/20948–T6) **System specification for the plutonium stabilization and packaging system.** BNFL Engineering Ltd., Denver, CO (United States). 1996. 188p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-96SF20948. Order Number DE96012347. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes functional design requirements for the Plutonium Stabilization and Packaging System (Pu SPS), as required by DOE contract DE-AC03-96SF20948 through contract modification 9 for equipment in Building 707 at Rocky Flats Environmental Technology Site (RFETS).

1957 (DOE/SR/18035–T2) **XRF and leaching characterization of waste glasses derived from wastewater treatment sludges.** Ragsdale, R.G., Jr. Clemson Univ., SC (United States). Dept. of Environmental Systems Engineering. Dec 1994. 108p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96011434. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of this study was to investigate use of XRF (x-ray fluorescence spectrometry) as a near real-time method to determine melter glass compositions. A range of glasses derived from wastewater treatment sludges associated with DOE sites was prepared. They were analyzed by XRF and wet chemistry digestion with atomic absorption/inductively coupled emission spectrometry. Results indicated good correlation between these two methods. A rapid sample preparation and analysis technique was developed and demonstrated by acquiring a sample from a pilot-scale simulated waste glass melter and analyzing it by XRF within one hour. From the results, XRF shows excellent potential as a process control tool for waste glass vitrification. Glasses prepared for this study were further analyzed for durability by toxicity characteristic leaching procedure and product consistency test and results are presented.

1958 (INEL–95/0038) **Non-fertile fuels development for plutonium and high-enriched uranium dispositioning in water cooled reactors.** Olsen, C.S. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1994. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003537. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of dismantling the bomb, there is about 100 MT of excess weapons grade plutonium in the United States and about 150 MT in the Commonwealth of Independent States. In addition, there is another 1000 MT of plutonium in commercial spent fuel that may be used as degraded weapons material. This report discusses one means to disposition weapons grade plutonium is by irradiating the fuel in light water reactors (LWRs) using a non-fertile fuel based on plutonium dispersed in an oxide mixture of zirconia stabilized with calcia or yttria as a solid solution. Plutonium dispersed in a zirconia matrix offers the potential to achieve very high burnups while maintaining mechanical integrity.

1959 (INEL–95/0214) **Glass waste forms for the Na-bearing high activity waste fractions.** Vinjamuri, K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001553. Source: OSTI; NTIS; INIS; GPO Dep.

Candidate experimental glasses for the Na-bearing high activity waste fractions were synthesized by crucible melting a mixture of reagent chemicals representative of the Na-bearing waste, the pilot plant alumina calcine, and frit additives at 1,200 or 1,600 C for 2–5 hours followed by air cooling of the melt. These glasses were characterized for density, elastic properties, viscosity, electrical resistivity, chemical durability, structural parameters, and glass phase separation. The results are discussed in this report.

1960 (INEL–95/0384) **Opportunities for mixed oxide fuel testing in the advanced test reactor to support plutonium disposition.** Terry, W.K. (and others); Ryskamp, J.M.; Sterbentz, J.W. Fermi National Accelerator Lab., Batavia, IL (United States). Aug 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001187. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous technical issues must be resolved before LWR operating licenses can be amended to allow the use of MOX fuel. These issues include the following: (1) MOX fuel fabrication process verification; (2) Whether and how to use burnable poisons to depress MOX fuel initial reactivity, which is higher than that of urania; (3) The effects of WGPu isotopic composition; (4) The feasibility of loading MOX fuel with plutonia content up to 7% by weight; (5) The effects of americium and gallium in WGPu; (6) Fission gas release from MOX fuel pellets made from WGPu; (7) Fuel/cladding gap closure; (8) The effects of power cycling and off-normal events on fuel integrity; (9) Development of radial distributions of burnup and fission products; (10) Power spiking near the interfaces of MOX and urania fuel assemblies; and (11) Fuel performance code validation. The Advanced Test Reactor (ATR) at the Idaho National Engineering Laboratory possesses many advantages for performing tests to resolve most of the issues identified above. We have performed calculations to show that the use of hafnium shrouds can produce spectrum adjustments that will bring the flux spectrum in ATR test loops into a good approximation to the spectrum anticipated in a commercial LWR containing MOX fuel while allowing operation of the test fuel assemblies near their optimum values of linear heat generation rate. The ATR would be a nearly ideal test bed for developing data needed to support applications to license LWRs for operation with MOX fuel made from weapons-grade plutonium. The requirements for planning and implementing a test program in the ATR have been identified. The facilities at Argonne National Laboratory-West can meet all potential needs for pre- and post-irradiation examination that might arise in a MOX fuel qualification program.

1961 (INEL–95/00458) **Stored Transuranic Waste Management Program at the Idaho National Engineering Laboratory.** Clements, T.L. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–76: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009059. Source: OSTI; NTIS; INIS; GPO Dep.

Since 1970, INEL has provided interim storage capacity for transuranic (TRU)-contaminated wastes generated by activities supporting US national defense needs. About 60% of the nation's current inventory of TRU-contaminated waste is stored at INEL, awaiting opening of the Waste Isolation Pilot Plant (WIPP), the designated federal repository. A number of activities are currently underway for enhancing current management capabilities, conducting projects that support local and national TRU management activities, and preparing for production-level waste retrieval, characterization, examination, certification, and shipment of untreated TRU waste to WIPP in April 1998. Implementation of treatment capability is planned in 2003 to achieve disposal of all stored TRU-contaminated waste by a target date of December 31, 2015, but no later than December 31, 2018.

1962 (INEL–95/00459) **Assessment of gas flammability in transuranic waste container.** Connolly, M.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Loehr, C.A.; Djordjevic, S.M.; Spangler, L.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950216–160: Waste management '95, Tucson, AZ (United States), 26 Feb - 2 Mar 1995). Order Number DE96003509. Source: OSTI; NTIS; INIS; GPO Dep.

The Safety Analysis Report for the TRUPACT-II Shipping Package [Transuranic Package Transporter-II (TRUPACT-II) SARP] set limits for gas generation rates, wattage limits, and flammable volatile organic compound (VOC) concentrations in transuranic (TRU) waste containers that would be shipped to the Waste Isolation Pilot Plant (WIPP). Based on existing headspace gas data for drums stored at the Idaho National Engineering Laboratory (INEL) and the Rocky Flats Environmental Technology Site (RFETS), over 30 percent of the contact-handled TRU waste drums contain flammable VOC concentrations greater than the limit. Additional requirements may be imposed for emplacement of waste in the WIPP facility. The conditional no-migration determination (NMD) for the test phase of the facility required that flame tests be performed if significant levels of flammable VOCs were present in TRU waste containers. This paper describes an approach for investigating the potential flammability of TRU waste drums, which would increase the allowable concentrations of flammable VOCS. A flammability assessment methodology is presented that will allow more drums to be shipped to WIPP without treatment or repackaging and reduce the need for flame testing on drums. The approach includes experimental work to determine mixture lower explosive limits (MLEL) for the types of gas mixtures observed in TRU waste, a model for predicting the MLEL for mixtures of VOCS, hydrogen, and methane, and revised screening limits for total flammable VOCs concentrations and concentrations of hydrogen and methane using existing drum headspace gas data and the model predictions.

1963 (INEL–95/00461) **Position for determining gas phase volatile organic compound concentrations in transuranic waste containers.** Connolly, M.J. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Liekhus, K.J.; Djordjevic, S.M.; Loehr, C.A. Spangler, L.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–2: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96003511. Source: OSTI; NTIS; INIS; GPO Dep.

In the conditional no-migration determination (NMD) for the test phase of the Waste isolation Pilot Plant (WIPP), the US Environmental Protection Agency (EPA) imposed certain conditions on the US Department of Energy (DOE) regarding gas phase volatile organic compound (VOC) concentrations in the void space of transuranic (TRU) waste containers. The EPA required the DOE to ensure that each waste container has no layer of confinement that contains flammable mixtures of gases or mixtures of gases that could become flammable when mixed with air. The EPA also required that sampling of the headspace of waste containers outside inner layers of confinement be representative of the entire void space of the container. The EPA stated that all layers of confinement in a container would have to be sampled until DOE can demonstrate to the EPA that sampling of all layers is unnecessary. A test program was conducted to demonstrate that the gas phase VOC concentration in the void space of each layer of confinement in vented drums can be estimated from measured drum headspace using a theoretical transport model and that sampling of each layer of confinement is unnecessary. This report summarizes the studies performed in the INEL test program and extends them for the purpose of developing a methodology for determining gas phase VOC concentrations in both vented and unvented TRU waste containers. The methodology specifies conditions under which waste drum headspace gases can be said to be representative of drum gases as a whole and describes a method for predicting drum concentrations in situations where the headspace concentration is not representative.

1964 (INEL–95/0511) **Evaluation of Rocky Flats Plant stored plutonium inventory at the Idaho National Engineering Laboratory.** Clements, T.L. Jr.; Einerson, J.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Sep 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003534. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to evaluate reported inventories of plutonium contained in stored transuranic (TRU) waste generated by the Rocky Flats Plant (RFP). From 1970 to 1989, this waste was shipped to the Idaho National Engineering Laboratory (INEL) and placed in aboveground retrievable storage at the Radioactive Waste Management

Complex (RWMC)-Transuranic Storage Area (TSA). This evaluation was initiated to address potential uncertainty in quantities of stored plutonium reported in the Radioactive Waste Management Information System (RWMIS). The RWMIS includes radionuclide information from generators that shipped TRU waste to INEL for storage. Recent evaluations performed on buried TRU waste (1954-1970) resulted in significant revision to the original reported values of plutonium, americium, and enriched uranium. These evaluations were performed based on Rocky Flats Plant (RFP) Inventory Difference (ID) records. This evaluation for stored TRU waste was performed to: (1) identify if significant discrepancies exist between RWMIS reported values and RFP ID records, (2) describe the methodology used to perform the RWMIS evaluation, (3) determine a Best Estimate (BE) and 95% Upper Confidence Bound (UB) on the plutonium inventory, (4) provide conclusions based on this evaluation, and (5) identify recommendations and/or actions that might be needed.

1965 (LA–13011) **The radiological hazard of plutonium isotopes and specific plutonium mixtures.** Heindel, G.; Clow, J.; Inkret, W.; Miller, G. Los Alamos National Lab., NM (United States). Nov 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96001443. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy defines the hazard categories of its nuclear facilities based upon the potential for accidents to have significant effects on specific populations and the environment. In this report, the authors consider the time dependence of hazard category 2 (significant on-site effects) for facilities with inventories of plutonium isotopes and specific weapons-grade and heat-source mixtures of plutonium isotopes. The authors also define relative hazard as the reciprocal of the hazard category 2 threshold value and determine its time dependence. The time dependence of both hazard category 2 thresholds and relative hazards are determined and plotted for 10,000 years to provide useful information for planning long-term storage or disposal facilities.

1966 (LA–13058-MS) **Technology survey for real-time monitoring of plutonium in a vitrifier off-gas system.** Berg, J.M.; Veirs, D.K. Los Alamos National Lab., NM (United States). Jan 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96007461. Source: OSTI; NTIS; INIS; GPO Dep.

We surveyed several promising measurement technologies for the real-time monitoring of plutonium in a vitrifier off-gas system. The vitrifier is being developed by Westinghouse Savannah River Corp. and will be used to demonstrate vitrification of plutonium dissolved in nitric acid for fissile material disposition. The risk of developing a criticality hazard in the off-gas processing equipment can be managed by using available measurement technologies. We identified several potential technologies and methods for detecting plutonium that are sensitive enough to detect the accumulation of a mass sufficient to form a criticality hazard. We recommend gross alpha-monitoring technologies as the most promising option for Westinghouse Savannah River Corp. to consider because that option appears to require the least additional development. We also recommend further consideration for several other technologies because they offer specific advantages and because gross alpha-monitoring could prove unsuitable when tested for this specific application.

1967 (LA-UR–96-2301) **Applying modular concepts to process and authorization basis issues for plutonium residue stabilization.** Hildner, R.A.; Zygmunt, S.J. Los Alamos National Lab., NM (United States). [1996]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9607134–3: 10. American Glovebox Society annual conference, San Diego, CA (United States), 22-25 Jul 1996). Order Number DE96012827. Source: OSTI; NTIS; INIS; GPO Dep.

A recent study completed for the Rocky Flats Environmental Technology Site proved that it is feasible to use modular, skid-mounted processes for disposition of Category 1 quantities of nuclear materials. This would allow personnel to assemble, test, and authorize the processes outside of the nuclear material management area. Besides having cost and schedule advantages, this technology reduces the uncertainty and risk in applications involving disposition of materials and facilities. This paper explains the previous research into modular skid-mounted processes and suggests various future applications of the technology.

1968 (PFC/RR–95-11) **Detection of plutonium with the microwave plasma continuous emissions monitor.** Rhee, D.Y. (Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center); Woskov, P.P.; Gervais, K.; Surma, J.E. Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center; Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011009. Source: OSTI; NTIS; INIS; GPO Dep.

The first successful detection of plutonium with a continuous microwave plasma emissions monitor has been demonstrated. Seven plutonium emission peaks in the 362 - 366 nm and 449 - 454 nm ranges were clearly observed. The strongest peak was at 453.62 nm. This peak and five of the other plutonium peaks were easily distinguishable from possible interference from iron emission peaks with a spectrometer resolution of 0.1 nm. 2 refs., 3 figs.

1969 (PNL–10787) **Determination of the radioactive material and plutonium holdup in ducts and piping in the 327 Building.** Haggard, D.L.; Brackenbush, L.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000749. Source: OSTI; NTIS; INIS; GPO Dep.

The 327 Building Post Irradiation Testing Laboratory is used for temporary storage and for destructive and nondestructive examination of irradiated reactor fuels and structural materials. The facility contains 12 shielded hot cells, two water-filled basins, and dry storage. This report describes the measurements performed to determine the radionuclide content and mass of Pu in ducts, filters, and piping in the basement of the 327 Building at the Hanford Site in Washington State. This information is needed to characterize facility radiation levels, to verify compliance with criticality safety specifications, and to allow more accurate nuclear material control using nondestructive assay (NDA) methods. Gamma assay techniques typically employed for NDA analysis were used to determine the gamma-emitting isotopes in the ducts, filters, and piping. Passive neutron counting was selected to estimate the Pu content because high gamma levels from fission and activation products effectively mask any gamma emissions from Pu. A high-purity gamma-ray detector was used to measure the mixed fission and activation radionuclides. A slab neutron detector containing five ^{3}He proportional counters was used to determine the neutron emission rates and estimate the mass of Pu present. Estimated Pu mass in the basement ductwork and filters is 7.2 grams. The radioactive liquid waste system line has 4.2 grams and Special Environmental Radiometallurgy Facility cell recirculating system contains 8.7 grams in the lower filter housing and associated piping. Total Pu mass holdup estimates range from 20.1 grams, assuming that the Pu is weapons-grade Pu, to a best estimate of 11.0 grams Pu, assuming 11% ^{240}Pu.

1970 (WHC-SA–2781) **International shipment of plutonium by air.** Mercado, J.E.; McGrogan, J.P. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9506150–7: 2. annual Department of Energy defense programs packaging workshop, San Francisco, CA (United States), 12-15 Jun 1995). Order Number DE95016337. Source: OSTI; NTIS; INIS; GPO Dep.

In support of the United States (US) Government's decision to place excess plutonium oxide at the US Department of Energy's (DOE) Hanford Site under International Atomic Energy Agency (IAEA) safeguards, the Department of State notified the Congress that a plutonium storage vault at the Plutonium Finishing Plant at the Hanford Site would be added to the eligible facilities list. As part of the preparations to transfer the plutonium oxide under IAEA safeguards, samples of the powder were taken from the inventory to be shipped to the IAEA headquarters in Vienna, Austria, for laboratory analysis. The analysis of these samples was of high priority, and the IAEA requested that the material be shipped by aircraft, the most expeditious method.

1971 (WHC-SA–2833) **Comparison of NDA and DA measurement techniques for excess Pu powders at the Hanford Site: Operator and IAEA experience.** Welsh, T.L. (and others); McRae, L.P.; Delegard, C.H. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950787–27: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE95015740. Source: OSTI; NTIS; INIS; GPO Dep.

Quantitative physical measurements are necessary components of the International Atomic Energy Agency (IAEA) nuclear material safeguards verification regime. In December 1994, IAEA safeguards were initiated on an inventory of plutonium-bearing oxide and scrap items in Vault 3 of the 2736-Z Building of the Plutonium Finishing Plant on the United States Department of Energy's (USDOE) Hanford Site. The material originated in the United States nuclear weapons complex. The diversity of the chemical form and the heterogenous physical form of the plutonium in this inventory were expected to challenge the target precision and accuracy of methods employed by IAEA: quantitative destructive analytical techniques (which are susceptible to sampling error) and quantitative coincident neutron measurements (which rely on knowledge of the material's chemical form and purity). Because of the diverse and heterogenous nature of plutonium-bearing scrap, plant operations increasingly have adopted calorimetric techniques both for item inventory measurements and for verification purposes. During the recent advent of IAEA safeguards at Vault 3, a set of destructive and nondestructive methods were applied to a number of inventory items (cans of plutonium-bearing powders) with widely ranging chemical purities. Results of these measurements, gathered by the operator's and IAEA's laboratories and instruments as well as by instruments from Pacific Northwest Laboratory and USDOE's Los Alamos National Laboratory (LANL), are presented and statistically compared.

1972 (WHC-SA–2834) **Comparison of NDA and DA measurement techniques for excess plutonium powders at the Hanford Site: Statistical design and heterogeneity testing.** Welsh, T.L. (Westinghouse Hanford Co., Richland, WA (United States)); McRae, L.P.; Delegard, C.H.; Liebetrau, A.M.; Johnson, W.C.; Theis, W.; Lemaire, R.J.; Xiao, J. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950787–26: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE95015738. Source: OSTI; NTIS; INIS; GPO Dep.

Quantitative physical measurements are a n component of the International Atomic Energy Agency (IAEA) nuclear material m&guards verification regime. In December 1994, LA.FA safeguards were initiated on an inventory of excess plutonium powder items at the Plutonium Finishing Plant, Vault 3, on the US Department of Energy's Hanford Site. The material originl from the US nuclear weapons complex. The diversity of the chemical form and the heterogenous physical form of this inventory were anticipated to challenge the precision and accuracy of quantitative destructive analytical techniques. A sampling design was used to estimate the degree of heterogeneity of the plutonium content of a variety of inventory items. Plutonium concentration, the item net weight, and the ^{240}Pu content were among the variables considered in the design. Samples were obtained from randomly selected location within each item. Each sample was divided into aliquots and analyzed chemically. Operator measurements by calorimetry and IAEA measurements by coincident neutron nondestructive analysis also were performed for the initial physical inventory verification materials and similar items not yet under IAEA safeguards. The heterogeneity testing has confirmed that part of the material is indeed significantly heterogeneous; this means that precautionary measures must be taken to obtain representative samples for destructive analysis. In addition, the sampling variability due to material heterogeneity was found to be comparable with, or greater than, the variability of the operator's calorimetric measurements.

1973 (WHC-SA–3017-FP) **Plutonium storage phenomenology.** Szempruch, R. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951259–6: Plutonium stabilization and immobilization workshop, Washington, DC (United States), 12-14 Dec 1995). Order Number DE96009107. Source: OSTI; NTIS; INIS; GPO Dep.

Plutonium has been produced, handled, and stored at Department of Energy (DOE) facilities since the 1940s. Many changes have occurred during the last 40 years in the sources, production demands, and end uses of plutonium. These have resulted in corresponding changes in the isotopic composition as well as the chemical and physical forms of the processed and stored plutonium. Thousands of ordinary food pack tin cans have been used successfully for many years to handle and store plutonium. Other containers have been used with equal success. This paper addressees the exceptions to this satisfactory experience. To aid in understanding the challenges of handling plutonium for storage or immobilization the lessons learned from past storage experience and the necessary countermeasures to improve storage performance are discussed.

1974 (WHC-SD-CP-DRD-003) **Vault safety and inventory system conceptual baseline document.** Corrigan, N.B. Westinghouse Hanford Co., Richland, WA (United States). 5 Sep 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050001. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the baseline scope, schedule, and cost of the replacement computer system for the Vault Safety and Inventory System at the Plutonium Finishing Plant.

1975 (WHC-SD-CP-SA-026-Rev.1) **Seismic analyses of equipment in 2736-Z complex. Revision 1.** Ocoma, E.C. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 863p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012487. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the structural qualification for the existing equipment when subjected to seismic loading in the Plutonium Storage Complex. It replaces in entirety Revision 0 and reconciles the U.S. Department of Energy (DOE) comments on Revision 0. The Complex consists of 2736-Z Building (plutonium storage vault), 2736-ZA Building (vault ventilation equipment building), and 2736-ZB Building (shipping/receiving, repackaging activities). The existing equipment structurally qualified in this report are the metal storage racks for 7 inch and lard cans in room 2 of Building 2736-Z; the cubicles, can holders and pedestals in rooms 1, 3, and 4 of Building 2736-Z; the ventilation duct including exhaust fans/motors, emergency diesel generator, and HEPA filter housing in Building 2736-ZA; the repackaging glovebox in Building 2736-ZB; and the interface duct between Buildings 2736-Z and 2736-ZA.

1976 (WHC-SD-CP-TI-195) **Ash Stabilization Campaign Blend Plan.** Winstead, M.L. Westinghouse Hanford Co., Richland, WA (United States). 21 Jun 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015549. Source: OSTI; NTIS; INIS; GPO Dep.

This Stabilization Blend Plan documents the material to be processed and the processing order for the FY95 Ash Stabilization Campaign. The primary mission of this process is to reduce the inventory of unstable plutonium bearing ash. The source of the ash is from Rocky Flats and the 232-Z incinerator at the Plutonium Finishing Plant (PFP). The ash is currently being stored in Room 235B and Vault 174 in building 234-5Z. The sludge is to be thermally stabilized in a glovebox in room 230A of the 234-5Z building and material handling for the process will be done in room 230B of the same building. The campaign is scheduled for approximately 12–16 weeks. A total of roughly 4 kg of Pu will be processed.

1977 (WHC-SD-PRP-HA-002-Rev.2) **Plutonium finishing plant hazards assessment.** Sutton, L.N. Westinghouse Hanford Co., Richland, WA (United States). 8 Sep 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050018. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes the technical basis in support of Emergency Planning activities for the Plutonium Finishing Plant on the Hanford Site. Through this document, the technical basis for the development of facility speific Emergency Action Levels and the Emergency Planning Zone is demonstrated.

1978 (WHC-SD-SNF-TA-007) **Surveillance and prediction methods for the plutonium limit in the K-East Fuel Storage Basin Sandfilter Backwash Pit.** Harris, R.A. Westinghouse Hanford Co., Richland, WA (United States). 1 Jun 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014311. Source: OSTI; NTIS; INIS; GPO Dep.

Methods to predict and measure the amount of plutonium added to the 105-K East fuel storage basin sandfilter backwash pit have been developed. The bases for the methods and an evaluation of available data used in the methods are described.

1979 (WHC-SD-SQA-CSA-20397) **Addendum 6 to CSAR 79-038 out-of-hood plutonium storage (burial box).** Chiao, T. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015550. Source: OSTI; NTIS; INIS; GPO Dep.

The Addendum considered an increase in the limit of fissile material in a stacked container array to 500 grams. In other words, the sum of fissile material in an array of containers is limited to 500 grams, regardless of whether the containers are stacked or not. The results of this evaluation indicates that with the modification of the fissile limits described, the system of a container array will stay sub-critical.

1980 (WHC-SD-WM-ER-422-Rev.2) **Tank 241-BY-108 headspace gas and vapor characterization results for samples collected in March 1994 and October 1994.** Huckaby, J.L. (Pacific Northwest Lab., Richland, WA (United States)); Bratzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 59p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050119. Source: OSTI; NTIS; INIS; GPO Dep.

Significant changes have been made to all of the original vapor characterization reports. This report documents specific headspace gas and vapor characterization results for all vapor sampling events to date. In addition, changes have been made to the original vapor reports to qualify the data based on quality assurance issues associated with the performing laboratories.

1981 (WSRC-MS-95-0354) **Temperature and humidity effects on the corrosion of aluminum-base reactor fuel cladding materials during dry storage.** Peacock, H.B.; Sindelar, R.L.; Lam, P.S. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9509253-7: 18. international meeting on reduced enrichment for research and test reactors, Paris (France), 18-21 Sep 1995). Order Number DE96003361. Source: OSTI; NTIS; INIS; GPO Dep.

The effect of temperature and relative humidity on the high temperature (up to 200°C) corrosion of aluminum cladding alloys was investigated for dry storage of spent nuclear fuels. A dependency on alloy type and temperature was determined for saturated water vapor conditions. Models were developed and benchmarked to allow prediction of cladding behavior of 1100, 5052, and 6061 aluminum alloys for up to 50+ years at 100% relative humidity. Calculations show that for a closed system, corrosion stops after all moisture and oxygen is used up during corrosion reactions with aluminum alloys.

1982 (WSRC-TR-95-0468) **Vitrification of Rocky Flats ash followed by encapsulation in the Defense Waste Processing Facility.** McKibben, J.M. (Westinghouse Savannah River Co., Aiken, SC (United States)); Land, B.; Strachan, D.M.; Perez, J.M. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-951259-7: Plutonium stabilization and immobilization workshop, Washington, DC (United States), 12-14 Dec 1995). Order Number DE96009645. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 10 to 20 metric tons of plutonium in the US is in the form of scrap, residues, oxides, ash, metal, sludge, compounds, etc. This paper describes a relatively simple concept of stabilizing most of this type of plutonium by converting it into encapsulated glass. A full-scale hot demonstration of the concept is proposed, in which Rocky Flats ash would be vitrified and sealed in small cans, followed by encapsulation of the cans in Defense Waste Processing Facility (DWPF) canisters with high-level waste glass. The proposal described in this paper offers an integrated national approach for early stabilization and disposition of the nation's plutonium-bearing residues.

1983 (WSRC-TR-95-0472) **Glass and ceramic immobilization alternatives and the use of new facilities.** Kan, T. (Lawrence Livermore National Lab., CA (United States)); Sullivan, K. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-951259-9: Plutonium stabilization and immobilization workshop, Washington, DC (United States), 12-14 Dec 1995). Order Number DE96009647. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is examining options for placing weapons-usable surplus nuclear materials (principally plutonium [Pu] and highly enriched uranium [U]) in a form or condition that is substantially and inherently more difficult to use in weapons either by the Host Country or by a subnational group. The two most promising alternatives for achieving these aims are: fabrication and use as fuel, without reprocessing, in existing or modified nuclear reactors; or vitrification in combination with high-level radioactive waste. The mission of the immobilization technologies and facilities considered in this paper and the paper "Use of Savannah River Site (SRS) Facilities for Glass and Ceramics," is to produce a waste form by incorporating plutonium in either an amorphous glass or a crystalline ceramic matrix and then disposal of it in a geologic repository. This paper summarizes all the glass and ceramic alternatives under consideration and presents the immobilization options using new facilities. The subsequent paper presents the immobilization options which use existing facilities at the Savannah River Site.

DECONTAMINATION & DECOMMISSIONING

Refer also to citation(s) 11, 38, 106, 204, 209, 344, 348, 351, 352, 358, 408, 409, 410, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426, 427, 428, 429, 430, 431, 432, 433, 434, 435, 436, 437, 439, 440, 441, 442, 443, 444, 445, 446, 447, 448, 449, 450, 451, 452, 453, 454, 455, 456, 457, 458, 459, 460, 461, 462, 463, 464, 465, 466, 467, 468, 469, 499, 585, 586, 661, 663, 667, 725, 748, 821, 823, 834, 864, 981, 1055, 1113, 1263, 1911, 1936, 1944, 2288, 2299, 2300, 2338, 2362, 2368, 2369, 2373, 2374, 2388, 2429, 2430, 2438, 2439, 2461, 2464, 2473, 2604, 2626

1984 (AFIT/ENS-95-01) **Comparative life-cycle cost analysis for low-level mixed waste remediation alternatives.** Jackson, J.A.; White, T.P.; Kloeber, J.M.; Toland, R.J.; Cain, J.P.; Buitrago, D.Y. Air Force Inst. of Tech., Wright-Patterson AFB, OH (United States). Mar 1995. 302p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011131. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is two-fold: (1) to develop a generic, life-cycle cost model for evaluating low-level, mixed waste remediation alternatives, and (2) to apply the model specifically, to estimate remediation costs for a site similar to the Fernald Environmental Management Project near Cincinnati, OH. Life-cycle costs for vitrification, cementation, and dry removal process technologies are estimated. Since vitrification is in a conceptual phase, computer simulation is used to help characterize the support infrastructure of a large scale vitrification plant. Cost estimating relationships obtained from the simulation data, previous cost estimates, available process data, engineering judgment, and expert opinion all provide input to an Excel based spreadsheet for generating cash flow streams. Crystal Ball, an Excel add-on, was used for discounting cash flows for net present value analysis. The resulting LCC data was then analyzed using multi-attribute decision analysis techniques with cost and remediation time as criteria. The analytical framework presented allows alternatives to be evaluated in the context of budgetary, social, and political considerations. In general, the longer the remediation takes, the lower the net present value of the process. This is true because of the time value of money and large percentage of the costs attributed to storage or disposal.

1985 (ANL-95-32) **Equipment decontamination: A brief survey of the DOE complex.** Conner, C.; Chamberlain, D.B; Chen, L.; Vandegrift, G.F. Argonne National Lab., IL (United States). Mar 1995. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96005816. Source: OSTI; NTIS; INIS; GPO Dep.

Deactivation at DOE facilities has left a tremendous amount of contaminated equipment behind. In-situ methods are needed to decontaminate the interiors of the equipment sufficiently to allow either free release or land disposal. A brief survey was completed of the DOE complex on their needs for equipment decontamination with in-situ technology to determine (1) the types of contamination problems within the DOE complex, (2) decontamination processes that are being used or are being developed within the DOE, and (3) the methods that are available to dispose of spent decontamination solutions. In addition, potential sites for testing decontamination methods were located. Based on the information obtained from these surveys, the Rocky Flats Plant and the Idaho National Engineering Laboratory appear to be best suited to complete the initial testing of the decontamination processes.

1986 (ANL/CMT/CP–87864) **A review of chemical decontamination systems for nuclear facilities.** Chen, L.; Chamberlain, D.B.; Conner, C.; Vandegrift, G.F. Argonne National Lab., IL (United States). Chemical Technology Div. [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960443–6: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96008403. Source: OSTI; NTIS; INIS; GPO Dep.

With the downsizing of the Department of Energy (DOE) complex, many of its buildings and facilities will be decommissioned and dismantled. As part of this decommissioning, some form of decontamination will be required. To develop an appropriate technology for in situ chemical decontamination of equipment interiors in the decommissioning of DOE nuclear facilities, knowledge of the existing chemical decontamination methods is needed. This paper attempts to give an up-to-date review of chemical decontamination methods. This survey revealed that aqueous systems are the most widely used for the decontamination and cleaning of metal surfaces. We have subdivided the aqueous systems by types of chemical solvent: acid, alkaline permanganate, highly oxidizing, peroxide, and proprietary. Two other systems, electropolishing and foams and gels, are also described in this paper.

1987 (ANL/CMT/CP–87865) **Decontamination of actinides and fission products from stainless steel surfaces.** Mertz, C. (Argonne National Lab., IL (United States)); Chamberlain, D.B.; Chen, L.; Conner, C.; Vandegrift, G.F.; Drockelman, D.; Kaminski, M.; Landsberger, S.; Stubbins, J. Argonne National Lab., IL (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960443–5: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96008402. Source: OSTI; NTIS; INIS; GPO Dep.

Seven in situ decontamination processes were evaluated as possible candidates to reduce radioactivity levels in nuclear facilities throughout the DOE complex. These processes were tested using stainless steel coupons (Type 304) contaminated with actinides (Pu and Am) or fission products (a mixture of Cs, Sr, and Gd). The seven processes were decontamination with nitric acid, nitric acid plus hydrofluoric acid, fluoboric acid, silver(II) persulfate, hydrogen peroxide plus oxalic acid plus hydrofluoric acid, alkaline persulfate followed by citric acid plus oxalic acid, and electropolishing using nitric acid electrolyte. Of the seven processes, the nitric acid plus hydrofluoric acid and fluoboric acid solutions gave the best results; the decontamination factors for 3- to 6-h contacts at 80°C were as high as 600 for plutonium, 5500 for americium, 700 for cesium, 15000 for strontium, and 1100 for gadolinium.

1988 (ANL/D-D/TM–95/1) **A survey of commercially available manipulators, end-effectors, and delivery systems for reactor decommissioning activities.** Henley, D.R. (Argonne National Lab., IL (United States)); Litka, T.J. Argonne National Lab., IL (United States). May 1996. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96013516. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous nuclear facilities owned by the U.S. Department of Energy (DOE) are under consideration for decommissioning. Currently, there are no standardized, automated, remote systems designed to dismantle and thereby reduce the size of activated reactor components and vessels so that they can be packaged and shipped to disposal sites. Existing dismantling systems usually consist of customized, facility-specific tooling that has been developed to dismantle a specific reactor system. Such systems have a number of drawbacks. Generally, current systems cannot be disassembled, moved, and reused. Developing and deploying the tooling for current systems is expensive and time-consuming. In addition, the amount of manual work is significant because long-handled tools must be used; as a result, personnel are exposed to excessive radiation. A standardized, automated, remote system is therefore needed to deliver the tooling necessary to dismantle nuclear facilities at different locations. Because this system would be reusable, it would produce less waste. The system would also save money because of its universal design, and it would be more reliable than current systems.

1989 (ANL/D-D/TM–96/1) **Waste minimization handbook, Volume 1.** Boing, L.E.; Coffey, M.J. Argonne National Lab., IL (United States). Dec 1995. 168p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96009935. Source: OSTI; NTIS; INIS; GPO Dep.

This technical guide presents various methods used by industry to minimize low-level radioactive waste (LLW) generated during decommissioning and decontamination (D and D) activities. Such activities generate significant amounts of LLW during their operations. Waste minimization refers to any measure, procedure, or technique that reduces the amount of waste generated during a specific operation or project. Preventive waste minimization techniques implemented when a project is initiated can significantly reduce waste. Techniques implemented during decontamination activities reduce the cost of decommissioning. The application of waste minimization techniques is not limited to D and D activities; it is also useful during any phase of a facility's life cycle. This compendium will be supplemented with a second volume of abstracts of hundreds of papers related to minimizing low-level nuclear waste. This second volume is expected to be released in late 1996.

1990 (ANL/DIS/CP–87709) **Unit decontamination and dismantlement (D&D) costs.** Folga, S. (Argonne National Lab., IL (United States)); Swanston, R.; Davis, M.; Janke, R.J. Argonne National Lab., IL (United States). 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960212–16: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006904. Source: OSTI; NTIS; INIS; GPO Dep.

A series of relationships have been developed for estimating unit decontamination and dismantlement (D&D) costs for a number of building types which may be applied in the absence of other data to obtain rough order-of-magnitude (ROM) cost estimates for D&D activities. The relationships were developed using unit D&D costs for a number of building structure types at the Department of Energy Fernald site. These unit costs into account the level of radioactive contamination as well as the, building size.

1991 (ANL/EA/CP--87182) **On-site disposal of decontaminated and dismantled (D and D) materials: A management approach.** Hall, J.S. (Dept. of Energy, Cincinnati, OH (United States). Fernald Area Office); Clark, T.R.; Davis, M.J.; Picel, K.C. Argonne National Lab., IL (United States). 19 Jul 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868--31: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96002273. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP) is a federal facility located near Cincinnati, Ohio that is being remediated. Operable Unit 3 (OU3) of the FEMP consists of 232 buildings and other structures that formerly housed various uranium and thorium metallurgical and chemical processes. The buildings are constructed primarily of steel and concrete, with transite siding. The structures are being decontaminated and dismantled using an interim remedial action approach. The disposition of the debris and other waste materials generated by the interim action is being addressed by the final remedial action for the operable unit. The preferred alternative is disposal of most of the material in an engineered disposal cell located on the FEMP property. This is complicated by the fact that the FEMP is located in an environmentally sensitive area and by the complex nature of the materials. The principal aquifer located beneath the site, the Great Miami Aquifer, is designated as a sole-source aquifer under the Safe Drinking Water Act. Disposal of any wastes at the FEMP must be protective of the aquifer. Dismantlement of OU3 structures will result in a very heterogeneous waste stream, both in terms of types of materials and levels of contamination. Wastes to be managed also include contaminated production equipment and drummed materials associated with former production activities, as well as structural materials. All of these factors complicate the management of OU3 materials. This paper discusses the approach proposed by the FEMP for the management of materials resulting from the interim remedial action. The components of the management approach being used to address disposal of the heterogeneous wastes from OU3 in an environmentally sensitive manner are discussed, followed by some conclusions.

1992 (ANL/EA/CP--88311) **Estimating D and D costs for structures at DOE facilities: Some considerations.** Davis, M.J. (Argonne National Lab., IL (United States)); Folga, S.; Swanston, R.; Janke, R.J. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960443--7: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96008445. Source: OSTI; NTIS; INIS; GPO Dep.

A number of issues are examined related to estimating decontamination and decommissioning costs for structures at US Department of Energy facilities. The ability to develop detailed estimates for such facilities is generally well established and the general range of costs for such activity is well understood. However, current ability to quickly develop credible planning estimates is more limited. A need exists for a continuing synthesis of experience to allow for an improved ability to develop both detailed and planning estimates.

1993 (ANL/EAD/TM--51) **Derivation of guidelines for uranium residual radioactive material in soil at the B&T Metals Company site, Columbus, Ohio.** Kamboj, S.; Nimmagadda, Mm.; Yu, C. Argonne National Lab., IL (United States). Environmental Assessment Div. Jan 1996. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96005808. Source: OSTI; NTIS; INIS; GPO Dep.

Guidelines for uranium residual radioactive material in soil were derived for the B&T Metals Company site in Columbus, Ohio. This site has been identified for remedial action under the US Department of Energy's (DOE's) Formerly Utilized Sites Remedial Action Program (FUSRAP). Single-nuclide and total-uranium guidelines were derived on the basis of the requirement that following remedial action, the 50-year committed effective dose equivalent to a hypothetical individual living or working in the immediate vicinity of the site should not exceed a dose constraint of 30 mrem/yr for the current use and likely future use scenarios or a dose limit of 100 n-mrem/yr for less likely future use scenarios. The DOE residual radioactive material guideline computer code, RESRAD, was used in this evaluation. RESRAD implements the methodology described in the DOE manual for establishing residual radioactive material guidelines. Three scenarios were considered; each assumed that for a period of 1,000 years following remedial action, the site would be used without radiological restrictions. The three scenarios varied with regard to the type of site use, time spent at the site by the exposed individual, and sources of food and water consumed. The evaluations indicate that the dose constraint of 30 mrem/yr would not be exceeded for uranium (including uranium-234, uranium-235, and uranium-238) within 1,000 years, provided that the soil concentration of total uranium (uranium-234, uranium-235, and uranium-238) at the B&T Metals site did not exceed 1, I 00 pCi/g for Scenario A (industrial worker, current use) or 300 pCi/g for Scenario B (resident with municipal water supply, a likely future use). The dose limit of 100 mrem/yr would not be exceeded at the site if the total uranium concentration of the soil did not exceed 880 pCi/g for Scenario C (resident with an on-site water well, a plausible but unlikely future use).

1994 (ANL/EAD/TM--55) **Postremediation dose assessment for the former Alba Craft Laboratory site, Oxford, Ohio.** Kamboj, S. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Nimmagadda, M.; Yu, C. Argonne National Lab., IL (United States). Apr 1996. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96012031. Source: OSTI; NTIS; INIS; GPO Dep.

Potential maximum radiation dose rates were calculated for the former Alba Craft Laboratory site in Oxford, Ohio, which was involved in machining of uranium metal in the 1950s for the U.S. atomic energy program. The site is not currently being used. The residual radioactive material guidelines (RESRAD) computer code, which implements the methodology described in the US Department of Energy's (DOE's) manual for establishing residual radioactive material guidelines, was sued in this evaluation. Three potential land use scenarios were considered for the former Alba Craft site; the scenarios vary with regard to the type of site use, time spent at the site by the exposed individual, and sources of food consumed. Scenario A (a possible land use scenario) assumed industrial use of the site; Scenario B (a likely future land use scenario) assumed residential use of the site; and Scenario C (a possible but unlikely land use scenario) assumed the presence of a resident farmer. For scenario A, it was assumed that any water used for domestic or industrial activities would be from uncontaminated off-site municipal sources. The water used for drinking, household purposes, and irrigation was assumed to be from uncontaminated municipal sources in Scenario B; groundwater drawn from a well located at the downgradient edge of the contaminated zone would be the only source of water for drinking, irrigation, and raising livestock in Scenario C. The results of the evaluation indicated that the DOE dose limit of 100 mrem/yr would not be exceeded for any of the scenarios analyzed. The potential maximum dose rates for Scenarios A, B, and C are 0.64, 2.0, and 11 mrem/yr, respectively.

1995 (ANL/EMO/CP--90483) **Minimizing waste in environmental restoration.** Moos, L.; Thuot, J.R. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960741--11: Pollution prevention conference, Chicago, IL (United States), 9-11 Jul 1996). Order Number DE96012757. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental restoration, decontamination and decommissioning and facility dismantelment projects are not typically known for their waste minimization and pollution prevention efforts. Typical projects are driven by schedules and milestones with little attention given to cost or waste minimization. Conventional wisdom in these projects is that the waste already exists and cannot be reduced or minimized. In fact, however, there are three significant areas where waste and cost can be reduced. Waste reduction can occur in three ways: beneficial reuse or recycling; segregation of waste types; and reducing generation of secondary waste. This paper will discuss several examples of reuse, recycle, segregation, and secondary waste reduction at ANL restoration programs.

1996 (ANL/ESH-HP--96/01) **Radiological status report for the EBWR containment building. Volume 1: Summary and analysis.** Murdoch, B.T. Argonne National Lab., IL (United States). Feb 1996. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96008722. Source: OSTI; NTIS; INIS; GPO Dep.

At the conclusion of the EBWR D and D process, ANL Health Physics conducted a release survey to determine the radiological status of the facility. The primary goal of the survey was to verify that residual activities on building surfaces met DOE and ANL guidelines for downposting of a Radiologically Contaminated Area to a Radiologically Controlled Area. The resultant area was to bear no contamination designation, with no requirements for radiological personnel monitoring or protective clothing. ANL Health Physics designed a survey procedure, using a graded approach considering the building history, the D and D process, and the intended future use. The survey followed the general guidance of NRC NUREG/CR-5849, but simplified and reduced in scope to match the release goal. The building interior surfaces were divided into 15 principal survey units and one special survey unit. Each of the principal survey units had to meet the controlled release guidelines. The procedure consisted of dual full floor scans for beta/gamma activity, sampling measurements of total and removable alpha and beta/gamma activities, and background gamma exposure surveys. In the 15 principal survey units, surface activities were measured at a total of 444 locations. With the exception of certain excluded contaminated areas and mechanical equipment, the building interior meets the limited release guidelines.

1997 (ANL/ESH-HP--96/02) **Verification survey of buildings 200 hot cells.** Sholeen, C.M. Argonne National Lab., IL (United States). Mar 1996. 212p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96011918. Source: OSTI; NTIS; INIS; GPO Dep.

At the start of this D&D project, the decontamination goals were set at (1) reducing the stack emissions to 10% of the 1991 emissions; (2) reducing the exposure rate in each cell to < 1 mR/h; and (3) reducing the removable contamination to none detectable. Since the contamination can be fixed with paint, the other two goals were given priority. The estimate of the 1995 emissions from K-3 was 20% of the 1991 emissions estimate. However, the 1996 estimates are ~9% of the 1991 emissions estimate. Since in 1991 the K-3 emissions were only 1/2% of the emissions from M-1, even the 20% reduction has little effect on the project reduction. The total emissions have been reduce to ~2 1/4% of the 1991 emissions from the 5 hot cells that were decontaminated. The emissions and exposure rates are presented in Table I below. Cells A-1 and M-1 exceed the exposure rate criteria. For the other cells, the general exposure rate in the middle of the cell meets the criteria. However, near the prefilters, the exposure rates increase. Cell M-1 has extensive floor contamination that penetrated to a 6 inch depth. At 30 cm above the floor, the exposure rate through the lead blanket is 50 mR/h. A more detailed list of acceptance criteria were specified before the final verification survey. Table ii compares the maximum survey results on the wall or floor surface of each cell to these criteria. Cells M-1 and A-1 frequently fail to meet these criteria.

1998 (ANL/ES/RP--89091) **Mound-ACT*DE*CON^{SM} feasibility study. Phase 2: Final report.** Argonne National Lab., IL (United States). Dec 1994. 242p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE96008777. Source: OSTI; NTIS; INIS; GPO Dep.

A portion of the abandoned Miami-Erie Canal paralleling the Greater Miami River receives the runoff and storm-water discharge from Mound Laboratory. In 1969, a low-level plutonium leak contaminated sediment as far away as 1.5 mi from the Mound site along the old canal system. An estimated one million cubic feet of sediment requires remediation. The technology being evaluated for the remediation of the low-level plutonium-238 contamination of the sediment involves two processes: washing the sediments with ACT*DE*CON^{SM} solution to dissolve the contaminant, followed by extraction of the solution and processing with the MAG*SEP^{SM} process to concentrate the contaminant and allow reuse of the ACT*DE*CON^{SM} solution. The processes are being optimized for pilot-scale and field demonstration. Phase 2 of the project primarily involved identification at the laboratory scale of the optimal ACT*DE*CON^{SM} formulation, identification of the ion-exchanger and MAG*SEP^{SM} particles, verification of the plutonium mobility in the treated soil, and evaluation of other process parameters according to a series of tasks.

1999 (ANL/EWM/CP--82616) **Preliminary investigation of the 317 Area, ANL-E.** Wescott, J. (Argonne National Lab., IL (United States)); Moos, L.; Remeikis, A. Argonne National Lab., IL (United States). [1995]. 13p. Sponsored by

USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950225–2: Geoenvironment 2000 meeting, Baton Rouge, LA (United States), 22-24 Feb 1995). Order Number DE95012940. Source: OSTI; NTIS; INIS; GPO Dep.

The 317 Area at Argonne National Laboratory-East (ANL-E) is scheduled to undergo a Resource Conservation and Recovery Act (RCRA) Facility Investigation, Act or RFI. Prior to the formal RFI, a voluntary, preliminary characterization of the 317 Area was conducted by ANL-E. The characterization results were used to formulate the RFI work plan and provided a better focus for the formal investigation. This site presents a difficult engineering challenge. The nature of the waste disposed at this site in the past includes both liquid chemicals and radioactive waste. The 317 Area is classified as a radiologically controlled area because of operations currently performed there. Present Department of Energy policy stipulates that waste material from such an area must be considered radioactive. The possible presence of hazardous constituents in the soil and groundwater would require the investigation-derived waste generated at the site be disposed as radioactive mixed waste. Besides the nature of the waste possibly contaminating this site, the geology of the site poses an equally enigmatic situation. The ANL-E site is located in a region of recessional glacial moraine deposits.

2000 (ANL/TD/CP–85768) **Decontamination and decommissioning of the Experimental Boiling Water Reactor at Argonne National Laboratory.** Sears, L.F. (ALARON Corp. (United States)); Fellhauer, C. Argonne National Lab., IL (United States). [1995]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950414–6: 57. annual American power conference, Chicago, IL (United States), 18-20 Apr 1995). Order Number DE95013787. Source: OSTI; NTIS; INIS; GPO Dep.

The Experimental Boiling Water Reactor (EBWR), located on the Argonne National Laboratory-East (ANL-E) site, started operations in 1957. The initial rating was 20 MW(t). The rating was eventually increased to 70 MW(t) in 1959 and 100 MW(t) in 1962. The reactor was shut down in 1967 and all of the fuel was removed from the facility. The facility was placed in dry lay-up until 1986. ANL-E personnel started the decontamination and decommissioning (D&D) effort in 1986. Supporting equipment such as the external steam system and some of the upper reactor components, the core riser and the top fuel shroud, were removed at that time. Characterization of the facility was also undertaken. The contract to complete the EBWR D&D Project was issued in December 1993. The initial schedule called for the final effort to be divided into five phases that were to be completed over a four year period. However, this schedule was subsequently consolidated, at the request of ANL-E, to a thirteen month period, with the on-site work to be completed by the end of 1994. The EBWR D&D Project is approximately 88% complete. A small quantity of reactor internals remains to be volume reduced along with the removal of the SFSP water treatment system. Upon completion of this work the facility will be decontaminated and a final survey completed. The planned completion of on-site work is scheduled for July 1995.

2001 (ANL/TD/CP–86095) **Low impact plutonium glovebox D&D.** Rose, R.W. Argonne National Lab., IL (United States). [1995]. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950868–37: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96005084. Source: OSTI; NTIS; INIS; GPO Dep.

A dilemma often encountered in decontamination and decommissioning operations is the lack of choice as to the location where the work is to be performed. Facility siting, laboratory location, and adjacent support areas were often determined based on criteria, which while appropriate at the time, are not always the most conducive to a D&D project. One must learn to adapt and cope with as found conditions. High priority research activities, which cannot be interrupted, may be occurring in adjacent non-radiological facilities in the immediate vicinity where highly contaminated materials must be handled in the course of a D&D operation. The execution of a project within such an environment involves a high level of coordination, cooperation, professionalism and flexibility among the project, the work force and the surrounding occupants. Simply moving occupants from the potentially affected area is not always an option and much consideration must be given in the selection of the D&D methodology to be employed and the processes to be implemented. Determining project boundaries and the ensuring that adjacent occupants are included in the planning/scheduling of specific operations which impact their work area are important in the development of the safety envelope. Such was the case in the recent D&D of 61 gloveboxes contaminated with plutonium and other transuranic nuclides at the Argonne National Laboratory-East site. The gloveboxes, which were used in Department of Energy research and development program activities over the past 30 years, were decontaminated to below transuranic waste criteria, size reduced, packaged and removed from Building 212 by Argonne National Laboratory personnel in conjunction with Nuclear Fuel Services, Inc. with essentially no impact to adjacent occupants.

2002 (ANL/TD/CP–88550) **Aerosol measurements from plasma torch cuts on stainless steel, carbon steel, and aluminum.** Novick, V.J.; Brodrick, C.J.; Crawford, S.; Nasiatka, J.; Pierucci, K.; Reyes, V.; Sambrook, J.; Wrobel, S.; Yeary, J. Argonne National Lab., IL (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-960443–1: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96004296. Source: OSTI; NTIS; INIS; GPO Dep.

The main purpose of this project is to quantify aerosol particle size and generation rates produced by a plasma torch whencutting stainless steel, carbon steel and aluminum. the plasma torch is a common cutting tool used in the dismantling of nuclear facilities. Eventually, other cutting tools will be characterized and the information will be compiled in a user guide to aid in theplanning of both D&D and other cutting operations. The data will be taken from controlled laboratory experiments on uncontaminated metals and field samples taken during D&D operations at ANL nuclear facilities. The plasma torch data was collected from laboratory cutting tests conducted inside of a closed, filtered chamber. The particle size distributions were determined by isokinetically sampling the exhaust duct using a cascade impactor. Cuts on different thicknesses showed there was no observable dependence of the aerosol quantity produced as a function of material thickness for carbon steel. However, data for both stainless steel and aluminum revealed that the aerosol mass produced for these materials appear to have some dependance on thickness, with thinner materials producing tmore aerosols. The results of the laboratory cutting tests show that most measured particle size distributions are bimodal with one mode at about 0.2 μm and the other at about 10 μm. The average Mass Median Aerodynamic Diameters (MMAD's) for these tests are 0.36 $\pm$0.08 μm for stainless steel, 0.48 $\pm$0.17μm for aluminum and 0.52$\pm$0.12 μm for carbon steel.

2003 (ANL/TD/CP--89321) **The D&D of the Experimental Boiling Water Reactor (EBWR).** Fellhauer, C.R.; Boling, L.E.; Yule, T.J.; Bhattacharyya, S.K. Argonne National Lab., IL (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960306--8: ICONE 4: ASME/JSME international conference on nuclear engineering, New Orleans, LA (United States), 10-13 Mar 1996). Order Number DE96007055. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory has completed the D&D of the Experimental Boiling Water Reactor. The Project consisted of decontaminating and for packaging as radioactive waste the reactor vessel and internals, contaminated piping systems, miscellaneous tanks, pumps, and associated equipment. The D&D work involved dismantling process equipment and associated plumbing, ductwork drain lines, etc., performing size reduction of reactor vessel internals in the fuel pool, packaging and manifesting all radioactive and mixed waste, and performing a thorough survey of the facility after the removal of activated and contaminated material. Non-radioactive waste was disposed of in the ANL-E landfill or recycled. In January 1996 the EBWR facility was formally decommissioned and transferred from EM-40 to EM-30. This paper will discuss the details of this ten year effort.

2004 (ANL/TD/CP--89380) **Waste minimization and pollution prevention in D&D operations at the Argonne National Laboratory-East site.** Boing, L.E.; Coffey, M.J.; Ditch, R.W.; Fellhauer, C.R.; Rose, R.W. Argonne National Lab., IL (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960741--6: Pollution prevention conference, Chicago, IL (United States), 9-11 Jul 1996). Order Number DE96012690. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory (ANL) is implementing waste minimization and pollution prevention activities into its conduct of decontamination and decommissioning (D&D) projects. Many of these activities are rather straight forward and simple approaches, yet they are often overlooked and not implemented as often as they should or could be. Specific activities involving recycling and reuse of materials and structures, which have proven useful in lowering decommissioning and disposal costs on D&D projects at ANL are presented.

2005 (ANL/TD/SUMM--85849) **Experiences in the D&D of the EBWR reactor complex at Argonne National Laboratory.** Bhattacharyya, S.K.; Boing, L.E.; Fellhauer, C.R. Argonne National Lab., IL (United States). Feb 1995. 3p. Sponsored by USDOE, Washington, DC (United States). (CONF-950601--12: Annual meeting of the American Nuclear Society (ANS), Philadelphia, PA (United States), 25-29 Jun 1995). Order Number DE95013713. Source: OSTI; NTIS; INIS; GPO Dep.

EBWR went critical in Dec 1957 at 20 MW(t), was upgraded to 100 MW(t) operation. EBWR was shut down July 1967 and placed in dry lay-up. In 1986, the D&D work was planned in 4 phases: final planning and preparations for D&D, removal of reactor systems, removal of reactor vessel complex, and final decontamination and project closeout. Despite precautions, there was an uptake of ^{241}Am by D&D workers following underwater plasma arc cutting within the pool; the cause was traced to an experimental ^{241}Pu foil (200 μg) that was lost in the mid-1960s in the reactor vessel. Several major lessons were learned from this episode, among which is the fact that research facilities often involve unusual experiments which may not be recorded. Safety analysis and review procedure for D&D operations need to be carefully considered since they represent considerably different situations than reactor operations. EBWR is one of the very few cases of a prototypic reactor facility designed, operated, tested and now D&D'd by one organization.

2006 (BCLDP--063095) **Site environmental report for Calendar Year 1994 on radiological and nonradiological parameters.** Battelle Columbus Labs., OH (United States). Decommissioning Project. 30 Jun 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-92. Order Number DE95017200. Source: OSTI; NTIS; INIS; GPO Dep.

Battelle Memorial Institute's nuclear research facilities are currently being maintained in a surveillance and maintenance (S&M) mode with continual decontamination and decommissioning (D&D) activities being conducted under Department of Energy (DOE) Contract W-7405-ENG-92. These activities are referred to under the Contract as the Battelle Columbus Laboratories Decommissioning Project (BCLDP). Operations referenced in this report are performed in support of S&M and D&D activities. Battelle's King Avenue facility is not considered in this report to the extent that the West Jefferson facility is. The source term at the King Avenue site is a small fraction of the source term at the West Jefferson site. Off site levels of radionuclides that could be attributed to the west Jefferson and King Avenue nuclear operations wereindistinguishable from background levels at specific locations where air, water, and direct radiation measurements were performed. Environmental monitoring continued to demonstrate compliance by Battelle with federal, state and local regulations. Routine, nonradiological activities performed include monitoring liquid effluents and monitoring the ground water system for the West Jefferson North site. Samples of various environmental media including air, water, grass, fish, field and garden crops, sediment and soil were collected from the region surrounding the two sites and analyzed.

2007 (BHI--00167-Rev.) **Final hazard classification for the 183-C D&D project.** Zimmer, J.J. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96006963. Source: OSTI; NTIS; INIS; GPO Dep.

The intent of this document is to provide a final Hazard Classification for the Decontamination and Decommissioning (D&D) activities associated with the 183-C Filter Plant/Pump Room facility. The Hazard Classification was determined based upon DOE-EM-STD-5502-94, "DOE Limited Standard, Hazard Baseline Documentation," issued by the US Department of Energy. The 183-C Filter Plant/Pump Room facility was constructed to support operations of the 105-B and 105-C Reactors at the Hanford Site. Since shutdown of the 105-C Reactor in April 1969, the 183-C facility has been kept in a safe storage condition.

2008 (BHI--00530) **309 plutonium recycle test reactor ion exchanger vault deactivitation report.** Griffin, P.W.

Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009902. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the deactivation of the ion exchanger vault at the 309 Plutonium Recycle Test Reactor (PRTR) Facility in the 300 Area. The vault deactivation began in May 1995 and was completed in June 1995. The final site restoration and shipment of the low-level waste for disposal was finished in September 1995. The ion exchanger vault deactivation project involved the removal and disposal of twelve ion exchangers and decontaminating and fixing of residual smearable contamination on the ion exchanger vault concrete surfaces.

2009 (BHI–00536-Rev.) **Final report for the dismantlement and interim stabilization of the 107-C, 107-KE, and 107-KW retention basins.** Smith, D.L. Bechtel Hanford, Inc., Richland, WA (United States). [1996]. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005930. Source: OSTI; NTIS; INIS; GPO Dep.

This final report provides a general description of the activities performed to dismantle and interim stabilize the 107-C, 107-KE, and 107-KW retention basins. These activities were performed as part of the Radiation Area Remedial Action Project. Dismantlement and interim stabilization were required to minimize wind and biotic transport vectors at these sites until final remediation occurs.

2010 (BHI–00606) **Final report for the 1304-N Emergency Dump Tank dose reduction.** Smith, D.S. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008015. Source: OSTI; NTIS; INIS; GPO Dep.

The 1304-N Emergency Dump Tank Decontamination Project began as an attempt to demonstrate a specific decontamination technology (chemical decontamination). The initial technical approach selected was to incorporate testing the effectiveness of Corpex™ chemicals on a radiologically contaminated steel surface painted with lead-based primer paint to achieve unrestricted release while at the same time perform useful decommissioning work. After discussions between the Department of Energy and Bechtel Hanford, Inc., the focus of the project shifted to the successful completion of Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-16-12F, for dose reduction at the shoreline of the Columbia River. Chemical decontamination was included as part of the work scope, but was no longer the primary objective of the project. Dose reduction having become the goal, decontamination to releasable levels of contamination was no longer the prime consideration.

2011 (BHI–00745) **Technical basis and radiological release plan for trackhoe #H0-17-5669 at 100 BC-1.** Wesselman, M.A. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009926. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the development of a method for the radiological release of a tracked heavy equipment vehicle used in the excavation of the 116 C-1 crib at Hanford Reservation, including the technical bases for selection of release criteria and the instrumentation to be used for the surveys. The vehicle is a backhoe with an articulated arm extending from a tracked vehicle body and for ease is called a "trackhoe". The trackhoe was used at the 1301N crib to install the initial string of temporary casing. The trackhoe dug into the crib overburden to a depth of about 10 feet and in the process the bucket became contaminated with mixed fission/activation products and plutonium. An attempt was made to decontaminate the bucket, but was only partially successful as the facilities at the work site were not adequate to achieve a complete release. Surveys of the bucket indicated that direct readings for beta-gamma contamination were over 100 times higher than those for alpha contamination.

2012 (BHI–00748) **N-Springs Pump and Treat Database user guide.** Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012135. Source: OSTI; NTIS; INIS; GPO Dep.

The N-Springs Pump - and - treat Database is an access database system that contains information regarding daily operations, daily process analytical data, and performance monitoring analytical data. The purpose of the N-Springs Pump and Treat Database User Guide is to describe how to access the database. The system is part of an expedited response action at the 100-N Area located at the Hanford Site.

2013 (BHI–00758) **N basin stabilization project independent readiness evaluation plan for high exposure rate hardware removal.** Volkman, C.L.; Adamson, E.L. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009925. Source: OSTI; NTIS; INIS; GPO Dep.

Completion of the N Basin Stabilization Project will accomplish the following objectives: removing equipment, debris, and any suspect fuel pieces; removing water from N Basin and associated pits; and stabilizing N Basin surfaces to prevent the spread of radioactive contamination. N Basin stabilization includes the activities defined in BHI-00251, N Basin Stabilization Project Readiness Plan, Rev. 5. This plan is no longer required with the issuance of BHI-DE-01, EDPI 4.32-01 "Readiness Evaluations"; however, activities, will remain categorized as previously established. The high exposure rate hardware removal activity is one of several identified activities that will be performed to complete the N Basin Stabilization Project. The 100-N Basin Stabilization Project ALARA Plan proposed that the decision point between low-exposure rate hardware and high-exposure rate hardware should be $\geq$ 1R/hr on contact. The high exposure rate hardware removal activity waste consists primarily of irradiated N Reactor components. These components include process tube pieces, in-core instrumentation, fuel spacers, and other items. The waste may also include general basin hardware that did not meet the $\leq$ 1R/hr guideline for above water packaging. The high exposure rate hardware removal activity waste will be collected in stainless steel fuel baskets, moved to an underwater grouting location, and placed inside a specially fabricated steel pipe. The pipe and contents will be encased in high-slump grout, cured, removed from the basin, decontaminated, painted and placed inside an L3-181 overpack cask, and then transported to the disposal site. This IRE does not cover the disposal site.

2014 (BHI–00759) **Demonstration of radionuclides removal at the 105-N basin using the 3M system.** Hobart, S.A.; Hyman, M. Bechtel Hanford, Inc., Richland, WA

(United States). Mar 1996. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009920. Source: OSTI; NTIS; INIS; GPO Dep.

A field demonstration of the Minnesota Mining and Manufacturing Company (3M) innovative Cs- and Sr-removal technology was undertaken to support deactivation of the Hanford Site's N Reactor. The field demonstration and laboratory studies performed by Pacific Northwest National Laboratory are documented in this report. The deactivation of N Reactor includes an aggressive schedule for removing water from the reactor's original fuel storage pool, known as N Basin. The plan for treating N Basin water involves particulate filtration, followed by further treatment at the Hanford Site's Effluent Treatment Facility (ETF) before the water is discharged to a permitted soil column. Prudence calls for developing a backup treatment plan in the event that ETF is not available to support the N Basin critical path schedule. The 3M technique uses membrane filters that are impregnated with chemical species to remove specific ions from water by ion exchange or selective reaction. Sodium titanate is used to remove Sr by ion exchange, and potassium-cobalt hexacyanoferrate (COHEX) is used to remove Cs by formation of cesium-cobalt ferrocyanide. As a result of this field test, the following recommendations are made: 3M technology should not be considered for removing Sr from N Basin water, although the technology merits consideration for Sr removal in waters that have relatively low Cs content; application of 3M technology by recirculation of basin water through 3M adsorption cartridges for removal of Cs-137 should be considered since it efficiently removes Cs and may be cost effective; additional pilot-scale tests should be performed to determine the capacity of COHEX for Cs-137 removal, if full-scale application is desired.

2015 (BHI–00762) **N Area Project Maintenance Plan.** Little, N.C. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012124. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the 100-N Area site maintenance plan beginning with the planned deactivation and remediation process and the initiation of decontamination and decommissioning activities. A graded approach is used to address the applicable objectives provided by the U.S. DOE Order 4330.4B, 'Maintenance Management Program'.

2016 (BHI–00800) **Conceptual Plan for 105-N Basin high-exposure rate hardware.** Pisarcik, D.J. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005871. Source: OSTI; NTIS; INIS; GPO Dep.

This conceptual plan describes the selected approach for handling and packaging hardware waste with contact exposure rates greater than 1 R/hr. This plan is intended to guide the performance of detailed planning, and the development of work packages and procedures for this activity. This plan discusses; the grouting process for high-exposure rate hardware shall be performed underwater; removal of fuel fragments from the N Basin; and the grouting of irradiated hardware before removal from the 105-N Basin.

2017 (BHI–00802) **Decommissioning of the 216-B-3 Effluent Disposal Pond.** Smith, D.L. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008016. Source: OSTI; NTIS; INIS; GPO Dep.

The decommissioning of the 216-B-3 pond had to be compatible with future remediation activities at the pond. The 216-B-3 pond had received RCRA and Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)-regulated waste. However, remediation of the site may not occur for many years because of an overall strategy to concentrate on other higher priority waste sites at the Hanford Site. Therefore, there would be an undetermined length of time between decommissioning and final remediation during which the pond would sit idle. The Hanford Site is in an arid area with only 18 cm of precipitation annually. The potential for waste to move downward in the soil column after the pond was decommissioned was small. However, once the bottom sediments have been exposed, mechanical and biotic transport of the waste would be possible. The main objective of the decommissioning was to place the pond in a configuration that would minimize biotic and wind-driven contamination from the site between the period of decommissioning and remediation. The second objective was to minimize the impacts to characterization and final remediation of the pond resulting from decommissioning of the site.

2018 (BHI–00803) **Field screening sampling and analysis strategy and methodology for the 183-H Solar Evaporation Basins: Phase 2, Soils.** Antipas, A.; Hopkins, A.M.; Wasemiller, M.A.; McCain, R.G. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008195. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides a sampling/analytical strategy and methodology for Resource Conservation and Recovery Act (RCRA) closure of the 183-H Solar Evaporation Basins within the boundaries and requirements identified in the initial Phase II Sampling and Analysis Plan for RCRA Closure of the 183-H Solar Evaporation Basins.

2019 (BHI–00808) **High exposure hardware removal activity readiness evaluation.** Plastino, J.C. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008209. Source: OSTI; NTIS; INIS; GPO Dep.

This document comprises the Readiness Evaluation Plan for the High Exposure Rate Hardware (HERH) Removal Activity planned for the N Basin area at the Hanford Reservation in Richland Washington. This activity will consist of collecting hardware, depositing hardware in stainless-steel fuel element storage baskets, placing baskets in specially fabricated steel grout pipe, and encasing the contents in a high-slump grout.

2020 (BHI–00812) **Conceptual plan for 100-N Emergency Dump Basin (EDB) deactivation.** Davis, C.M.; Day, R.S.; Smith, D.L. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012131. Source: OSTI; NTIS; INIS; GPO Dep.

The Emergency Dump Basin (EDB) is an outdoor concrete retention pond with a 3/16 in. thick carbon-steel liner underlain with fiberglass. The basin is approximately 9 ft south of the southwest corner of the 105-N Reactor Building transfer areas locate at the Hanford Site. As of February

1996, the EDB contained an estimated 260,000 gal of water and approximately 2,300 ft3 of sediment. The average sediment thickness is estimated at 2.5 ft and is covered with approximately 12 to 14 ft of water. The EDB was originally designed as a quenching pool for reactor blowdown in the event of a primary coolant leak. However, the EDB only received routine steam-generator blowdowns from 1963 to 1987. The steam-generator blow-down and leaking isolation valves allowed radioactively contaminated water from primary and secondary reactor coolant leaks to enter the EDB. Over the years, wind-blown sand and dust have settled in the EDB, resulting in the present layer of sediments.

2021 (BHI–00856) **Preliminary hazard classification for N-Basin intrusive activities.** Larson, A.R.; Smith, R.I. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012133. Source: OSTI; NTIS; INIS; GPO Dep.

This document defines the inventory of both radioactive and hazardous materials in the N Basin Segment to establish a preliminary hazard classification for the N Basin intrusive activities effort. This document uses the methodology as outlined in DOE-STD-1027-92, 'Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports'. The preliminary hazard classification for the N Basin Segment intrusion activities is Category 3.

2022 (BNL–52486) **Corrosion analysis of decommissioned carbon steel waste water tanks at Brookhaven National Laboratory.** Soo, P.; Roberts, T.C. Brookhaven National Lab., Upton, NY (United States). Jul 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC02-76CH00016. Order Number DE96004059. Source: OSTI; NTIS; INIS; GPO Dep.

A corrosion analysis was carried out on available sections of carbon steels taken from two decommissioned radioactive waste water tanks at Brookhaven National Laboratory. One of the 100,000 gallon tanks suffered from a pinhole failure in the wall which was subsequently patched. From the analysis it was shown that this leak, and two adjacent leaks were initiated by a discarded copper heating coil that had been dropped into the tank during service. The failure mechanism is postulated to have been galvanic attack at points of contact between the tank structure and the coil. Other leaks in the two tanks are also described in this report.

2023 (CONF-940406–17) **Site characterization of ORNL D&D facilities.** Kelsey, A.P. (Bechtel Environmental, Inc., Oak Ridge, TN (United States)); Mandry, G.J.; Haghighi, M.H. Oak Ridge National Lab., TN (United States). 1994. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994. Order Number DE96009994. Source: OSTI; NTIS; INIS; GPO Dep.

Site characterization for decontamination and decommissioning (D&D) planning purposes was done for two surplus facilities at Oak Ridge National Laboratory (ORNL) in late 1993 and early 1994. This site characterization includes measurements of radiological and chemical contaminants, assessment of general structural conditions, and investigation of unknown conditions within the buildings. It will serve as input to decisions on D&D engineering, D&D task sequences, radiological and contamination control, and waste management. This paper presents the methods used to investigate these facilities and discusses the preliminary results as they apply to D&D planning. Investigation methods include gross alpha, beta, and gamma surveys; directional gamma surveys; gamma spectroscopy; concrete coring; photography; and collection of soil and miscellaneous samples that are analyzed for radiological and chemical contaminants. Data will be analyzed using radiological models to sort sources and estimate exposure rates and waste volumes due to D&D. The former Waste Evaporator Facility (WEF), consisting of two concrete cells and an operating gallery, once contained a liquid radwaste evaporator. Subsequently it was used for an incinerator experiment and as a dressing area for remediation work on an adjacent tank farm. The building has been partially decontaminated. Figure 1 is a photograph of the WEF. The Fission Product Pilot Plant (FPPP) is a small concrete building containing two cells. It was used to extract isotopes of ruthenium, strontium, cesium, cerium, and other elements from liquid waste. This facility is highly contaminated. In 1960 all doors into FPPP were sealed with concrete block and mortar, and concrete block shielding was added to the external walls making them up to five feet thick. Prior to this study, almost nothing was known about the interior of this building.

2024 (CONF-940815–115) **Innovative technology for expedited site remediation of extensive surface and subsurface contamination.** Audibert, J.M.E.; Lew, L.R. Coleman Research Corp., Houston, TX (United States). 1994. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31190. From SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994. Order Number DE96008767. Source: OSTI; NTIS; INIS; GPO Dep.

Large scale surface and subsurface contamination resulted from numerous releases of feed stock, process streams, waste streams, and final product at a major chemical plant. Soil and groundwater was contaminated by numerous compounds including lead, tetraethyl lead, ethylene dibromide, ethylene dichloride, and toluene. The state administrative order dictated that the site be investigated fully, that remedial alternative be evaluated, and that the site be remediated within a year period. Because of the acute toxicity and extreme volatility of tetraethyl lead and other organic compounds present at the site and the short time frame ordered by the regulators, innovative approaches were needed to carry out the remediation while protecting plant workers, remediation workers, and the public.

2025 (CONF-9508169–3) **The development and application of a risk-based prioritization model for the Oak Ridge Environmental Restoration Program.** Dail, J.L.; White, R.K. Oak Ridge National Lab., TN (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Energy Facilities Contractors Operating Group, Prioritization Working Group & Prioritization Methodology Users Group prioritization methodology workshop; Idaho Falls, ID (United States); 22-23 Aug 1995. Order Number DE96003756. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge Environmental Restoration (ER) Program developed and implemented the Environmental Restoration Benefit Assessment Matrix (ERBAM) early in 1994 to provide a simple, efficient process for prioritizing and justifying fiscal budget decisions for a diverse set of activities. The decision to develop a methodology for prioritizing sites was necessitated by the large number of buildings and areas managed by the DOE Oak Ridge Field Office and the finite resources available to address these areas. The ERBAM was based on the Integrated Resource Management System prioritization methodology historically used by the United States Department of Energy (DOE) and Lockheed Martin Energy Systems, Inc., to rank compliance and operational activities. To develop the matrix, ER Program management, working with federal and state regulators, agreed on impact criteria that balance the major objectives within the ER Program: protection of public health, protection of the environment, protection of on-site workers, consideration of stakeholder/community preference, achievement of ER mission, and optimization of cost efficiency. Lessons learned from the initial application of the matrix were used to make refinements and improvements in the methodology. A standard set of assumptions (both overall and categoric) and a prioritization board, consisting of top level DOE and Lockheed Martin Energy Systems, Inc., managers along with federal and state regulatory representatives, were established to facilitate consistent application. Current and future improvements include a method to incorporate existing quantitative risk data and facilitate increased efficiency in applying baseline cost data and approved funding levels to the prioritized output. Application of the prioritization methodology yields a prioritized list of all work activities within the programs' work breakdown structure.

2026 (CONF-950917–9) **Risk-based cleanup and recycling of residuals from United States Department of Energy Decontamination and Decommissioning facilities in Oak Ridge, Tennessee, USA.** DeLozier, F. Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international conference on radioactive waste management and environmental remediation; Berlin (Germany); 3-9 Sep 1995. Order Number DE95010222. Source: OSTI; NTIS; INIS; GPO Dep.

Decontamination and Decommissioning Program activities at United States Department of Energy facilities in Oak Ridge, Tennessee, involve a wide variety of buildings, building materials, and contaminants. There are approximately 100 buildings/structures included in the program, and they are primarily large gaseous diffusion plant buildings (one of which is 170,000 m^2 under roof), several research reactors, chemical and isotope processing facilities, and weapons component production facilities. The major contaminants at these facilities are uranium, mercury, solvents, cesium, strontium, asbestos, polychlorinated biphenyls, and other metals and radionuclides. Many of the buildings assigned to the Decontamination and Decommissioning Program are located on or near contaminated land units that are regulated under the Comprehensive Environmental Response, Compensation, and Liability Act, which prescribes risk-based cleanup. Original decontamination and decommissioning plans assumed free release standards similar to those proposed for power reactors by the United States Nuclear Regulatory Commission. However, now it is being proposed that decontamination and decommissioning work, like other remedial action work at the facilities, be governed by the Comprehensive Environmental Response, Compensation, and Liability Act-based regulatory agreement in place between the Department of Energy, the United States Environmental Protection Agency, and state regulators. It is also proposed that the facilities be cleaned up to a level dictated by the results of health and environmental-based risk assessments and consistent with the land beneath and around the buildings. The major emphasis, with all decontamination and decommissioning work, has been, and will continue to be, placed on recycling metal and other building materials when feasible.

2027 (CONF-9509100–11) **Verification of criticality accident alarm system for environmental restoration activities.** Broadhead, B.L.; Childs, R.L.; Hopper, C.M. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 5. international conference on nuclear criticality safety; Albuquerque, NM (United States); 17-22 Sep 1995. Order Number DE95017432. Source: OSTI; NTIS; INIS; GPO Dep.

This work analyzes the optimal placement of a criticality accident alarm system (CAAS) necessitated by an unexpected accumulation of fissile materials in the filtration system of an idled experimental nuclear reactor. Results using multidimensional deterministic and Monte Carlo methods confirmed the suitability of an existing CAAS placement located in the adjacent reactor building.

2028 (CONF-960271–2) **Disposition of the fluoride fuel and flush salts from the Molten Salt Reactor experiment at Oak Ridge National Laboratory.** Peretz, F.J. Oak Ridge National Lab., TN (United States). [1996]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From American Institute of Chemical Engineers (AIChE) spring meeting; New Orleans, LA (United States); 26-29 Feb 1996. Order Number DE96006708. Source: OSTI; NTIS; INIS; GPO Dep.

The Molten Salt Reactor Experiment (MSRE) is an 8 MW reactor that was operated at Oak Ridge National Laboratory (ORNL) from 1965 through 1969. The reactor used a unique liquid salt fuel, composed of a mixture of LIF, BeF_2, ZrF_4, and UF_4, and operated at temperatures above 600°C. The primary fuel salt circulation system consisted of the reactor vessel, a single fuel salt pump, and a single primary heat exchanger. Heat was transferred from the fuel salt to a coolant salt circuit in the primary heat exchanger. The coolant salt was similar to the fuel salt, except that it contains only LiF (66%) and BeF, (34%). The coolant salt passed from the primary heat exchanger to an air-cooled radiator and a coolant salt pump, and then returned to the primary heat exchanger. Each of the salt loops was provided with drain tanks, located such that the salt could be drained out of either circuit by gravity. A single drain tank was provided for the non-radioactive coolant salt. Two drain tanks were provided for the fuel salt. Since the fuel salt contained radioactive fuel, fission products, and activation products, and since the reactor was designed such that the fuel salt could be drained immediately into the drain tanks in the event of a problem in the fuel salt loop, the fuel salt drain tanks were provided with a system to remove the heat generated by radioactive decay. A third drain tank connected to the fuel salt loop was provided for a batch of flush salt. This batch of salt, similar in composition to the coolant salt, was used to condition the fuel salt loop after it had been exposed to air and to flush the fuel salt loop of residual fuel salt prior to accessing the reactor circuit for maintenance or experimental activities. This report discusses the disposition of the fluoride fuel and flush salt.

2029 (CONF-960804–13) **A concept of a nonfissile uranium hexafluoride overpack for storage, transport,**

and processing of corroded cylinders. Pope, R.B. (Oak Ridge National Lab., TN (United States)); Cash, J.M.; Singletary, B.H. Oak Ridge National Lab., TN (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009408. Source: OSTI; NTIS; INIS; GPO Dep.

There is a need to develop a means of safely transporting breached 48-in. cylinders containing depleted uranium hexafluoride (UF_6) from current storage locations to locations where the contents can be safely removed. There is also a need to provide a method of safely and easily transporting degraded cylinders that no longer meet the US Department of Transportation (DOT) and American National Standards Institute, Inc., (ANSI) requirements for shipments of depleted UF_6. A study has shown that an overpack can be designed and fabricated to satisfy these needs. The envisioned overpack will handle cylinder models 48G, 48X, and 48Y and will also comply with the ANSI N14.1 and the American Society of Mechanical Engineers (ASME) Sect. 8 requirements.

2030 (DOE/AL/62350–12) **Publications desktop survival guide.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 229p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016207. Source: OSTI; NTIS; GPO Dep.

Purpose of this guide is to document and simplify the writing, reviewing, and production process for the Uranium Mill Tailings Remedial Action (UMTRA) Project Technical Assistance Contractor (TAC) staff and to provide specific answers concerning the content, style, and format of UMTRA Project documents. Goal of the UMTRA Project document preparation process is to deliver to the US DOE high-quality documents that meet requirements (meets expressed client needs; accurate and consistent technical content; clear writing; well organized document; consistent style). A document review process has been established to ensure that TAC documents are accurate, consistent, and well organized. The editing process applies standard rules for style and format, spelling, grammar, punctuation, and sentence structure to make the document consistent and easier to read. This guide sets forth the rules to be applied to UMTRA Project documents.

2031 (DOE/AL/62350–21F-Rev.1) **Remedial Action Plan and Site design for stabilization of the inactive Uranium Mill Tailings sites at Slick Rock, Colorado: Revision 1. Remedial action selection report, Attachment 2, geology report, Attachment 3, ground water hydrology report, Attachment 4, water resources protection strategy. Final.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000224. Source: OSTI; NTIS; INIS; GPO Dep.

The Slick Rock uranium mill tailings sites are located near the small community of Slick Rock, in San Miguel County, Colorado. There are two designated Uranium Mill Tailings Remedial Action (UMTRA) Project sites at Slick Rock: the Union Carbide site and the North Continent site. Both sites are adjacent to the Dolores River. The sites contain former mill building concrete foundations, tailings piles, demolition debris, and areas contaminated by windblown and waterborne radioactive materials. The total estimated volume of contaminated materials is approximately 621,000 cubic yards (475,000 cubic meters). In addition to the contamination at the two processing site areas, 13 vicinity properties were contaminated. Contamination associated with the UC and NC sites has leached into ground water. Pursuant to the requirements of the Uranium Mill Tailings Radiation Control Act (UMTRCA) (42 USC §7901 et seq.), the proposed remedial action plan (RAP) will satisfy the final US Environmental Protection Agency (EPA) standards in 40 CFR Part 192 (60 FR 2854) for cleanup, stabilization, and control of the residual radioactive material (RRM) (tailings and other contaminated materials) at the disposal site at Burro Canyon. The requirements for control of the RRM (Subpart A) will be satisfied by the construction of an engineered disposal cell. The proposed remedial action will consist of relocating the uranium mill tailings, contaminated vicinity property materials, demolition debris, and windblown/weaterborne materials to a permanent repository at the Burro Canyon disposal site. The site is approximately 5 road mi (8 km) northeast of the mill sites on land recently transferred to the DOE by the Bureau of Land Management.

2032 (DOE/AL/62350–21F-Rev.1-Attach.) **Uranium Mill Tailings Remedial Action Project (UMTRAP), Slick Rock, Colorado, Revision 1. Bid schedule, special conditions, specifications, and subcontract drawings.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). [1995]. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000228. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains: bidding requirements; terms and conditions; specifications for Division 1 – general requirements; specifications for Division 2 – sitework; specifications for Divisions 5 – metals; subcontract drawings, (general, Union Carbide processing site, North Continent processing site, and Burro Canyon disposal site).

2033 (DOE/AL/62350–21F-Rev.1-Attach.3-App.B) **Remedial Action Plan and Site Design for Stabilization of the Inactive Uranium Mill Tailings Sites at Slick Rock, Colorado: Appendix B to Attachment 3, Lithologic logs and monitor well construction information. Final report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000226. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains lithology logs and monitor well construction information for: NC processing site; UC processing site; and Burro Canyon disposal site. This information pertains to the ground water hydrology investigations which is attachment 3 of this series of reports.

2034 (DOE/AL/62350–21F-Rev.1-Attach.3-App.C) **Remedial Action Plan and Site Design for stabilization of the inactive Uranium Mill Tailings sites at Slick Rock, Colorado: Appendix C to Attachment 3, Calculations. Final.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000227. Source: OSTI; NTIS; INIS; GPO Dep.

This volume contains calculations for: Slick Rock processing sites background ground water quality; Slick Rock processing sites lysimeter water quality; Slick Rock processing sites on-site and downgradient ground water quality; Slick Rock disposal site background water quality; Burro Canyon disposal site, Slick Rock, Colorado, average hydraulic gradients and average liner ground water velocities in the upper, middle, and lower sandstone units of the Burro Canyon formation; Slick Rock–Burro Canyon disposal site, Burro Canyon pumping and slug tests–analyses; water balance and surface contours–Burro Canyon disposal cell; and analytical calculation of drawdown in a hypothetical well completed in the upper sandstone unit of the Burro Canyon formation.

2035 (DOE/AL/62350–21F-Rev.1-Vol.1) **Uranium Mill Tailings Remedial Action Project (UMTRAP), Slick Rock, Colorado, Revision 1. Volume 1, Calculations, Final design for construction.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000229. Source: OSTI; NTIS; INIS; GPO Dep.

Volume one contains calculations for: embankment design–embankment material properties; Union Carbide site–bedrock contours; vicinity properties–origin of contamination; North Continent and Union Carbide sites contaminated materials–excavation quantities; and demolition debris–quantity estimate.

2036 (DOE/AL/62350–21F-Rev.1-Vol.2) **Uranium Mill Tailings Remedial Action Project (UMTRAP), Slick Rock, Colorado, Revision 1. Volume 2, Calculations, Final design for construction.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000230. Source: OSTI; NTIS; INIS; GPO Dep.

Volume two contains calculations for: embankment design–slope stability analysis; embankment design–excavation stability; embankment design–settlement and cover cracking analysis; radon barrier design–statistical analysis of ra-226 concentrations for North Continent and Union Carbide sites; radon barrier design–RAECOM input data; radon barrier design–design thickness; and cover design–frost penetration depth.

2037 (DOE/AL/62350–21F-Rev.1-Vol.3) **Uranium Mill Tailings Remedial Action Project (UMTRAP), Slick Rock, Colorado, Revision 1, Volume 3. Calculations, Final design for construction.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000231. Source: OSTI; NTIS; INIS; GPO Dep.

Volume three contains calculations for: site hydrology–rainfall intensity, duration, and frequency relations; site hydrology– probable maximum precipitation; erosion protection–rock quality evaluation; erosion protection–embankment top and side slope; erosion protection–embankment toe apron; erosion protection–gradations and layer thicknesses; Union Carbide site–temporary drainage ditch design; Union Carbide site–retention basin sediment volume; Union Carbide site–retention basin sizing; Burro Canyon site temporary drainage–temporary drainage facilities; and Union Carbide site temporary drainage–water balance.

2038 (DOE/AL/62350–21F-Rev.1-Vol.4) **Uranium Mill Tailings Remedial Action Project (UMTRAP), Slick Rock, Colorado, Revision 1, Volume 4. Calculations, Final design for construction.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Morrison-Knudsen Corp., San Francisco, CA (United States). Sep 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000232. Source: OSTI; NTIS; INIS; GPO Dep.

Volume four contains calculations for: Borrow areas–site evaluation; temporary facilities–material quantities; embankment quantities–excavation and cover materials; Burro Canyon site excavation quantities–rippable and unrippable materials; site restoration–earthwork quantities and seeding; and bid schedule quantities and material balance.

2039 (DOE/AL/62350–76-Rev.7) **ERD UMTRA Project quality assurance program plan, Revision 7.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96007512. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the revised Quality Assurance Program Plan (QAPP) dated September, 1995 for the Environmental Restoration Division (ERD) Uranium Mill Tailings Remedial Action Project (UMTRA). Quality Assurance requirements for the ERD UMTRA Project are based on the criteria outlined in DOE Order 5700.6C or applicable sections of 10 CFR 830.120. QA requirements contained in this QAPP shall apply to all personnel, processes, and activities, including planning, scheduling, and cost control, performed by the ERD UMTRA Project and its contractors.

2040 (DOE/AL/62350–77-Rev.1) **Long-term surveillance plan for the Bodo Canyon Disposal Site, Durango, Colorado. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003199. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Act on (UMTRA) Project Bodo Canyon disposal site at Durango, Colorado, describes the surveillance activities for the disposal site. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal call continues to function as designed This LTSP was prepared as a requirement for DOE acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials (RRM) from processing uranium ore. This LTSP documents that the land and interests are owned by the United States and details how long-term care of the disposal site will be carried out. It is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a). Following the introduction, contents of this report include the following: site final condition; site drawings and photographs; permanent site surveillance features; ground water monitoring; annual site inspections; unscheduled inspections; custodial maintenance; corrective action; record keeping and reporting requirements; emergency notification and reporting;

quality assurance; personal health and safety; list of contributions; and references.

2041 (DOE/AL/62350–149-Rev.1) **Baseline risk assessment of ground water contamination at the uranium mill tailings site near Canonsburg, Pennsylvania. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96005292. Source: OSTI; NTIS; INIS; GPO Dep.

For the UMTRA Project site located near Canonsburg, Pennsylvania (the Canonsburg site), the Surface Project cleanup occurred from 1983 to 1985, and involved removing the uranium processing mill tailings and radioactively contaminated soils and materials from their original locations and placing them in a disposal cell located on the former Canonsburg uranium mill site. This disposal cell is designed to minimize radiation emissions and further contamination of ground water beneath the site. The Ground Water Project will evaluate the nature and the extent of ground water contamination resulting from uranium processing at the former Canonsburg uranium mill site, and will determine a ground water strategy for complying with the US Environmental Protection Agency's (EPA) ground water standards established for the UMTRA Project. For the Canonsburg site, an evaluation was made to determine whether exposure to ground water contaminated by uranium processing could affect people's health. This risk assessment report is the first site-specific document prepared for the UMTRA Ground Water Project at the Canonsburg site. The results of this report and further site characterization of the Canonsburg site will be used to determine how to protect public health and the environment, and how to comply with the EPA standards.

2042 (DOE/AL/62350–151) **Integrated Project Management System description.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1994. 139p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95009832. Source: OSTI; NTIS; INIS; GPO Dep.

The Integrated Program Management System (IPMS) Description is a "working" document that describes the work processes of the Uranium Mill Tailings Remedial Action Project Office (UMTRA) and IPMS Group. This document has undergone many revisions since the UMTRA Project began; this revision not only updates the work processes but more clearly explains the relationships between the Project Office, contractors, and other participants. The work process flow style has been revised to better describe Project work and the relationships of participants. For each work process, more background and guidance on "why" and "what is expected" is given. For example, a description of activity data sheets has been added in the work organization and the Project performance and reporting processes, as well as additional detail about the federal budget process and funding management and improved flow charts and explanations of cost and schedule management. A chapter has been added describing the Cost Reduction/Productivity Improvement Program. The Change Control Board (CCB) procedures (Appendix A) have been updated. Project critical issues meeting (PCIM) procedures have been added as Appendix B. Budget risk assessment meeting procedures have been added as Appendix C. These appendices are written to act as stand-alone documentation for each process. As the procedures are improved and updated, the documentation can be updated separately.

2043 (DOE/AL/62350–155-Rev.1) **Technical Assistance Contractor management plan. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003970. Source: OSTI; NTIS; INIS; GPO Dep.

The Technical Assistance Contractor (TAC) for the Uranium Mill Tailings Remedial Action (UMTRA) Project comprises Jacobs Engineering Group Inc. (JEG) as the prime contractor and three teaming partner subcontractors: Roy F. Weston, Inc. (RFW), AGRA Earth and Environmental, Inc. (AGRA), and Geraghty and Miller, Inc. (G and M). The TAC contract's scope is to provide technical, analytical, environmental, engineering, design, inspection, and management support services to the US Department of Energy (DOE) for both Surface and Ground Water Projects. The TAC team supports the DOE in completing surface remedial action and initiating ground water remediation work for start-up, characterization, compliance planning, design, construction oversight, and remedial operations. The TAC provides the DOE UMTRA Project Team with a dedicated management, scientific, and technical resource base in Albuquerque, New Mexico, which is supplemented by corporate resources. A carefully developed and maintained staff of technical experts is available to assess, analyze, develop, and execute cost-effective solutions to the demanding technical and institutional problems presented by the UMTRA Project.

2044 (DOE/AL/62350–156-Rev.) **Site observational work plan for the UMTRA Project site at Spook, Wyoming.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1995. 463p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95015442. Source: OSTI; NTIS; INIS; GPO Dep.

The Spook, Wyoming, site observational work plan proposes site-specific activities to achieve compliance with Subpart B of 40 CFR Part 192 (1994) of the final US Environmental Protection Agency (EPA) ground water protection standards 60 FR 2854 (1995) at this Uranium Mill Tailing Remedial Action (UMTRA) Project site. This draft SOWP presents a comprehensive summary of existing site characterization data, a conceptual site model of the nature and extent of ground water contamination, exposure pathways, and potential impact to human health and the environment. Section 2.0 describes the requirements for meeting ground water standards at UMTRA Project sites. Section 3.0 defines past and current conditions, describes potential environmental and human health risks, and provides site-specific data that supports the selection of a proposed ground water compliance strategy. Section 4.0 provides the justification for selecting the proposed ground water compliance strategy based on the framework defined in the ground water programmatic environmental impact statement (PEIS).

2045 (DOE/AL/62350–171) **UMTRA Project-Level Cost Reduction/Productivity Improvement Program manual.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1995. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016204. Source: OSTI; NTIS; INIS; GPO Dep.

Mission of the Uranium Mill Tailings Remedial Action (UMTRA) Project Cost Reduction/Productivity Improvement Program (CR/PIP) is to contribute to the UMTRA Project's environmental restoration mission by providing the means to achieve and recognize continuous improvements and cost savings. This manual includes program definition, description of UMTRA project organizational responsibilities and interfaces with existing project functions, guidance to contractors, and definition of project-level functions.

2046 (DOE/AL/62350–182) **Long-term surveillance plan for the Tuba City, Arizona disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008304. Source: OSTI; NTIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site at Tuba City, Arizona, describes the site surveillance activities. The U.S. Department of Energy (DOE) will carry out these activities to ensure the disposal cell continues to function as designed. This final LTSP was prepared as a requirement for acceptance under the U.S. Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials (RRM) (10 CFR §40.27).

2047 (DOE/AL/62350–183) **Final audit report of remedial action construction at the UMTRA Project, Grand Junction, Colorado, processing site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95011231. Source: OSTI; NTIS; INIS; GPO Dep.

This final audit report (FAR) for remedial action at the Grand Junction, Colorado, Uranium Mill Tailings Remedial Action (UMTRA) Project processing site consists of a summary of the radiological surveillances/audits, the quality assurance (QA) in-process surveillances, and the QA final close-out inspection performed by the US Department of Energy (DOE) and Technical Assistance Contractor (TAC). The FAR also summarizes other surveillances performed by the US Nuclear Regulatory Commission (NRC). To summarize, a total of one finding and 127 observations were noted during DOE/TAC audit and surveillance activities. The NRC noted general site-related observations during the OSCRs. Follow-up to responses required from MK-Ferguson for the DOE/TAC finding and observations indicated that all issues related to the Grand Junction processing site were resolved and closed out to the DOE's satisfaction. The NRC OSCRs resulted in no issues related to the Grand Junction processing site requiring a response from MK-Ferguson.

2048 (DOE/AL/62350–184) **Uranium Mill Tailings Remedial Action Project 1994 environmental report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); MK-Ferguson Co., Albuquerque, NM (United States). Aug 1995. 320p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003200. Source: OSTI; NTIS; INIS; GPO Dep.

This annual report documents the Uranium Mill Tailings Remedial Action (UMTRA) Project environmental monitoring and protection program. The UMTRA Project routinely monitors radiation, radioactive residual materials, and hazardous constituents at associated former uranium tailings processing sites and disposal sites. At the end of 1994, surface remedial action was complete at 14 of the 24 designated UMTRA Project processing sites: Canonsburg, Pennsylvania; Durango, Colorado; Grand Junction, Colorado; Green River Utah, Lakeview, Oregon; Lowman, Idaho; Mexican Hat, Utah; Riverton, Wyoming; Salt Lake City, Utah; Falls City, Texas; Shiprock, New Mexico; Spook, Wyoming, Tuba City, Arizona; and Monument Valley, Arizona. Surface remedial action was ongoing at 5 sites: Ambrosia Lake, New Mexico; Naturita, Colorado; Gunnison, Colorado; and Rifle, Colorado (2 sites). Remedial action has not begun at the 5 remaining UMTRA Project sites that are in the planning stage. Belfield and Bowman, North Dakota; Maybell, Colorado; and Slick Rock, Colorado (2 sites). The ground water compliance phase of the UMTRA Project started in 1991. Because the UMTRA Project sites are.' different stages of remedial action, the breadth of the UMTRA environmental protection program differs from site to site. In general, sites actively undergoing surface remedial action have the most comprehensive environmental programs for sampling media. At sites where surface remedial action is complete and at sites where remedial action has not yet begun, the environmental program consists primarily of surface water and ground water monitoring to support site characterization, baseline risk assessments, or disposal site performance assessments.

2049 (DOE/AL/62350–185) **An assessment of potential hydrologic and ecologic impacts of constructing mitigation wetlands, Rifle, Colorado, UMTRA project sites.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016206. Source: OSTI; NTIS; INIS; GPO Dep.

This-assessment examines the consequences and risks that could result from the proposed construction of mitigation wetlands at the New and Old Rifle Uranium Mill Tailings Remedial Action (UMTRA) Project sites near Rifle, Colorado. Remediation of surface contamination at those sites is now under way. Preexisting wetlands at or near the Old and New Rifle sites have been cleaned up, resulting in the loss of 0.7 and 10.5 wetland acres (ac) (0.28 and 4.2 hectares [ha]) respectively. Another 9.9 ac (4.0 ha) of wetlands are in the area of windblown contamination west of the New Rifle site. The US Army Corps of Engineers (USACE) has jurisdiction over the remediated wetlands. Before remedial action began, and before any wetlands were eliminated, the USACE issued a Section 404 Permit that included a mitigation plan for the wetlands to be lost. The mitigation plan calls for 34.2 ac (1 3.8 ha) of wetlands to be constructed at the south end and to the west of the New Rifle site. The mitigation wetlands would be constructed over and in the contaminated alluvial aquifer at the New Rifle site. As a result of the hydrologic characteristics of this aquifer, contaminated ground water would be expected to enter the environment through the proposed wetlands. A preliminary assessment was therefore required to assess any potential ecological risks associated with constructing the mitigation wetlands at the proposed location.

2050 (DOE/AL/62350–187) **Long-term surveillance plan for the Falls City Disposal Site, Falls City, Texas.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States)..Jun 1995. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95013796. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project Falls City disposal site, Falls City, Texas, describes the surveillance activities for the disposal site. DOE will carry out these activities to ensure that the disposal cell continues to function as designed. This LTSP was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials. This LTSP documents whether the land and interests are owned by the United States and details how long-term care of the disposal site will be carried out. It is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a).

2051 (DOE/AL/62350–187-Rev.1) **Long-term Surveillance Plan for the Falls City Disposal Site, Falls City, Texas. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Aug 1995. 134p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95016202. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project Falls City disposal site, Falls City, Texas, describes the surveillance activities for the disposal site. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal cell continues to function as designed. This LTSP was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials. This LTSP documents whether the land and interests are owned by the United States and details how long-term care of the disposal site will be carried out. It is based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program (DOE, 1992a).

2052 (DOE/AL/62350–188) **Final audit report of remedial action construction at the UMTRA Project Falls City, Texas, site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE95013502. Source: OSTI; NTIS; INIS; GPO Dep.

This final audit report for the Falls City, Texas, Uranium Mill Tailings Remedial Action Project site summarizes the radiological audits and the quality assurance (QA) in-process surveillances, audits, and final close-out inspection performed by the U.S. Department of Energy (DOE) and Technical Assistance Contractor (TAC). It also summarizes U.S. Nuclear Regulatory Commission (NRC) surveillances. One radiological audit and three radiological surveillances were performed at the Falls City site. These surveillances and audit, which resulted in 31 observations, focused primarily on processing site activities and were performed on the following dates: 3-6 August 1992, 29-30 October 1992, 22-26 March 1993, and 1-3 November 1993. All outstanding radiological issues were closed out at the completion of the construction activities. Six QA in-process surveillances, which resulted in 71 observations, were performed at the Falls City site on the following dates: 22-24 July 1992, 23-25 November 1992, 17-19 May 1993, 16-18 August 1993, 13-15 October 1993, and 2-4 February 1994. All outstanding issues were closed out with the February surveillance on 3 March 1994. The DOE/TAC remedial action close-out inspections of the Falls City site, which resulted in 56 observations, were conducted 9-10 June 1994 and 26 July 1994. The inspections were closed out on 26 January 1995. The NRC performed three on-site construction reviews (OSCR), resulting in seven observations of remedial action construction activities that occurred during site visits. The OSCRs were performed 9 December 1992, 12 May 1993, and 25 October 1993. Since all audit and surveillance observations and recommendations have been closed out, this final audit report segment of the site certification process is complete.

2053 (DOE/AL/62350–189) **Guidance for implementing the long-term surveillance program for UMTRA Project Title I Disposal Sites.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96006188. Source: OSTI; NTIS; INIS; GPO Dep.

This guidance document has two purposes: it provides guidance for writing site-specific long-term surveillance plans (LTSP) and it describes site surveillance, monitoring, and long-term care techniques for Title I disposal sites of the Uranium Mill Tailings Radiation Control Act (UMTRCA) (42 USC Section 7901 et seq.). Long-term care includes monitoring, maintenance, and emergency measures needed to protect public health and safety and the environment after remedial action is completed. This document applies to the UMTRCA-designated Title I disposal sites. The requirements for long-term care of the Title I sites and the contents of the LTSPs are provided in U.S. Nuclear Regulatory Commission (NRC) regulations (10 CFR Section 40.27) provided in Attachment 1.

2054 (DOE/AL/62350–197) **Comment and response document for the final remedial action plan site design for stabilization of the Inactive Uranium Mill Tailings Sites at Slick Rock, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 140p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000652. Source: OSTI; NTIS; INIS; GPO Dep.

This document consists of comments and responses; the reviewers are the U.S. Nuclear Regulatory Commission (NRC), Colorado Dept. of Public Health and Environment, and the remedial action contractor (RAC).

2055 (DOE/AL/62350–197-Rev.2) **Comment and response document for the final remedial action plan and site design for stabilization of the inactive uranium mill tailings sites at Slick Rock, Colorado. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1996. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96011536. Source: OSTI; NTIS; INIS; GPO Dep.

This document for the final remedial action plan and site design has been prepared for US Department of Energy Environmental Restoration Division as part of the Uranium Mill Tailings Remedial Action plan. Comments and responses are included for the site design for stabilization of the inactive uranium mill tailings sites at Slick Rock, Colorado.

2056 (DOE/AL/62350–198) **Annual monitoring report for the Gunnison, Colorado, wetlands mitigation plan.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96002054. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) administers the Uranium Mill Tailings Remedial Action (UMTRA) Project to clean up uranium mill tailings and other surface contamination at 24 abandoned uranium mill sites in 10 states. One of these abandoned mill sites is near the town of Gunnison, Colorado; surface remediation and the environmental impacts of remedial action are described in the Gunnison environmental assessment (EA) (DOE, 1992). Remedial action resulted in the elimination of 4.3 acres (ac) 1.7 hectares (ha) of wetlands and mitigation of this loss of wetlands is being accomplished through the enhance of 18.4 ac (7.5 ha) of riparian plant communities in six spring feed areas on Bureau of Land Management (BLM) land. The description of the impacted and mitigation wetlands is provided in the Mitigation and Monitoring Plan for Impacted Wetlands at the Gunnison UMTRA Project Site, Gunnison, Colorado (DOE, 1994), which is attached to the US Army corps of Engineers (USACE) Section 404 Permit. As part of the wetlands mitigation plan, the six mitigation wetlands were fenced in the fall of 1993 to exclude livestock grazing. Baseline of grazed conditions of the wetlands vegetation was determined during the summer of 1993 (DOE, 1994). A 5-year monitoring program of these six sites has been implemented to document the response of vegetation and wildlife to the exclusion of livestock. This annual monitoring report provides the results of the first year of the 5-year monitoring period.

2057 (DOE/AL/62350–200-Rev.1) **UMTRA project disposal cell cover biointrusion sensitivity assessment, Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003087. Source: OSTI; NTIS; INIS; GPO Dep.

This study provides an analysis of potential changes that may take place in a Uranium Mill Tailings Remedial Action (UMTRA) Project disposal cell cover system as a result of plant biointrusion. Potential changes are evaluated by performing a sensitivity analysis of the relative impact of root penetrations on radon flux out of the cell cover and/or water infiltration into the cell cover. Data used in this analysis consist of existing information on vegetation growth on selected cell cover systems and information available from published studies and/or other available project research. Consistent with the scope of this paper, no new site-specific data were collected from UMTRA Project sites. Further, this paper does not focus on the issue of plant transport of radon gas or other contaminants out of the disposal cell cover though it is acknowledged that such transport has the potential to be a significant pathway for contaminants to reach the environment during portions of the design life of a disposal cell where plant growth occurs. Rather, this study was performed to evaluate the effects of physical penetration and soil drying caused by plant roots that have and are expected to continue to grow in UMTRA Project disposal cell covers. An understanding of the biological and related physical processes that take place within the cover systems of the UMTRA Project disposal cells helps the U.S. Department of Energy (DOE) determine if the presence of a plant community on these cells is detrimental, beneficial, or of mixed value in terms of the cover system's designed function. Results of this investigation provide information relevant to the formulation of a vegetation control policy.

2058 (DOE/AL/62350–203) **Long-term surveillance plan for the Canonsburg, Pennsylvania, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96002056. Source: OSTI; NTIS; INIS; GPO Dep.

This document establishes elements of the US Department of Energy's (DOE) Long-Term Surveillance Plan for the Canonsburg, Pennsylvania, disposal site. The US Nuclear Regulatory Commission (NRC) will use this plan in support of license issuance for the long-term surveillance of the Canonsburg site. The Canonsburg (CAN) site is located within the borough of Canonsburg, Washington County, in southwestern Pennsylvania. The Canonsburg site covers approximately 30 acres (74 hectares). The disposal cell contains approximately 226,000 tons (241,000 tons) of residual radioactive material (RRM). Area C is southeast of the Canonsburg site, between Strabane Avenue and Chartiers Creek. Contaminated soils were removed from Area C during the remedial action, and the area was restored with uncontaminated fill material.After this cleanup, residual quantities of thorium-230 were detected at several Area C locations. The remedial action plan did not consider the ingrowth of radium-226 from thorium-230 as part of the Area C cleanup, and only two locations contained sufficient thorium-230 concentrations to result in radium-226 concentrations slightly above the US Environmental Protection Agency (EPA) standards.

2059 (DOE/AL/62350–204) **Final audit report of remedial action construction at the UMTRA Project Ambrosia Lake, New Mexico, site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000216. Source: OSTI; NTIS; INIS; GPO Dep.

The final audit report for remedial action at the Ambrosia Lake, New Mexico, Uranium Mill Tailings Remedial Action (UMTRA) Project site consists of a summary of the radiological surveillances/audits, quality assurance (QA) in-process surveillances, and a QA final closeout inspection performed by the US Department of Energy (DOE) and the Technical Assistance Contractor (TAC). One radiological surveillance and three radiological audits were performed at the Ambrosia Lake site. The surveillance was performed on 12–16 April 1993 (DOE, 1993d). The audits were performed on 26–29 July 1993 (DOE, 1993b); 21–23 March 1994 (DOE, 1994d); and 1–2 August 1994 (DOE, 1994d). The surveillance and audits resulted in 47 observations. Twelve of the observations raised DOE concerns that were resolved on site or through subsequent corrective action. All outstanding issues were satisfactorily closed out on 28 December 1994. The radiological surveillance and audits are discussed in this report. A total of seven QA in-process surveillances were performed at the Ambrosia Lake UMTRA site are discussed. The DOE/TAC Ambrosia Lake final remedial action close-out inspection was conducted on 26 July 1995 (DOE, 1995a). To summarize, a total of 155 observations were noted during DOE/TAC audit and surveillance activities. Follow-up to responses required from the RAC for the DOE/TAC surveillance and audit observations indicated that all issues related to the Ambrosia Lake site were resolved and closed to the satisfaction of the DOE.

2060 (DOE/AL/62350–205) **Final audit report of remedial action construction at the UMTRA Project Mexican Hat, Utah – Monument Valley, Arizona, sites.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Oct 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96002055. Source: OSTI; NTIS; INIS; GPO Dep.

The final audit report for remedial action at the Mexican Hat, Utah, Monument Valley, Arizona, Uranium Mill Tailings Remedial Action (UMTRA) Project sites consists of a summary of the radiological surveillances/audits, quality assurance (QA) in-process surveillances, and QA remedial action close-out inspections performed by the US Department of Energy (DOE) and the Technical Assistance Contractor (TAC); on-site construction reviews (OSCR) performed by the US Nuclear Regulatory Commission (NRC); and a surveillance performed by the Navajo Nation. This report refers to remedial action activities performed at the Mexican Hat, Utah–Monument Valley, Arizona, Uranium Mill Tailings Remedial Action (UMTRA) Project sites.

2061 (DOE/AL/62350–207) **Long-term surveillance plan for the Mexican Hat disposal site, Mexican Hat, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004141. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the long-term surveillance activities for the Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site at Mexican Hat, Utah. The US Department of Energy (DOE) will carry out these activities to ensure that the disposal site continues to function as designed. This long-term surveillance plan (LTSP) was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive material (RRM). This LTSPC documents the land ownership interests and details how the long-term care of the disposal site will be accomplished.

2062 (DOE/AL/62350–207-Rev.1) **Long-term surveillance plan for the Mexican Hat Disposal Site, Mexican Hat, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008002. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes the long-term surveillance activities for the Uranium Mill Tailings Remedial Action (UMTRA) Project disposal site at Mexican Hat, Utah. The U.S. Department of Energy (DOE) will carry out these activities to ensure that the disposal site continues to function as designed. This long-term surveillance plan (LTSP) was prepared as a requirement for acceptance under the U.S. Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive material (RRM). This LTSP (based on the DOE's Guidance for Implementing the UMTRA Project Long-term Surveillance Program), documents the land ownership interests and details how the long-term care of the disposal site will be accomplished.

2063 (DOE/AL/62350–208) **Public affairs plan.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96000233. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Uranium Mill Tailings Remedial Action (UMTRA) Project Public Affairs Plan is to establish goals for the fiscal year (FY) 1996 UMTRA Project public affairs program and to identify specific activities to be conducted during the year. It describes the roles of various agencies involved in the public affairs program and defines the functions of the UMTRA Project Technical Assistance Contractor (TAC) Public Affairs Department. It replaces the FY 1995 Public Affairs Plan (DOE/AL/62350-154). The plan also describes the US Department of Energy's (DOE) plans to keep stakeholders and other members of the public informed about UMTRA Project policies, plans, and activities, and provide opportunities for stakeholders and interested segments of the public to participate in UMTRA Project decision-making processes. The plan applies to the UMTRA Project Team; the DOE Grand Junction Projects Office (GJPO); the DOE Albuquerque Operations Office, Office of Public Affairs (OPA); the TAC; the UMTRA Project Remedial Action Contractor (RAC); and other cooperating agencies.

2064 (DOE/AL/62350–210) **Comment and response document for the long-term surveillance plan for the Bodo Canyon Disposal Site, Durango, Colorado, Revision 0.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96003076. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the comment and response document for the Draft Long-Term Surveillance Plan of the Bodo Canyon Site in Durango, California. This is a part of the Uranium Mill Tailings Remedial Action (UMTRA) Project. Questions and comments regarding specific sections or statements in the report are described and then a response to each review comment or question is provided.

2065 (DOE/AL/62350–211) **Long-term surveillance plan for the Ambrosia Lake, New Mexico disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Nov 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004149. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) for the Uranium Mill Tailings Remedial Action (UMTRA) Project Ambrosia Lake disposal site in McKinley County, New Mexico, describes the US Department of Energy's (DOE) long-term care program for the disposal site. The DOE will carry out this program to ensure that the disposal cell continues to function as designed. This LTSP was prepared as a requirement for acceptance under the US Nuclear Regulatory Commission (NRC) general license for custody and long-term care of residual radioactive materials.

2066 (DOE/AL/62350–212) **Economic impact study of the Uranium Mill Tailings Remedial Action project in Colorado: Colorado state fiscal year 1995.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004147. Source: OSTI; NTIS; INIS; GPO Dep.

This Colorado economic impact study summarizes employment and economic benefits to the state from activities associated with the Uranium Mill Tailings Remedial Action (UMTRA) Project during Colorado state fiscal year (FY) 1995 (1 July 1994 through 30 June 1995). To capture employment information, a questionnaire was distributed to subcontractor employees at the active UMTRA Project sites of Grand Junction, Gunnison, Maybell, Naturita, Rifle, and Slick Rock, Colorado. Economic data were requested from the Remedial Action Contractor (RAC), the Technical Assistance Contractor (TAC) and the US Department of Energy (DOE). The most significant benefits associated with the UMTRA Project in Colorado are summarized.

2067 (DOE/AL/62350–212-Rev.1) **Economic impact study of the Uranium Mill Tailings Remedial Action project in Colorado: Colorado state fiscal year 1995. Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Dec 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96004144. Source: OSTI; NTIS; INIS; GPO Dep.

As required by the Romer-Twining Agreement of 1990, the US Department of Energy (DOE) has prepared this annual economic impact study for the state of Colorado. This report assesses the economic impacts related to the DOE Uranium Mill Tailings Remedial Action (UMTRA) Project in Colorado during the state fiscal year (FY) between 1 July 1994 and 30 June 1995. To estimate net economic benefit, employment, salaries and wages, and other related economic benefits are discussed, quantified, and then compared to the state's 10 percent share of the remedial action costs. Actual data obtained from sites currently undergoing remedial action were used as the basis for analyses. If data were not available, estimates were used to derive economic indicators. This study describes the types of employment associated with the UMTRA Project and estimates of the numbers of people employed by UMTRA Project subcontractors in Colorado during state FY 1995. Employment totals are reported in estimated average annual jobs; however, the actual number of workers at the site fluctuates depending on weather and on the status of remedial action activities. In addition, the actual number of people employed on the Project during the year may be higher than the average annual employment reported due to the temporary nature of some of the jobs.

2068 (DOE/AL/62350–217) **Final audit report of remedial action construction at the UMTRA Project Site, Gunnison, Colorado. Revision 0.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jan 1996. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96007514. Source: OSTI; NTIS; INIS; GPO Dep.

The final audit report for remedial action at the Gunnison, Colorado Uranium Mill Tailings Remedial Action (UMTRA) Project site consists of a summary of the radiological surveillances/audits, quality assurance (QA) in-process surveillances, and QA remedial action close-out inspections performed by the U.S. Department of Energy (DOE) and the Technical Assistance Contractor (TAC); and on-site construction reviews (OSCR) performed by the U.S. Nuclear Regulatory Commission (NRC). Two radiological surveillances and four radiological audits were performed at the Gunnison site. The surveillances were performed on 16 to 19 September 1992 and 28 June to 1 July 1993. The radiological audits were performed on 4 to 7 October 1993; 13 to 16 June 1994; 19 to 22 September 1994 and 10 to 12 July 1995. The surveillances and audits resulted in 79 observations. Thirty-four of the observations raised DOE concerns that were resolved on the site or through subsequent corrective action. All outstanding issues were closed on 12 July 1995. The radiological surveillances and audits are discussed in Section 2.0 of this report. Ten QA in-process surveillances were performed at the Gunnison UMTRA Project site. The surveillances were performed on 24 to 25 September 1992, 7 to 9 July 1993, 29 October 1993, 27 to 28 June 1994, 31 October to 1 November 1994, 19 to 20 June 1 995, 20 to 21 July 1995, 17 to 18 August 1995, 20 September 1995, and 11 to 13 October 1995. The surveillances resulted in 100 observations. Six observations contained recommendations that required responses from the Remedial Action Contractor (RAC). Ninety-five observations contained a recommendation that required no response. All outstanding issues were closed on 8 January 1996. The QA in-process surveillances are discussed in Section 3.0 of this report.

2069 (DOE/AL/62350–221-Rev.1) **UMTRA Surface Project management action process document. Final report: Revision 1.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1996. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96010980. Source: OSTI; NTIS; INIS; GPO Dep.

A critical mission of the US Department of Energy (DOE) is the planning, implementation, and completion of environmental restoration (ER) programs at facilities that were operated by or in support of the former Atomic Energy Commission (AEC) from the late 1940s into the 1970s. Among these facilities are the 24 former uranium mill sites designed in the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978 (42 USC § 7901 et seq.) Title 1 of the UMTRCA authorized the DOE to undertake remedial actions at these designated sites and associated vicinity properties (VP), which contain uranium mill tailings and other residual radioactive materials (RRM) derived from the processing sites. Title 2 of the UMTRCA addresses uranium mill sites that were licensed at the time the UMTRCA was enacted. Cleanup of these Title 2 sites is the responsibility of the licensees. The cleanup of the Title 1 sites has been split into two separate projects: the Surface Project, which deals with the mill buildings, tailings, and contaminated soils at the sites and VPs; and the Ground Water Project, which is limited to the contaminated ground water at the sites. This management action process (MAP) document discusses the Uranium Mill Tailings Remedial Action (UMTRA) Surface Project only; a separate MAP document has been prepared for the UMTRA Ground Water Project.

2070 (DOE/AL/62350–221-Rev.2) **UMTRA Surface Project management action process document: Final. Revision 2.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jun 1996. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013528. Source: OSTI; NTIS; INIS; GPO Dep.

Title 1 of the UMTRCA authorized the DOE to undertake remedial actions at these designed sites and associated vicinity properties (VP), which contain uranium mill tailings and other residual radioactive materials (RRM) derived from the processing sites. Title 2 of the UMTRCA addresses uranium mill sites that were licensed at the time the UMTRCA was enacted. Cleanup of these Title 2 sites is the responsibility of the licensees. The cleanup of the Title 1 sites has been split into two separate projects: the Surface Project, which deals with the mill buildings, tailings, and contaminated soils at the sites and VPs; and the Ground Water Project, which is limited to the contaminated ground water at the sites. This management action process (MAP) document discusses the Uranium Mill Tailings Remedial Action (UMTRA) Surface Project. Since its inception through March 1996, the Surface Project (hereinafter called the Project) has cleaned up 16 of the 24 designated processing sites and approximately 5,000 VPs, reducing the risk to human health and the environment posed by the uranium mill tailings. Two of the 24 sites, Belfield and Bowman, North Dakota, will not be remediated at the request of the state, reducing the total number of sites to 22. By the start of FY1998, the remaining 6 processing sites and associated VPs will be cleaned up. The remedial action activities to be funded in FY1998 by the FY1998 budget request are remediation of the remaining Grand Junction, Colorado, VPs; closure of the Cheney disposal cell in Grand Junction, Colorado; and preparation of the completion reports for 4 completed sites.

2071 (DOE/AL/62350–222) **Long-term surveillance plan for the Gunnison, Colorado, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Feb 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008305. Source: OSTI; NTIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Gunnison disposal site in Gunnison County, Colorado. The U.S. Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites will be cared for in a manner that protects the public health and safety and the environment. For each disposal site to be licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Gunnison disposal site. The general license becomes effective when the NRC concurs with the DOE's determination of completion of remedial action for the Gunnison site and the NRC formally accepts this LTSP. This LTSP describes the long-term surveillance program the DOE will implement to ensure that the Gunnison disposal site performs as designed. The program is based on two distinct activities: (1) site inspections to identify threats to disposal cell integrity, and (2) ground water monitoring to demonstrate disposal cell performance. The LTSP is based on the UMTRA Project long-term surveillance program guidance and meets the requirements of 10 CFR §40.27(b) and 40 CFR §192.03.

2072 (DOE/AL/62350–222(5/96)) **Long-term surveillance plan for the Gunnison, Colorado, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013506. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the US Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Gunnison disposal site in Gunnison County, Colorado. The US Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites will be cared for in a manner that protects the public health and safety and the environment.For each disposal site to be licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Gunnison disposal site. The general license becomes effective when the NRC concurs with the DOE's determination of completion of remedial action for the Gunnison site and the NRC formally accepts this LTSP.

2073 (DOE/AL/62350–222-Rev.) **Long-term surveillance plan for the Gunnison, Colorado disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Apr 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96011650. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Gunnison disposal site in Gunnison County, Colorado. The U.S. Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites will be cared for in a manner that protects the public health and safety and the environment. For each disposal site to be licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Gunnison disposal site. The general license becomes effective when the NRC concurs with the DOE's determination of completion of remedial action for the Gunnison site and the NRC formally accepts this LTSP. This LTSP describes the long-term surveillance program the DOE will implement to ensure that the Gunnison disposal site performs as designed. The program is based on two distinct activities: (1) site inspections to identify threats to disposal cell integrity, and (2) ground water monitoring to demonstrate disposal cell performance. The LTSP is based on the UMTRA Project long-term surveillance program guidance and meets the requirements of 10 CFR §40.27(b) and 40 CFR §192.03.

2074 (DOE/AL/62350–222-Rev.1) **Long-term surveillance plan for the Gunnison, Colorado, disposal site.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). May 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013527. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the U.S. Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project Gunnison disposal site in Gunnison County, Colorado. The U.S. Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CFR Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites will be cared for in a manner that protects the public health and safety and the environment. For each disposal site to be licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the Gunnison disposal site. The general license becomes effective when the NRC concurs with the DOE's determination of completion of remedial action for the Gunnison site and the NRC formally accepts this LTSP. This LTSP describes the long-term surveillance program the DOE will implement to ensure that the Gunnison disposal site performs as designed. The program is based on two distinct activities: (1) site inspections to identify threats to disposal cell integrity, and (2) ground water monitoring to demonstrate disposal cell performance. The LTSP is based on the UMTRA Project long-term surveillance program guidance and meets the requirements of 10 CFR §40.27(b) and 40 CFR §192.03.

2075 (DOE/AL/62350–225) **Biological assessment of remedial action at the abandoned uranium mill tailings site near Naturita, Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 53p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96008306. Source: OSTI; NTIS; GPO Dep.

Pursuant to the Uranium Mill Tailings Radiation Control Act (UMTRCA) of 1978, the U.S. Department of Energy (DOE) is proposing to conduct remedial action to clean up the residual radioactive materials (RRM) at the Naturita uranium processing site in Colorado. The Naturita site is in

Montrose County, Colorado, and is approximately 2 miles (mi) (3 kilometer [km]) from the unincorporated town of Naturita. The proposed remedial action is to remove the RRM from the Naturita site to the Upper Burbank Quarry at the Uravan disposal site. To address the potential impacts of the remedial action on threatened and endangered species, the DOE prepared this biological assessment. Informal consultations with the U.S. Department of the Interior, Fish and Wildlife Service (FWS) were initiated in 1986, and the FWS provided a list of the threatened and endangered species that may occur in the Naturita study area. This list was updated by two FWS letters in 1988 and by verbal communication in 1990. A biological assessment was included in the environmental assessment (EA) of the proposed remedial action that was prepared in 1990. This EA addressed the impacts of moving the Naturita RRM to the Dry Flats disposal site. In 1993, the design for the Dry Flats disposal alternative was changed. The FWS was again consulted in 1993 and provided a new list of threatened and endangered species that may occur in the Naturita study area. The Naturita EA and the biological assessment were revised in response to these changes. In 1994, remedial action was delayed because an alternate disposal site was being considered. The DOE decided to move the FIRM at the Naturita site to the Upper Burbank Quarry at the Uravan site. Due to this delay, the FWS was consulted in 1995 and a list of threatened and endangered species was provided. This biological assessment is a revision of the assessment attached to the Naturita EA and addresses moving the Naturita RRM to the Upper Burbank Quarry disposal site.

2076 (DOE/AL/62350–228) **Long-term surveillance plan for the South Clive Disposal Site, Clive, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Mar 1996. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96011513. Source: OSTI; NTIS; INIS; GPO Dep.

This long-term surveillance plan (LTSP) describes the US Department of Energy's (DOE) long-term care program for the Uranium Mill Tailings Remedial Action (UMTRA) Project South Clive disposal site in Clive, Utah. The US Nuclear Regulatory Commission (NRC) has developed regulations for the issuance of a general license for the custody and long-term care of UMTRA Project disposal sites in 10 CRF Part 40. The purpose of this general license is to ensure that the UMTRA Project disposal sites will be cared for in a manner that protects the public health and safety and the environment. For each disposal site to be licensed, the NRC requires the DOE to submit a site-specific LTSP. The DOE prepared this LTSP to meet this requirement for the South Clive disposal site. The general license becomes effective when the NRC concurs with the DOE's determination of completion of remedial action for the South Clive site and the NRC formally accepts this LTSP. This LTSP describes the long-term surveillance program the DOE will implement to ensure that the South Clive disposal site performs as designed. The program's primary activity is site inspections to identify threats to disposal cell integrity.

2077 (DOE/AL/62350–231) **Geophysical surveys at the UMTRA project Shiprock, New Mexico site.** Wightman, E.; Smith, B.; Newlin, B. Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Geraghty and Miller, Inc., Denver, CO (United States). Mar 1996. 156p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96011835. Source: OSTI; NTIS; INIS; GPO Dep.

Geophysical surveys were performed at the Uranium Mill Tailings Remedial Action (UMTRA) Shiprock site in New Mexico during February 1996. The surveys were designed to locate areas of ground water contamination, consisting largely of sulfate and nitrate salts and uranium. Electrical geophysical methods were used to locate areas of sulfate and nitrate concentrations since these products, when present in ground water, increase its electrical conductivity. These contaminants also increase the density of water, making the water with the highest concentrations of these salts sink to the bottom of the water column. At the Shiprock site, where alluvium is underlain by the impervious Mancos Shale, the saline water will tend to rest in depressions on the shale surface. Seismic refraction surveys were conducted on the floodplain. The site comprises two areas, the terrace and the floodplain, separated by a steep scarp of some 70 feet (ft) (20 meters [m]). Measurements of electrical conductivity were taken over these two areas, searching for possible pockets of saline ground water resting on top of the bedrock. Conductivity surveys were also run to identify fractures within the bedrock that may act as conduits for ground water movement. Several areas of higher than normal conductivity were found on the terrace, including halos of higher conductivities on three sides of the tailings cell. The conductivity measurements searching for fractures found only a small number of minor fracture-like anomalies. These are not considered important. On the floodplain, both conductivity and seismic refraction measurements were taken. The conductivity measurements clearly show areas of high conductivity interpreted to result from ground water contamination. The seismic refraction measurements identified bedrock depressions that may contain denser, and more saline ground water lenses. Generally, the areas of high conductivity coincide with the bedrock depressions.

2078 (DOE/AL/62350–233) **Comment and response document for the long-term surveillance plan for the Bodo Canyon Disposal Site, Durango. Colorado.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States). Jul 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013530. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains comments made by the US Nuclear Regulatory Commission upon their review of the Long-Term Surveillance Plan for the Bodo Canyon Disposal Site, Durango, Colorado. Responses to the comments are also included in the document.

2079 (DOE/AL/62350–T7) **Remedial action plan and site conceptual design for stabilization of the inactive uranium mill tailings sites at Rifle, Colorado. Appendix D, Final report.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Colorado State Dept. of Public Health, Denver, CO (United States). Feb 1992. 595p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350 ; FC04-82AL16257. Order Number DE95015507. Source: OSTI; NTIS; INIS; GPO Dep.

This appendix assesses the present conditions and data gathered about the two designated inactive uranium mill tailings sites near Rifle, Colorado, and the proposed disposal site six miles north of Rifle in the area of Estes Gulch. It consolidates available engineering, radiological, geotechnical, hydrological, meteorological, and other information pertinent to the design of the Remedial Action Plan (RAP). The data characterize conditions at the mill, tailings, and disposal site so that the Remedial Action Contractor (RAC) may complete final designs for the remedial actions.

2080 (DOE/AL/62350–T8) **Scope of work-supplemental standards-related fieldwork - Salt Lake City UMTRA Project Site, Salt Lake City, Utah.** Jacobs Engineering Group, Inc., Albuquerque, NM (United States); Texas Univ., Austin, TX (United States). Inst. for Fusion Studies. 23 Jan 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350 ; FG05-80ET53088. Order Number DE96005572. Source: OSTI; NTIS; INIS; GPO Dep.

This scope of work governs the field effort to conduct transient in situ (hereafter referred to by the trademark name HydroPunch®) investigative subsurface logging and ground water sampling, and perform well point installation services at the U.S. Department of Energy's (DOE) Uranium Mill Tailings Remedial Action (UMTRA) Project site near Salt Lake City, Utah. The HydroPunch® and well point services subcontractor (the Subcontractor) shall provide services as stated herein to be used to investigate the subsurface, collect and analyze ground water samples, and install shallow well points.

2081 (DOE/AL/62350–T9) **Uranium Mill Tailings Remedial Action Project, fiscal year 1995 annual report to stakeholders.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 30 Sep 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96012683. Source: OSTI; NTIS; INIS; GPO Dep.

In 1978, Congress authorized the DOE to assess and clean up contamination at 24 designated former uranium processing sites. The DOE is also responsible for cleaning up properties in the vicinity of the sites where wind and water erosion deposited tailings or people removed them from the site for use in construction or landscaping projects. Cleanup is being undertaken in cooperation with state governments and Indian tribes within whose boundaries the sites are located. It is being conducted in two phases: the surface project and the ground water project. This report addresses specifics about both phases of the UMTRA Project. DOE's UMTRA Project is the world's largest materials management project ever undertaken to reduce or eliminate risk to the general public from exposure to potentially hazardous and radioactive materials. With an estimated cost at completion of nearly $2 billion for both phases of the UMTRA Project, and with the responsibility for encapsulating and isolating almost one-fourth of all the uranium mill tailings generated across the entire US (more than 44 million cubic yards), the UMTRA Project and its people have achieved a long record of safely and effectively completing its mission. It continually enhances its national reputation through its diligent process and cost efficiency as well as its international recognition for its technological innovation.

2082 (DOE/AL/62350–T10) **Remedial action plan for stabilization of the inactive uranium mill tailings site at Monument Valley, Arizona.** Jacobs Engineering Group, Inc., Washington, DC (United States). Feb 1986. 202p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-91AL62350. Order Number DE96013585. Source: OSTI; NTIS; GPO Dep.

This Remedial Action Plan (RAP) has been developed to serve a two-fold purpose. It presents the series of activities which are proposed by the U.S. Department of Energy (DOE) to accomplish long-term stabilization and control of radioactive materials at the inactive uranium processing site located near Monument Valley, Arizona It also serves to document the concurrence of both the Navajo Nation and the U.S. Nuclear Regulatory Commission (NRC) in the remedial action. This agreement, upon execution by DOE and the Navajo Nation and concurrence by NRC, becomes Appendix B of the Cooperative Agreement.

2083 (DOE/EA–0988) **Transfer of Plutonium-Uranium Extraction Plant and N Reactor irradiated fuel for storage at the 105-KE and 105-KW fuel storage basins, Hanford Site, Richland Washington.** USDOE Richland Operations Office, WA (United States). Jul 1995. 72p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016112. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) needs to remove irradiated fuel from the Plutonium-Uranium Extraction (PUREX) Plant and N Reactor at the Hanford Site, Richland, Washington, to stabilize the facilities in preparation for decontamination and decommissioning (D&D) and to reduce the cost of maintaining the facilities prior to D&D. DOE is proposing to transfer approximately 3.9 metric tons (4.3 short tons) of unprocessed irradiated fuel, by rail, from the PUREX Plant in the 200 East Area and the 105 N Reactor (N Reactor) fuel storage basin in the 100 N Area, to the 105-KE and 105-KW fuel storage basins (K Basins) in the 100 K Area. The fuel would be placed in storage at the K Basins, along with fuel presently stored, and would be dispositioned in the same manner as the other existing irradiated fuel inventory stored in the K Basins. The fuel transfer to the K Basins would consolidate storage of fuels irradiated at N Reactor and the Single Pass Reactors. Approximately 2.9 metric tons (3.2 short tons) of single-pass production reactor, aluminum clad (AC) irradiated fuel in four fuel baskets have been placed into four overpack buckets and stored in the PUREX Plant canyon storage basin to await shipment. In addition, about 0.5 metric tons (0.6 short tons) of zircaloy clad (ZC) and a few AC irradiated fuel elements have been recovered from the PUREX dissolver cell floors, placed in wet fuel canisters, and stored on the canyon deck. A small quantity of ZC fuel, in the form of fuel fragments and chips, is suspected to be in the sludge at the bottom of N Reactor's fuel storage basin. As part of the required stabilization activities at N Reactor, this sludge would be removed from the basin and any identifiable pieces of fuel elements would be recovered, placed in open canisters, and stored in lead lined casks in the storage basin to await shipment. A maximum of 0.5 metric tons (0.6 short tons) of fuel pieces is expected to be recovered.

2084 (DOE/EA–1149-Draft) **Draft environmental assessment – Closure of the Waste Calcining Facility (CPP-633), Idaho National Engineering Laboratory.** Braun, J.B.; Irving, J.S.; Staley, C.S.; Stanley, N. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1996. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-76ID01570. Order Number DE96010275. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE-Idaho Operations Office has prepared an environmental assessment (EA) to analyze the environmental impacts of closing the Waste Calcining Facility (WCF) at the Idaho National Engineering Laboratory (INEL). The purpose of the action is to reduce the risk of radioactive exposure and release of radioactive and hazardous constituents and eliminate the need for extensive long-term surveillance and maintenance. DOE has determined that the closure is needed to reduce these risks to human health and the environment and to comply with Resource Conservation and Recovery Act requirements. The WCF closure project is described in the DOE Programmatic Spent Nuclear Fuel

Management and Idaho National Engineering Laboratory Environmental Restoration and Waste Management Programs Final Environmental Impact Statement (Programmatic EIS). DOE determined in the Programmatic EIS Record of Decision (ROD) that certain actions would be implemented and other actions deferred. The EA examined the potential environmental impacts of the proposed action and evaluated reasonable alternatives, including the no action alternative in accordance with the Council on Environmental Quality Regulations. Based on the analysis in the EA, the action will not have a significant effect on the human environment.

2085 (DOE/EM–0234) **Cost quality management assessment report for the Kansas City Plant. Final report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of Engineering and Cost Management. Apr 1995. 104p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95011865. Source: OSTI; NTIS; GPO Dep.

The Office of Engineering and Cost Evaluation (EM-24) conducted a Cost Quality Management Assessment (CQMA). at the Kansas City Plant (KCP) on March 16-27, 1992. The Round II CQMA at the KCP, conducted August 22-31, 1994, reviewed KCP's cost and cost-related management practices against POCs contained in the CQMA Site Handbook. Interviews of Department of Energy Kansas City Area Office (DOE-KCAO) and AlliedSignal personnel and a review of documents show that KCP has made measurable progress since the last CQMA. Of the 48 POCs, KCP meets 31 and partially meets 17. Among the key observations are the following: The DOE-KCAO and AlliedSignal are effectively managing the Environmental Restoration (ER) baseline, validated in FY 1992, through Baseline Change Control Procedures. KCP ER baseline performance is on schedule and under budget. Remedial Action at the KCP is expected to be completed by FY 2000. After FY 2000, only Waste Management (WM) operations in support of Defense Programs will be required. KCP has initiated a Baseline Change Proposal to combine five planned Corrective Measures Studies into one; the expected cost avoidance is $1M. AlliedSignal used the CQMA Handbook (Rev. 0) and the Action Plan developed in response to the Round I CQMA as a basis for improving cost-management systems, processes, and procedures. AlliedSignal is standardizing on Project 2/Series X software for baseline scheduling and cost and schedule performance reporting. For estimating environmental restoration and construction projects, AlliedSignal is converting to Composer Gold software, the commercial version Of MCACES Software developed by the U.S. Army Corps of Engineers. AlliedSignal is beginning to generate a site-specific database in Composer Gold for more accurately estimating constriction and remediation projects. The roles and responsibilities of DOE-KCAO and AlliedSignal managers and staff need to be clarified given the recent reorganization of AlliedSignal.

2086 (DOE/EM–0253) **Decontamination and decommissioning focus area. Technology summary.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. Jun 1995. 77p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016002. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents details of the facility deactivation, decommissioning, and material disposition research for development of new technologies sponsored by the Department of Energy. Topics discussed include; occupational safety, radiation protection, decontamination, remote operated equipment, mixed waste processing, recycling contaminated metals, and business opportunities.

2087 (DOE/EM–0265) **Uranium enrichment decontamination and decommissioning fund.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). 1994. 30p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003569. Source: OSTI; NTIS; INIS; GPO Dep.

One of the most challenging issues facing the Department of Energy's Office of Environmental Management is the cleanup of the three gaseous diffusion plants. In October 1992, Congress passed the Energy Policy Act of 1992 and established the Uranium Enrichment Decontamination and Decommissioning Fund to accomplish this task. This mission is being undertaken in an environmentally and financially responsible way by: devising cost-effective technical solutions; producing realistic life-cycle cost estimates, based on practical assumptions and thorough analysis; generating coherent long-term plans which are based on risk assessments, land use, and input from stakeholders; and, showing near-term progress in the cleanup of the gaseous diffusion facilities at Oak Ridge.

2088 (DOE/EM–0300) **Decontamination & decommissioning focus area.** USDOE Office of Scientific and Technical Information (OSTI), Oak Ridge, TN (United States). Aug 1996. 201p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013521. Source: OSTI; NTIS; INIS; GPO Dep.

In January 1994, the US Department of Energy Office of Environmental Management (DOE EM) formally introduced its new approach to managing DOE's environmental research and technology development activities. The goal of the new approach is to conduct research and development in critical areas of interest to DOE, utilizing the best talent in the Department and in the national science community. To facilitate this solutions-oriented approach, the Office of Science and Technology (EM-50, formerly the Office of Technology Development) formed five Focus AReas to stimulate the required basic research, development, and demonstration efforts to seek new, innovative cleanup methods. In February 1995, EM-50 selected the DOE Morgantown Energy Technology Center (METC) to lead implementation of one of these Focus Areas: the Decontamination and Decommissioning (D & D) Focus Area.

2089 (DOE/FUSRAP–140-96-005) **Environmental surveillance results for 1995 for the Hazelwood Interim Storage Site.** McCague, J.C. USDOE Formerly Utilized Sites Remedial Action Program (FUSRAP), Washington, DC (United States). 1 Jun 1996. 68p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96011247. Source: OSTI; NTIS; INIS; GPO Dep.

This memorandum presents and interprets analytical results and measurements obtained as part of the 1995 environmental surveillance program for the Hazelwood Interim Storage Site (HISS) under the Formerly Utilized Sites Remedial Action Program (FUSRAP). The discussion provides a comparative analysis of average historical background conditions and applicable regulatory criteria to the 1995 results reported for external gamma radiation and for samples from the media investigated (air, surface water, sediment, groundwater, and stormwater). Results from the 1995 environmental surveillance program at HISS indicate that, with the exception of thorium-230 in streambed sediment, applicable US Department of Energy (DOE) guidelines were not exceeded for any measured parameter or for any dose calculated for potentially exposed members of the general public. In the absence of sediment guidelines, DOE soil guidelines serve as a standard of comparison for data obtained from stream bed sediment; two samples from downstream locations contained concentrations of thorium-230 that exceeded DOE soil guidelines. All stormwater sample results were in compliance with permit-specified limits. Other radioactive materials include radium 226 and natural uranium.

2090 (DOE/HWP–171) **Technology application analyses at five Department of Energy Sites.** Oak Ridge National Lab., TN (United States). HAZWRAP Support Contractor Office. May 1995. 82p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016376. Source: OSTI; NTIS; INIS; GPO Dep.

The Hazardous Waste Remedial Actions Program (HAZWRAP), a division of Lockheed Martin Energy Systems, Inc., managing contractor for the Department of Energy (DOE) facilities in Oak Ridge, Tennessee, was tasked by the United States Air Force (USAF) through an Interagency Agreement between DOE and the USAF, to provide five Technology Application Analysis Reports to the USAF. These reports were to provide information about DOE sites that have volatile organic compounds contaminating soil or ground water and how the sites have been remediated. The sites were using either a pump-and-treat technology or an alternative to pump-and-treat. The USAF was looking at the DOE sites for lessons learned that could be applied to Department of Defense (DoD) problems in an effort to communicate throughout the government system. The five reports were part of a larger project undertaken by the USAF to look at over 30 sites. Many of the sites were DoD sites, but some were in the private sector. The five DOE projects selected to be reviewed came from three sites: the Savannah River Site (SRS), the Kansas City Site, and Lawrence Livermore National Laboratory (LLNL). SRS and LLNL provided two projects each. Both provided a standard pump-and-treat application as well as an innovative technology that is an alternative to pump-and-treat. The five reports on these sites have previously been published separately. This volume combines them to give the reader an overview of the whole project.

2091 (DOE/ID–10513) **FY-95 technology catalog. Technology development for buried waste remediation.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development. [1995]. 137p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AD07-93ID10513. Order Number DE96001578. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy's (DOE) Buried Waste Integrated Demonstration (BWID) program, which is now part of the Landfill Stabilization Focus Area (LSFA), supports applied research, development, demonstration, and evaluation of a multitude of advanced technologies dealing with underground radioactive and hazardous waste remediation. These innovative technologies are being developed as part of integrated comprehensive remediation systems for the effective and efficient remediation of buried waste sites throughout the DOE complex. These efforts are identified and coordinated in support of Environmental Restoration (EM-40) and Waste Management (EM-30) needs and objectives. Sponsored by the DOE Office of Technology Development (EM-50), BWID and LSFA work with universities and private industry to develop technologies that are being transferred to the private sector for use nationally and internationally. This report contains the details of the purpose, logic, and methodology used to develop and demonstrate DOE buried waste remediation technologies. It also provides a catalog of technologies and capabilities with development status for potential users. Past FY-92 through FY-94 technology testing, field trials, and demonstrations are summarized. Continuing and new FY-95 technology demonstrations also are described.

2092 (DOE/ID/12584–271) **Radiological decontamination, survey, and statistical release method for vehicles.** Goodwill, M.E.; Lively, J.W.; Morris, R.L. Rust Geotech, Inc., Grand Junction, CO (United States). Jun 1996. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86ID12584. (GJPO-MRAP-27). Order Number DE96013690. Source: OSTI; NTIS; INIS; GPO Dep.

Earth-moving vehicles (e.g., dump trucks, belly dumps) commonly haul radiologically contaminated materials from a site being remediated to a disposal site. Traditionally, each vehicle must be surveyed before being released. The logistical difficulties of implementing the traditional approach on a large scale demand that an alternative be devised. A statistical method for assessing product quality from a continuous process was adapted to the vehicle decontamination process. This method produced a sampling scheme that automatically compensates and accommodates fluctuating batch sizes and changing conditions without the need to modify or rectify the sampling scheme in the field. Vehicles are randomly selected (sampled) upon completion of the decontamination process to be surveyed for residual radioactive surface contamination. The frequency of sampling is based on the expected number of vehicles passing through the decontamination process in a given period and the confidence level desired. This process has been successfully used for 1 year at the former uranium millsite in Monticello, Utah (a cleanup site regulated under the Comprehensive Environmental Response, Compensation, and Liability Act). The method forces improvement in the quality of the decontamination process and results in a lower likelihood that vehicles exceeding the surface contamination standards are offered for survey. Implementation of this statistical sampling method on Monticello projects has resulted in more efficient processing of vehicles through decontamination and radiological release, saved hundreds of hours of processing time, provided a high level of confidence that release limits are met, and improved the radiological cleanliness of vehicles leaving the controlled site.

2093 (DOE/MC/29103–96/CO565) **Field test of a post-closure radiation monitor.** Reed, S. (Babcock & Wilcox, Alliance, OH (United States)); Christy, C.E.; Heath, R.E. Babcock and Wilcox Co., Allison, OH (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29103. (CONF-9510108–25: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003434. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE is conducting remedial actions at many sites contaminated with radioactive materials. After closure of these sites, long-term subsurface monitoring is typically required by law. This monitoring is generally labor intensive and expensive using conventional sampling and analysis techniques. The U.S. Department of Energy's Morgantown Energy Technology Center (METC) has contracted with Babcock and Wilcox to develop a Long-Term Post-Closure Radiation Monitoring System (LPRMS) to reduce these monitoring costs. A prototype LPRMS probe was built, and B&W and FERMCO field tested this monitoring probe at the Fernald Environmental Management Project in the fall of 1994 with funding from the DOE's Office of Technology Development (EM-50) through METC. The system was used to measure soil and water with known uranium contamination levels, both in drums and in situ at depths up to 3 meters. For comparison purposes, measurements were also performed using a more conventional survey probe with a sodium iodide scintillator directly butt-coupled to detection electronics. This paper presents a description and the results of the field tests. The results were used to characterize the lower detection limits, precision and bias of the system, which allowed the DOE to judge the monitoring system's ability to meet its long-term post-closure radiation monitoring needs. Based on the test results, the monitoring system has been redesigned for fabrication and testing in a potential Phase III of this program. If the DOE feels that this system can meet its needs and chooses to continue into Phase III of this program, this redesigned full scale prototype system will be built and tested for a period of approximately a year. Such a system can be used at a variety of radioactively contaminated sites.

2094 (DOE/MC/29103–5100) **Development of a long-term post-closure radiation monitor: Phase 2, Topical report, March 1994–July 1995.** Reed, S.E. Babcock and Wilcox Co., Alliance, OH (United States). Jul 1995. 275p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29103. Order Number DE96000629. Source: OSTI; NTIS; INIS; GPO Dep.

The long-term monitoring of a hazardous waste site for migration of radionuclides requires installation of radiation sensors at a large number of subsurface locations. The concept under development employs a passive in-ground measurement probe which contains a scintillator coupled to an optical lightguide. The overall goal of the Long-Term Post-Closure Radiation Monitor System (LPRMS) development program is to configure a long-term radiation monitor using commercially available, demonstrated components to the largest extent possible. The development program is planned as a three phase program spanning a total time of 53 months. The problems to be solved during Phase 1 were primarily those associated with selection of the most appropriate components (scintillator, coupling optics, optical fiber, and opto-electronics) to maximize the signal reaching the detectors and thereby minimizing the integration time required to obtain a reliable measure of radiation. Phase 2 (the current Phase) encompassed the fabrication and testing of the prototype LPRMS probe at a contaminated DOE site, the Fernald Environmental Management Project, in southwestern Ohio. Uranium isotopes are the primary contaminants of concern at this site. The single probe and opto-electronic device were used to made measurements in-situ at relatively shallow subsurface depths. The end objective of Phase 2 was the design of a full-scale prototype system which incorporates all the features expected to be necessary on a commercial system, including 50 meter depth of measurement, multiplexing of multiple probes, and remote transmission of data. This full-scale prototype will be fabricated and field tested for 12 months during Phase 3, and a commercial design will be developed based upon the data gathered and experience gained during the entire program.

2095 (DOE/MC/29104–96/CO566) **Mobile worksystems for decontamination and dismantlement.** Osborn, J.; Bares, L.C.; Thompson, B.R. Carnegie-Mellon Univ., Pittsburgh, PA (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104. (CONF-9510108–26: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003433. Source: OSTI; NTIS; INIS; GPO Dep.

Many DOE nuclear facilities have aged beyond their useful lifetimes. They need to be decommissioned in order to be safe for human presence in the short term, to eventually recover valuable materials they contain, and ultimately to be transitioned to alternative uses or green field conditions. Decontamination and dismantlement are broad classes of activities that will enable these changes to occur. Most of these facilities - uranium enrichment plants, weapons assembly plants, research and production reactors, and fuel recycling facilities - are dormant, though periodic inspection, surveillance and maintenance activities within them are ongoing. DOE estimates that there are over 5000 buildings that require deactivation to reduce the costs of performing such work with manual labor. In the long term, 1200 buildings will be decommissioned, and millions of metric tons of metal and concrete will have to be recycled or disposed of The magnitude of the problem calls for new approaches that are far more cost effective than currently available techniques. This paper describes two technologies that are viable solutions for facility D&D.

2096 (DOE/MC/29113–96/CO571) **Interactive computer-enhanced remote viewing system.** Tourtellott, J.A.; Wagner, J.F. Mechanical Technology, Inc., Latham, NY (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. (CONF-9510108–27: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003432. Source: OSTI; NTIS; INIS; GPO Dep.

Remediation activities such as decontamination and decommissioning (D&D) typically involve materials and activities hazardous to humans. Robots are an attractive way to conduct such remediation, but for efficiency they need a good three-dimensional (3-D) computer model of the task space where they are to function. This model can be created from engineering plans and architectural drawings and from empirical data gathered by various sensors at the site. The model is used to plan robotic tasks and verify that selected paths am clear of obstacles. This need for a task space model is most pronounced in the remediation of obsolete production facilities and underground storage tanks. Production facilities at many sites contain compact process machinery and systems that were used to produce weapons grade material. For many such systems, a complex maze of pipes (with potentially dangerous contents) must be removed, and this represents a significant D&D challenge. In an analogous way, the underground storage tanks at sites such as Hanford represent a challenge because of their limited entry and the tumbled profusion of in-tank hardware. In response to this need, the Interactive Computer-Enhanced Remote Viewing System (ICERVS) is being designed as a software system to: (1) Provide a reliable geometric description of a robotic task space, and (2) Enable robotic remediation to be conducted more effectively and more economically than with available techniques. A system such as ICERVS is needed because of the problems discussed below.

2097 (DOE/MC/29467–4080) **Decontamination systems information and research program. Quarterly report, January–March 1995.** National Research Center for Coal and Energy, Morgantown, WV (United States). Apr 1995. 360p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE95009726. Source: OSTI; NTIS; GPO Dep.

The projects reported during this period are categorized into the following three areas: 1.0 Site Remediation Technologies, 2.0 Advanced Product Applications Testing, and 3.0 Information Systems, Public Policy, Community Outreach, and Economics. Summaries of the significant accomplishments for the projects reported during this period, are presented.

2098 (DOE/MC/29467–4091) **Decontamination systems information and research program. Quarterly report, April–June 1995.** West Virginia Univ. Research Corp., Morgantown, WV (United States). Jul 1995. 344p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE96000580. Source: OSTI; NTIS; GPO Dep.

West Virginia University (WVU) and the US Department of Energy Morgantown Energy Technology Center (DOE/METC) entered into a Cooperative Agreement on August 29, 1992 titled 'Decontamination Systems Information and Research Programs'. Requirements stipulated by the Agreement require WVU to submit Technical Progress reports on a quarterly basis. This report contains the efforts of the fourteen research projects comprising the Agreement for the period April 1 to June 30, 1995. During this period three new projects have been funded by the Agreement. These projects are: (1) WERC National Design Contest, (2) Graduate Interns to the Interagency Environmental Technology Office under the National Science and Technology Council, and (3) WV High Tech Consortium.

2099 (DOE/MC/29467–5127) **Decontamination systems information and research program. Quarterly report, July–September 1995.** West Virginia Univ., Morgantown, WV (United States). Oct 1995. 461p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE96000647. Source: OSTI; NTIS; GPO Dep.

The projects reported for the WVU Cooperative Agreement are categorized into the following three areas: (1) in situ remediation process development; (2) advanced product applications testing; and (3) information systems, public policy, community outreach, and economics. Summaries of the significant accomplishments for the projects reported during the period 1 July 1995 through 30 September 1995 are presented.

2100 (DOE/MC/29467–5177) **Decontamination systems information and research program. Quarterly report, October 1995–December 1995.** West Virginia Univ., Morgantown, WV (United States). Dec 1995. 392p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC29467. Order Number DE96004454. Source: OSTI; NTIS; GPO Dep.

West Virginia University (WVU) and the U.S. Department of Energy Morgantown Energy Technology Center (DOE/METC) entered into a Cooperative Agreement on August 29, 1992 titled "Decontamination Systems Information and Research programs" (DOE Instrument No. DE-FC21-92MC29467) This report contains the efforts of the research projects comprising the Agreement for the 4th calendar quarter of 1995, and is the final quarterly report deliverable required for the period ending 31 December 1995. The projects reported for the WVU Cooperative Agreement are categorized into the following three areas: 1.0 In Situ Remediation Process Development, 2.0 Advanced Product Applications Testing, and 3.0 Information Systems, Public Policy, Community Outreach, and Economics. Summaries of the significant accomplishments for the projects reported during the period 1 October 95 through 31 December 95 are presented in the following discussions.

2101 (DOE/MC/30162–96/C0576) **Electrokinetic decontamination of concrete.** Lomasney, H. Isotron Corp., New Orleans, LA (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30162. (CONF-9510108–53: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96007381. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy has assigned a priority to the advancement of technology for decontaminating concrete surfaces which have become contaminated with radionuclides, heavy metals, and toxic organics. This agency is responsible for decontamination and decommissioning of thousands of buildings. Electrokinetic extraction is one of the several innovative technologies which emerged in response to this initiative. This technique utilizes an electropotential gradient and the subsequent electrical transport mechanism to cause the controlled movement of ionics species, whereby the contaminants exit the recesses deep within the concrete. The primary objective was to demonstrate the feasibility of this approach as a means to achieve "release levels" which could be consistent with unrestricted use of a decontaminated building. The secondary objectives were: To establish process parameters; to quantify the economics; to ascertain the ALARA considerations; and to evaluate wasteform and waste volume. The work carried out to this point has achieved promising results to the extent that ISOTRON® has been authorized to expand the planned activity to include the fabrication of a prototype version of a commercial device.

2102 (DOE/MC/30164–96/CO577) **Concrete decontamination by electro-hydraulic scabbling.** Goldfarb, V.; Gannon, R. Textron, Inc., Everett, MA (United States). Textron Defense Systems. 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30164. (CONF-9510108–14: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003465. Source: OSTI; NTIS; INIS; GPO Dep.

Textron Defense Systems (TDS) is developing an electrohydraulic device that has the potential for faster, safer, and less expensive scabbling of contaminated concrete surfaces. In the device, shock waves and cavitating bubbles are produced in water by the electric pulses, and the direct and reflected shock waves impinging on the concrete surface result in the crushing and cracking of the concrete. Pulse energy, frequency, and traverse speed control the depth of the scabbling action. Performance thus far has demonstrated the capability of a prototype unit to process a swath 24 inches wide, up to 3/4 inches deep at a linear velocity of up to 6 feet per hour, i.e., at a scabbling rate of 12 sq. ft. per hour.

2103 (DOE/MC/30165–96/CO578) **Remote operated vehicle with carbon dioxide blasting (ROVCO$_2$).** Resnick, A.M. Oceaneering International, Inc., Marlboro, MD (United States). 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30165. (CONF-9510108–24: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003436. Source: OSTI; NTIS; INIS; GPO Dep.

The Remote Operated Vehicle with Carbon Dioxide Blasting (ROVCO$_2$), as shown in a front view, is a six-wheeled remote land vehicle used to decontaminate concrete floors. The remote vehicle has a high pressure Cryogenesis blasting subsystem, Oceaneering Technologies (OTECH) developed a CO_2 xY Orthogonal Translational End Effector (COYOTEE) subsystem, and a vacuum/filtration and containment subsystem. Figure 2 shows a block diagram with the various subsystems labeled.

2104 (DOE/MC/30168–96/CO579) **Decontamination of process equipment using recyclable chelating solvent.** Jevec, J.; Lenore, C.; Ulbricht, S. Babcock and Wilcox Co., Allison, OH (United States). 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30168. (CONF-9510108–22: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003437. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is now faced with the task of meeting decontamination and decommissioning obligations at numerous facilities by the year 2019. Due to the tremendous volume of material involved, innovative decontamination technologies are being sought that can reduce the volumes of contaminated waste materials and secondary wastes requiring disposal. With sufficient decontamination, some of the material from DOE facilities could be released as scrap into the commercial sector for recycle, thereby reducing the volume of radioactive waste requiring disposal. Although recycling may initially prove to be more costly than current disposal practices, rapidly increasing disposal costs are expected to make recycling more and more cost effective. Additionally, recycling is now perceived as the ethical choice in a world where the consequences of replacing resources and throwing away reusable materials are impacting the well-being of the environment. Current approaches to the decontamination of metals most often involve one of four basic process types: (1) chemical, (2) manual and mechanical, (3) electrochemical, and (4) ultrasonic. "Hard" chemical decontamination solutions, capable of achieving decontamination factors (Df's) of 50 to 100, generally involve reagent concentrations in excess of 5%, tend to physically degrade the surface treated, and generate relatively large volumes of secondary waste. "Soft" chemical decontamination solutions, capable of achieving Df's of 5 to 10, normally consist of reagents at concentrations of 0.1 to 1%, generally leave treated surfaces in a usable condition, and generate relatively low secondary waste volumes. Under contract to the Department of Energy, the Babcock & Wilcox Company is developing a chemical decontamination process using chelating agents to remove uranium compounds and other actinide species from process equipment.

2105 (DOE/MC/30170–96/CO580) **Advanced technologies for decontamination and conversion of scrap metal.** Muth, T.R. (and others); Shasteen, K.E.; Liby, A.L. Manufacturing Sciences Corp., Oak Ridge, TN (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30170. (CONF-9510108–18: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003443. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) accumulated large quantities of radioactive scrap metal (RSM) through historic maintenance activities. The Decontamination and Decommissioning (D&D) of major sites formerly engaged in production of nuclear materials and manufacture of nuclear weapons will generate additional quantities of RSM, as much as 3 million tons of such metal according to a recent study. The recycling of RSM is quickly becoming appreciated as a key strategy in DOE's cleanup of contaminated sites and facilities.

2106 (DOE/MC/30178–96/CO590) **Advanced worker protection system.** Caldwell, B.; Duncan, P.; Myers, J. Oceaneering Space Systems, Houston, TX (United States). 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30178. (CONF-9510108–21: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003438. Source: OSTI; NTIS; INIS; GPO Dep.

The Department of Energy (DOE) is in the process of defining the magnitude and diversity of Decontamination and Decommissioning (D&D) obligations at its numerous sites. The DOE believes that existing technologies are inadequate to solve many challenging problems such as how to decontaminate structures and equipment cost effectively, what to do with materials and wastes generated, and how to adequately protect workers and the environment. Preliminary estimates show a tremendous need for effective use of resources over a relatively long period (over 30 years). Several technologies are being investigated which can potentially reduce D&D costs while providing appropriate protection to DOE workers. The DOE recognizes that traditional methods used by the EPA in hazardous waste site clean up activities are insufficient to provide the needed protection and worker productivity demanded by DOE D&D programs. As a consequence, new clothing and equipment which can adequately protect workers while providing increases in worker productivity are being sought for implementation at DOE sites. This project will result in the development of an Advanced Worker Protection System (AWPS). The AWPS will be built around a life support backpack that uses liquid air to provide cooling as well as breathing gas to the worker. The backpack will be combined with advanced protective garments, advanced liquid cooling garment, respirator, communications, and support equipment to provide improved worker protection, simplified system maintenance, and dramatically improve worker productivity through longer duration work cycles. Phase I of the project has resulted in a full scale prototype Advanced Worker Protection Ensemble (AWPE, everything the worker will wear), with sub-scale support equipment, suitable for integrated testing and preliminary evaluation. Phase II will culminate in a full scale, certified, pre-production AWPS and a site demonstration.

2107 (DOE/MC/30178–5181) **Advanced worker protection system. Topical report, Phase I.** Myers, J.

Oceaneering Space Systems, Houston, TX (United States). Jul 1995. 278p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30178. Order Number DE96004458. Source: OSTI; NTIS; GPO Dep.

The Department of Energy (DOE) is in the process of defining the magnitude and diversity of Decontamination and Decommissioning (D&D) obligations at its numerous sites. The DOE believes that existing technologies are inadequate to solve many challenging problems such as how to decontaminate structures and equipment cost effectively, what to do with materials and wastes generated, and how to adequately protect workers and the environment. Preliminary estimates show a tremendous need for effective use of resources over a relatively long period (over 30 years). Several technologies are being investigated which can potentially reduce D&D costs while providing appropriate protection to DOE workers. The DOE recognizes that traditional methods used by the EPA in hazardous waste site clean up activities are insufficient to provide the needed protection and worker productivity demanded by DOE D&D programs. As a consequence, new clothing and equipment which can adequately protect workers while providing increases in worker productivity are being sought for implementation at DOE sites. This project will result in the development of an Advanced Worker Protection System (AWPS). The AWPS will be built around a life support backpack that uses liquid air to provide cooling as well as breathing gas to the worker. The backpack will be combined with advanced protective garments, advanced liquid cooling garment, respirator, communications, and support equipment to provide improved worker protection, simplified system, maintenance, and dramatically improve worker productivity through longer duration work cycles.

2108 (DOE/MC/30179-96/CO591) **Protective clothing based on permselective membrane and carbon adsorption.** Gottschlich, D.; Baker, R. Membrane Technology and Research, Inc., Menlo Park, CA (United States). 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30179. (CONF-9510108-8: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003449. Source: OSTI; NTIS; INIS; GPO Dep.

This paper is a description of Phase I of the US DOE's program to develop improved protective clothing for use by workers engaged in decommissioning and decontamination of former DOE sites, including those used for atomic weapons research and production. Membrane Technology and Research has been developing the clothing with an innovative feature of an ultrathin, permselective outer membrane that is extremely permeable to water but impermeable to toxic organic compounds. Phase I (as described herein) includes fabric optimization, commercial-scale fabric production, and prototype suit evaluation. This phase is complete, with the results discussed in this document.

2109 (DOE/MC/30359-96/CO594) **Laser-based coatings removal.** Freiwald, J.G.; Freiwald, D. F2 Associates, Albuquerque, NM (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC30359. (CONF-9510108-2: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003446. Source: OSTI; NTIS; INIS; GPO Dep.

Over the years as building and equipment surfaces became contaminated with low levels of uranium or plutonium dust, coats of paint were applied to stabilize the contaminants in place. Most of the earlier paint used was lead-based paint. More recently, various non-lead-based paints, such as two-part epoxy, are used. For D & D (decontamination and decommissioning), it is desirable to remove the paints or other coatings rather than having to tear down and dispose of the entire building.

2110 (DOE/METC-96/1022) **Record of the facility deactivation, decommissioning, and material disposition (D and D) workshop: A new focus for technology development, opportunities for industry/government collaboration.** Bedick, R.C.; Bossart, S.J.; Hart, P.W. USDOE Morgantown Energy Technology Center, WV (United States). Jul 1995. 116p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States);International Society for Decontamination and Decommissioning Professionals. (CONF-9507185-Summ.: Record of the Facility deactivation, decommissioning, and material disposition (D&D) workshop: a new focus for technology development, opportunities for industry/government collaboration, Morgantown, WV (United States), 11-12 Jul 19 Order Number DE96000553. Source: OSTI; NTIS; INIS; GPO Dep.

This workshop was held at the Morgantown Energy Technology Center (METC) in Morgantown, West Virginia, on July 11–12, 1995. The workshop sought to establish a foundation for continued dialogue between industry and the DOE to ensure that industry's experiences, lessons learned, and recommendations are incorporated into D and D program policy, strategy, and plans. The mission of the D and D Focus Area is to develop improved technologies, processes and products, to characterize, deactivate, survey, maintain, decontaminate, dismantle, and dispose of DOE surplus structures, buildings, and contents. The target is a five-to-one return on investment through cost avoidance. The cornerstone of the D and D focus area activities is large-scale demonstration projects that actually decontaminate, decommission, and dispose of a building. The aim is to demonstrate innovative D and D technologies as part of an ongoing DOE D and D project. OTD would pay the incremental cost of demonstrating the innovative technologies. The goal is to have the first demonstration project completed within the next 2 years. The intent is to select projects, or a project, with visible impact so all of the stakeholders know that a building was removed, and demonstrate at a scale that is convincing to the customers in the EM program so they feel comfortable using it in subsequent D and D projects. The plan is to use a D and D integrating contractor who can then use the expertise in this project to use in jobs at other DOE sites.

2111 (DOE/METC/C-96/7220) **Technology demonstrations in the Decontamination and Decommissioning Focus Area.** Bossart, S.J. USDOE Morgantown Energy Technology Center, WV (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). (CONF-960487-1: ANS topical meeting on best of decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96005197. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes three large-scale demonstration projects sponsored jointly by the Decontamination and Decommissioning Focus Area (DDFA), and the three US Department of Energy (DOE) Operations Offices that successfully offered to deactivate or decommission (D&D) one of its facilities using a combination of innovative and commercial D&D technologies. The paper also includes discussions on recent technology demonstrations for an Advanced Worker Protection System, an Electrohydraulic Scabbling System, and a Pipe Explorer™. The references at the conclusion of this paper should be consulted for more detailed information about the large-scale demonstration projects and recent technology demonstrations sponsored by the DDFA.

2112 (DOE/NV/10833-34) **An arid zone lysimeter facility for performance assessment and closure investigations at the Nevada Test Site.** Levitt, D.G. (Bechtel Nevada Corp., Las Vegas, NV (United States)); Lohrstorfer, C.F.; Sully, M.J.; Ginanni, J.M. Bechtel Nevada Corp., Las Vegas, NV (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-91NV10833. (CONF-960212-94: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96012182. Source: OSTI; NTIS; INIS; GPO Dep.

Two precision weighing lysimeters were installed near the Area 5 Radioactive Waste Management Site (RWMS) on the Nevada Test Site to provide support for investigations of water, solute, and heat fluxes in the near-surface of the soil. The lysimeters consist of soil tanks with a volume of 16 cubic meters mounted on a sensitive scale. One lysimeter was revegetated with native shrubs whereas the other was kept bare to stimulate a non-vegetated waste cover. Data consisting of physical and hydrological properties of the lysimeter soils, thermal and moisture conditions in the lysimeters, and atmospheric boundary conditions are being collected for calibrating and verifying computer models for simulating the flow of water and heat in the near surface alluvium at the Area 5 RWMS. This effort will provide site-specific models for demonstration of "no migration" of constituents to the water table. Moisture and thermal conditions in the lysimeters are monitored daily using time domain reflectometry probes and thermocouple psychrometers. Daily evaporation and evapotranspiration are calculated from the lysimeter scales. Meteorological variables are monitored by sensors mounted on a 3 meter tower adjacent to the lysimeters. An array of soil-solution samplers to be installed through the side of the soil tank will allow studies of waste mobility under natural conditions. Conceptual designs for closure at the RWMS are focused on using an upper layer of repacked native alluvium, which can be tested with the lysimeters. In addition, performance of other components such as a capillary barrier can be tested by installing a scaled version in one of the lysimeter tanks.

2113 (DOE/OR/21548-592) **Weldon Spring Site Environmental Report for Calendar Year 1995.** MK-Ferguson Co., St. Charles, MO (United States); Jacobs Engineering Group, Inc., St. Charles, MO (United States). Jun 1996. 336p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-86OR21548. Order Number DE96012446. Source: OSTI; NTIS; INIS; GPO Dep.

This Weldon Spring Site Environmental Report for Calendar Year 1995 has been prepared to provide information about the public safety and environmental protection programs conducted by the Weldon Spring Site Remedial Action Project (WSSRAP). The Weldon Spring site is located in southern St. Charles County, Missouri, approximately 48 km (30 mi) west of St. Louis. The site consists of two main areas, the Weldon Spring Chemical Plant and raffinate pits and the Weldon Spring Quarry. The chemical plant, raffinate pits, and quarry are located on Missouri State Route 94, southwest of U.S. Route 40/61. The objectives of the Site Environmental Report are to present a summary of data from the environmental monitoring program, to characterize trends and environmental conditions at the site, and to confirm compliance with environmental and health protection standards and requirements. The report also presents the status of remedial activities and the results of monitoring these activities to assess their impacts on the public and environment. This report includes monitoring data from routine radiological and nonradiological sampling activities. These data include estimates of dose to the public from the Weldon Spring site, estimates of effluent releases, and trends in groundwater contaminant levels. Additionally, applicable compliance requirements, quality assurance programs, and special studies conducted in 1995 to support environmental protection programs are discussed. Dose estimates presented in this report are based on hypothetical exposure scenarios for public use of areas near the site. In addition, release estimates have been calculated on the basis of 1995 National Pollutant Discharge Elimination System (NPDES) and air monitoring data. Effluent discharges from the site under routine NPDES and National Emission Standards for Hazardous Air Pollutants (NESHAPs) monitoring were below permitted levels.

2114 (DOE/ORO-2032) **Pilot-scale treatability testing – Recycle, reuse, and disposal of materials from decontamination and decommissioning activities: Soda blasting demonstration.** Oak Ridge K-25 Site, TN (United States); O'Brien and Gere Engineers, Inc., Syracuse, NY (United States). Aug 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96001201. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is in the process of defining the nature and magnitude of decontamination and decommissioning (D and D) obligations at its sites. With disposal costs rising and available storage facilities decreasing, DOE is exploring and implementing new waste minimizing D and D techniques. Technology demonstrations are being conducted by LMES at a DOE gaseous diffusion processing plant, the K-25 Site, in Oak Ridge, Tennessee. The gaseous diffusion process employed at Oak Ridge separated uranium-235 from uranium ore for use in atomic weapons and commercial reactors. These activities contaminated concrete and other surfaces within the plant with uranium, technetium, and other constituents. The objective of current K-25 D and D research is to make available cost-effective and energy-efficient techniques to advance remediation and waste management methods at the K-25 Site and other DOE sites. To support this objective, O'Brien and Gere tested a decontamination system on K-25 Site concrete and steel surfaces contaminated with radioactive and hazardous waste. A scouring system has been developed that removes fixed hazardous and radioactive surface contamination and minimizes residual waste. This system utilizes an abrasive sodium bicarbonate medium that is projected at contaminated surfaces. It mechanically removes surface contamination while leaving the surface intact. Blasting residuals are captured and dissolved in water and treated using physical/chemical processes. Pilot-scale testing of this soda blasting system and bench and pilot-scale treatment of the generated residuals were conducted from December 1993 to September 1994.

2115 (DOE/ORO–2034) **Contaminated concrete: Occurrence and emerging technologies for DOE decontamination.** Dickerson, K.S. (Oak Ridge National Lab., Grand Junction, CO (United States)); Wilson-Nichols, M.J.; Morris, M.I. Oak Ridge National Lab., TN (United States). Aug 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003221. Source: OSTI; NTIS; INIS; GPO Dep.

The goals of the Facility Deactivation, Decommissioning, and Material Disposition Focus Area, sponsored by the US Department of Energy (DOE) Office of Technology Development, are to select, demonstrate, test, and evaluate an integrated set of technologies tailored to provide a complete solution to specific problems posed by deactivation, decontamination, and decommissioning, (D&D). In response to these goals, technical task plan (TTP) OR152002, entitled Accelerated Testing of Concrete Decontamination Methods, was submitted by Oak Ridge National Laboratory. This report describes the results from the initial project tasks, which focused on the nature and extent of contaminated concrete, emerging candidate technologies, and matching of emerging technologies to concrete problems. Existing information was used to describe the nature and extent of contamination (technology logic diagrams, data bases, and the open literature). To supplement this information, personnel at various DOE sites were interviewed, providing a broad perspective of concrete contamination. Because characterization is in the initial stage at many sites, complete information is not available. Assimilation of available information into one location is helpful in identifying potential areas of concern in the future. The most frequently occurring radiological contaminants within the DOE complex are ^{137}Cs, ^{238}U (and it daughters), and ^{60}Co, followed closely by ^{90}Sr and tritium, which account for –30% of the total occurrence. Twenty-four percent of the contaminants were listed as unknown, indicating a lack of characterization information, and 24% were listed as other contaminants (over 100 isotopes) with less than 1% occurrence per isotope.

2116 (DOE/RL–90-11-Rev.1) **300 Area waste acid treatment system closure plan. Revision 1.** Department of Energy, Richland, WA (United States). Richland Operations Office. Mar 1996. 267p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96010174. Source: OSTI; NTIS; INIS; GPO Dep.

This section provides a description of the Hanford Site, identifies the proposed method of 300 Area Waste Acid Treatment System (WATS) closure, and briefly summarizes the contents of each chapter of this plan.

2117 (DOE/RL–93-54) **Risk evaluation of remedial alternatives for the Hanford Site.** USDOE Richland Operations Office, WA (United States). May 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017536. Source: OSTI; NTIS; INIS; GPO Dep.

The document identifies the points in the feasibility studies/corrective measures studies process in Hanford facilites under the Tri-Party Agreement, and the issues to address. This document also introduces semiquantitative and quantitative risk assessment techniques and guidance to ensure that a RERA (remedial alternative) provides an appropriate level of detail.

2118 (DOE/RL–93-64-Rev.3) **Sodium dichromate expedited response action assessment, Revision 3.** USDOE Richland Operations Office, WA (United States). Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017352. Source: OSTI; NTIS; GPO Dep.

The U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) recommended that the U.S. Department of Energy (DOE) perform an expedited response action (ERA) for the Sodium Dichromate Barrel Disposal Landfill. The ERA lead regulatory agency is Ecology and EPA is the support agency. The ERA was conducted in accordance with the applicable sections of Title 40, Code of Federal Regulations, the Hanford Federal Facility Agreement and Consent Order, the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and the Washington Model Toxics Control Act (MTCA). The ERA was categorized as nontime-critical, which required preparation of an engineering evaluation and cost analysis (EE/CA). The EE/CA, which was included in the proposal, is a rapid, focused evaluation of available technologies using specific screening factors to assess feasibility, appropriateness, and cost. The ERA goal is to reduce the potential for any contaminant migration from the landfill to the soil column, groundwater, and the Columbia River. Because the Sodium Dichromate Barrel Disposal Landfill is the only waste site within the operable unit, the removal action is the final remediation of the 100-IU-4 Operable Unit. This ERA process started in March 1992. The ERA proposal went through a parallel review process with Westinghouse Hanford Company (WHC), DOE Richland Operations Office (RL), EPA, Ecology, and a 30-day public comment period. Ecology and EPA issued an Action Agreement Memorandum in March 1993. The memorandum directed excavation of all anomalies and disposal of the collected materials at the Hanford Site Central Landfill. Primary field activities were completed by the end of April 1993. Final disposal of a minor quantity of hazardous waste was completed in July 1993.

2119 (DOE/RL–93-82) **Limited field investigation report for the 100-FR-1 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96000282. Source: OSTI; NTIS; INIS; GPO Dep.

This limited field investigation (LFI) report summarizes the data collection and analysis activities conducted during the 100-FR-1 Source Operable Unit LFI and the associated qualitative risk assessment (QRA), and makes recommendations on the continued candidacy of high-priority sites for interim remedial measures (IRM). The results and recommendations presented in this report are generally independent of future land use scenarios. An LFI is required when existing data are insufficient to formulate a conceptual model and perform a QRA. The purpose of the report is to identify those sites that are recommended to remain as candidates for IRM, provide a preliminary summary of site characterization studies, refine the conceptual model as needed, identify contaminant- and location-specific applicable or relevant and appropriate requirements (ARAR), and provide a qualitative assessment of the risks associated with the sites. This assessment includes consideration of whether contaminant concentrations pose an unacceptable risk that warrants action through IRM. The final decision to conduct an IRM will rely on many factors including risk, ARAR, future land use, point of compliance, time of compliance, a bias-for-action, and the threat to human health and the environment.

2120 (DOE/RL--94-20) **Pickling Acid Cribs remedial investigation/feasibility study.** USDOE, Washington, DC (United States). Jun 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017535. Source: OSTI; NTIS; INIS; GPO Dep.

The White Bluffs Pickling Acid Cribs Site, south of the White Bluffs town site in the Hanford 600 Area, is the only site identified in the 100-IU-5 Operable Unit. The cribs are believed to have received waste streams (mostly nitric acid and HF etch solutions) from a pipe fabrication facility operated 1943-1959. Soil samples were collected at the surface basin adjacent to the crib site. The basin is not in the 100-IU-5 Operable Unit. This report includes risk assessment information and data on the surface basin. Based on characterization activities and Hanford Site background levels, there is no radiological contamination. Only one detected nonradioactive element (zinc) had readings above background; this is attributed to scrapping of a glavanized pipe. Since the max Zn concentration was 554 mg/kg, well below the most restricted Zn soil concentration (2,400 mg/kg) in the human health risk-based screening, Zn was eliminated from further analysis. The ecological risk assessment considered the max detected Zn to be relatively nontoxic. The RI/FS supports a no action alternative.

2121 (DOE/RL--94-30) **Riverland expedited response action assessment.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jun 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017534. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) and Washington Department of Ecology (Ecology) recommended that the US Department of Energy (DOE) prepare an expedited response action (ERA) for the Riverland Railroad Car Wash Pit (located in the Riverland Rail Yard) and the 600 Area Army Munitions Burial Site (Munitions Cache). This assessment report details the actions taken to complete the Riverland ERA.

2122 (DOE/RL--94-48) **100-KR-4 Operable Unit focused feasibility study.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017528. Source: OSTI; NTIS; INIS; GPO Dep.

This focused feasibility study (FFS) presents a detailed analysis of alternatives for an interim remedial measure (IRM) in the 100-KR-4 Operable Unit. The FFS has been conducted as part of the remedial investigation/feasibility study (RI/FS) process included under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The 100-KR-4 Operable Unit includes the groundwater beneath the 100-K Area, which contains the K-East and K-West reactors. These reactors are two of the nine retired production reactors located in the northern portion of the Hanford Site. All of the operable units associated with the retired reactor areas are collectively referred to as the 100 Areas, one of four groupings of waste sites at Hanford that are on the US Environmental Protection Agency (EPA) National Priorities List (NPL) under CERCLA. The 100-KR-4 Operable Unit includes the groundwater beneath waste sites in the 100-K Area. The Columbia River shoreline represents the downgradient boundary. Waste sites in the 100-K Area are grouped into source operable units 100-KR-1 and 100-KR-2. The scope of environmental restoration activities within the 100-KR-4 Operable Unit may be partially controlled by potential adverse impacts in adjacent areas or to receptors outside the Operable Unit. These include groundwater, river water, riverbed sediments, and aquatic biota that may be exposed to contaminants as the result of groundwater flow from the Operable Unit.

2123 (DOE/RL--94-67) **100-HR-3 Operable Unit focused feasibility study.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1995. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017530. Source: OSTI; NTIS; INIS; GPO Dep.

This Focused Feasibility Study (FFS) report presents a detailed analysis of alternatives for an interim remedial measure (IRM). The IRM addresses groundwater contamination in the 100-HR-3 Operable Unit. The focus of the FFS is chromium, a waste constituent that is transported by groundwater flow from the 100 Areas into the Columbia River. Ecological receptors in the river ecosystem may be exposed to chromium concentrations that exceed criteria established for the protection of aquatic life. The 100-HR-3 Operable Unit includes the groundwater beneath the 100-D/DR and 100-H reactor areas, and the intervening area (600 Area), as bounded by the Columbia River shoreline and the southern extent of the two reactor areas. Environmental restoration activities within the operable unit may be influenced by potential adverse impacts in adjacent areas, including groundwater, river water, riverbed sediments, and aquatic biota that may be exposed to contaminants as the result of groundwater flow from the operable unit. The starting point for selecting remedial alternatives for detailed analysis in the FFS is the 100 Areas Feasibility Study, Phases 1 and 2 (DOE-RL 1994a). This study presents a generalized view of applicable and implementable remedial technologies for contaminants of potential concern that are typical of all 100 Areas operable units. The FFS refines the analysis of remedial technologies for groundwater by incorporating contaminant characteristics and hydrogeologic conditions that are specific to the 100-HR-3 Operable Unit.

2124 (DOE/RL--94-85) **Remedial investigation/feasibility study report for the 300-FF-5 Operable Unit.** Bechtel National, Inc., Richland, WA (United States). May 1995. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017542. Source: OSTI; NTIS; INIS; GPO Dep.

This report is the final remedial investigation (RI)/feasibility study (FS) report for the 300-FF-5 Operable Unit. The 300-FF-5 Operable Unit addresses the groundwater, contaminated saturated soils, river sediments, and river contamination associated with the 300 Area National Priorities List (NPL) site at the US Department of Energy (DOE) Hanford Site, located in Washington State. This RI/FS is being performed to characterize the nature and extent of contamination, assess risks to human health and the environment, and develop and evaluate alternatives for remediation of contamination in the 300-FF-5 Operable Unit that has resulted from 300 Area operations. Remediation goals for this operable unit do not include remediation of contaminants migrating into the operable unit from sources outside the 300 Area. These efforts are consistent with the statutory requirements of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), the regulatory requirements of the National Oil and Hazardous Substances Contingency Plan (NCP) (40 CFR 300), and the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) (Ecology et al. 1994), which was negotiated and approved by the DOE, the US Environmental Protection Agency (EPA), and the Washington State Department of Ecology (Ecology). This RI/FS will be used by the Tri-Party Agreement signatories to make a risk management-based selection of remedies for the contamination exceeding the remedial action objectives in the groundwater aquifer, shoreline saturated sediments, and river within the boundaries of the operable unit.

2125 (DOE/RL–94-119) **Proposal plan for interim remedial measures at the 100-KR-1 operable unit, Revision 0.** USDOE Richland Operations Office, WA (United States). Aug 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017512. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for interim remedial measures for remedial action at the 100-KR-1 Operable Unit at the Hanford Site. The alternative presented in this plan is to remove, treat, and dispose of the contaminated soil and associated structures from five waste sites within the Unit. These actions will reduce potential human health and ecological risks, ensure that contaminants present will not adversely affect groundwater, and leave the site suitable for future use. This alternative is the initial recommendation of the EPA, Ecology, and the DOE. Public comment on this plan is solicited.

2126 (DOE/RL–94-119-Rev.1) **Proposed plan for interim remedial measures at the 100-KR-1 Operable Unit. Revision 1.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96000283. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for interim remedial measures for remedial action of radioactive liquid waste disposal sites that include contaminated soils and structures at the 100-KR-1 Operable Unit, located at the Hanford Site. It also summarizes other remedial alternatives evaluated for interim remedial measures in this Operable Unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that pose potential threats to human health and the environment. This proposed plan is being issued by the US Environmental Protection Agency (EPA), the lead regulatory agency; the Washington State Department of Ecology (Ecology), the support regulatory agency; and the US Department of Energy (DOE), the responsible agency. The EPA, Ecology, and the DOE are issuing this proposed plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the "Superfund Law." This proposed plan is intended to be a fact sheet for public review which briefly describes the remedial alternatives analyzed, identifies a preferred alternative, and summarizes the information relied upon to recommend the preferred alternative.

2127 (DOE/RL–95-44) **Radioactive air emissions notice of construction for the removal of spacers from the 1303-N fuel spacer silos.** Bechtel National, Inc., Richland, WA (United States). May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017513. Source: OSTI; NTIS; INIS; GPO Dep.

This Notice of Construction (NOC) presents the proposed plans to remove the spacers from the silos located at the 100-N Area. September 30, 1995 is the milestone established by the Washington State Department of Ecology, the US Environmental Protection Agency (EPA), and the US Department of Energy for the disposal of these spacers. Fuel spacers were used to correctly position fuel in the pressure tubes of N Reactor. Spacers were ejected along with spent fuel during reactor refueling and were stored as waste in three underground silos adjacent to the reactor building. Periodically, the silos were emptied and the spacers removed to the burial ground. About 70,000 radioactive 5 cm (2-in.) diameter by 57.15 cm (22.5-in.) long (average length) perforated-tube spacers remain in storage in Silos 2 and 3 (Silo 1 is empty). Potentially, radioactive air emissions will be generated during the removal process of the spacers. The NOC describes the removal process and the airborne contamination controls proposed for this project.

2128 (DOE/RL–95-56) **100-BC-1 Excavation Demonstration Project Plan.** Bechtel National, Inc., Richland, WA (United States). Jun 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017543. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) have requested that the US Department of Energy (DOE), through the Environmental Restoration Contractor (ERC), perform removal actions at waste sites within the 100-BC-1 Operable Unit (OU) at the Hanford Site. To accelerate removal actions, the EPA (lead regulatory agency), Ecology (support regulatory agency), and DOE (responsible agency) have chosen an expedited response action (ERA) pathway for these removal actions. These removal actions will be non-time critical, and will follow the applicable sections of 40 CFR 300 Subpart E (EPA 1990), and the Comprehensive Environmental Response, Compensation, and Recovery Act of 1980 (CERCLA). The Resource Conservation and Recovery Act of 1976 and the Washington State Model Toxics Control Act (MTCA) are key sources of applicable or relevant and appropriate requirements (ARAR) for the removal actions. Section 7.0 of this plan details the ARARs. The 100-BC-1 Excavation Demonstration Project Plan provides information and guidance on the strategy planned to carry out the removal actions and meet all the project objectives. This document provides the objectives, site selection, subsystems, and phasing (Sections 2.0 through 5.0) of the project. Section 6.0 ties the previous sections together and details the strategy and data needs required to meet the project objectives while performing the removal actions. This strategy is applicable to all of the sites that will be addressed by this removal action project.

2129 (DOE/RL–95-60) **Proposed plan for the 100-IU-1, 100-IU-3, 100-IU-4, AND 100-IU-5 Operable Units.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jun 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017497. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for the Riverland Rad Yard, the Wahluke Slope, the Sodium Dichromate Baffel Landfill, and the, White Bluffs Pickling

Acid Cribs, located at the Hanford Site. These areas are known respectively as the 100-IU-1, 100-IU-3, 100-IU-4, and 100-IU-5 Operable Units. Between 1992 and 1994, each of the four operable units was the subject of an expedited response action that addressed removal of site contaminants in soil. Waste sites in the 100-IU-2 (White Bluffs Townsite) and 100-IU-6 (Hanford Townsite) Operable Units will be addressed in future proposed plans. A proposed plan is intended to be a fact sheet for public review that summarizes the information relied upon to recommend the preferred alternative. As presented in this proposed plan, no further action is the preferred alternative for the final resolution of the 100-IU-1, 100-IU-3, 100-IU-4, and 100-IU-5 Operable Units. The preferred alternative is recommended because all suspect hazardous substances above cleanup levels have been removed from the waste sites, and the sites are unlikely to pose any significant risk to human health or the environment.

2130 (DOE/RL–96-09) **Richland Environmental Restoration Project management action process document.** USDOE Richland Operations Office, WA (United States). Apr 1996. 202p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96008985. Source: OSTI; NTIS; INIS; GPO Dep.

This document is the prescribed means for providing direct input to the US Department of Energy Headquarters regarding the status, accomplishments, strategy, and issues of the Richland Environmental Restoration Project. The project mission, organizational interfaces, and operational history of the Hanford Site are provided. Remediation strategies are analyzed in detail. The document includes a status of Richland Environmental Restoration project activities and accomplishments, and it presents current cost summaries, schedules, and technical baselines.

2131 (EFR-TDD–950060) **Savannah River Site Surplus Facilities Available for Reuse.** Clarke, R.M.; Owens, M.B.; Lentz, D.W. Westinghouse Savannah River Co., Aiken, SC (United States). 14 Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96060012. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to provide a current, centralized list of Savannah River Site facilities, which are surplus and available for reuse. These surplus facilities may be made available for other DOE site missions, commercial economic development reuse, or other governmental reuse. SRS procedures also require that before new construction can be approved, available surplus facilities are screened for possible reuse in lieu of the proposed new construction.

2132 (FEMP–2362B) **The CAMU Rule: A tool for implementing a protective, cost-effective remedy at the Fernald Environmental Management Project.** Dupuis-Nouille, E.M. (Fernald Environmental Management Project, Cincinnati, OH (United States)); Goidell, L.C.; Strimbu, M.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950868–16: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96000318. Source: OSTI; NTIS; INIS; GPO Dep.

The Fernald Environmental Management Project (FEMP) is a former uranium processing facility currently under remediation pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act as amended (CERCLA). Contamination at the FEMP consists of low-level radioactivity, hazardous substances, hazardous wastes and/or mixed wastes. Regulations promulgated under the Resource Conservation and Recovery Act as amended (RCRA) are evaluated as applicable or relevant and appropriate requirements (ARARs) for remediation of the FEMP. Historically, joint CERCLA-RCRA guidance dictated that hazardous waste could not be treated, or moved out of the designated area of contiguous contamination (AOC), without triggering land disposal restrictions (LDRs) or minimum technology requirements (MTRs). To avoid invoking these stringent requirements, in situ capping was chosen as the lower cost remedy at many sites, although on-site disposal and/or treatment of hazardous wastes would have been more protective. The Corrective Action Management Units (CAMUs) and Temporary Units (TUs) Final Rule [58 FR 8658, Vol. 58, No. 29, hereinafter the "CAMU Rule"], promulgated on February 16, 1993, provides facilities regulated under RCRA corrective action authority with greater flexibility to move, treat, and dispose of wastes on site without triggering LDRs or MTRs, thereby encouraging application of innovative technologies and more protective remedies. The waste acceptance criteria for the on-site disposal facility is based on site-specific considerations including the mobility of the contaminants through the underlying site geology and the protectiveness of the engineered liners. Application of the "CAMU Rule" allows for disposition in the on-site facility based on these technical considerations rather than on regulatory classifications.

2133 (FEMP/SUB–096) **Cost estimating for CERCLA remedial alternatives a unit cost methodology.** Brettin, R.W. (PARSONS Environmental Remedial Action Project, Fairfield, OH (United States)); Carr, D.J.; Janke, R.J. Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project. Jun 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC24-92OR21972. (CONF-950868–17: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96000319. Source: OSTI; NTIS; INIS; GPO Dep.

The United States Environmental Protection Agency (EPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final, dated October 1988 (EPA 1988) requires a detailed analysis be conducted of the most promising remedial alternatives against several evaluation criteria, including cost. To complete the detailed analysis, order-of-magnitude cost estimates (having an accuracy of +50 percent to -30 percent) must be developed for each remedial alternative. This paper presents a methodology for developing cost estimates of remedial alternatives comprised of various technology and process options with a wide range of estimated contaminated media quantities. In addition, the cost estimating methodology provides flexibility for incorporating revisions to remedial alternatives and achieves the desired range of accuracy. It is important to note that the cost estimating methodology presented here was developed as a concurrent path to the development of contaminated media quantity estimates. This methodology can be initiated before contaminated media quantities are estimated. As a result, this methodology is useful in developing cost estimates for use in screening and evaluating remedial technologies and process options. However, remedial alternative cost estimates cannot be prepared without the contaminated media quantity estimates. In the conduct of the feasibility study for Operable Unit 5 at the Fernald Environmental Management Project (FEMP), fourteen remedial alternatives were retained for detailed analysis. Each remedial alternative was composed of combinations of remedial technologies and processes which were earlier determined to be best suited for addressing the media-specific contaminants found at the FEMP site, and achieving desired remedial action objectives.

2134 (INEL–94/0134) **Testing and evaluation of light ablation decontamination.** Demmer, R.L.; Ferguson, R.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1994. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002940. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This report details the testing and evaluation of light ablation decontamination. It details WINCO contracted research and application of light ablation efforts by Ames Laboratory. Tests were conducted with SIMCON (simulated contamination) coupons and REALCON (actual radioactive metal coupons) under controlled conditions to compare cleaning effectiveness, speed and application to plant process type equipment.

2135 (INEL–94/0165-Rev.1) **Nuclear fuel reprocessing deactivation plan for the Idaho Chemical Processing Plant, Revision 1.** Patterson, M.W. EG and G Idaho, Inc., Idaho Falls, ID (United States). Oct 1994. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002861. Source: OSTI; NTIS; INIS; GPO Dep.

The decision was announced on April 28, 1992 to cease all United States Department of Energy (DOE) reprocessing of nuclear fuels. This decision leads to the deactivation of all fuels dissolution, solvent extraction, krypton gas recovery operations, and product denitration at the Idaho Chemical Processing Plant (ICPP). The reprocessing facilities will be converted to a safe and stable shutdown condition awaiting future alternate uses or decontamination and decommissioning (D&D). This ICPP Deactivation Plan includes the scope of work, schedule, costs, and associated staffing levels necessary to achieve a safe and orderly deactivation of reprocessing activities and the Waste Calcining Facility (WCF). Deactivation activities primarily involve shutdown of operating systems and buildings, fissile and hazardous material removal, and related activities. A minimum required level of continued surveillance and maintenance is planned for each facility/process system to ensure necessary environmental, health, and safety margins are maintained and to support ongoing operations for ICPP facilities that are not being deactivated. Management of the ICPP was transferred from Westinghouse Idaho Nuclear Company, Inc. (WINCO) to Lockheed Idaho Technologies Company (LITCO) on October 1, 1994 as part of the INEL consolidated contract. This revision of the deactivation plan (formerly the Nuclear Fuel Reprocessing Phaseout Plan for the ICPP) is being published during the consolidation of the INEL site-wide contract and the information presented here is current as of October 31, 1994. LITCO has adopted the existing plans for the deactivation of ICPP reprocessing facilities and the plans developed under WINCO are still being actively pursued, although the change in management may result in changes which have not yet been identified. Accordingly, the contents of this plan are subject to revision.

2136 (INEL–95/0022) **Concrete decontamination scoping tests.** Archibald, K.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002941. Source: OSTI; NTIS; INIS; GPO Dep.

This report details the research efforts and scoping tests performed at the Idaho Chemical Process Plant using scabbling, chemical, and electro-osmotic decontamination techniques on radiologically contaminated concrete.

2137 (INEL–95/00108) **Development of waste minimization and decontamination technologies at the Idaho Chemical Processing Plant.** Ferguson, R.L. (and others); Archibald, K.E.; Demmer, R.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9505111-6: 11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress, Knoxville, TN (United States), 16-18 May 1995). Order Number DE96001924. Source: OSTI; NTIS; INIS; GPO Dep.

Emphasis on the minimization of decontamination secondary waste has increased because of restrictions on the use of hazardous chemicals and Idaho Chemical Processing Plant (ICPP) waste handling issues. The Lockheed Idaho Technologies Co. (LITCO) Decontamination Development Subunit has worked to evaluate and introduce new performed testing, evaluations, development and on-site demonstrations for a number of novel decontamination techniques that have not yet previously been used at the ICPP. This report will include information on decontamination techniques that have recently been evaluated by the Decontamination Development Subunit.

2138 (INEL–95/0123) **Decontamination of metals by melt refining/slagging. An annotated bibliography: Update on stainless steel and steel.** Worchester, S.A. (Montana Tech of the Univ., of Montana (United States)); Twidwell, L.G.; Paolini, D.J.; Weldon, T.A.; Mizia, R.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 88p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96004068. Source: OSTI; NTIS; INIS; GPO Dep.

The following presentation is an update to a previous annotation, i.e., WINCO-1138. The literature search and annotated review covers all metals used in the nuclear industries but the emphasis of this update is directed toward work performed on mild steels. As the number of nuclear installations undergoing decontamination and decommissioning (D&D) increases, current radioactive waste storage space is consumed and establishment of new waste storage areas becomes increasingly difficult, the problem of handling and storing radioactive scrap metal (RSM) gains increasing importance in the DOE Environmental Restoration and Waste Management Program. To alleviate present and future waste problems, Lockheed Idaho Technologies Co (LITCO) is managing a program for the recycling of RSM for beneficial use within the DOE complex. As part of that effort, Montana Tech has been awarded a contract to help optimize melting and refining technology for the recycling of stainless steel RSM. The scope of the Montana Tech program includes a literature survey, a decontaminating slag design study, small wide melting studies to determine optimum slag compositions for removal of radioactive contaminant surrogates, analysis of preferred melting techniques, and coordination of large scale melting demonstrations (100–2,000 lbs) to be conducted at selected facilities. The program will support recycling and decontaminating stainless steel RSM for use in waste canisters for Idaho Waste Immobilization Facility densified high level waste and Pit 9/RWMC boxes. This report is the result of the literature search conducted to establish a basis for experimental melt/slag program development. The program plan will be jointly developed by Montana Tech and LITCO.

2139 (INEL–95/0218) **Small pipe characterization system (SPCS) conceptual design.** Anderson, M.O.; Ferrante, T.A.; McKay, M.D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001370. Source: OSTI; NTIS; INIS; GPO Dep.

Throughout the Department of Energy (DOE) complex there are many facilities that have been identified for Decontamination and Decommissioning (D&D). As processes are terminated or brought off-line, facilities are placed on the inactive list, and facility managers and site contractors are required to assure a safe and reliable decommissioning and transition of these facilities to a clean final state. Decommissioning of facilities requires extensive reliable characterization, decontamination and in some cases dismantlement. Characterization of piping systems throughout the DOE complex is becoming more and more necessary. In addition to decommissioning activities, characterization activities are performed as part of surveillance and maintenance (S&M). Because of the extent of contamination, all inactive facilities require some type of S&M. These S&M activities include visual assessment, equipment and material accounting, and maintenance. The majority of the inactive facilities have piping systems 3 inches or smaller that are inaccessible because they are contaminated, imbedded in concrete, or run through hot cells. Many of these piping systems have been inactive for a number of years and there exists no current system condition information or the historical records are poor and/or missing altogether. Many of these piping systems are placed on the contaminated list, not because of known contamination, but because of the risk of internal contamination. Many of the piping systems placed on the contamination list may not have internal contamination. Because there is a potential however, they are treated as such. The cost of D&D can be greatly reduced by identifying and removing hot spot contamination, leaving clean piping to be removed using conventional methods. Accurate characterization of these piping systems is essential before, during and after all D&D activities.

2140 (INEL–95/00229) **Stationary low power reactor No. 1 (SL-1) accident site decontamination & dismantlement project.** Perry, E.F. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–29: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96004005. Source: OSTI; NTIS; INIS; GPO Dep.

The Army Reactor Area (ARA) II was constructed in the late 1950s as a test site for the Stationary Low Power Reactor No. 1 (SL-1). The SL-1 was a prototype power and heat source developed for use at remote military bases using a direct cycle, boiling water, natural circulation reactor designed to operate at a thermal power of 3,000 kW. The ARA II compound encompassed 3 acres and was comprised of (a) the SL-1 Reactor Building, (b) eight support facilities, (c) 50,000-gallon raw water storage tank, (d) electrical substation, (e) aboveground 1,400-gallon heating oil tank, (f) underground 1,000-gallon hazardous waste storage tank, and (g) belowground power, sewer, and water systems. The reactor building was a cylindrical, aboveground facility, 39 ft in diameter and 48 ft high. The lower portion of the building contained the reactor pressure vessel surrounded by gravel shielding. Above the pressure vessel, in the center portion of the building, was a turbine generator and plant support equipment. The upper section of the building contained an air cooled condenser and its circulation fan. The major support facilities included a 2,500 ft^2 two story, cinder block administrative building; two 4,000 ft^2 single story, steel frame office buildings; a 850 ft^2 steel framed, metal sided PL condenser building, and a 550 ft^2 steel framed decontamination and laydown building.

2141 (INEL–95/0287) **Pilot study dismantlement of 20 lead-lined shipping casks.** Thurmond, S.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Aug 1995. 44p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002300. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes a pilot study conducted at the INEL to dismantle lead-lined casks and shielding devices, separate the radiologically contaminated and hazardous materials, and recycle resultant scrap lead. The facility areas where the work was performed, dismantlement methods, and process equipment are described. Issues and results associated with recycling the lead as a free-released scrap metal are presented and discussed. Data and results from the pilot study are summarized and presented. The study concluded that cask dismantlement at the INEL can be performed as a legitimate recycling activity for scrap lead. Ninety-one percent of the lead recovered passed free-release criteria. The value of the 50,375 lb of recovered lead is approximately \$0.45/lb. Resultant waste streams can be satisfactorily treated and disposed. Only very low levels of bulk radiological contamination (47 picocuries/gram of 137 Cs and 3.2 picocuries/gram of ^{60}Co) were detected in the lead rejected for free release.

2142 (INEL–95/00403) **Selecting reasonable future land use scenarios.** Allred, W.E.; Smith, R.W. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951209–11: 17. low-level radioactive waste management conference, Phoenix, AZ (United States), 12-14 Dec 1995). Order Number DE96009023. Source: OSTI; NTIS; INIS; GPO Dep.

This paper examines a process to help select the most reasonable future land use scenario for hazardous waste and/or low-level radioactive waste disposal sites. The process involves evaluating future land use scenarios ab applying selected criteria currently used by commercial mortgage companies to determine the feasibility of obtaining a loan for purchasing such land. The basis for the process is that only land use activities for which a loan can be obtained well be considered. To examine the process, a low-level radioactive waste site, the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory, is used as an example. The authors suggest that the process is a very precise, comprehensive, and systematic approach for determining reasonable future use of land. Implementing such a process will help enhance the planning, decision-making, safe management, and cleanup of present and future disposal facilities.

2143 (INEL–95/0419) **Use of MCNP for characterization of reactor vessel internals waste from decommissioned nuclear reactors.** Love, E.F.; Pauley, K.A.; Reid, B.D. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002206. Source: OSTI; NTIS; INIS; GPO Dep.

This study describes the use of the Monte Carlo Neutron-Photon (MCNP) code for determining activation levels of irradiated reactor vessel internals hardware. The purpose of the analysis is to produce data for the Department of Energy's Greater-Than-Class C Low-Level Radioactive Waste Program. An MCNP model was developed to analyze the Yankee Rowe reactor facility. The model incorporates reactor geometry, material compositions, and operating history data acquired from Yankee Atomic Electric Company. In addition to the base activation analysis, parametric studies were performed to determine the sensitivity of activation to specific parameters. A component sampling plan was also developed to validate the model results, although the plan was not implemented. The calculations for the Yankee Rowe reactor predict that only the core baffle and the core support plates will be activated to levels above the Class C limits. The parametric calculations show, however, that the large uncertainties in the material compositions could cause errors in the estimates that could also increase the estimated activation level of the core barrel to above the Class C limits. Extrapolation of the results to other reactor facilities indicates that in addition to the baffle and support plates, core barrels may also be activated to above Class C limits; however the classification will depend on the specific operating conditions of the reactor and the specific material compositions of the metal, as well as the use of allowable concentration averaging practices in packaging and classifying the waste.

2144 (INEL–95/0453) **INEL D&D long-range plan.** Buckland, R.J.; Kenoyer, D.J.; LaBuy, S.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002230. Source: OSTI; NTIS; INIS; GPO Dep.

This Long-Range Plan presents the Decontamination and Dismantlement (D&D) Program planning status for facilities at the Idaho National Engineering Laboratory (INEL). The plan provides a general description of the D&D Program objectives, management criteria, and policy; discusses current activities; and documents the INEL D&D Program cost and schedule estimate projections for the next 15 years. Appendices are included that provide INEL D&D project historical information, a comprehensive descriptive summary of each current D&D surplus facility, and a summary database of all INEL contaminated facilities awaiting or undergoing the facility transition process.

2145 (INEL–95/00559) **Decontamination technologies evaluations.** Tripp, J. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960804–28: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010446. Source: OSTI; NTIS; INIS; GPO Dep.

Testing has been completed at the Idaho Chemical Processing Plant (ICPP) on in situ recyclable abrasives grit blasting, concrete cleaning (using scabbling, chemicals and electro-kinetics) and laser light ablation of metals. Several small scale tests have also been conducted with strippable coatings, CO_2 pellet blasting and various other techniques. The results of this testing is summarized in this paper.

2146 (INEL–96/0017) **Liquid abrasive pressure pot scoping tests report.** Archibald, K.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007524. Source: OSTI; NTIS; INIS; GPO Dep.

The primary initiatives of the LITCO Decontamination Development group at the Idaho Chemical Process Plant (ICPP) are the development of methods to eliminate the use of sodium bearing decontamination chemicals and minimization of the amount of secondary waste generated during decontamination activities. In July of 1994, a Commerce Business Daily (CBD) announcement was issued by the INEL to determine commercial interest in the development of an in-situ liquid abrasive grit blasting system. As a result of the CBD announcement, Klieber & Schulz issued an Expression of Interest letter which stated they would be interested in testing a prototype Liquid Abrasive Pressure Pot (LAPP). LITCO's Decontamination group and Kleiber & Schulz entered into a Cooperative Research and Development Agreement (CRADA) in which the Decontamination Development group tested the prototype LAPP in a non-radioactive hot cell mockup. Test results are provided.

2147 (K/TCD–1127) **Evaluation of gas-phase technetium decontamination and safety related experiments during FY 1994. A report of work in progress.** Simmons, D.W.; Munday, E.B. Oak Ridge K-25 Site, TN (United States). May 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012978. Source: OSTI; NTIS; INIS; GPO Dep.

Laboratory activities for FY94 included: evaluation of decontamination of Tc by gas-phase techniques, evaluation of diluted ClF_3 for removing U deposits, evaluation of potential hazard of wet air inlekage into a vessel containing ClF_3, planning and preparation for experiments to assess hazard of rapid reaction of ClF_3 and hydrated UO_2F_2 or powdered Al, and preliminary evaluation of compatibility of Tenic valve seat material.

2148 (LA–13060-MS) **Alpha contamination assessment for D&D activities: Monitoring inside glove boxes and vessels.** Rawool-Sullivan, M.W.; Bolton, R.D.; Conaway, J.G.; MacArthur, D.W. Los Alamos National Lab., NM (United States). Feb 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96007456. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a new approach to glove box monitoring that involves drawing air out of one glove port through a detection grid that collects ions created in the air inside the glove box by ionizing radiation, especially alpha radiation. The charge deposited on the detection grid by the ions is measured with a sensitive electrometer. The air can be circulated back to the glove box through the other glove port, preventing contamination from leaving the glove box and detector system. Initial experiments using a mock-up constructed of sheet metal indicate that this technology provides the measurement technique needed to perform a defensible, non-invasive measurement of alpha contamination inside glove boxes destined for waste disposal. This can result in an enormous cost savings if a given glove box can be shown to fall into the catagory of Low-Level Waste rather than Trans-Uranic Waste. Considering that hundreds of glove boxes contaminated with plutonium will be taken out of service at various nuclear facilities over the next few years, the potential cost savings associated with disposal as LLW rather than TRU waste are substantial.

2149 (LA–13061-MS) **Alpha contamination assessment for D&D activities: Monitoring concrete surfaces.** Rawool-Sullivan, M.W.; Conaway, J.G.; MacArthur, D.W. Los Alamos National Lab., NM (United States). Feb 1996. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96007455. Source: OSTI; NTIS; INIS; GPO Dep.

The process of decontaminating and decomissioning former nuclear facilities sometimes requires that large areas of concrete and other materials be scanned to verify they are not contaminated. A specially developed concrete surface monitor (CSM) can greatly expedite that process. The CSM is basically an aluminum box, open on the bottom, that uses an electrostatic field to transport ions created by alpha particles interacting with ambient air to a collection grid or plate. A sensitive electrometer measures the resulting current, which is essentially proportional to surface alpha activity. The initial prototype CSM surveys a surface area of some 300 cm^2 at one time, while a second-generation prototype surveys 2500 cm^2 and is designed to compensate automatically for radon, which can cause substantial errors in estimating surface contamination in some cases. These monitors have been successfully demonstrated on a number of concrete surfaces in situ as well as on concrete pieces cut from former facilities.

2150 (LA–13062-MS) **Alpha contamination assessment for D&D activities: Technology overview.** Conaway, J.G.; Rawool-Sullivan, M.W.; MacArthur, D.W. Los Alamos National Lab., NM (United States). Feb 1996. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96007454. Source: OSTI; NTIS; INIS; GPO Dep.

Instruments based on the principle of Long-Range Alpha Detection (LRAD) detect the ions created in ambient air by ionizing radiation, particularly alpha radiation, interacting with air molecules. Using either an electrostatic field or forced convection, these ions can be transported to a detection grid where the ions produce a small current that is measured with a sensitive electrometer. LRAD-based instruments can give separate, simultaneous measurements of alpha-emitting solids and inert radioactive gases such as radon. LRAD-based instruments assess surface contamination on an entire object or large surface area in a single, rapid measurement, including relatively inaccessible areas such as interior surfaces of pipes and process equipment. The LRAD concept is well proven and has been developed into a range of different radiation detection devices. This paper presents an overview of the technology, while several associated papers explore specific applications in greater detail.

2151 (LA–13063-MS) **Alpha contamination assessment for D&D activities: Monitoring pipe interiors.** Rawool-Sullivan, M.W.; Conaway, J.G.; MacArthur, D.W.; Vaccarella, J. Los Alamos National Lab., NM (United States). Feb 1996. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96006237. Source: OSTI; NTIS; INIS; GPO Dep.

We have developed a prototype instrument capable of assessing alpha-emitting contamination on interior surfaces of ducts, pipes, tanks, and other enclosed volumes without inserting a probe. Air is drawn through the potentially contaminated volume and then through a detection grid, where ions created in the air by alpha particles are collected and the resulting charge measured with a sensitive electrometer. A filter at the intake end of the contaminated volume excludes externally created ions, so only ions generated inside the volume are detected. We have studied the response of this prototype in initial experiments using calibrated alpha sources with various pipe diameters and configurations, air flows, and source locations in the pipes. The results of these experiments indicate that this method can be an effective approach to assessing internal contamination.

2152 (LA-SUB–95-99) **LANL environmental restoration site ranking system: System description. Final report.** Merkhofer, L. (Applied Decision Analysis, Inc., Menlo Park, CA (United States)); Kann, A.; Voth, M. Los Alamos National Lab., NM (United States); Applied Decision Analysis, Inc., Menlo Park, CA (United States). 13 Oct 1992. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (ADA–92-2106). Order Number DE95017359. Source: OSTI; NTIS; INIS; GPO Dep.

The basic structure of the LANL Environmental Restoration (ER) Site Ranking System and its use are described in this document. A related document, Instructions for Generating Inputs for the LANL ER Site Ranking System, contains detailed descriptions of the methods by which necessary inputs for the system will be generated. LANL has long recognized the need to provide a consistent basis for comparing the risks and other adverse consequences associated with the various waste problems at the Lab. The LANL ER Site Ranking System is being developed to help address this need. The specific purpose of the system is to help improve, defend, and explain prioritization decisions at the Potential Release Site (PRS) and Operable Unit (OU) level. The precise relationship of the Site Ranking System to the planning and overall budget processes is yet to be determined, as the system is still evolving. Generally speaking, the Site Ranking System will be used as a decision aid. That is, the system will be used to aid in the planning and budgetary decision-making process. It will never be used alone to make decisions. Like all models, the system can provide only a partial and approximate accounting of the factors important to budget and planning decisions. Decision makers at LANL will have to consider factors outside of the formal system when making final choices. Some of these other factors are regulatory requirements, DOE policy, and public concern. The main value of the site ranking system, therefore, is not the precise numbers it generates, but rather the general insights it provides.

2153 (LA-UR–95-2277) **Alpha detection for decontamination and decommissioning: Results and possibilities.** MacArthur, D. Los Alamos National Lab., NM (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950868–4: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95016792. Source: OSTI; NTIS; INIS; GPO Dep.

Alpha detectors based on the long-range alpha detection (LRAD) technology have numerous uses, both potential and demonstrated, in facility D&D. These monitors operate by detecting the ions created by alpha particles interacting with ambient air. Thus, detection is not limited by the short range of the alpha particle and no window is required between the contamination and the detection region. These properties make LRAD-based detectors ideal for operation in field environments where complex objects to be monitored are the norm and reliability is crucial. Three monitors of particular interest in D&D operations are the building surface monitor, the internal volume monitor for use on the inner surfaces of pipes, ducts, and tanks, and the conveyer belt monitor for concrete rubble and structural steel. Surface monitors have been used extensively, both in laboratory and field environments, internal volume monitors have been tested in the laboratory, and the conveyer system is still a conceptual design. These monitors and related applications demonstrate the utility of LRAD-based monitors for D&D operations as well as exploring some of the new ways that fieldable monitoring systems can be used for D&D. Ion collection sensing technology can be used to solve many of the alpha detection problems unique to the D&D field.

2154 (LA-UR–95-2435) **Preliminary assessments the shortcut to remediation (category III-surplus facility assessments).** Byars, L.L. Los Alamos National Lab., NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950868–9: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95016323. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the preliminary assessments for the shortcut of decontamination of surplus nuclear facilities. Topics discussed include: environment, health and safety concerns; economic considerations; reduction of transition time; preliminary characterization reports; preliminary project plan; health and safety plan; quality assurance plan; surveillance and maintenance plan; and waste management plan.

2155 (LA-UR–95-2465) **Lessons learned from decommissioning projects at Los Alamos National Laboratory.** Salazar, M. Los Alamos National Lab., NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-950868–10: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE95016910. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes lessons learned over the last 20 years from 12 decommissioning projects at Los Alamos National Laboratory. These lessons relate both to overall program management and to management of specific projects during the planning and operations phases. The issues include waste management; the National Environmental Policy Act (NEPA); the Resource Conservation and Recovery Act (RCRA); the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA); contracting; public involvement; client/customer interface; and funding. Key elements of our approach are to be proactive; follow the observation method; perform field activities concurrently; develop strategies to keep reportable incidents from delaying work; seek and use programs, methods, etc., in existence to shorten learning curves; network to help develop solutions; and avoid overstudying and overcharacterizing. This approach results in preliminary plans that require very little revision before implementation, reasonable costs and schedules, early acquisition of permits and NEPA documents, preliminary characterization reports, and contracting documents. Our track record is good – the last four projects (uranium and plutonium-processing facility and three research reactors) have been on budget and on schedule.

2156 (LA-UR–95-4294) **Waste minimization value engineering workshop for the Los Alamos National Laboratory Omega West Reactor Decommissioning Project.** Hartnett, S. (Benchmark Environmental Corp., Albuquerque, NM (United States)); Seguin, N.; Burns, M. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–5: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96005597. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory Pollution Prevention Program Office sponsored a Value Engineering (VE) Workshop to evaluate recycling options and other pollution prevention and waste minimization (PP/WMin) practices to incorporate into the decommissioning of the Omega West Reactor (OWR) at the laboratory. The VE process is an organized, systematic approach for evaluating a process or design to identify cost saving opportunities, or in this application, waste reduction opportunities. This VE Workshop was a facilitated process that included a team of specialists in the areas of decontamination, decommissioning, PP/WMin, cost estimating, construction, waste management, recycling, Department of Energy representatives, and others. The uniqueness of this VE Workshop was that it used an interdisciplinary approach to focus on PP/WMin practices that could be included in the OWR Decommissioning Project Plans and specifications to provide waste reduction. This report discusses the VE workshop objectives, summarizes the OWR decommissioning project, and describes the VE workshop activities, results, and lessons learned.

2157 (LA-UR–96-91) **Decontamination and demolition of a former plutonium processing facility's process exhaust system, firescreen, and filter plenum buildings.** LaFrate, P.J. Jr.; Stout, D.S.; Elliott, J.W. Los Alamos National Lab., NM (United States). [1996]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960443–2: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96007177. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Decommissioning Project has decontaminated, demolished, and decommissioned a process exhaust system, two filter plenum buildings, and a firescreen plenum structure at Technical Area 21 (TA-2 1). The project began in August 1995 and was completed in January 1996. These high-efficiency particulate air (HEPA) filter plenums and associated ventilation ductwork provided process exhaust to fume hoods and glove boxes in TA-21 Buildings 2 through 5 when these buildings were active plutonium and uranium processing and research facilities. This paper summarizes the history of TA-21 plutonium and uranium processing and research activities and provides a detailed discussion of integrated work process controls, characterize-as-you-go methodology, unique engineering controls, decontamination techniques, demolition methodology, waste minimization, and volume reduction. Also presented in detail are the challenges facing the LANL Decommissioning Project to safely and economically decontaminate and demolish surplus facilities and the unique solutions to tough problems. This paper also shows the effectiveness of the integrated work package concept to control work through all phases.

2158 (LA-UR-96-0421) **Decontamination and demolition of a former plutonium processing facility's process exhaust system, firescreen, and filter plenum buildings.** LaFrate, P.J. Jr.; Stout, D.S.; Elliott, J.W. Los Alamos National Lab., NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–68: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008123. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Decommissioning Project has decontaminated, demolished, and decommissioned a process exhaust system, two filter plenum buildings, and a firescreen plenum structure at Technical Area 21 (TA-21). The project began in August 1995 and was completed in January 1996. These high-efficiency particulate air (HEPA) filter plenums and associated ventilation ductwork provided process exhaust to fume hoods and glove boxes in TA-21 Buildings 2 through 5 when these buildings were active plutonium and uranium processing and research facilities. This paper summarizes the history of TA-21 plutonium and uranium processing and research activities and provides a detailed discussion of integrated work process controls, characterize-as-you-go methodology, unique engineering controls, decontamination techniques, demolition methodology, waste minimization, and volume reduction. Also presented in detail are the challenges facing the LANL Decommissioning Project to safely and economically decontaminate and demolish surplus facilities and the unique solutions to tough problems. This paper also shows the effectiveness of the integrated work package concept to control work through all phases.

2159 (LA-UR–96-2051) **The Los Alamos National Laboratory Chemistry and Metallurgy Research Facility upgrades project - A model for waste minimization.** Burns, M.L.; Durrer, R.E.; Kennicott, M.A. Los Alamos National Lab., NM (United States). Jul 1996. 6p. Sponsored by USDOE, Washington, DC (United States). (CONF-960741–15: Pollution prevention conference, Chicago, IL (United States), 9-11 Jul 1996). Order Number DE96012638. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory (LANL) Chemistry and Metallurgy Research (CMR) Facility, constructed in 1952, is currently undergoing a major, multi-year construction project. Many of the operations required under this project (i.e., design, demolition, decontamination, construction, and waste management) mimic the processes required of a large scale decontamination and decommissioning (D&D) job and are identical to the requirements of any of several upgrades projects anticipated for LANL and other Department of Energy (DOE) sites. For these reasons the CMR Upgrades Project is seen as an ideal model facility - to test the application, and measure the success of - waste minimization techniques which could be brought to bear on any of the similar projects. The purpose of this paper will be to discuss the past, present, and anticipated waste minimization applications at the facility and will focus on the development and execution of the project's "Waste Minimization/Pollution Prevention Strategic Plan."

2160 (MMSC-EM–95011) **Pinellas Plant Annual Site Environmental Report for calendar year 1994.** Lockheed Martin Specialty Components, Inc., Largo, FL (United States). Jun 1995. 146p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-92AL73000. Order Number DE95014021. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a comprehensive summary of the results of the Environmental Monitoring, Waste Management, and Environmental Restoration Programs at the Pinellas Plant, in Pinellas County, Florida for 1994. This report also includes the plant's performance in the areas of compliance with applicable regulatory requirements and standards and identifies major Environmental, Safety and Health Program initiatives and accomplishments for 1994. As a result of the end of Department of Energy Defense Programs mission production on September 30, 1994, considerable changes at the Pinellas Plant occurred. These changes, which included transitioning the plant toward alternate use in support of economic development and safe shutdown, both increased and heightened Environmental, Safety and Health responsibilities. In December 1994, the Department of Energy announced it had reached an agreement to sell the Pinellas Plant to the Pinellas County Industry Council in March 1995. The plant is being leased back by the Department of Energy through September 1997 to complete safe shutdown, reconfiguration, transfer of equipment to other Department of Energy production facilities, and transition to commercial ventures. Permit modifications and transfers will be completed during 1995 to reflect the new ownership by the Pinellas County Industry Council and to include new tenants as needed.

2161 (ORNL/ER–230) **Project management plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory. Environmental Restoration Program.** Oak Ridge National Lab., TN (United States). [1995]. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008963. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Isotopes Facilities Deactivation Project (IFDP) is to place nineteen former isotopes production facilities at the Oak Ridge National Laboratory in a safe, stable, and environmentally sound condition suitable for an extended period of minimum surveillance and maintenance (S&M) and as quickly and economically as possible. Implementation and completion of the deactivation project win further reduce the already small risks to the environment and to public safety and health. Furthermore, the project should result in significant S&M cost savings in the future. The IFDP management plan has been prepared to document the project objectives, define organizational relationships and responsibilities, and outline the management control systems to be employed in the management of the project. The project has adopted a strategy to deactivate the simple facilities first, to reduce the scope of the project, and to gain experience before addressing more difficult facilities. A decision support system is being developed to identify those activities that best promote the project mission and result in largest cost savings. The Work Plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory

(Energy Systems 1994) defines the project schedule, the cost estimate, and the technical approach for the project.

2162 (ORNL/ER–230/R1) **Project Management Plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory.** Oak Ridge National Lab., TN (United States). Apr 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016168. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

The purpose of the Isotopes Facilities Deactivation Project (IFDP) is to place former isotopes production facilities at the Oak Ridge National Laboratory in a safe, stable, and environmentally sound condition suitable for an extended period of minimum surveillance and maintenance (S&M) and as quickly and economically as possible. Implementation and completion of the deactivation project will further reduce the already small risks to the environment and to public safety and health. Furthermore, the project should result in significant S&M cost savings in the future. The IFDP management plan has been prepared to document the project objectives, define organizational relationships and responsibilities, and outline the management control systems to be employed in the management of the project. The project has adopted a strategy to deactivate the simple facilities first, to reduce the scope of the project, and to gain experience before addressing more difficult facilities. A decision support system is being developed to identify those activities, that best promote the project mission and result in largest cost savings. The Work Plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory (Energy Systems 1994) defines the project schedule, the cost estimate, and the technical approach for the project.

2163 (ORNL/ER–249/R1) **Work plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory.** Oak Ridge National Lab., TN (United States). May 1995. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014995. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Isotopes Facilities Deactivation Project (IFDP) is to place former isotopes production facilities at the Oak Ridge National Laboratory in a safe, stable, and environmentally sound condition; suitable for an extended period of minimum surveillance and maintenance (S&M) and as quickly and economical as possible. Implementation and completion of the deactivation project will further reduce the risks to the environment and to public safety and health. Furthermore, completion of the project will result in significant S&M cost savings in future years. The IFDP work plan defines the project schedule, the cost estimate, and the technical approach for the project. A companion document, the IFDP management plan, has been prepared to document the project objectives, define organizational relationships and responsibilities, and outline the management control systems to be employed in the management of the project. The project has adopted the strategy of deactivating the simple facilities first, to reduce the scope of the project and to gain experience before addressing more difficult facilities. A decision support system is being developed to identify the activities that best promote the project mission and result in the largest cost savings. This work plan will be reviewed and revised annually. Deactivation of IFDP facilities was initiated in FY 1994 and will be completed in FY 1999. The schedule for deactivation of facilities is shown. The total cost of the project is estimated to be $36M. The costs are summarized. Upon completion of deactivation, annual S&M costs of these facilities will be reduced from the current level of $5M per year to less than $1M per year.

2164 (ORNL/ER–249/R2) **Work plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Aug 1995. 181p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016574. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Isotopes Facilities Deactivation Project (IFDP) is to place former isotopes production facilities at the Oak Ridge National Laboratory in a safe, stable, and environmentally sound condition; suitable for an extended period of minimum surveillance and maintenance (S and M) and as quickly and economical as possible. Implementation and completion of the deactivation project will further reduce the risks to the environment and to public safety and health. Furthermore, completion of the project will result in significant S and M cost savings in future years. The IFDP work plan defines the project schedule, the cost estimate, and the technical approach for the project. A companion document, the EFDP management plan, has been prepared to document the project objectives, define organizational relationships and responsibilities, and outline the management control systems to be employed in the management of the project. The project has adopted the strategy of deactivating the simple facilities first, to reduce the scope of the project and to gain experience before addressing more difficult facilities. A decision support system is being developed to identify the activities that best promote the project mission and result in the largest cost savings. This work plan will be reviewed and revised annually. Deactivation of EFDP Facilities was initiated in FY 1994 and will be completed in FY 2000. The schedule for deactivation of facilities is shown. The total cost of the project is estimated to be $51M. The costs are summarized. Upon completion of deactivation, annual S and M costs of these facilities will be reduced from the current level of $5M per year to less than $1M per year.

2165 (ORNL/ER–311) **Level 3 Baseline Risk Assessment for Building 3515 at Oak Ridge National Lab., Oak Ridge, TN.** Wollert, D.A. (Univ. of Tennessee, Knoxville, TN (United States)); Cretella, F.M.; Golden, K.M. Oak Ridge National Lab., TN (United States). Aug 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017406. Source: OSTI; NTIS; INIS; GPO Dep.

The baseline risk assessment for the Fission Product Pilot Plant (Building 3515) at the Oak Ridge National laboratory (ORNL) provides the Decontamination and Decommissioning (D&D) Program at ORNL and Building 3515 project managers with information concerning the results of the Level 3 baseline risk assessment performed for this building. The document was prepared under Work Breakdown Structure 1.4.12.6.2.01 (Activity Data Sheet 3701, Facilities D&D) and includes information on the potential long-term impacts to human health and the environment if no action is taken to remediate Building 3515. Information provided in this document forms the basis for the development of remedial alternatives and the no-action risk portion of the Engineering Evaluation/Cost Analysis report.

2166 (ORNL/ER–325) **Lifecycle baseline summary for ADS 6504IS isotopes facilities Deactivation Project**

at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States). Aug 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017060. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

The scope of this Activity Data Sheet (ADS) is to provide a detailed plan for the Isotopes Facilities Deactivation Project (IFDP) at the Oak Ridge National Laboratory (ORNL). This project places the former isotopes production facilities in a safe, stable, and environmentally sound condition suitable for an extended period of minimum surveillance and maintenance (S&M) until the facilities are included in the Decontamination and Decommissioning (D&D) Program. The facilities included within this deactivation project are Buildings 3026-C, 3026-D, 3028, 3029, 3038-AHF, 3038-E, 3038-M, 3047, 3517, 7025, and the Center Circle Facilities (Buildings 3030, 3031, 3032, 3033, 3033-A, 3034, and 3118). The scope of deactivation identified in this Baseline Report include surveillance and maintenance activities for each facility, engineering, contamination control and structural stabilization of each facility, radioluminescent (RL) light removal in Building 3026, re-roofing Buildings 3030, 3118, and 3031, Hot Cells Cleanup in Buildings 3047 and 3517, Yttrium (Y) Cell and Barricades Cleanup in Building 3038, Glove Boxes & Hoods Removal in Buildings 3038 and 3047, and Inventory Transfer in Building 3517. For a detailed description of activities within this Work Breakdown Structure (WBS) element, see the Level 6 and Level 7 Element Definitions in Section 3.2 of this report.

2167 (ORNL/ER–326) **Health and safety plan for the Molten Salt Reactor Experiment remediation project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Burman, S.N.; Uziel, M.S. Oak Ridge National Lab., TN (United States). Dec 1995. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96009986. Source: OSTI; NTIS; INIS; GPO Dep.

The Lockheed Martin Energy Systems, Inc., (Energy Systems) policy is to provide a safe and healthful workplace for all employees and subcontractors. The accomplishment of the policy requires that operations at the Molten Salt Reactor Experiment (MSRE) facility at the Department of Energy (DOE) Oak Ridge National Laboratory (ORNL) are guided by an overall plan and consistent proactive approach to safety and health (S and H) issues. The policy and procedures in this plan apply to all MSRE operations. The provisions of this plan are to be carried out whenever activities are initiated at the MSRE that could be a threat to human health or the environment. This plan implements a policy and establishes criteria for the development of procedures for day-to-day operations to prevent or minimize any adverse impact to the environment and personnel safety and health and to meet standards that define acceptable management of hazardous and radioactive materials and wastes. The plan is written to utilize past experience and the best management practices to minimize hazards to human health or the environment from events such as fires, explosions, falls, mechanical hazards, or any unplanned release of hazardous or radioactive materials to the air.

2168 (ORNL/ER–334) **D and D alternatives risk assessment for Building 3515 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Robers, S.K. (DASKR Ltd. (United States)); Golden, K.M. Oak Ridge National Lab., TN (United States). Sep 1995. 37p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96007657. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the Level 3 Decontamination and Decommissioning (D and D) Alternatives Risk Assessment (DARA) performed on Building 3515 located at the Oak Ridge National Laboratory (ORNL). The goal of the risk evaluation process is to provide risk information necessary to assist decision making for Environmental Restoration (ER) Program D and D facilities. This risk information is developed in the baseline risk assessment (BRA) and in the DARA. The BRA provides risk information necessary for determining whether or not a facility represents an unacceptable risk and requires remediation. In addition, the BRA also provides an estimation of the risks associated with the no-action alternative for use in the DARA. The objective of this Level 3 DARA is to evaluate and document the potential risks to human health, human safety, and the environment associated with the proposed remedial action at Building 3515. A Level 3 assessment is the least rigorous type of DARA. The decision to conduct a Level 3 DARA was based on the fact that characterization data from the facility are limited, and currently only one remedial alternative (complete dismantlement) is being evaluated in addition to the no-action alternative. The results of the DARA along with cost and engineering information may be used by project managers in making decisions regarding the final disposition of Building 3515. This Level 3 assessment meets the requirements of the streamlined risk assessment necessary for an Engineering Evaluation/Cost Analysis (EE/CA).

2169 (ORNL/ER–336) **Quality assurance plan for the Molten Salt Reactor Experiment Remediation Project at the Oak Ridge National Laboratory. Phase 1 – Interim corrective measures and Phase 2 – Purge and trap reactive gases.** Oak Ridge National Lab., TN (United States). Nov 1995. 69p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006664. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Plan (QAP) identifies and describes the systems utilized by the Molten Salt Reactor Experiment Remediation Project (MSRERP) personnel to implement the requirements and associated applicable guidance contained in the Quality Program Description Y/QD-15 Rev. 2 (Energy Systems 1995f). This QAP defines the quality assurance (QA) requirements applicable to all activities and operations in and directly pertinent to the MSRERP Phase 1–Interim Corrective Measures and Phase 2–Purge and Trap objectives. This QAP will be reviewed, revised, and approved as necessary for Phase 3 and Phase 4 activities. This QAP identifies and describes the QA activities and procedures implemented by the various Oak Ridge National Laboratory support organizations and personnel to provide confidence that these activities meet the requirements of this project. Specific support organization (Division) quality requirements, including the degree of implementation of each, are contained in the appendixes of this plan.

2170 (ORNL/ER–343) **Completion report for the Inactive Liquid Low-Level Waste Tank Remediation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Feb 1996. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011792. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the results of the Inactive Liquid Low-Level Waste Tank Remediation Project at Oak Ridge National Laboratory (ORNL). The work performed is compared with that proposed in the statement of work and the service contract specification for the maintenance action to remediate tanks 3013, 3004-B, T-30, and 3001-B. The Federal Facility Agreement (FFA) among the U.S. Environmental Protection Agency (EPA), the Tennessee Department of Environment and Conservation (TDEC), and the U.S. Department of Energy (DOE) requires that all tanks, which have been removed from service and are designated in the FFA as Category D, must be remediated in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements. The Environmental Restoration Program's inactive tank removal program strategy and plans for remediating the inactive LLLW tanks were documented in a report issued in January 1995 (Inactive Tanks Remediation Program Strategy and Plans for Oak Ridge National Laboratory, Oak Ridge, Tennessee, ORNL/ER-297). The inactive (Category D) tanks were initially screened for remediation according to risk, remediation technology required, level of instrumentation available, interferences with other piping and equipment, location, and available sludge removal techniques and storage requirements. On the basis of this preliminary screening, the tanks were assigned to one of five batches (I through V) for consideration of remedial action alternatives, and these batches were tentatively scheduled for remedial actions. The eight links tentatively assigned to Batch I were divided into two groups (Series I and Series II).

2171 (ORNL/ER–345) **Annual summary report on the surveillance and maintenance activities for the Oak Rige National Laboratory Environmental Restoration Program for fiscal year 1995.** Oak Ridge National Lab., TN (United States); Stoller (S.M.) Corp., Oak Ridge, TN (United States). Nov 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006669. Source: OSTI; NTIS; INIS; GPO Dep.

This Annual Summary Report on the Surveillance and Maintenance Activities for the Oak Ridge National Laboratory Environmental Restoration Program for Fiscal Year 1995 was prepared to communicate the accomplishments of the Program during fiscal year 1995. This work was performed under work breakdown structure element 1.4.12.6.1.14.20 (activity data sheet 3314, "Remedial Action Surveillance and Maintenance"). Publication of this document meets the Life Cycle Baseline milestone date of November 30, 1995. This document provides the accomplishments for both the Remedial Action and Decontamination and Decommissioning Surveillance and Maintenance programs.

2172 (ORNL/ER–347) **HAZWOPER project documents for demolition of the Waste Evaporator Facility, Building 3506, at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Allied Technology Group, Inc., Oak Ridge, TN (United States). Mar 1996. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96009987. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This document, in support of the Waste Evaporator Facility (WEF) demolition project and contains the Project Work Plan and the Project Health and Safety Plan for demolition and partial remediation actions by ATG at the Waste Evaporator Facility, Building 3506. Various activities will be conducted during the course of demolition, and this plan provides details on the work steps involved, the identification of hazards, and the health and safety practices necessary to mitigate these hazards. The objective of this document is to develop an approach for implementing demolition activities at the WEF. This approach is based on prior site characterization information and takes into account all of the known hazards at this facility. The Project Work Plan provides instructions and requirements for identified work steps that will be utilized during the performance of demolition, while the Health and Safety Plan addresses the radiological, hazardous material exposure, and industrial safety concerns that will be encountered.

2173 (ORNL/ER–355) **Molten Salt Reactor Experiment Facility (Building 7503) standards/requirements identification document adherence assessment plan at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Feb 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006674. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

This is the Phase 2 (adherence) assessment plan for the Building 7503 Molten Salt Reactor Experiment (MSRE) Facility standards/requirements identification document (S/RID). This document outlines the activities to be conducted from FY 1996 through FY 1998 to ensure that the standards and requirements identified in the MSRE S/RID are being implemented properly. This plan is required in accordance with the Department of Energy Implementation Plan for Defense Nuclear Facilities Safety Board Recommendation 90-2, November 9, 1994, Attachment 1A. This plan addresses the major aspects of the adherence assessment and will be consistent with Energy Systems procedure QA-2. 7 "Surveillances."

2174 (ORNL/ER–370/R1) **Health and safety plan for the Isotopes Facilities Deactivation Project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Aug 1996. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96013409. Source: OSTI; NTIS; INIS; GPO Dep.

This HASP describes the process for identifying the requirements, written safety documentation, and procedures for protecting personnel involved in the Isotopes Facilities Deactivation Project. Objective of this project is to place 19 former isotope production facilities at ORNL in a safe condition in anticipation of an extended period of minimum surveillance and maintenance.

2175 (ORNL/ER–376) **Project management plan for the isotopes facilities deactivation project at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Aug 1996. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012622. Source: OSTI; NTIS; INIS; GPO Dep.

Purpose of the deactivation project is to place former isotopes production facilities at ORNL in a safe, stable, and environmentally sound condition suitable for an extended period of minimum surveillance and maintenance. This management plan was prepared to document project objectives, define organizational relationships and responsibilities, and outline the management control systems. The project has adopted the strategy of deactivating the simple facilities first. The plan provides a road map for the quality assurance program and identifies other documents supporting the Isotopes Facilities Deactivation Project.

2176 (ORNL/RASA–94/3) **Results of the supplementary radiological survey at the former C. H. Schnoor and Company site, 644 Garfield Street, Springdale, Pennsylvania (CVP001).** Coleman, R.L.; Murray, M.E.; Brown, K.S. Oak Ridge National Lab., TN (United States). Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012542. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted radiological surveys at the former C. H. Schnoor and Company site, 644 Garfield Street, Springdale, Pennsylvania. The surveys were performed on October 11-13 and November 14-17, 1993, in order to provide a complete characterization prior to site remediation. The surveys included a gamma scan and a scan for surface contamination from alpha and beta-gamma emitters; measurement of direct and removable alpha and beta-gamma levels; systematic FIDLER measurements at the surface of the concrete; and the collection of samples from boreholes for radionuclide analysis. Results of the surveys revealed radionuclide concentrations and surface contamination levels in excess of applicable DOE guidelines for ^{238}U. Radionuclide distributions were higher than typical background levels for ^{238}U in the Springdale, Pennsylvania area.

2177 (ORNL/RASA–95/1) **Results of the independent radiological verification survey at the former C.H. Schnoor and Company Site, 644 Garfield Street, Springdale, Pennsylvania (CPV001).** Murray, M.E. (and others); Brown, K.S.; Foley, R.D. Oak Ridge National Lab., TN (United States). Sep 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000836. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the U.S. Department of Energy (DOE), a team from Oak Ridge National Laboratory (ORNL) conducted an independent radiological verification survey at the former C. H. Schnoor and Company Site in Springdale, Pennsylvania. The survey was performed from August to October of 1994. The purpose of the survey was to verify that the site was remediated to levels below DOE guidelines from FUSRAP sites. Results of the independent radiological verification survey at the former C. H. Schnoor and Company Site confirm that the residual uranium contamination at the site is below DOE FUSRAP guidelines for unrestricted use.

2178 (ORNL/RASA–95/2) **Results of the independent radiological verification survey of the remedial action performed at 525 S. Main Street, Oxford, Ohio, (OXO002).** Kleinhans, K.R.; Rice, D.E.; Murray, M.E.; Carrier, R.F. Oak Ridge National Lab., TN (United States). Apr 1996. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96010626. Source: OSTI; NTIS; INIS; GPO Dep.

Between October 1952 and February 1957, National Lead of Ohio (NLO), a primary contractor for the Atomic Energy Commission (AEC), subcontracted certain uranium machining operations to Alba Craft Laboratory, Incorporated, located at 10-14 West Rose Avenue, Oxford, Ohio. In 1992, personnel from Oak Ridge National Laboratory (ORNL) confirmed the presence of residual radioactive materials from the AEC-related operations in and around the facility in amounts exceeding the applicable Department of Energy (DOE) guidelines. Above-guideline radiation levels were also found both indoors and outdoors at 525 S. Main Street, a private residential property in the immediate vicinity of the Alba Craft site. This document reports the findings at this private residence. Although the amount of uranium found on the properties posed little health hazard if left undisturbed, the levels were sufficient to require remediation to bring radiological conditions into compliance with current guidelines, thus ensuring that the public and the environment are protected. A team from ORNL conducted a radiological verification survey of the property at 525 S. Main Street, between November 1993 and December 1994. The survey was conducted at the request of DOE and included directly measured radiation levels, the collection and analysis of soil samples to determine concentrations of uranium and certain other radionuclides, and comparison of these data to the guidelines.

2179 (ORNL/RASA–95/13) **Radiological survey results at 1 Shady Lane, Lodi, New Jersey (LJ095).** Foley, R.D.; Johnson, C.A. Oak Ridge National Lab., TN (United States). Jul 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016566. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) conducted remedial action at the Stepan property in Maywood, New Jersey and several vicinity properties in Lodi, New Jersey as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP). These properties are in the vicinity of the DOE-owned Maywood Interim Storage Site (MISS), adjacent to the former Maywood Chemical Works facility. The property at One Shady Lane, Lodi, New Jersey was not one of these vicinity properties but was surveyed by DOE at the request of the owner. At the request of DOE, a team from Oak Ridge National Laboratory conducted a radiological survey at this property. The purpose of the survey, conducted in November 1994, was to confirm whether remedial actions were to be performed on the property in order to be in compliance with the identified Guidelines. The radiological survey included surface gamma scans and gamma readings at 1 meter, and the collection of soil samples for radionuclide analysis. Results of the survey demonstrated that all radiological measurements on the property at One Shady Lane, Lodi, New Jersey, were comparable to background levels in the area, and well within the limits prescribed by DOE radiological guidelines. Based on the results of the radiological survey data, this property does not meet guidelines for inclusion under FUSRAP.

2180 (ORNL/RASA–95/14) **Results of the radiological verification survey at the former Herring-Hall-Marvin Safe Company, 1550 Grand Boulevard, Hamilton Ohio (HO001V).** Murray, M.E.; allred, J.F.; Johnson, C.A. Oak Ridge National Lab., TN (United States). Nov 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003584. Source: OSTI; NTIS; INIS; GPO Dep.

During the period between the 1940s and early 1950s, the Herring-Hall-Marvin Safe Company, 1550 Grand Boulevard, Hamilton, Ohio, was one company under subcontract to the Manhattan Engineer District (MED), and the Atomic Energy Commission (AEC), the lead agencies in the development of nuclear energy for defense-related projects. The US Department of Energy (DOE) conducted radiological surveys of these sites to evaluate current radiological conditions as part of the Formerly Utilized Sites Remedial Action Program

(FUSRAP). In 1988, a radiological survey of the Herring-Hall-Marvin Safe Company facility was conducted, and after small fragments of uranium metal were removed, no beta or gamma radiation above background was detected and the building was dismissed from any additional DOE restrictions. In 1993, it was discovered that a portion of the actual machining work was conducted on the third floor of the facility, located in the southeastern comer of the building. At the request of DOE, this part of the facility was radiologically surveyed by an ORNL survey team to determine whether fixed surface contamination could be found that might exceed the DOE guidelines. Results of this radiological survey indicated ^{238}U contamination in excess of the DOE criteria for surface contamination, and the site was recommended for remediation. In February and March of 1995, a verification survey of the third floor of the former Herring-Hall-Marvin Safe Company facility by an ORNL survey team was performed in conjunction with decontamination operations conducted under the supervision of Bechtel National Incorporated. The verification survey included gamma scans at the surface and at one meter, alpha and beta-gamma scans for fixed contamination, and smears for transferable contamination.

2181 (ORNL/RASA–95/15) **Results of the independent radiological verification survey at the former Associate Aircraft Tool and Manufacturing Company site, Fairfield, Ohio (FOH001).** Rice, D.E.; Murray, M.E.; Brown, K.S. Oak Ridge National Lab., TN (United States). Jan 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006026. Source: OSTI; NTIS; INIS; GPO Dep.

The former Associate Aircraft Tool and Manufacturing Company site is located at 3550 Dixie Highway, Fairfield, Ohio. Associate Aircraft Tool and Manufacturing Company produced hollow uranium slugs in a machine shop at the site in 1956. The work was performed for National Lead of Ohio in a contract with the Atomic Energy Commission to augment the capacity of the Feed Materials Production Center at Fernald in the development of nuclear energy for defense-related projects. The current occupant of the building, Force Control, operates a multipurpose machine shop. At the request of the US Department of Energy (DOE), a team from Oak Ridge National Laboratory conducted an independent radiological verification survey at the former Associate Aircraft Tool and Manufacturing Company Site, Fairfield, Ohio. The survey was performed from February to May of 1995. The purpose of the survey was to verify that radioactivity from residues of ^{238}U was remediated to a level below acceptable DOE guidelines levels.

2182 (ORNL/RASA–95/16) **Results of the independent radiological verification survey at 4400 Piehl Road, Ottawa Lake, Michigan (BTO002).** Murray, M.E.; Brown, K.S. Oak Ridge National Lab., TN (United States). Apr 1996. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96011220. Source: OSTI; NTIS; INIS; GPO Dep.

At the request of the US Department of Energy (DOE), a team from Oak Ridge National Laboratory (ORNL) conducted an independent radiological verification survey at Ottawa Lake, Michigan. The survey was performed in November and December of 1994. The purpose of the survey was to verify that the site was remediated to levels below the DOE guidelines for FUSRAP sites. Results of the independent radiological verification survey at Ottawa Lake, Michigan confirm that the residual uranium contamination at the site is below DOE FUSRAP guidelines for unrestricted use.

2183 (ORNL/TM–12968) **Results of the independent radiological verification survey of the remedial action performed at the former Alba Craft Laboratory site, Oxford, Ohio, (OXO001).** Kleinhans, K.R.; Murray, M.E.; Carrier, R.F. Oak Ridge National Lab., TN (United States). Apr 1996. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96010625. Source: OSTI; NTIS; INIS; GPO Dep.

Between October 1952 and February 1957, National Lead of Ohio (NLO), a primary contractor for the Atomic Energy Commission (AEC), subcontracted certain uranium machining operations to Alba Craft Laboratory, Incorporated, located at 10-14 West Rose Avenue, Oxford, Ohio. In 1992, personnel from Oak Ridge National Laboratory (ORNL) confirmed the presence of residual radioactive materials from the AEC-related operations in and around the facility in amounts exceeding the applicable Department of Energy (DOE) guidelines. Although the amount of uranium found on the property posed little health hazard if left undisturbed, the levels were sufficient to require remediation to bring radiological conditions into compliance with current guidelines, thus ensuring that the public and the environment are protected. A team from ORNL conducted a radiological verification survey of the former Alba Craft Laboratory property between December 1994 and February 1995. The survey was conducted at the request of DOE and included directly measured radiation levels, the collection and analysis of soil samples to determine concentrations of uranium and certain other radionuclides, and comparison of these data to the guidelines. This document reports the findings of this survey. The results of the independent verification survey of the former Alba Craft Laboratory property demonstrate that all contaminated areas have been remediated to radionuclide concentrations and activity levels below the applicable guideline limits set by DOE.

2184 (ORNL/TM–13026) **Thermal analysis to support decommissioning of the molten salt reactor experiment.** Sulfredge, C.D.; Morris, D.G.; Park, J.E.; Williams, P.T. Oak Ridge National Lab., TN (United States). Jun 1996. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96011585. Source: OSTI; NTIS; INIS; GPO Dep.

As part of the decommissioning process for the Molten Salt Reactor Experiment (MSRE) at Oak Ridge National Laboratory, several thermal-sciences issues were addressed. Apparently a mixture of UF_6 and F_2 had diffused into the upper portion of one charcoal column in the MSRE auxiliary charcoal bed (ACB), leading to radiative decay heating and possible chemical reaction sources. A proposed interim corrective action was planned to remove the water from the ACB cell to reduce criticality and reactivity concerns and then fill the ACB cell with an inert material. This report describes design of a thermocouple probe to obtain temperature measurements for mapping the uranium deposit, as well as development of steady-state and transient numerical models for the heat transfer inside the charcoal column. Additional numerical modeling was done to support filling of the ACB cell. Results from this work were used to develop procedures for meeting the goals of the MSRE Remediation Project without exceeding appropriate thermal limits.

2185 (ORNL/TM–13098) **Demonstration recommendations for accelerated testing of concrete**

decontamination methods. Dickerson, K.S.; Ally, M.R.; Brown, C.H.; Morris, M.I.; Wilson-Nichols, M.J. Oak Ridge National Lab., TN (United States). Dec 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006024. Source: OSTI; NTIS; INIS; GPO Dep.

A large number of aging US Department of Energy (DOE) surplus facilities located throughout the US require deactivation, decontamination, and decommissioning. Although several technologies are available commercially for concrete decontamination, emerging technologies with potential to reduce secondary waste and minimize the impact and risk to workers and the environment are needed. In response to these needs, the Accelerated Testing of Concrete Decontamination Methods project team described the nature and extent of contaminated concrete within the DOE complex and identified applicable emerging technologies. Existing information used to describe the nature and extent of contaminated concrete indicates that the most frequently occurring radiological contaminants are ^{137}Cs, ^{238}U (and its daughters), ^{60}Co, ^{90}Sr, and tritium. The total area of radionuclide-contaminated concrete within the DOE complex is estimated to be in the range of 7.9×10^8 ft^2or approximately 18,000 acres. Concrete decontamination problems were matched with emerging technologies to recommend demonstrations considered to provide the most benefit to decontamination of concrete within the DOE complex. Emerging technologies with the most potential benefit were biological decontamination, electro-hydraulic scabbling, electrokinetics, and microwave scabbling.

2186 (ORNL/TM–13142) **A descriptive model of the molten salt reactor experiment after shutdown: Review of FY 1995 progress.** Williams, D.F.; Del Cul, G.D.; Toth, L.M. Oak Ridge National Lab., TN (United States). Jan 1996. 66p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96008017. Source: OSTI; NTIS; INIS; GPO Dep.

During FY 1995 considerable progress was made toward gaining a better understanding of the chemistry and transport processes that continue to govern the behavior of the Molten Salt Reactor Experiment (MSRE). As measurements in the MSRE proceed, laboratory studies continue, and better analyses are available, our understanding of the state of the MSRE and the best path toward remediation improves. Because of the immediate concern about the deposit in the auxiliary charcoal bed (ACB), laboratory studies in the past year focused on carbon-fluorine chemistry. Secondary efforts were directed toward investigation of gas generation from MSRE salts by both radiolytic and nonradiolytic pathways. In addition to the laboratory studies, field measurements at the MSRE provided the basis for estimating the inventory of uranium and fluorine in the ACB. Analysis of both temperature and radiation measurements provided independent and consistent estimates of about 2.6 kg of uranium deposited in the top of the ACB. Further analysis efforts included a refinement in the estimates of the fuel- salt source term, the deposited decay energy, and the projected rate of radiolytic gas generation. This report also provides the background material necessary to explain new developments and to review areas of particular interest. The detailed history of the MSRE is extensively documented and is cited where appropriate. This work is also intended to update and complement the more recent MSRE assessment reports.

2187 (PNL–10615) **Cost update technology, safety, and costs of decommissioning a reference uranium hexafluoride conversion plant.** Miles, T.L.; Liu, Y. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 50p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017599. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this study is to update the cost estimates developed in a previous report, NUREG/CR-1757 (Elder 1980) for decommissioning a reference uranium hexafluoride conversion plant from the original mid-1981 dollars to values representative of January 1993. The cost updates were performed by using escalation factors derived from cost index trends over the past 11.5 years. Contemporary price quotes wee used for costs that have increased drastically or for which is is difficult to find a cost trend. No changes were made in the decommissioning procedures or cost element requirements assumed in NUREG/CR-1757. This report includes only information that was changed from NUREG/CR-1757. Thus, for those interested in detailed descriptions and associated information for the reference uranium hexafluoride conversion plant, a copy of NUREG/CR-1757 will be needed.

2188 (PNL–10651) **Development of a risk-based approach to Hanford Site cleanup.** Hesser, W.A. (Pacific Northwest Lab., Richland, WA (United States)); Daling, P.M.; Baynes, P.A. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 350p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001420. Source: OSTI; NTIS; INIS; GPO Dep.

In response to a request from Mr. Thomas Grumbly, Assistant Secretary of Energy for Environmental Management, the Hanford Site contractors developed a conceptual set of risk-based cleanup strategies that (1) protect the public, workers, and environment from unacceptable risks; (2) are executable technically; and (3) fit within an expected annual funding profile of 1.05 billion dollars. These strategies were developed because (1) the US Department of Energy and Hanford Site budgets are being reduced, (2) stakeholders are dissatisfied with the perceived rate of cleanup, (3) the US Congress and the US Department of Energy are increasingly focusing on risk and riskreduction activities, (4) the present strategy is not integrated across the Site and is inconsistent in its treatment of similar hazards, (5) the present cleanup strategy is not cost-effective from a risk-reduction or future land use perspective, and (6) the milestones and activities in the Tri-Party Agreement cannot be achieved with an anticipated funding of 1.05 billion dollars annually. The risk-based strategies described herein were developed through a systems analysis approach that (1) analyzed the cleanup mission; (2) identified cleanup objectives, including risk reduction, land use, and mortgage reduction; (3) analyzed the existing baseline cleanup strategy from a cost and risk perspective; (4) developed alternatives for accomplishing the cleanup mission; (5) compared those alternatives against cleanup objectives; and (6) produced conclusions and recommendations regarding the current strategy and potential risk-based strategies.

2189 (PNL–10855) **Assessment of unabated facility emission potentials for evaluating airborne radionuclide monitoring requirements at Pacific Northwest National Laboratory - 1995.** Ballinger, M.Y.; Jette, S.J.; Sula, M.J. Pacific Northwest Lab., Richland, WA (United States). Nov 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002887. Source: OSTI; NTIS; INIS; GPO Dep.

Assessments were performed to evaluate compliance with the airborne radionuclide emission monitoring requirements in the National Emission Standards for Hazardous Air Pollutants. In these assessments, potential unabated offsite doses were evaluated for 31 emission locations at the US DOE's Pacific Northwest National Laboratory on the Hanford Site. Four buildings met Sate and Federal critical for continuous sampling of airborne radionuclide emissions. The assessments were performed using building radionuclide inventory data obtained in 1995.

2190 (SAND–94-0686) **Determination of kinetic coefficients for the simultaneous reduction of sulfate and uranium by Desulfovibrio desulfuricans bacteria.** Tucker, M.D. Sandia National Labs., Albuquerque, NM (United States). May 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95011839. Source: OSTI; NTIS; INIS; GPO Dep.

Uranium contamination of groundwaters and surface waters near abandoned mill tailings piles is a serious concern in many areas of the western United States. Uranium usually exists in either the U(IV) or the U(VI) oxidation state. U(VI) is soluble in water and, as a result, is very mobile in the environment. U(IV), however, is generally insoluble in water and, therefore, is not subject to aqueous transport. In recent years, researchers have discovered that certain anaerobic microorganisms, such as the sulfate-reducing bacteria Desulfovibrio desulfuricans, can mediate the reduction of U(VI) to U(IV). Although the ability of this microorganism to reduce U(VI) has been studied in some detail by previous researchers, the kinetics of the reactions have not been characterized. The purpose of this research was to perform kinetic studies on Desulfovibrio desulficans bacteria during simultaneous reduction of sulfate and uranium and to determine the phase in which uranium exists after it has been reduced and precipitated from solution. The studies were conducted in a laboratory-scale chemostat under substrate-limited growth conditions with pyruvate as the substrate. Kinetic coefficients for substrate utilization and cell growth were calculated using the Monod equation. The maximum rate of substrate utilization (k) was determined to be 4.70 $days^{-1}$ while the half-velocity constant (K_s) was 140 mg/l COD. The yield coefficient (Y) was determined to be 0.17 mg cells/mg COD while the endogenous decay coefficient (k_d) was calculated as 0.072 $days^{-1}$. After reduction, U(IV) Precipitated from solution in the uraninite (UO_2) phase. Uranium removal efficiency as high as 90% was achieved in the chemostat.

2191 (SAND–94-3100C) **Geostatistics and cost-effective environmental remediation.** Rautman, C.A. Sandia National Labs., Albuquerque, NM (United States). 12 Apr 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9609131–1: 5. international geostatistics congress, Wollongong (Australia), 22-27 Sep 1996). Order Number DE96010863. Source: OSTI; NTIS; INIS; GPO Dep.

Numerous sites within the U.S. Department of Energy (DOE) complex have been contaminated with various radioactive and hazardous materials by defense-related activities during the post-World War II era. The perception is that characterization and remediation of these contaminated sites will be too costly using currently available technology. Consequently, the DOE Office of Technology Development has funded development of a number of alternative processes for characterizing and remediating these sites. The former Feed-Materials Processing Center near Fernald, Ohio (USA), was selected for demonstrating several innovative technologies. Contamination at the Fernald site consists principally of particulate uranium and derivative compounds in surficial soil. A field-characterization demonstration program was conducted during the summer of 1994 specifically to demonstrate the relative economic performance of seven proposed advanced-characterization tools for measuring uranium activity of in-situ soils. These innovative measurement technologies are principally radiation detectors of varied designs. Four industry-standard measurement technologies, including conventional, regulatory-agency-accepted soil sampling followed by laboratory geochemical analysis, were also demonstrated during the program for comparative purposes. A risk-based economic-decision model has been used to evaluate the performance of these alternative characterization tools. The decision model computes the dollar value of an objective function for each of the different characterization approaches. The methodology not only can assist site operators to choose among engineering alternatives for site characterization and/or remediation, but also can provide an objective and quantitative basis for decisions with respect to the completeness of site characterization.

2192 (SAND–95-1689) **VAMOS: The verification and monitoring options study: Current research options for in-situ monitoring and verification of contaminant remediation and containment within the vadose zone.** Betsill, J.D. (Sandia National Labs., Albuquerque, NM (United States)); Gruebel, R.D. Sandia National Labs., Albuquerque, NM (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96001761. Source: OSTI; NTIS; INIS; GPO Dep.

The Verification and Monitoring Options Study Project (VAMOS) was established to identify high-priority options for future vadose-zone environmental research in the areas of in-situ remediation monitoring, post-closure monitoring, and containment emplacement and verification monitoring. VAMOS examined projected needs not currently being met with applied technology in order to develop viable monitoring and verification research options. The study emphasized a compatible systems approach to reinforce the need for utilizing compatible components to provide user friendly site monitoring systems. To identify the needs and research options related to vadose-zone environmental monitoring and verification, a literature search and expert panel forums were conducted. The search included present drivers for environmental monitoring technology, technology applications, and research efforts. The forums included scientific, academic, industry, and regulatory environmental professionals as well as end users of environmental technology. The experts evaluated current and future monitoring and verification needs, methods for meeting these needs, and viable research options and directions. A variety of high-priority technology development, user facility, and technology guidance research options were developed and presented as an outcome of the literature search and expert panel forums.

2193 (WHC-SA–2746) **Deactivation and cleanout of the 308 Fuels Laboratory and the 232-Z Incinerator at the Hanford site.** Gerber, M.S.; Bliss, R.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950216–138: Waste management '95, Tucson, AZ (United States), 26

Feb - 2 Mar 1995). Order Number DE95008788. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes the deactivation and source term reduction activities conducted over the recent past in two plutonium-contaminated Hanford Site buildings: the 308 Fuels Development Laboratory and the 232-Z Incinerator. Both of these facilities belong to the U.S. Department of Energy, and the projects are unique success stories carried out in direct support of EM-60 functions and requirements. In both cases the buildings, for different reasons, contained unacceptable amounts of plutonium, and were stabilized and placed in a safe, pre-D&D (decontamination and decommissioning) mode. The concept of deactivation as the last step in the operating life of a facility will be discussed. The need for and requirements of EM-60 transition between operations and D&D, the costs savings, techniques, regulations and lessons learned also will be discussed. This paper describes the strategies that led to successful source term reduction: accurate characterization, cooperation among different divisions within DOE and the Hanford Site, attention to regulations (especially unique in this case since the 232-Z Incinerator has been nominated as a Historic Structure to the National Register of Historic Places), and stakeholder concerns involving the proximity of the 308 Building to the Columbia River. The paper also weaves in the history, missions, and plutonium accumulation of the two buildings. The lessons learned are cogent to many other present and future deactivation activities across the DOE complex and indeed across the world.

2194 (WHC-SA–2761) **Educational understanding of pollution prevention in decontamination and decommissioning/environmental restoration activities.** Betsch, M.D. (Westinghouse Hanford Co., Richland, WA (United States)); Lewis, R.A. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9505111–3: 11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress, Knoxville, TN (United States), 16-18 May 1995). Order Number DE95012573. Source: OSTI; NTIS; INIS; GPO Dep.

Demolishing outdated structures from the US Department of Energy Hanford Site in Washington, generates large quantities of waste which can be minimized. The Hanford cleanup is one of the world's largest and most complex environmental restoration efforts. Approximately 280 square miles of ground water and soil are contaminated; there are more than 80 surplus facilities, including nine shut-down nuclear reactors in various stages of decay; and there are 177 underground waste storage tanks containing highly radioactive waste. In all, 1,500 cleanup sites have been identified and the Environmental Restoration Contractor (ERC) is currently responsible for surveillance and maintenance of 170 structures. A two hour orientation training in pollution prevention was developed by the Westinghouse Hanford Company to provide all Decontamination and Decommissioning/Environmental Restoration (D&D/ER) personnel with the knowledge to apply waste minimization principles during their cleanup activities. The ERC Team Pollution Prevention Workshop serves to communicate pollution prevention philosophies and influences the way D&D/ER projects are conducted at the Hanford Site.

2195 (WHC-SA–2786) **Production reactor disposal on the Hanford site.** Romano, T. (Westinghouse Hanford Co., Richland, WA (United States)); Miller, R.L. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951203–41: PATRAM '95: 11. international conference on packaging and transportation of radioactive materials, Las Vegas, NV (United States), 3-8 Dec 1995). Order Number DE96005194. Source: OSTI; NTIS; INIS; GPO Dep.

One of the many restoration challenges for the Hanford Site is the disposal of eight plutonium production reactors inactive since 1971. In order to minimize environmental and public health and safety impacts disposal alternatives were evaluated in an Environmental Impact Statement (EIS). Alternatives considered were no action, immediate one-piece removal, safe storage followed by deferred one- piece removal, safe storage followed by deferred dismantlement, and in-situ decommissioning. Evaluation of the EIS by the US Department of Energy resulted in the selection of the safe storage followed by one-piece removal alternative, which is discussed in this report.

2196 (WHC-SA–2807-FP) **Resolution of USQ regarding source term in the 232-Z Waste Incinerator Building.** Westsik, G.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-950923–15: 5. international conference on facility-safeguards interface, Jackson Hole, WY (United States), 24-30 Sep 1995). Order Number DE96001599. Source: OSTI; NTIS; INIS; GPO Dep.

The 232-Z Waste Incinerator at the Hanford Plutonium Finishing Plant (PFP) was used to incinerate plutonium-bearing combustible materials generated during normal plant operations. Nondestructive (NDA) measurements performed after the incinerator ceased operations indicated high plutonium loadings in exhaust ductwork near the incinerator glovebox, while the incinerator was found to have only low quantities. Measurements, following a campaign to remove some of the ductwork, resulted in markedly higher assay value for the incinerator glovebox itself. Subsequent assays confirmed the most recent results and pointed to a potential further underestimation of the holdup, in part because of attenuation due to fire brick, which could not be seen easily and which had been reported to not be present. NaI detector based measurements were used to map the deposits. Extended count times, using high resolution Ge detectors helped estimate the isotopic composition of the plutonium and quantify the deposits. Experiments were performed using a Ge detector to obtain adequate corrections for the high attenuation of the incinerator glovebox. Several neutron detectors and detector configurations were employed to understand and quantify the neutron flux. Due to the disparity that was anticipated to occur between the gamma ray and neutron assay results, radiation modeling was used to try to reconcile the divergent results. This was a third aspect of the team's effort, utilizing computer modeling to resolve discrepancies between measurement methods.

2197 (WHC-SA–3035-FP) **Electrical resistivity tomography at the DOE Hanford site.** Narbutovskih, S.M. (Westinghouse Hanford Co., Richland, WA (United States)); Halter, T.D.; Sweeney, M.D.; Daily, W.; Ramirez, A.L. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960477–3: 9. annual symposium on the application of geophysics to engineering and environmental problems, Denver, CO

(United States), 15 Apr - 1 May 1996). Order Number DE96009908. Source: OSTI; NTIS; INIS; GPO Dep.

Recent work at the DOE Hanford site has established the potential of applying Electrical Resistivity Tomography (ERT) for early leak detection under hazardous waste storage facilities. Several studies have been concluded to test the capabilities and limitations of ERT for two different applications. First, field experiments have been conducted to determine the utility of ERT to detect and map leaks from underground storage tanks during waste removal processes. Second, the use of ERT for long term vadose zone monitoring has been tested under different field conditions of depth, installation design, acquisition mode/equipment and infiltration chemistry. This work involves transferring the technology from Lawrence Livermore National Laboratory (LLNL) to the Resource Conservation and Recovery Act (RCRA) program at the DOE Hanford Site. This paper covers field training studies relevant to the second application for long term vadose zone monitoring.

2198 (WHC-SD-C018H-ATP–004) **Project C-018H, 242-A evaporator/PUREX Plant Process Condensate Treatment Facility Instrumentation and Control (I&C).** Dupuis, A. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1995. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014433. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Procedure (ATP) has been prepared to demonstrate that the Collection System Instrumentation & Control System for Project C-018H performs according to design. Specifically, this ATP is designed to verify the following overall system requirements: The input and outputs properly connected to the LCU terminal strips. The control system software conforms to the configuration specified by the logic diagrams, piping and instrumentation diagrams (P&ID), and the LERF operating philosophy. Testing will be performed using actual signals. If actual signals are not available, then simulated signals will be used to complete the tests.

2199 (WHC-SD-C018H-ATR–002) **Electrical/instrumentation acceptance test report for Project C-018H, 242-A Evaporator/PUREX Plant condensate treatment facility.** Compau, R.A. Jr. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); Kaiser Engineers Hanford Co., Richland, WA (United States). 1 Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014425. Source: OSTI; NTIS; INIS; GPO Dep.

This project is part of the 200 Area Effluent Treatment Facility. The acceptance test procedure describes test methods for leak detection units, pump flow switches, pump level control valves, room air temperature monitor, leachate pump status contacts, basin pump status contacts, catch basin leak detector, leachate level monitors, and basin level monitors. These are all components of the C-018H Collection System.

2200 (WHC-SD-C018H-FDC–001-Rev.3) **Project C-018H, 242-A Evaporator/PUREX Plant Process Condensate Treatment Facility, functional design criteria. Revision 3.** Sullivan, N. Westinghouse Hanford Co., Richland, WA (United States). 2 May 1995. 111p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015749. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Functional Design Criteria (FDC) for Project C-018H, the 242-A Evaporator and Plutonium-Uranium Extraction (PUREX) Plant Condensate Treatment Facility (Also referred to as the 200 Area Effluent Treatment Facility [ETF]). The project will provide the facilities to treat and dispose of the 242-A Evaporator process condensate (PC), the Plutonium-Uranium Extraction (PUREX) Plant process condensate (PDD), and the PUREX Plant ammonia scrubber distillate (ASD).

2201 (WHC-SD-CP-CR–036) **PFP supply fan motor starters.** Keck, R.D. Westinghouse Hanford Co., Richland, WA (United States). 31 May 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014309. Source: OSTI; NTIS; INIS; GPO Dep.

The Plutonium Finishing Plant (PFP) is currently stabilizing about 25 kg of Pu sludge; upon completion of this task, PFP will be maintained in a safe standby condition to await decision from the PFP NEPA review. It can take about 10 years to initiate and complete terminal cleanout after this; the facility will then be decommissioned and decontaminated. The 234-5Z ventilation system must continue to operate until terminal cleanout. Part of the ventilation system is the seismic fan shutdown system which shuts down the ventilation supply fans in case of strong earthquake. This document presents criteria for installing solid state, reduced voltage motor starters and isolation contactors for the 8 main ventilation supply fans. The isolation contactors will shutdown the supply fans in event of earthquake.

2202 (WHC-SD-CP-MAR–002) **PUREX Plant deactivation mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013878. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the PUREX Deactivation Project mission analysis is to define the problem to be addressed by the PUREX mission, and to lay the ground work for further system definition. The mission analysis is an important first step in the System Engineering (SE) process. This report presents the results of the PUREX Deactivation Project mission analysis. The purpose of the PUREX Deactivation Project is to prepare PUREX for Decontamination and Decommissioning within a five year time frame. This will be accomplished by establishing a passively safe and environmentally secure configuration of the PUREX Plant, that can be preserved for a 10-year horizon. During deactivation, appropriate portions of the safety envelop will be maintained to ensure deactivation takes place in a safe and regulatory compliant manner.

2203 (WHC-SD-CP-OCD–040-Rev.1) **Basis document for sludge stabilization. Revision 1.** Dayley, L. Westinghouse Hanford Co., Richland, WA (United States). 5 Apr 1995. 103p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010701. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the technical basis for the operating specifications to be used in the Sludge Stabilization Process at the Plutonium Finishing Plant.

2204 (WHC-SD-CP-OTR–152) **Closed loop cooling operation with MICON.** Navarro, G.E. Westinghouse Hanford Co., Richland, WA (United States). 11 May 1995.

48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012580. Source: OSTI; NTIS; INIS; GPO Dep.

This Operability Test Procedure (OTP) provides instructions for testing the Closed Loop Cooling System interface with the MICON Terminal at the Plutonium Finishing Plant located at the 200 West Area of the Hanford Site. The Closed Loop Cooling System consists of several primary loops and a single secondary cooling loop. The test objectives are to functionally prove the interlocks and instruments of the closed loop cooling system with the MICON and to show operability of the system from the MICON Terminal. Any out of tolerance readings during the test will be adjusted immediately or with a new calibration package at a later time per cognizant engineers direction.

2205 (WHC-SD-CP-OTR–153) **PFP Wastewater Sampling Facility.** Hirzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 11 May 1995. 35p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012578. Source: OSTI; NTIS; INIS; GPO Dep.

This test report documents the results obtained while conducting operational testing of the sampling equipment in the 225-WC building, the PFP Wastewater Sampling Facility. The Wastewater Sampling Facility houses equipment to sample and monitor the PFP's liquid effluents before discharging the stream to the 200 Area Treated Effluent Disposal Facility (TEDF). The majority of the streams are not radioactive and discharges from the PFP Heating, Ventilation, and Air Conditioning (HVAC). The streams that might be contaminated are processed through the Low Level Waste Treatment Facility (LLWTF) before discharging to TEDF. The sampling equipment consists of two flow-proportional composite samplers, an ultrasonic flowmeter, pH and conductivity monitors, chart recorder, and associated relays and current isolators to interconnect the equipment to allow proper operation. Data signals from the monitors are received in the 234-5Z Shift Office which contains a chart recorder and alarm annunciator panel. The data signals are also duplicated and sent to the TEDF control room through the Local Control Unit (LCU). Performing the OTP has verified the operability of the PFP wastewater sampling system. This Operability Test Report documents the acceptance of the sampling system for use.

2206 (WHC-SD-CP-SDD–004-Rev.2) **Definition and means of maintaining the supply ventilation system seismic shutdown portion of the PFP safety envelope. Revision 2.** Keck, R.D. Westinghouse Hanford Co., Richland, WA (United States). 27 Jun 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015547. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the modifications to the ventilation system for the Plutonium Finishing Plant. Topics discussed in this report include; system functional requirements, evaluations of equipment, a list of drawings showing the safety envelope boundaries; list of safety envelope equipment, functional requirements for individual safety envelope equipment, and a list of the operational, maintenance and surveillance procedures necessary to operate and maintain the system equipment.

2207 (WHC-SD-EN-AP–186) **105-DR Large Sodium Fire Facility decontamination, sampling, and analysis plan.** Knaus, Z.C. Westinghouse Hanford Co., Richland, WA (United States). 12 Jun 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015654. Source: OSTI; NTIS; INIS; GPO Dep.

This is the decontamination, sampling, and analysis plan for the closure activities at the 105-DR Large Sodium Fire Facility at Hanford Reservation. This document supports the 105-DR Large Sodium Fire Facility Closure Plan, DOE-RL-90-25. The 105-DR LSFF, which operated from about 1972 to 1986, was a research laboratory that occupied the former ventilation supply room on the southwest side of the 105-DR Reactor facility in the 100-D Area of the Hanford Site. The LSFF was established to investigate fire fighting and safety associated with alkali metal fires in the liquid metal fast breeder reactor facilities. The decontamination, sampling, and analysis plan identifies the decontamination procedures, sampling locations, any special handling requirements, quality control samples, required chemical analysis, and data validation needed to meet the requirements of the 105-DR Large Sodium Fire Facility Closure Plan in compliance with the Resource Conservation and Recovery Act.

2208 (WHC-SD-EN-TI–300) **218 E-8 Borrow Pit Demolition Site clean closure soil evaluation report.** Korematsu-Olund, D.M. Westinghouse Hanford Co., Richland, WA (United States). 12 Jun 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015653. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the sampling activities undertaken and the analytical results obtained in a soil sampling and analyses study performed for the 218 E-8 Borrow Pit Demolition Site (218 E-8 Demolition Site). The 218 E-8 Demolition Site is identified as a Resource Conservation and Recovery Act (RCRA) treatment unit that will be closed in accordance with the applicable laws and regulations. The site was used for the thermal treatment of discarded explosive chemical products. No constituents of concern were found in concentrations indicating contamination of the soil by 218 E-8 Demolition Site activities.

2209 (WHC-SD-FF-CSER–004) **Criticality safety evaluation for long term storage of FFTF fuel in interim storage casks.** Richard, R.F. Westinghouse Hanford Co., Richland, WA (United States). 11 May 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012576. Source: OSTI; NTIS; INIS; GPO Dep.

It has been postulated that a degradation phenomenon, referred to as "hot cell rot", may affect irradiated FFTF mixed plutonium-uranium oxide (MOX) fuel during dry interim storage. "Hot cell rot" refers to a variety of phenomena that degrade fuel pin cladding during exposure to air and inert gas environments. It is thought to be a form of caustic stress corrosion cracking or environmentally assisted cracking. Here, a criticality safety analysis was performed to address the effect of the "hot cell rot" phenomenon on the long term storage of irradiated FFTF fuel in core component containers. The results show that seven FFTF fuel assemblies or six Ident-69 pin containers stored in core component containers within interim storage casks will remain safely subcritical.

2210 (WHC-SD-FF-HC–002-Rev.1) **Hazard categorization and baseline documentation for the Sodium Storage Facility. Revision 1.** Bowman, B.R. Westinghouse Hanford Co., Richland, WA (United States). 16 Jun 1995. 8p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC06-87RL10930. Order Number DE95016341. Source: OSTI; NTIS; INIS; GPO Dep.

Hazard Categorization evaluation has been performed in accordance with DOE-STD-1027 for the Sodium Storage Facility at FFTF and a determination of less than Category 3 or non-nuclear has been made. Hazard Baseline Documentation has been performed in accordance with DOE-EM-STD-5502 and a determination of "Radiological Facility" has been made.

2211 (WHC-SD-FF-MAR–001) **FFTF Plant transition mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 25 May 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013564. Source: OSTI; NTIS; INIS; GPO Dep.

FFTF (Fast Flux Test Facility) is a 400-MW(t) sodium-cooled, fast flux test reactor at Hanford, designed to test fuels and materials for advanced nuclear power plants; it has no capability for generating electric power. Since a long-term mission could not be found for FFTF, it was placed in standby, and a recommendation was made that it be shut down. Purpose of the FFTF Transition Project is to prepare it for Decontamination and Decommissioning; this will be accomplished by establishing a passively safe and environmentally secure configuration, that can be preserved for several decades. This report presents the results of the mission analysis, which is required by Hanford systems engineering procedures.

2212 (WHC-SD-FF-TRP–019) **Effect of long-term thermal aging on the fracture toughness of austenitic stainless steel base and weld metals.** Huang, F.F. Westinghouse Hanford Co., Richland, WA (United States). 27 Sep 1995. 128p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050016. Source: OSTI; NTIS; INIS; GPO Dep.

Compact tension specimens taken from FFTF primary piping materials (Type 316 stainless steel (SS) and 16-8-2 SS weld metal) and from reactor vessel materials (304 SS and 308 SS weld metal) were heated in laboratory furnaces from 100,000 hours. Fracture toughness testing was performed on these specimens, which are 7.62- and 25.4-mm thick, respectively at the aging temperature (482 and 427 degrees). Results were analyzed with the multiple-specimen method. Thermal aging continues to reduce the fracture toughness of FFTF component materials. Results show that thermal aging has a strong effect on the toughness degradation of weld metals, particularly for 16-8-2 SS weld whose aged/unaged Jc ratio is only 0.31 after 100,000-hour aging. The fracture toughness of the 308 and 16-8-2 SS weld metals fluctuated during 20,000 to 50,000-hour aging but deteriorated as the aging time increased to 100,000 hours; the toughness degradation is significant. Fracture control based on a fracture mechanics approach should be considered

2213 (WHC-SD-FL-MAR–001) **308 Building deactivation mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013900. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the 308 Building (Fuels Development Laboratory) Deactivation Project mission analysis. Hanford systems engineering (SE) procedures call for a mission analysis. The mission analysis is an important first step in the SE process. The functions and requirements to successfully accomplish this mission, the selected alternatives and products will later be defined using the SE process.

2214 (WHC-SD-FL-MAR–002) **300 Area fuel supply facilities deactivation mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013882. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the 300 Area fuel supply facilities (formerly call "N reactor fuel fabrication facilities") Deactivation Project mission analysis. Hanford systems engineering (SE) procedures call for a mission analysis. The mission analysis is an important first step in the SE process.

2215 (WHC-SD-NR-ISB–001) **Interim safety basis for fuel supply shutdown facility.** Brehm, J.R.; Deobald, T.L.; Benecke, M.W.; Remaize, J.A. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013349. Source: OSTI; NTIS; INIS; GPO Dep.

This ISB in conjunction with the new TSRs, will provide the required basis for interim operation or restrictions on interim operations and administrative controls for the Facility until a SAR is prepared in accordance with the new requirements. It is concluded that the risk associated with the current operational mode of the Facility, uranium closure, clean up, and transition activities required for permanent closure, are within Risk Acceptance Guidelines. The Facility is classified as a Moderate Hazard Facility because of the potential for an unmitigated fire associated with the uranium storage buildings.

2216 (WHC-SD-SNF-CM–001) **Spent Nuclear Fuel Project Configuration Management Plan.** Reilly, M.A. Westinghouse Hanford Co., Richland, WA (United States). 9 Jun 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015582. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a rewrite of the draft "C" that was agreed to "in principle" by SNF Project level 2 managers on EDT 609835, dated March 1995 (not released). The implementation process philosphy was changed in keeping with the ongoing reengineering of the WHC Controlled Manuals to achieve configuration management within the SNF Project.

2217 (WHC-SD-SNF-DQO–004) **Data quality objectives for the initial fuel conditioning examinations.** Lawrence, L.A. Westinghouse Hanford Co., Richland, WA (United States). 23 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014310. Source: OSTI; NTIS; INIS; GPO Dep.

The Data Quality Objectives (DQOs) were established for the response of the first group of fuel samples shipped from the K West Basin to the Hanford 327 Building hot cells for examinations to the proposed Path Forward conditioning process. Controlled temperature and atmosphere furnace testing testing will establish performance parameters using the conditioning process (drying, sludge drying, hydride decomposition passivation) proposed by the Independent Technical Assessment (ITA) Team as the baseline.

2218 (WHC-SD-SNF-SD–003-Vol.2) **Spent Nuclear Fuel Project technical baseline document fiscal year 1995. Volume 2: Supporting data.** Cramond, R. (TRW, Inc., Cleveland, OH (United States)); Paedon, R.J.; Ghigleri, T. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 315p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010600. Source: OSTI; NTIS; INIS; GPO Dep.

Volume 2 of this SNFP technical baseline document presents the data which supports the information contained in Volume 1 of this document, Baseline Description. This document presents the results of the SNFP systems engineering analyses since September 1994. The mission of the Spent Nuclear Fuel Project at Hanford is to provide safe, economic, and environmentally sound management of Hanford SNF in a manner that stages it to final disposition. Spent fuels include what are in the K Basins, various buildings throughout the site, and fuels from the FFTF.

2219 (WHC-SD-SNF-TC–004) **Development test procedure High Pressure Water Jet System.** Crystal, J.B. Westinghouse Hanford Co., Richland, WA (United States). 5 Jun 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015584. Source: OSTI; NTIS; INIS; GPO Dep.

Development testing will be performed on the water jet cleaning fixture to determine the most effective arrangement of water jet nozzles to remove contamination from the surfaces of canisters and other debris. The following debris may be stained with dye to simulate surface contaminates: Mark O, Mark I, and Mark II Fuel Storage Canisters (both stainless steel and aluminum), pipe of various size, (steel, stainless, carbon steel and aluminum). Carbon steel and stainless steel plate, channel, angle, I-beam and other surfaces, specifically based on the Scientific Ecology Group (SEG) inventory and observations of debris within the basin. Test procedure for developmental testing of High Pressure Water Jet System.

2220 (WHC-SD-SP-MAR–001) **309 Building deactivation mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 24p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013884. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of the 309 Building (Plutonium Fuels Utilization Program) Deactivation Project mission analysis. Hanford systems engineering (SE) procedures call for a mission analysis. The mission analysis is an important first step in the SE process. The functions and requirements to successfully accomplish this mission, the selected alternatives and products will later be defined using the SE process.

2221 (WHC-SD-W059-DR–001) **Engineer/Constructor Management Plan B-Plant Canyon Ventilation Upgrade Project W-059.** Condron, J.D. ICF Kaiser Hanford Co., Richland, WA (United States). 27 Apr 1995. 131p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011545. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the conceptual design for Project W-059, B Plant Canyon Ventilation Upgrade.

2222 (WHC-SD-W236A-ER–021-Rev.2) **Multi-Function Waste Tank Facility phase out basis. Revision 2.** Awadalla, N.G. Westinghouse Hanford Co., Richland, WA (United States). 9 Jun 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014308. Source: OSTI; NTIS; INIS; GPO Dep.

Additional double-shell tank storage capacity is not needed until FY 2004 or later. The waste volume in the current baseline program can be managed within the existing tank capacity. However, this requires implementation of some risk management actions and significant investment in software and hardware to accomplish the actions necessary to maximize use of existing storage tank space.

2223 (WHC-SD-W236A-TI–07) **Position paper: Live load design criteria for Project W-236A Multi-Function Waste Tank Facility.** Giller, R.A. ICF Kaiser Hanford Co., Richland, WA (United States). 9 Jun 1995. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015747. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this paper is to discuss the live loads applied to the underground storage tanks of the Multi Function Waste Tank Facility, and to provide the basis for Project W-236A live load criteria. Project 236A provides encompasses building a Weather Enclosure over the two underground storage tanks at the 200-West area. According to the Material Handling Study, the Groves AT 1100 crane used within the Weather Enclosure will have a gross vehicle weight of 66.5 tons. Therefore, a 100-ton concentrated live load is being used for the planning of the construction of the Weather Enclosure.

2224 (WHC-SD-W259-ACDR–001) **Advanced conceptual design report: T Plant secondary containment and leak detection upgrades. Project W-259.** Hookfin, J.D. Westinghouse Hanford Co., Richland, WA (United States). 12 May 1995. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013337. Source: OSTI; NTIS; INIS; GPO Dep.

The T Plant facilities in the 200-West Area of the Hanford site were constructed in the early 1940s to produce nuclear materials in support of national defense activities. T Plant includes the 271-T facility, the 221-T facility, and several support facilities (eg, 2706-T), utilities, and tanks/piping systems. T Plant has been recommended as the primary interim decontamination facility for the Hanford site. Project W-259 will provide capital upgrades to the T Plant facilities to comply with Federal and State of Washington environmental regulations for secondary containment and leak detection. This document provides an advanced conceptual design concept that complies with functional requirements for the T Plant Secondary Containment and Leak Detection upgrades.

2225 (WHC-SD-WM-AP–037) **Alternatives for the disposition of PUREX organic solution.** Nelson, D.W. Westinghouse Hanford Co., Richland, WA (United States). 16 Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015794. Source: OSTI; NTIS; INIS; GPO Dep.

This Supporting Document submits options and recommendations for final management of Tank 40 Plutonium-Uranium Extraction (PUREX) Plant organic solution per Tri-Party Agreement Milestorm Number M-80-00-T03. Hanford is deactivating the PUREX Plant for the US DOE. One the key element of this Deactivation is disposition of approximately 81,300 liters (21,500 gallons) of slightly radioactively contaminated organic solution to reduce risk to the environment, reduce cost of long-term storage, and assure regulatory compliance. An announcement in the Commerce Business Daily (CBD) on October 14, 1994 has resulted in the submission of proposals from two facilities capabLe of receiving and thermally destroying the solution. Total decomposition by thermal destruction is the recommended option for the disposition of the PUREX organic solution and WHC is evaluating the proposals from the two facilities.

2226 (WHC-SD-WM-DRR–049) **Flexible receiver adapter formal design review.** Krieg, S.A. Westinghouse Hanford Co., Richland, WA (United States). 13 Jun 1995. 316p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015788. Source: OSTI; NTIS; INIS; GPO Dep.

This memo summarizes the results of the Formal (90%) Design Review process and meetings held to evaluate the design of the Flexible Receiver Adapters, support platforms, and associated equipment. The equipment is part of the Flexible Receiver System used to remove, transport, and store long length contaminated equipment and components from both the double and single-shell underground storage tanks at the 200 area tank farms.

2227 (WHC-SD-WM-ES–283-Vol.1) **Long-term decontamination engineering study. Volume 1.** Geuther, W.J. Westinghouse Hanford Co., Richland, WA (United States). 3 Apr 1995. 154p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010930. Source: OSTI; NTIS; INIS; GPO Dep.

This report was prepared by Westinghouse Hanford Company (WHC) with technical and cost estimating support from Pacific Northwest Laboratories (PNL) and Parsons Environmental Services, Inc. (Parsons). This engineering study evaluates the requirements and alternatives for decontamination/treatment of contaminated equipment at the Hanford Site. The purpose of this study is to determine the decontamination/treatment strategy that best supports the Hanford Site environmental restoration mission. It describes the potential waste streams requiring treatment or decontamination, develops the alternatives under consideration establishes the criteria for comparison, evaluates the alternatives, and draws conclusions (i.e., the optimum strategy for decontamination). Although two primary alternatives are discussed, this study does identify other alternatives that may warrant additional study. hanford Site solid waste management program activities include storage, special processing, decontamination/treatment, and disposal facilities. This study focuses on the decontamination/treatment processes (e.g., waste decontamination, size reduction, immobilization, and packaging) that support the environmental restoration mission at the Hanford Site.

2228 (WHC-SD-WM-ES–283-Vol.2) **Long-term decontamination engineering study: Appendix A, Appendix B, Appendix C, Appendix D. Volume 2.** Westinghouse Hanford Co., Richland, WA (United States). [1995]. 400p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010931. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains Appendix A,B,C, and D for the Long-Term Decontamination Study and is a compilation of presentations, draft documents, and supporting documents compiled by the Westinghouse Hanford Company T Plant Systems Engineering Team (TPSET). This information was not formally approved, but provides insight into understanding the uncertainty associated with waste stream projections, facility evaluations, and possible alternatives for decontamination/treatment. This information was used in developing and refining the decontamination/treatment alternatives considered in this study.

2229 (WHC-SD-WM-ES–283-Vol.3) **Long-term decontamination engineering study. Volume 3: Appendix E, Appendix F, Appendix G, Appendix H.** Geuther, W.J. Westinghouse Hanford Co., Richland, WA (United States). [1995]. 609p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010932. Source: OSTI; NTIS; INIS; GPO Dep.

Appendix E contains a T plant condition and viability assessment. Appendix F describes the upgrades recommended by the viability assessment provided in Appendix D. Appendix G contains cost estimating information for the two T plant scenarios. Scenario 1 is the previously estimated and evaluated Long Term/Long Length option and Scenario 2 is the Full Service option, also previously estimated and evaluated. Appendix H contains costs estimating information for the two New Facility scenarios. Scenario 1 is the annex facility proposed to be placed near the existing 2706-T Facility. Scenario 2 is the large, full service, new facility previously estimated and evaluated.

2230 (WHC-SD-WM-ES–315) **T Plant canyon deck-level allowable floor-load study.** Barlow, D.E. Westinghouse Hanford Co., Richland, WA (United States). 19 Apr 1995. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010942. Source: OSTI; NTIS; INIS; GPO Dep.

T Plant is to become a decontamination facility for the Hanford Site. This mission will require that large pieces of equipment be installed on the deck-level floor of the canyon in 221-T building. The objective of this study is to determine the maximum loads that can be applied safely to the canyon deck-level floor. These loads are caused by the weight of installed equipment. These load limits are to be used as design limits for the installation of the new equipment. The load limits for normal operating conditions are based on American Concrete Institute (ACI) 318.1 permissible stresses. The various floor configurations in building sections 1 through 20 are considered. Cover blocks are considered to be installed in all deck openings to create the worst possible case. The building is designated as safety class 3. The internal stresses, resulting from the inertial forces caused by the concrete during horizontal seismic accelerations, are out of scope for this report. They are considered in the seismic analysis of the building section. Vertical reactions when equipment is subjected to overturning moments during horizontal seismic accelerations must be determined and applied as part of the floor load. The new equipment to be installed has relatively small mass compared to the building weight, and there is a 25% reduction in the load factor during seismic events. Thus, the seismic effects are expected to be accommodated within the envelope of this static analysis.

2231 (WHC-SD-WM-MAR–006) **B plant mission analysis report.** Lund, D.P. Westinghouse Hanford Co., Richland, WA (United States). 24 May 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013901. Source: OSTI; NTIS; INIS; GPO Dep.

This report further develops the mission for B Plant originally defined in WHC-EP-0722, "System Engineering

Functions and Requirements for the Hanford Cleanup Mission: First Issue." The B Plant mission analysis will be the basis for a functional analysis that breaks down the B Plant mission statement into the necessary activities to accomplish the mission. These activities are the product of the functional analysis and will then be used in subsequent steps of the systems engineering process, such as identifying requirements and allocating those requirements to B Plant functions. The information in this mission analysis and the functional and requirements analysis are a part of the B Plant technical baseline.

2232 (WHC-SP–1167) **3000 Area Phase 1 environmental assessment.** Ranade, D.G. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003350. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is planning to sell the 3000 Area to prospective buyers. Environmental Services was requested by the WHC Economic Transition group to assess potential environmental liabilities in the area. Historical review of the area indicated that the site was the location of "Camp Hanford" in 1951 and has been used for a variety of purposes since then. The activities in the area have changed over the years. A number of Buildings from the area have been demolished and at least 15 underground storage tanks (USTs) have been removed. Part of the 3000 Area was identified as Operable Unit 1100-EM-3 in the Tri-Party Agreement and was cleaned up by the US Army Corps of Engineers (USACE). The cleanup included removal of contaminated soil and USTS. WHC and ICF KH had also performed sampling and analysis at some locations in the 3000 Area prior to USACE's work on the Operable Unit 1100-EM-3. They removed a number of USTs and performed remediation.

2233 (WSRC-TR–95-0157) **Shielded Cells D&D and Dismantlement System Requirements.** Witherspoon, R.L. Westinghouse Savannah River Co., Aiken, SC (United States). 27 Mar 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95060139. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the basis for the development of the System for Highly Radioactive Equipment Dismantlement or SHRED. It is the result of a thorough investigation into current and past dismantlement practices at shielded cell facilities around the DOE complex. This information has been used to formulate the development requirements for the SHRED.

2234 (WSRC-TR–95-0231) **Chemicals, metals, and pesticide pits waste unit low induction number electromagnetic survey.** Cumbest, R.J.; Mohon, D. Westinghouse Savannah River Co., Aiken, SC (United States). Jun 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002952. Source: OSTI; NTIS; INIS; GPO Dep.

An electromagnetic survey was conducted at the Chemicals, Metals, and Pesticide Waste Unit to identify any buried metallic objects that may be present in the materials used to fill and cover the pits after removal of pit debris. The survey was conducted with a Geonics EM-31 Terrain Conductivity Meter along north - south oriented traverses with 5-ft station intervals to produce a 5-ft by 5-ft square grid node pattern. Both conductivity and in-phase components were measured at each station for vertical dipole orientation with the common axis of the dipoles in the north - south and east - west orientations. The conductivity data clearly show elevated conductivities (2.1 to 7.0 mS/m) associated with the material over the pits, as compared with the surrounding area that is characterized by lower conductivities (1 to 2 mS/m). This is probably the result of the higher clay content of the fill material relative to the surrounding area, which has a higher sand to clay ratio and the presence of a plastic cover beneath the fill that has probably trapped water. Many metal objects are present in the survey area including manhole covers, monitoring well heads, metal, signs, drain culverts, abandoned wells, and BP waste unit marker balls. AU of these exhibit associated conductivity and in-phase anomalies of various magnitude. In addition to these anomalies that can be definitely associated with surface sources, conductivity and in-phase anomalies are also present with no obvious surface source. These anomalies are probably indicative of subsurface buried metallic objects. A high concentration of these objects appears to be present in the southwest corner of the survey area.

2235 (Y/WM–224) **Building 9201-4 at the Oak Ridge Y-12 Site annual surveillance and maintenance report 1994.** Sollenberger, M.L.; Sparkman, D.E.; Reynolds, R.M. Oak Ridge Y-12 Plant, TN (United States). Jan 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003423. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge Y-12 Plant Decontamination and Decommissioning (D&D) Program is part of the Waste Management/D&D Organization and is funded by the Office of Environmental Restoration (EM-40). Strategic goals are to protect human health and environment and to reduce the number of hazardous material-contaminated facilities by properly managing and dispositioning facilities when they are no longer required to fulfill a site mission. The D&D Program objectives include (1) providing surveillance and maintenance (S&M) activities in support of facilities in standby and awaiting D&D; (2) developing specific methods, schedules, and funding plans for the D&D of shutdown facilities; and (3) implementing plans to provide for facility disposition in a safe, compliant, and cost effective manner. Presently Building 9201-4 (Alpha-4) is the only facility at the complex that is in the Y-12 D&D Program. This report provides a status of the program plans and specific S&M requirements for Building 9201-4 as part of the Y-12 D&D Program.

ROBOTICS

Refer also to citation(s) 485, 1224, 1315, 1988, 2095, 2096, 2103, 2463, 2499

2236 (CONF-9410231–3) **Model of rotary-actuated flexible beam with notch filter vibration suppression controller and torque feedforward load compensation controller.** Bills, K.C. (Oak Ridge National Lab., TN (United States)); Kress, R.L.; Kwon, D.S.; Baker, C.P. Oak Ridge National Lab., TN (United States). [1994]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 8. Deneb user group meeting; Detroit, MI (United States); 10-14 Oct 1994. Order Number DE95014254. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes ORNL's development of an environment for the simulation of robotic manipulators. Simulation includes the modeling of kinematics, dynamics, sensors, actuators, control systems, operators, and environments. Models will be used for manipulator design, proposal evaluation, control system design and analysis, graphical preview of proposed motions, safety system development, and training. Of particular interest is the development of models for robotic manipulators having at least one flexible link. As a first application, models have been developed for the Pacific Northwest Laboratory's Flexible Beam Test Bed (PNL FBTB), which is a 1-Degree-of-Freedom, flexible arm with a hydraulic base actuator. ORNL transferred control algorithms developed for the PNL FBTB to controlling IGRIP models. A robust notch filter is running in IGRIP controlling a full dynamics model of the PNL test bed. Model results provide a reasonable match to the experimental results (quantitative results are being determined) and can run on ORNL's Onyx machine in approximately realtime. The flexible beam is modeled as six rigid sections with torsional springs between each segment. The spring constants were adjusted to match the physical response of the flexible beam model to the experimental results. The controller is able to improve performance on the model similar to the improvement seen on the experimental system. Some differences are apparent, most notably because the IGRIP model presently uses a different trajectory planner than the one used by ORNL on the PNL test bed. In the future, the trajectory planner will be modified so that the experiments and models are the same. The successful completion of this work provides the ability to link C code with IGRIP, thus allowing controllers to be developed, tested, and tuned in simulation and then ported directly to hardware systems using the C language.

2237 (CONF-9411197–2) **Fiber optic coherent laser radar 3d vision system.** Sebastian, R.L. (and others); Clark, R.B.; Simonson, D.L. Coleman Research Corp., Springfield, VA (United States). 1994. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31190. From SPIE: International Society for Optical Engineering meeting; Boston, MA (United States); 2-4 Nov 1994. Order Number DE96008768. Source: OSTI; NTIS; INIS; GPO Dep.

Recent advances in fiber optic component technology and digital processing components have enabled the development of a new 3D vision system based upon a fiber optic FMCW coherent laser radar. The approach includes a compact scanner with no moving parts capable of randomly addressing all pixels. The system maintains the immunity to lighting and surface shading conditions which is characteristic of coherent laser radar. The random pixel addressability allows concentration of scanning and processing on the active areas of a scene, as is done by the human eye-brain system.

2238 (CONF-951006–32) **Long range position and orientation tracking system.** Armstrong, G.A.; Jansen, J.F.; Burks, B.L.; Bernacki, B.E.; Nypaver, D.J. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE96005542. Source: OSTI; NTIS; INIS; GPO Dep.

The long range position and orientation tracking system (LRPOTS) will consist of two measurement pods, a VME-based computer system, and a detector array. The system is used to measure the position and orientation of a target that may be attached to a robotic arm, teleoperated manipulator, or autonomous vehicle. The pods have been designed to be mounted in the man-ways of the domes of the Fernald K-65 waste silos. Each pod has two laser scanner subsystems as well as lights and camera systems. One of the laser scanners will be oriented to scan in the pan direction, the other in the tilt direction. As the lasers scan across the detector array, the angles of incidence with each detector are recorded. Combining measurements from each of the four lasers yields sufficient data for a closed-form solution of the transform describing the location and orientation of the Content Mobilization System (CMS). Redundant detectors will be placed on the CMS to accommodate occlusions, to provide improved measurement accuracy, and to determine the CMS orientation.

2239 (CONF-951006–33) **Remote systems for waste retrieval from the Oak Ridge National Laboratory gunite tanks.** Falter, D.D. (Oak Ridge National Lab., TN (United States). Robotics and Process Systems Div.); Babcock, S.M.; Burks, B.L.; Lloyd, P.D.; Randolph, J.D.; Rutenber, J.E.; Van Hoesen, S.D. Oak Ridge National Lab., TN (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE96005647. Source: OSTI; NTIS; INIS; GPO Dep.

As part of a Comprehensive Environmental Response, Compensation, and Liability Act Treatability Study funded by the Department of Energy, the Oak Ridge National Laboratory (ORNL) is preparing to demonstrate and evaluate two approaches for the remote retrieval of wastes in underground storage tanks. This work is being performed to identify the most cost-effective and efficient method of waste removal before full-scale remediation efforts begin in 1998. System requirements are based on the need to dislodge and remove sludge wastes ranging in consistency from broth to compacted clay from Gunite (Shotcrete) tanks that are approaching fifty years in age. Systems to be deployed must enter and exit through the existing 0.6 m (23.5 in.) risers and conduct retrieval operations without damaging the layered concrete walls of the tanks. Goals of this project include evaluation of confined sluicing techniques and successful demonstration of a telerobotic arm-based system for deployment of the sluicing system. As part of a sister project formed on the Old Hydrofracture Facility tanks at ORNL, vehicle-based tank remediation will also be evaluated.

2240 (CONF-951006–36) **Topographical mapping system for hazardous and radiological environments.** Armstrong, G.A. (Oak Ridge National Lab., TN (United States)); Burks, B.L.; Bernacki, B.E.; Pardini, A. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE96005393. Source: OSTI; NTIS; INIS; GPO Dep.

This report focuses on the results of the acceptance test of the Topographical Mapping System (TMS) delivered to the Hanford site. The TMS was tested for accuracy over the specified range of 45 feet. The TMS was also tested to ensure that the unit could be deployed through multiple risers and maintain accuracy and registration of the surface mapping data. In addition, the TMS was disassembled and reassembled and redeployed to test field replacement of modules that make up the sensor head that is deployed in the vapor space of Underground Storage Tanks such as those located at the Hanford site in southeastern Washington State. The results from these tests along with temperature testing on the complete system and radiation testing of selected susceptible components are covered in this report. The primary purpose of the TMS is to generate reliable and accurate three-dimensional maps of the internal surfaces of storage tank. One use for these mapping systems is in creating and maintaining a current map of the tank interior as input to a robotic "world model" that is used to test remediation strategies or plan robot trajectories. Another use is tracking the movement of the waste surface as it responds to expanding bubbles of trapped Gas. A third use of the TMS is to perform a volumetric analysis of the amount of waste removed from the tanks during remediation.

2241 (CONF-951006–37) **Control issues for a hydraulically powered dissimilar teleoperated system.** Jansen, J.F.; Kress, R.L. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 Nov 1995. Order Number DE96005987. Source: OSTI; NTIS; INIS; GPO Dep.

This paper will address two issues associated with the implementation of a hydraulically powered dissimilar master-slave teleoperated system. These issues are the overall system control architecture and the design of robust hydraulic servo controllers for the position control problem. Finally, a discussion of overall system performance on an actual teleoperated system will be presented. (Schilling's Titan II hydraulic manipulators are the slave manipulators and the master manipulators are from the Oak Ridge National Laboratory-developed Advanced Servo Manipulator.)

2242 (CONF-9510307–1) **Long range position and Orientation Tracking System.** Armstrong, G.A. (and others); Jansen, J.F.; Burks, B.L. Oak Ridge National Lab., TN (United States). 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 6. topical meeting on robotics and remote systems; San Francisco, CA (United States); 29 Oct - 2 Nov 1995. Order Number DE96005986. Source: OSTI; NTIS; INIS; GPO Dep.

The long range Position and Orientation Tracking System is an active triangulation-based system that is being developed to track a target to a resolution of 6.35 mm (0.25 in.) and 0.009°(32.4 arcseconds) over a range of 13.72 m (45 ft.). The system update rate is currently set at 20 Hz but can be increased to 100 Hz or more. The tracking is accomplished by sweeping two pairs of orthogonal line lasers over infrared (IR) sensors spaced with known geometry with respect to one another on the target (the target being a rigid body attached to either a remote vehicle or a remote manipulator arm). The synchronization and data acquisition electronics correlates the time that an IR sensor has been hit by one of the four lasers and the angle of the respective mirror at the time of the hit. This information is combined with the known geometry of the IR sensors on the target to determine position and orientation of the target. This method has the advantage of allowing the target to be momentarily lost due to occlusions and then reacquired without having to return the target to a known reference point. The system also contains a camera with operator controlled lighting in each pod that allows the target to be continuously viewed from either pod, assuming their are no occlusions.

2243 (CONF-951135–25) **Practical risk-based decision making: Good decisions made efficiently.** Haire, M.J. (Oak Ridge National Lab., TN (United States)); Guthrie, V.; Walker, D.; Singer, R. Oak Ridge National Lab., TN (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 1995 International mechanical engineering congress and exhibition; San Francisco, CA (United States); 12-17 Nov 1995. Order Number DE96003031. Source: OSTI; NTIS; INIS; GPO Dep.

The Robotics and Process Systems Division of the Oak Ridge National Laboratory and the Westinghouse Savannah River Company have teamed with JBF Associates, Inc. to address risk-based robotic planning. The objective of the project is to provide systematic, risk-based relative comparisons of competing alternatives for solving clean-up problems at DOE facilities. This paper presents the methodology developed, describes the software developed to efficiently apply the methodology, and discusses the results of initial applications for DOE. The paper also addresses current work in applying the approach to problems in other industries (including an example from the hydrocarbon processing industry).

2244 (CONF-960448–13) **Hydraulically powered dissimilar teleoperated system controller design.** Jansen, J.F.; Kress, R.L. Oak Ridge National Lab., TN (United States). 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From IEEE international conference on robotics and automation; Minneapolis, MN (United States); 22-28 Apr 1996. Order Number DE96008644. Source: OSTI; NTIS; INIS; GPO Dep.

This paper will address two issues associated with the implementation of a hydraulically powered dissimilar master-slave teleoperated system. These issues are the overall system control architecture and the design of robust hydraulic servo controllers for the position control problem. Finally, a discussion of overall system performance on an actual teleoperated system will be presented.

2245 (CONF-960448–14) **Workload, flow, and telepresence during teleoperation.** Draper, J.V. (Oak Ridge National Lab., TN (United States)); Blair, L.M. Oak Ridge National Lab., TN (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From IEEE international conference on robotics and automation; Minneapolis, MN (United States); 22-28 Apr 1996. Order Number DE96008805. Source: OSTI; NTIS; INIS; GPO Dep.

There is much speculation about the relations among workload, flow, telepresence, and performance during teleoperation, but few data that provide evidence concerning them. This paper presents results an investigation conducted during completion of a pipe cutting task using a teleoperator at ORNL. Results show support for the hypothesis that telepresence is related to expenditure of attentional resources, and some support for the hypothesis that telepresence is related to flow. The discussion examines the results from an attentional resources perspective on teleoperation.

2246 (DOE/EM–0250) **Robotics Technology Crosscutting Program. Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Jun 1995. 114p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016130. Source: OSTI; NTIS; INIS; GPO Dep.

The Robotics Technology Development Program (RTDP) is a needs-driven effort. A length series of presentations and discussions at DOE sites considered critical to DOE's Environmental Restoration and Waste Management (EM) Programs resulted in a clear understanding of needed robotics applications toward resolving definitive problems at the sites. A detailed analysis of the resulting robotics needs assessment revealed several common threads running through the sites: Tank Waste Retrieval (TWR), Contaminant Analysis Automation (CAA), Mixed Waste Operations (MWO), and Decontamination and Dismantlement (D and D). The RTDP Group also realized that some of the technology development in these four areas had common (Cross Cutting-CC) needs, for example, computer control and sensor interface protocols. Further, the OTD approach to the Research, Development, Demonstration, Testing, and Evaluation (RDDT and E) process urged an additional organizational breakdown between short-term (1–3 years) and long-term (3–5 years) efforts (Advanced Technology-AT). These factors lead to the formation of the fifth application area for Crosscutting and Advanced Technology (CC and AT) development. The RTDP is thus organized around these application areas – TWR, CAA, MWO, D and D, and CC and AT – with the first four developing short-term applied robotics. An RTDP Five-Year Plan was developed for organizing the Program to meet the needs in these application areas.

2247 (DOE/MC/29104–96/C0698) **Rosie: A mobile worksystem for decontamination and dismantlement operations.** Thompson, B.R.; Conley, L. Redzone Robotics, Inc., Pittsburgh, PA (United States). [1996]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29104. (CONF-960443–8: American Nuclear Society (ANS) topical meeting on decontamination and decommissioning, Chicago, IL (United States), 14-17 Apr 1996). Order Number DE96010171. Source: OSTI; NTIS; INIS; GPO Dep.

RedZone Robotics, Inc. and Carnegie Mellon University's Field Robotics Center have undertaken a contract to develop a next-generation worksystem for decommissioning and dismantlement tasks in Department of Energy (DOE) facilities. Currently, the authors are closing the second phase of this three phase effort and have completed the design and fabrication of the worksystem: Rosie. Rosie includes a locomotor, heavy manipulator, control center, and control system for robot operation. The locomotor is an omnidirectional platform with tether management and hydraulic power capabilities. The heavy manipulator is a high-payload, long-reach system intended to deploy tools into the work area. The heavy manipulator is capable of deploying systems such as the Dual-Arm Work Module–a five degree-of-freedom platform supporting two highly dexterous manipulators–or a single manipulator for performing simpler, less dexterous tasks. Rosie is telerobotic to the point of having servo-controlled motions which can be operated and coordinated through the control center.

2248 (DOE/MC/29113–4048) **Integrated computer-enhanced remote viewing system. Quarterly report Number 5, October 1993–December 1993.** Mechanical Technology, Inc., Latham, NY (United States). 22 Feb 1994. 199p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE95011301. Source: OSTI; NTIS; GPO Dep.

The Interactive, Computer-Enhanced, Remote Viewing System (ICERVS) is a system designed to provide a reliable geometric description of a robotic task space in a fashion that enables robotic remediation to be carried out more efficiently and economically that with present systems. The key elements are a faithful way to store empirical data and a friendly user interface that provides an operator with timely access to all that is known about a scene. ICERVS will help an operator to analyze a scene and generate additional geometric data for automating significant portions of the remediation activity. Features that enable this include the following: storage and display of empirical sensor data; ability to update segments of the geometric description of the task space; side-by-side comparisons of a live TV scene and a computer generated view of the same scene; ability to create and display computer models of perceived objects in the task space, together with textual comments, and easy export of data to robotic world models for robot guidance.

2249 (DOE/MC/29115–96/CO562) **An intelligent inspection and survey robot.** Byrd, J.S. South Carolina Universities Research and Education Foundation, Clemson, SC (United States). Strom Thurman Inst. 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29115. (CONF-9510108–23: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003435. Source: OSTI; NTIS; INIS; GPO Dep.

Large quantities of mixed and low-level radioactive waste contained in 55-, 85-, and 110-gallon steel drums are stored at Department of Energy (DOE) warehouses located throughout the United States. The steel drums are placed on pallets and stacked on top of one another, forming a column of drums ranging in heights of one to four drums and up to 16 feet high. The columns of drums are aligned in rows forming an aisle approximately three feet wide between the rows of drums. Tens of thousands of drums are stored in these warehouses throughout the DOE complex. ARIES (Autonomous Robotic Inspection Experimental System), is under development for the DOE to survey and inspect these drums. The robot will navigate through the aisles and perform an inspection operation, typically performed by a human operator, making decisions about the condition of the drums and maintaining a database of pertinent information about each drum.

2250 (DOE/MC/29115–96/CO586) **Mechanical deployment system on aries an autonomous mobile robot.** Rocheleau, D.N. South Carolina Universities Research, Clemson, SC (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29115. (CONF-951258–1: 4. national applied mechanisms and robotics conference, Cincinnati, OH (United States), 10-13 Dec 1995). Order Number DE96003445. Source: OSTI; NTIS; INIS; GPO Dep.

ARIES (Autonomous Robotic Inspection Experimental System) is under development for the Department of Energy (DOE) to survey and inspect drums containing low-level radioactive waste stored in warehouses at DOE facilities. This paper focuses on the mechanical deployment system-referred to as the camera positioning system (CPS)-used in the project. The CPS is used for positioning four identical but separate camera packages consisting of vision cameras and other required sensors such as bar-code readers and light stripe projectors. The CPS is attached to the top of a mobile robot and consists of two mechanisms. The first is a lift mechanism composed of 5 interlocking rail-elements which starts from a retracted position and extends upward to simultaneously position 3 separate camera packages to inspect the top three drums of a column of four drums. The second is a parallelogram special case Grashof four-bar mechanism which is used for positioning a camera package on drums on the floor. Both mechanisms are the subject of this paper, where the lift mechanism is discussed in detail.

2251 (DOE/MC–30165-3972) **Remote Operated Vehicle with CO_2 Blasting (ROVCO$_2$). Phase 1.** Oceaneering Technologies, Upper Marlboro, MD (United States). Oct 1994. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30165. Order Number DE95000056. Distribution: UC-2060. Source: OSTI; NTIS; GPO Dep.

This report documents the first phase of the Remote Operated Vehicle with CO_2 Blasting (ROVCO$_2$) Program. The ROVCO$_2$ Program's goal is to develop and demonstrate a tool to improve the productivity of concrete floor decontamination. The first phase adapted and tested the critical subsystems; the CO_2 blasting, the workhead manipulation, the controls, and the base vehicle. The testing documented the performance of the subsystems and preformed a concept demonstration of the integrated ROVCO$_2$ system. This testing and demonstration verified that the ROVCO$_2$ development exceeded it Phase 1 success criteria.

2252 (DOE/MC/30358–4067) **Geophex Airborne Unmanned Survey System (GAUSS). Topical report, October 1993–March 1995.** Geophex Ltd., Raleigh, NC (United States). Mar 1995. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30358. Order Number DE95009713. Source: OSTI; NTIS; GPO Dep.

The objectives of the project are to construct a geophysical sensor system based on a remotely operated model helicopter (ROH) and to evaluate the efficacy of the system for characterization of hazardous environmental sites. Geophex Airborne Unmanned Survey System (GAUSS) is a geophysical survey system that uses a ROH as the survey vehicle. We have selected the ROH because of its advantages over fixed wing and ground based vehicles. Lower air speed and superior maneuverability of the ROH make it better suited for geophysical surveys than a fixed wing model aircraft. The ROH can fly close to the ground, allowing detection of weak or subtle anomalies. Unlike ground based vehicles, the ROH can traverse difficult terrain while providing a stable sensor platform. ROH does not touch the ground during the course of a survey and is capable of functioning over water and surf zones. The ROH has been successfully used in the motion picture industry and by geology companies for payload bearing applications. The only constraint to use of the airborne system is that the ROH must remain visible to the pilot. Obstructed areas within a site can be characterized by relocating the base station to alternate positions. GAUSS consists of a ROH with radio controller, a data acquisition and processing (DAP) system, and lightweight digital sensor systems. The objective of our Phase I research was to develop a DAP and sensors suitable for ROH operation. We have constructed these subsystems and integrated them to produce an automated, hand-held geophysical surveying system, referred to as the "pre-prototype". We have performed test surveys with the pre-prototype to determine the functionality of the and DAP and sensor subsystems and their suitability for airborne application. The objective of the Phase II effort will be to modify the existing subsystems and integrate them into an airborne prototype. Efficacy of the prototype for geophysical survey of hazardous sites will then be determined.

2253 (DOE/MC/30362–96/CO620) **BOA: Pipe asbestos insulation removal robot system.** Schempf, H. (and others); Bares, J.; Schnorr, W. Carnegie-Mellon Univ., Pittsburgh, PA (United States). 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30362. (CONF-9510108–32: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003686. Source: OSTI; NTIS; INIS; GPO Dep.

The BOA system is a mobile pipe-external robotic crawler used to remotely strip and bag asbestos-containing lagging and insulation materials (ACLIM) from various diameter pipes in (primarily) industrial installations. Steam and process lines within the DOE weapons complex warrant the use of a remote device due to the high labor costs and high level of radioactive contamination, making manual removal extremely costly and highly inefficient. Currently targeted facilities for demonstration and remediation are Fernald in Ohio and Oak Ridge in Tennessee.

2254 (DOE/MC/30362–4049) **BOA: Asbestos pipe insulation removal robot system. Phase 1.** Schempf, H.; Bares, J.E. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst. Feb 1995. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30362. Order Number DE95000095. Source: OSTI; NTIS; GPO Dep.

The project described in this report targets the development of a mechanized system for safe, cost-efficient and automated abatement of asbestos containing materials used as pipe insulation. Based on several key design criteria and site visits, a proof-of-concept prototype robot system, dubbed BOA, was designed and built, which automatically strips the lagging and insulation from the pipes, and encapsulates them under complete vacuum operation. The system can operate on straight runs of piping in horizontal or vertical orientations. Currently we are limited to four-inch diameter piping without obstacles as well as a somewhat laborious emplacement and removal procedure – restrictions to be alleviated through continued development. BOA removed asbestos at a rate of 4-5 ft./h compared to 3 ft./h for manual removal of asbestos with a 3-person crew. The containment and vacuum system on BOA was able to achieve the regulatory requirement for airborne fiber emissions of 0.01 fibers/ccm/8-hr. shift. This program consists of two phases. The first phase was completed and a demonstration was given to a review panel, consisting of DOE headquarters and site representatives as well as commercial abatement industry representatives. Based on the technical and programmatic recommendations drafted, presented and discussed during the review meeting, a new plan for the Phase II effort of this project was developed. Phase 11 will consist of a 26-month effort, with an up-front 4-month site-, market-, cost/benefit and regulatory study before the next BOA robot (14 months) is built, and then deployed and demonstrated (3 months) at a DOE site (such as Fernald or Oak Ridge) by the beginning of FY'97.

2255 (DOE/MC/30362–5113) **BOA: Asbestos pipe-insulation removal robot system. Phase I. Topical report, November 1993–December 1994.** Schempf, H.; Bares, J.E. Carnegie-Mellon Univ., Pittsburgh, PA (United States). Jan 1995. 105p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AR21-93MC30362. Order Number DE96004341. Source: OSTI; NTIS; INIS; GPO Dep.

Based on several key design criteria and site visits, we developed a Robot design and built a system which automatically strips the lagging and insulation from the pipes, and encapsulates them under complete vacuum operation. The system can operate on straight runs of piping in horizontal or vertical orientations. Currently we are limited to four-inch diameter piping without obstacles as well as a somewhat laborious emplacement and removal procedure. Experimental results indicated that the current robotic abatement process is sound yet needs to be further expanded and modified. One of the main discoveries was that a longitudinal cut to fully allow the paddles to dig in and compress the insulation off the pipe is essential. Furthermore, a different cutting method might be explored to alleviate the need for a deeper cut and to enable a combination of certain functions such as compression and cutting. Unfortunately due to a damaged mechanism caused by extensive testing, we were unable to perform vertical piping abatement experiments, but foresee no trouble in implementing them in the next proposed Phase. Other encouraging results have BOA removing asbestos at a rate of 4-5 ft./h compared to 3 ft./h for manual removal of asbestos with a 3-person crew. However, we feel confident that we can double the asbestos removal rate by improving cutting speed, and increasing the length of the BOA robot. The containment and vacuum system on BOA is able to achieve the regulatory requirement for airborne fiber emissions of 0.01 fibers/ccm/8-hr. shift. Currently, BOA weighs about 117 pounds which is more than a human is permitted to lift overhead under OSHA requirements (i.e., 25 pounds). We are considering designing the robot into two components (i.e., locomotor section and cutter/removal section) to aid human installation as well as incorporating composite materials. A more detailed list of all the technical modifications is given in this topical report.

2256 (DOE/MC/30363–90/C0627) **A robotic end effector for inspection of storage tanks.** Hughes, G.; Gittleman, M. Oceaneering Space Systems, Houston, TX (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30363. (CONF-9510108–46: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004625. Source: OSTI; NTIS; INIS; GPO Dep.

The structural integrity of waste storage tanks is of primary importance to the DOE, and is one aspect of the High-Level Waste Tank Remediation focus area. Cracks and/or corrosion damage in the inner tank walls can lead to the release of dangerous substances into the environment. The detection and sizing of corrosion and cracking in steel tank walls through remote non destructive evaluation (NDE) is the primary focus of this work.

2257 (DOE/MC–31190-96/CO630) **Environmental technology development through industry partnership.** Sebastion, R.L. Coleman Research Corp., Springfield, VA (United States). 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-94MC31190. (CONF-9510108–45: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003774. Source: OSTI; NTIS; INIS; GPO Dep.

The Coherent Laser Vision System (CLVS) is being developed to provide precision real-time 3D world views to support site characterization and robotic operations and during facilities Decontamination and Decommissioning. Autonomous or semiautonomous robotic operations requires an accurate, up-to-date 3D world view. Existing technologies for real-time 3D imaging, such as AM laser radar, have limited accuracy at significant ranges and have variability in range estimates caused by lighting or surface shading. Recent advances in fiber optic component technology and digital processing components have enabled the development of a new 3D vision system based upon a fiber optic FMCW coherent laser radar. The approach includes a compact scanner with no-moving parts capable of randomly addressing all pixels. The system maintains the immunity to lighting and surface shading conditions which is characteristic to coherent laser radar. The random pixel addressability allows concentration of scanning and processing on the active areas of a scene, as is done by the human eye-brain system. The precision measurement capability of the coherent laser radar (CLR) technology has already been demonstrated in the form of the CLR 3D Mapper, of which several copies have been delivered or are under order. The CLVS system, in contrast to the CLR 3D Mapper, will have substantially greater imaging speed with a compact no-moving parts scanner, more suitable for real-time robotic operations.

2258 (DOE/MC/32092–96/CO621) **Houdini: Reconfigurable in-tank robot.** White, D.W.; Slifko, A.D.; Thompson, B.R.; Fisher, C.G. Redzone Robotics, Inc., Pittsburgh, PA (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32092. (CONF-9510108–42: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003691. Source: OSTI; NTIS; INIS; GPO Dep.

RedZone Robotics, Inc. and Carnegie Mellon University (CMU) are developing a tethered mobile robot, Houdini, to work inside waste storage tanks in support of the Department of Energy's Environmental Restoration and Waste Management (EM) Program. This project is funded by the DOE's Environmental Management Office of Technology Development through the Morgantown Energy Technology Center (METC). Our goal is to develop technology that is useful for in-tank operations throughout the DOE's EM program. The first application of the Houdini system is to support the waste retrieval action planned for the final remediation of the Fernald site's waste silos. RedZone and CMU have discussed potential applications for the system with personnel from several other DOE sites, and have found that the system would be widely useful in the DOE complex for tasks both inside and outside of waste storage tanks. We are tailoring the first implementation of the Houdini system to the specific needs of the Fernald silo remediation. The Fernald application-specific design constraints are primarily interface issues and should not interfere with the utility of the system at other sites. In addition, DOE personnel at the Oak Ridge National Laboratories (ORNL) have expressed a strong interest in the Houdini system. They have a target application scheduled for mid-1996. This program represents a unique opportunity to develop a new technology that has immediate application in two CERCLA cleanup actions; the proposed applications at Fernald and ORNL support Federal Facility compliance agreements.

2259 (DOE/MC–92113-4016) **Interactive Computer-Enhanced Remote Viewing System (ICERVS). Phase 2.** Tourtellott, J. Mechanical Technology, Inc., Latham, NY (United States). Nov 1994. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29113. Order Number DE95000086. Distribution: UC-2060. Source: OSTI; NTIS; GPO Dep.

This report documents the results of the Phase 2 development of ICERVS. Supporting the USDOE missions in environmental restoration, ICERVS integrates capabilities for data acquisition, data visualization, data analysis, and geometric model synthesis in a workstation-based system. The following sections trace ICERVS development from intermediate system design, prototyping of critical elements, and detailed design of seven subsystems through implementation of source code and system performance testing. As a result of Phase 2, ICERVS has demonstrated the combined capabilities of integration and display of 3D sensor data, and interactive synthesis and display of geometric shapes to model regions in 3D space. Such capabilities are essential to effective, efficient task planning, path planning, and collision avoidance in robotic remediation systems.

2260 (DOE/OR/21400–T482) **Development of a modular integrated control architecture for flexible manipulators. Final report.** Burks, B.L. (Oak Ridge National Lab., TN (United States)); Battiston, G. Oak Ridge National Lab., TN (United States). 8 Dec 1994. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000762. Source: OSTI; NTIS; INIS; GPO Dep.

In April 1994, ORNL and SPAR completed the joint development of a manipulator controls architecture for flexible structure controls under a CRADA between the two organizations. The CRADA project entailed design and development of a new architecture based upon the Modular Integrated Control Architecture (MICA) previously developed by ORNL. The new architecture, dubbed MICA-II, uses an object-oriented coding philosophy to provide a highly modular and expandable architecture for robotic manipulator control. This architecture can be readily ported to control of many different manipulator systems. The controller also provides a user friendly graphical operator interface and display of many forms of data including system diagnostics. The capabilities of MICA-II were demonstrated during oscillation damping experiments using the Flexible Beam Experimental Test Bed at Hanford.

2261 (INEL–95/0090) **Functions and requirements for the INEL light duty utility arm sampler end effector.** Pace, D.P.; Barnes, G.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1995. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002372. Source: OSTI; NTIS; INIS; GPO Dep.

This sampler end effector system functions and requirements document defines the system functions that the end effector must perform as well as the requirements the design must meet. Safety, quality assurance, operations, environmental conditions, and regulatory requirements have been considered. The main purpose of this document is to provide a basis for the end effector engineering, design, and fabrication activities. The document shall be the living reference document to initiate the development activities and will be updated as system technologies are finalized.

2262 (INEL–95/0091) **Functions and requirements for the INEL light duty utility arm gripper end effector.** Pace, D.P.; Barnes, G.E. EG and G Idaho, Inc., Idaho Falls, ID (United States). Feb 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002373. Source: OSTI; NTIS; INIS; GPO Dep.

This gripper end effector system functions and requirements document defines the system functions that the end effector must perform as well as the requirements the design must meet. Safety, quality assurance, operations, environmental conditions, and regulatory requirements have been considered. The main purpose of this document is to provide a basis for the end effector engineering, design, and fabrication activities. The document shall be the living reference document to initiate the development activities and will be updated as system technologies are finalized.

2263 (INEL–95/00196) **Remote technologies for buried waste retrieval.** Smith, A.M.; Rice, P. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9506184–3: Society of Women Engineers national meeting, Boston, MA (United States), 27 Jun - 1 Jul 1995). Order Number DE96001610. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE is evaluating what should be done with this buried waste. Although the radioactive waste is not particularly mobile unless airborne, some of it was buried with volatile organics and/or other substances that tend to spread easily to surrounding soil or water tables. Volatile organics are hazardous materials (such as trichloroethylene) and require clean-up at certain levels in drinking water. There is concern that the buried volatile organics will spread into the water table and contaminate drinking water. Because of this, the DOE is considering options for handling this buried waste and reducing the risks of spreading or exposure. There are two primary options: containment and stabilization, or retrieval. Containment and stabilization systems would include systems that would leave the waste where it is, but contain and stabilize it so that the radioactive and hazardous materials would not spread to the surrounding soil, water, or air. For example, an in situ vitrification system could be used to melt the waste into a composite glass-like material that would not leach into the surrounding soil, water, or air. Retrieval systems are those that would remove the waste from its burial location for treatment and/or repackaging for long term storage. The objective of this project was to develop and demonstrate remote technologies that would minimize dust generation and the spread of airborne contaminants during buried waste retrieval. Remote technologies are essential for the retrieval of buried waste because they remove workers from the hazardous environment and provide greater automation, reducing the chances of human error. Minimizing dust generation is also essential to increased safety for the workers and the environment during buried waste retrieval. The main contaminants within the waste are micron-sized particles of plutonium and americium oxides, chlorides, and hydroxides, which are easily suspended in air and spread if disturbed.

2264 (INEL–95/0231) **Cooperative Telerobotic Retrieval system Phase 1 technology evaluation report.** Hyde, R.A.; Croft, K.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001560. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the results from the Cooperative Telerobotic Retrieval demonstration and testing conducted at the Idaho National Engineering Laboratory during December 1994 and January 1995. The purpose of the demonstration was to ascertain the feasibility of the system for deploying tools both independently and cooperatively for supporting remote characterization and removal of buried waste in a safe manner and in compliance with all regulatory requirements. The procedures and goals of the demonstration were previously defined in the Cooperative Telerobotic Retrieval System Test Plan for Fiscal Year 1994, which served as a guideline for evaluating the system.

2265 (INEL–95/0266) **Safety plan for the cooperative telerobotic retrieval system equipment development area.** Haney, T.J.; Jessmore, J.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003547. Source: OSTI; NTIS; INIS; GPO Dep.

This plan establishes guidelines to minimize safety risks for the cooperative telerobotic retrieval project at the North Boulevard Annex (NBA). This plan has the dual purpose of minimizing safety risks to workers and visitors and of securing sensitive equipment from inadvertent damage by nonqualified personnel. This goal will be accomplished through physical control of work zones and through assigned responsibilities for project personnel. The scope of this plan is limited to establishing the working zone boundaries and entry requirements, and assigning responsibilities for project personnel. This plan does not supersede current safety organization responsibilities for the Landfill Stabilization Focus Area Transuranic (LSFA TRU) Arid outlined in the Environment, Safety, Health, and Quality Plan for the Buried Waste Integrated Demonstration Program; Tenant Manual; Idaho Falls Building Emergency Control Plan;; applicable Company Procedures; the attached Interface Agreement (Appendix A).

2266 (PNL–10757) **Structural vibration control of micro/macro-manipulator using feedforward and feedback approaches.** Lew, J.Y. (Pacific Northwest Lab., Richland, WA (United States)); Cannon, D.W.; Magee, D.P.; Book, W.J. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001341. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PDL) researchers investigated the combined use of two control approaches to minimize micro/macro-manipulator structural vibration: (1) modified input shaping and (2) inertial force active damping control. Modified input shaping (MIS) is used as a feedforward controller to modify reference input by canceling the vibratory motion. Inertial force active damping (IFAD) is applied as a feedback controller to increase the system damping and robustness to unexpected disturbances. Researchers implemented both control schemes in the PNL micro/macro flexible-link manipulator testbed collaborating with Georgia Institute of Technology. The experiments successfully demonstrated the effectiveness of two control approaches in reducing structural vibration. Based on the results of the experiments, the combined use of two controllers is recommended for a micro/macro manipulator to achieve the fastest response to commands while canceling disturbances from unexpected forces.

2267 (PNL-SA–26161) **Micro-manipulator motion control to suppress macro-manipulator structural vibrations.** Lew, J.Y.; Trudnowski, D.J.; Evans, M.S.; Bennett, D.W. Pacific Northwest Lab., Richland, WA (United States). May 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9505193–5: 1995 international conference on robotics and automation, Nagoya (Japan), 21-27 May 1995). Order Number DE95014614. Source: OSTI; NTIS; GPO Dep.

The feasibility of several pyrochemical approaches for separating non-radioactive constituents from ICPP BLW calcine were examined. The removal of aluminum as $AlCl_3$ from aluminia calcine was successfully demonstrated. The examination of pyrochemical processes to remove non-radioactive constituents, primarily aluminium, zirconium, calcium and fluorine, from zirconia calcine showed that fluorine removal was required inorder to chlorinate the calcine. A molten calcium chloride wash, a calcium reduction, and a sulfuric acid treatment were examined as possible zirconia calcine pretreatment options for fluorine removal. Fluorine removal from simulated ICPP zirconia calcine was demonstrated by both a $CaCl_2$ wash method and a sulfuric acid treatment method. X-ray fluorescence analysis indicated that greater than 97% of the fluorine can be removed by either method. Fluorine removal by a calcium reduction using an alloying agent, zinc, or a calcium reduction using a filtration separation were also demonstrated, but the efficiencies of fluorine removal were considerably less ranging from 50 to 90%.

2268 (SAND–94-3267) **Performance benefits of telerobotics and teleoperation - enhancements for an arm-based tank waste retrieval system.** Horschel, D.S. (Sandia National Labs., Albuquerque, NM (United States)); Gibbons, P.W.; Draper, J.V. Sandia National Labs., Albuquerque, NM (United States). Jun 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95013912. Distribution: UC-2030. Source: OSTI; NTIS; INIS; GPO Dep.

This report evaluates telerobotic and teleoperational arm-based retrieval systems that require advanced robotic controls. These systems will be deployed in waste retrieval activities in Hanford's Single Shell Tanks (SSTs). The report assumes that arm-based, retrieval systems will combine a teleoperational arm and control system enhanced by a number of advanced and telerobotic controls. The report describes many possible enhancements, spanning the full range of the control spectrum with the potential for technical maturation. The enhancements considered present a variety of choices and factors including: the enhancements to be included in the actual control system, safety, detailed task analyses, human factors, cost-benefit ratios, and availability and maturity of technology. Because the actual system will be designed by an offsite vendor, the procurement specifications must have the flexibility to allow bidders to propose a broad range of ideas, yet build in enough restrictions to filter out infeasible and undesirable approaches. At the same time they must allow selection of a technically promising proposal. Based on a preliminary analysis of the waste retrieval task, and considering factors such as operator limitations and the current state of robotics technology, the authors recommend a set of enhancements that will (1) allow the system to complete its waste retrieval mission, and (2) enable future upgrades in response to changing mission needs and technological advances.

2269 (SAND–95-0849C) **Motion planning for multiple moving objects.** Hwang, Y.K. Sandia National Labs., Albuquerque, NM (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract

AC04-94AL85000. (CONF-9508119–1: 1. international symposium on assembly and task planning, Pittsburgh, PA (United States), 10-11 Aug 1995). Order Number DE95011888. Source: OSTI; NTIS; GPO Dep.

We present a motion planner for multiple moving objects in two dimensions. The search for collision-free paths is performed in the composite configuration space of all the moving objects to guarantee a solution, and the efficiency of our planner is demonstrated with examples. Our motion planner can be characterized with a hierarchical, multi-resolution search of the configuration space along with a generate-and-test paradigm for solution paths. Because of the high dimensionality of the composite configuration space, our planner is most useful for cases with a small number of moving objects. Some of the potential applications are navigation of several mobile robots, and planning part motions for a multi-handed assembly operation.

2270 (SAND–95-2196C) **Trajectory generation for two robots cooperating to perform a task.** Lewis, C.L. Sandia National Labs., Albuquerque, NM (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960448–4: IEEE international conference on robotics and automation, Minneapolis, MN (United States), 22-28 Apr 1996). Order Number DE96001725. Source: OSTI; NTIS; INIS; GPO Dep.

This paper formulates an algorithm for trajectory generation for two robots cooperating to perform an assembly task. Treating the two robots as a single redundant system, this paper derives two Jacobian matrices which relate the joint rates of the entire system to the relative motion of the grippers with respect to one another. The advantage of this formulation over existing methods is that a variety of secondary criteria can be conveniently satisfied using motion in the null-space of the relative Jacobian. This paper presents methods for generating dual-arm joint trajectories which perform assembly tasks while at the same time avoiding obstacles and joint limits, and also maintaining constraints on the absolute position and orientation of the end-effectors.

2271 (SAND–95-2393) **View graph presentations of the sixth DOE industry/university/lab forum on robotics for environmental restoration and waste management.** Sandia National Labs., Albuquerque, NM (United States). Oct 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9508189--Summ.: 6. DOE industry/university/lab forum on robotics for environmental restoration and waste management, Albuquerque, NM (United States), 16-17 Aug 1995). Order Number DE96002342. Distribution: UC-2060. Source: OSTI; NTIS; INIS; GPO Dep.

Contains vugraphs.

The mission of the Robotics Technology Development Program involves the following: develop robotic systems where justified by safety, cost, and/or efficiency arguments; integrate the best talent from National Labs, industry, and universities in focused teams addressing complex-wide problems; and involve customers in the identification and development of needs driven technologies. This presentation focuses on five areas. They are: radioactive tank waste remediation (Richland); mixed waste characterization, treatment, and disposal (Idaho Falls); decontamination and decommissioning (Morgantown); landfill stabilization (Savannah River); and contaminant plumes containment and remediation (Savannah River).

2272 (SAND–96-0485C) **System design for safe robotic handling of nuclear materials.** Drotning, W.; Wapman, W.; Fahrenholtz, J.; Kimberly, H.; Kuhlmann, J. Sandia National Labs., Albuquerque, NM (United States). [1996]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9606123–1: Robotics for challenging environments, Albuquerque, NM (United States), 1-6 Jun 1996). Order Number DE96006399. Source: OSTI; NTIS; INIS; GPO Dep.

Robotic systems are being developed by the Intelligent Systems and Robotics Center at Sandia National Laboratories to perform automated handling tasks with radioactive nuclear materials. These systems will reduce the occupational radiation exposure to workers by automating operations which are currently performed manually. Because the robotic systems will handle material that is both hazardous and valuable, the safety of the operations is of utmost importance; assurance must be given that personnel will not be harmed and that the materials and environment will be protected. These safety requirements are met by designing safety features into the system using a layered approach. Several levels of mechanical, electrical and software safety prevent unsafe conditions from generating a hazard, and bring the system to a safe state should an unexpected situation arise. The system safety features include the use of industrial robot standards, commercial robot systems, commercial and custom tooling, mechanical safety interlocks, advanced sensor systems, control and configuration checks, and redundant control schemes. The effectiveness of the safety features in satisfying the safety requirements is verified using a Failure Modes and Effects Analysis. This technique can point out areas of weakness in the safety design as well as areas where unnecessary redundancy may reduce the system reliability.

2273 (SAND–96-0521) **System analysis: Developing tools for the future.** De Jong, K.; clever, J.; Draper, J.V.; Davies, B.; Lonks, A. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 154p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96008356. Source: OSTI; NTIS; GPO Dep.

This report introduces and evaluates system analysis tools that were developed, or are under development, for the Robotics Technology Development Program (RTDP). Additionally, it discusses system analysis work completed using these tools aimed at completing a system analysis of the retrieval of waste from underground storage tanks on the Hanford Reservation near Richland, Washington. The tools developed and evaluated include a mixture of commercially available tools adapted to RTDP requirements, and some tools developed in house. The tools that are included in this report include: a Process Diagramming Tool, a Cost Modeling Tool, an Amortization Modeling Tool, a graphical simulation linked to the Cost Modeling Tool, a decision assistance tool, and a system thinking tool. Additionally, the importance of performance testing to the RTDP and the results of such testing executed is discussed. Further, the results of the Tank Waste Retrieval (TWR) System Diagram, the TWR Operations Cost Model, and the TWR Amortization Model are presented, and the implication of the results are discussed. Finally, the RTDP system analysis tools are assessed and some recommendations are made regarding continuing development of the tools and process.

2274 (SAND–96-0881C) **Rapid world modelling for robotics.** Littile, C.Q. (Sandia National Labs., Albuquerque, NM (United States)); Wilson, C.W. Sandia National Labs., Albuquerque, NM (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-9603143–1: International symposium on robotics and manufacturing (ISRM), Montpellier (France), 27-30 Mar 1996). Order Number DE96008906. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to use an interactive world model, whether it is for robotics simulation or most other virtual graphical environments, relies on the users ability to create an accurate world model. Typically this is a tedious process, requiring many hours to create 3-D CAD models of the surfaces within a workspace. The goal of this ongoing project is to develop usable methods to rapidly build world models of real world workspaces. This brings structure to an unstructured environment and allows graphical based robotics control to be accomplished in a reasonable time frame when traditional CAD modelling is not enough. To accomplish this, 3D range sensors are deployed to capture surface data within the workspace. This data is then transformed into surface maps, or models. A 3D world model of the workspace is built quickly and accurately, without ever having to put people in the environment.

2275 (UCRL-JC–118897) **Automated system for handling tritiated mixed waste.** Dennison, D.K.; Merrill, R.D.; Reitz, T.C. Lawrence Livermore National Lab., CA (United States). Mar 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950877–7: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE95011842. Source: OSTI; NTIS; INIS; GPO Dep.

Lawrence Livermore National Laboratory (LLNL) is developing a semi system for handling, characterizing, processing, sorting, and repackaging hazardous wastes containing tritium. The system combines an IBM-developed gantry robot with a special glove box enclosure designed to protect operators and minimize the potential release of tritium to the atmosphere. All hazardous waste handling and processing will be performed remotely, using the robot in a teleoperational mode for one-of-a-kind functions and in an autonomous mode for repetitive operations. Initially, this system will be used in conjunction with a portable gas system designed to capture any gaseous-phase tritium released into the glove box. This paper presents the objectives of this development program, provides background related to LLNL's robotics and waste handling program, describes the major system components, outlines system operation, and discusses current status and plans.

2276 (WHC-SA–2924) **Remote controlled tool systems for nuclear sites have subsea applications.** Bath, B. (Sonsub Environmental Services, Houston, TX (United States)); Yemington, C.; Kuhta, B. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9501119–1: Underwater intervention conference, New Orleans, LA (United States), 5-7 Jan 1995). Order Number DE96005188. Source: OSTI; NTIS; INIS; GPO Dep.

Remotely operated underwater tool systems designed to operate in Nuclear Fuel Storage Basins can be applied to deep water, subsea oilfield applications. Spent nuclear fuel rods re stored underwater in large indoor swimming pool-like facilities where the water cover shields the workers from the radiation. This paper describes three specialized tooling systems that were designed and built by Sonsub for work at the Department of Energy's Hanford site. The Door Seal Tool removed an existing seal system, cleaned a 20 ft. tall, carbon steel, underwater hatch and installed a new stainless steel gasket surface with underwater epoxy. The Concrete Sampling Tool was built to take core samples from the vertical, concrete walls of the basins. The tool has three hydraulic drills with proprietary hollow core drill bits to cut and retrieve the concrete samples. The Rack Saw remotely attached itself to a structure, cut a variety of steel shapes and pipes, and retained the cut pieces for retrieval. All of these systems are remotely operated with onboard video cameras and debris collection systems. The methods and equipment proven in this application are available to refurbish sealing surfaces and to drill or sample concrete in offshore oil field applications.

2277 (WHC-SA–2974-FP) **Radiation exposure modeling and project schedule visualization.** Jaquish, W.R. (ICF Kaiser Hanford Co., Richland, WA (United States)); Enderlin, V.R. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9510206–3: Deneb Robotics' user group conference and exhibition, Ypsilanti, MI (United States), 9-13 Oct 1995). Order Number DE96004830. Source: OSTI; NTIS; INIS; GPO Dep.

This paper discusses two applications using IGRIP (Interactive Graphical Robot Instruction Program) to assist environmental remediation efforts at the Department of Energy (DOE) Hanford Site. In the first application, IGRIP is used to calculate the estimated radiation exposure to workers conducting tasks in radiation environments. In the second, IGRIP is used as a configuration management tool to detect interferences between equipment and personnel work areas for multiple projects occurring simultaneously in one area. Both of these applications have the capability to reduce environmental remediation costs by reducing personnel radiation exposure and by providing a method to effectively manage multiple projects in a single facility.

2278 (WSRC-MS–95-0271) **SWAMI, Stored Waste Autonomous Mobile Inspector.** McCarthy, K. Westinghouse Savannah River Co., Aiken, SC (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-9507186–2: Meeting of the Korea Atomic Energy Research Institute, Taejon (Korea, Republic of), 16-22 Jul 1995). Order Number DE96001847. Source: OSTI; NTIS; INIS; GPO Dep.

Short communication. ROBOTS; CONTAINERS/inventories; CONTAINERS/inspection; ROBOTS; CONTAINERS; INVENTORIES; INSPECTION; RADIOACTIVE WASTE STORAGE; RADIATION HAZARDS

2279 (WSRC-MS–95-0299) **Robotics and remote systems applications.** Rabold, D.E. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96009338. Source: OSTI; NTIS; INIS; GPO Dep.

This article is a review of numerous remote inspection techniques in use at the Savannah River (and other) facilities. These include: (1) reactor tank inspection robot, (2) californium waste removal robot, (3) fuel rod lubrication robot, (4) cesium source manipulation robot, (5) tank 13 survey and decontamination robots, (6) hot gang valve corridor decontamination and junction box removal robots, (7) lead removal from deionizer vessels robot, (8) HB line cleanup robot, (9) remote operation of a front end loader at WIPP, (10) remote overhead video extendible robot, (11) semi-intelligent mobile observing navigator, (12) remote camera systems in the SRS canyons, (13) cameras and borescope for the DWPF, (14) Hanford waste tank camera system, (15) in-tank precipitation camera system, (16) F-area retention basin pipe crawler, (17) waste tank wall crawler and annulus camera, (18) duct inspection, and (19) deionizer resin sampling.

CHARACTERIZATION, MONITORING AND SENSOR TECHNOLOGY

Refer also to citation(s) 344, 350, 353, 359, 395, 402, 478, 480, 487, 494, 524, 525, 528, 559, 576, 579, 582, 583, 584, 594, 613, 816, 853, 855, 884, 886, 896, 962, 996, 1015, 1030, 1192, 1271, 1311, 1335, 1337, 1349, 1350, 1351, 1352, 1353, 1355, 1356, 1357, 1358, 1359, 1360, 1361, 1362, 1363, 1364, 1367, 1370, 1372, 1373, 1374, 1375, 1376, 1377, 1378, 1379, 1382, 1385, 1387, 1388, 1389, 1391, 1392, 1393, 1394, 1395, 1396, 1397, 1398, 1399, 1400, 1401, 1402, 1403, 1404, 1408, 1411, 1412, 1413, 1414, 1415, 1420, 1421, 1422, 1423, 1424, 1425, 1427, 1428, 1432, 1442, 1443, 1444, 1445, 1446, 1447, 1451, 1455, 1478, 1489, 1495, 1498, 1522, 1547, 1580, 1589, 1616, 1617, 1626, 1628, 1666, 1668, 1669, 1672, 1675, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1695, 1696, 1698, 1699, 1716, 1719, 1720, 1721, 1722, 1723, 1724, 1725, 1726, 1727, 1728, 1729, 1730, 1731, 1732, 1733, 1734, 1735, 1736, 1737, 1738, 1739, 1740, 1741, 1742, 1743, 1744, 1745, 1746, 1747, 1748, 1749, 1750, 1751, 1755, 1756, 1757, 1758, 1759, 1760, 1761, 1762, 1763, 1764, 1765, 1766, 1767, 1768, 1769, 1770, 1771, 1772, 1773, 1774, 1775, 1776, 1777, 1778, 1779, 1780, 1781, 1782, 1783, 1784, 1785, 1787, 1788, 1789, 1790, 1791, 1792, 1793, 1794, 1795, 1796, 1797, 1798, 1800, 1801, 1802, 1803, 1804, 1805, 1806, 1807, 1808, 1809, 1825, 1828, 1829, 1830, 1840, 1841, 1842, 1843, 1844, 1845, 1846, 1847, 1848, 1849, 1850, 1851, 1852, 1853, 1854, 1855, 1856, 1858, 1859, 1860, 1861, 1862, 1865, 1869, 1871, 1885, 1886, 1887, 1888, 1889, 1890, 1891, 1892, 1893, 1895, 1896, 1897, 1898, 1899, 1900, 1903, 1966, 1984, 2014, 2023, 2040, 2061, 2065, 2094, 2139, 2143, 2145, 2171, 2219, 2252, 2261, 2262, 2263, 2636

2280 (ANL–94/41) **Analytical electron microscopy characterization of Fernald soils. Annual report, October 1993–September 1994.** Buck, E.C.; Brown, N.R.; Dietz, N.L. Argonne National Lab., IL (United States). Mar 1995. 51p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95010856. Source: OSTI; NTIS; INIS; GPO Dep.

A combination of backscattered electron imaging and analytical electron microscopy (AEM) with electron diffraction have been used to determine the physical and chemical properties of uranium contamination in soils from the Fernald Environmental Management Project in Ohio. The information gained from these studies has been used in the development and testing of remediation technologies. Most chemical washing techniques have been reasonably effective with uranyl [U(VI)] phases, but U(IV) phases have proven difficult to remove from the soils. Carbonate leaching in an oxygen environment (heap leaching) has removed some of the U(IV) phases, and it appears to be the most effective technique developed in the program. The uranium metaphosphate, which was found exclusively at an incinerator site, has not been removed by any of the chemical methods. We suggest that a physical extraction procedure (either a magnetic separation or aqueous biphasic process) be used to remove this phase. Analytical electron microscopy has also been used to determine the effect of the chemical agents on the uranium phases. It has also been used to examine soils from the Portsmouth site in Ohio. The contamination there took the form of uranium oxide and uranium calcium oxide phases. Technology transfer efforts over FY 1994 have led to industry-sponsored projects involving soil characterization.

2281 (ANL/ACL–94/2) **The determination of PCBs in Rocky Flats Type IV waste sludge by gas chromatography/electron capture detection. Part 2.** Parish, K.J.; Applegate, D.V.; Postlethwait, P.D.; Boparai, A.S.; Reedy, G.T. Argonne National Lab., IL (United States). Dec 1994. 56p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE95015692. Source: OSTI; NTIS; INIS; GPO Dep.

Before disposal, radioactive sludge (Type IV) from Rocky Flats Plant (RFP) must be evaluated for polychlorinated biphenyl (PCB) content. The Type IV sludge consists of organic solvents, degreasers, cutting oils, and transuranic (TRU) waste mixed with calcium silicate (MicroCel E® and Oil Dri® to form a grease or paste-like material. For laboratory testing, a nonradioactive simulated Type 17V RFP sludge was prepared at Argonne National Laboratory-East (ANL-E). This sludge has a composition similar to that expected from field samples. In an earlier effort, a simplified method was developed for extraction, cleanup of extract, and determination of PCBs in samples of simulated sludge spiked with Aroclors 1254 and 1260. The simplified method has now been used to determine the presence and quantities of other Aroclors in the simulated sludge, namely, Aroclors 10 1 6, 1221, 1232, 1242, and 1248. The accuracy and precision of the data for these Aroclors were found to be similar to the data for sludges spiked with Aroclors 1254 and 1260. Since actual sludges may vary in composition, the method was also verified by analyzing another source of Type IV simulated sludge, prepared by Argonne National Laboratory-West (ANL-W).

2282 (ANL/ACL–94/3) **Determination of the toxicity characteristic for metals in soil: A comparison of the toxicity characteristic leaching procedure and total metal determination.** Bass, D.A.; Taylor, J.D. Argonne National Lab., IL (United States). Dec 1994. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95013359. Source: OSTI; NTIS; GPO Dep.

A comparison is made of the concentrations of metals extracted from soils using the Toxicity Characteristic Leaching Procedure (TCLP) and a total determination method. This information is of interest in two ways. First, it is hoped that a relationship might be established between the amount of each metal determined after extraction by the TCLP and the amount determined using a total determination method. And second, data are also presented which indicate the general extractability of various metals in soil samples using the TCLP. This study looks specifically at inorganic elements (Sb, As, Ba, Cd, Cu, Cr, Pb, Mg, Hg, Se, Ag, Sn, and Zn) in soils from a firing range. Results show that total determination methods for metals can not generally be used for heterogeneous samples, such as soil samples from a firing range. Some correlation between a total determination method and TCLP was observed when Ba and Cd were present in the samples at lower concentrations (less than 80 mg/kg for Ba and less than 25 mg/kg for Cd); however, additional data are necessary to verify this correlation.

2283 (ANL/ACL–95/3) **Waste minimization through high-pressure microwave digestion of soils for gross α/β analyses.** Yaeger, J.S.; Smith, L.L. Argonne National Lab., IL (United States). Apr 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. Order Number DE95017580. Source: OSTI; NTIS; INIS; GPO Dep.

As a result of the U.S. Department of Energy's (DOE) environmental restoration and waste management activities, laboratories receive numerous analytical requests for gross α/β analyses. Traditional sample preparation methods for gross α/β analysis of environmental and mixed waste samples require repetitive leaching, which is time consuming and generates large volumes of secondary wastes. An alternative to leaching is microwave digestion. In the past. microwave technology has had limited application in the radiochemical laboratory because of restrictions on sample size resulting from vessel pressure limitations. However, new microwave vessel designs allow for pressures on the order of 11 MPa (1500 psi). A procedure is described in which microwave digestion is used to prepare environmental soil samples for gross α/β analysis. Results indicate that the described procedure meets performance requirements for several soil types and is equivalent to traditional digestion techniques. No statistical differences at the 95% confidence interval exist between the measurement on samples prepared from the hot plate and microwave digestion procedures for those soils tested. Moreover, microwave digestion allows samples to be prepared in a fraction of the time with significantly less acid and with lower potential of cross-contamination. In comparison to the traditional hot plate method, the waste volumes required for the microwave procedure are a factor of 10 lower, while the analyst time for sample processing is at least a factor of three lower.

2284 (ANL/CMT-ACL/CP–86742) **Application of Empore™ disk technology to environmental radiochemical analysis.** Smith, L.L. (Argonne National Lab., IL (United States)); Orlandini, K.A.; Alvarado, J.S.; Hoffmann, K.M.; Seely, D.C.; Shannon, R.T. Argonne National Lab., IL (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9511133–3: 41. annual conference on bioassay, analytical and environmental radiochemistry, Boston, MA (United States), 12-16 Nov 1995). Order Number DE96004657. Source: OSTI; NTIS; INIS; GPO Dep.

The costs associated with environmental restoration and waste management at both government and private facilities are burdensome, and continue to grow. The Department of Energy estimates that over one million samples, many containing radioactive components, will be analyzed per annum to support remediation programs at its 4000 sites. The development and implementation of new analytical technologies can significantly reduce the high costs associated with these programs. Disk solid-phase extraction technology has been proven to be highly effective for sample preparation in the analysis of organic compounds, waste waters, and other aqueous samples. Disk technology significantly improves sample throughput, while reducing secondary waste and costs. Moreover, many of the hazardous chemicals associated with traditional procedures are eliminated. This technology may be readily automated and lends itself to field applications. Through a Cooperative Research and Development Agreement, the 3M Company and Argonne National Laboratory are expanding this technology to address sample preparation and recovery of radionuclides from aqueous samples, i.e., surface, ground, and drinking waters. Disks have been developed which demonstrate high selectivity and great affinity for important radionuclides, including ^{99}Tc, $^{89/90}$Sr, and $^{226/228}$Ra.

2285 (ANL/CMT-ACL/VU–84890) **Determination of naturally-occurring actinides and their progeny in fresh water using inductively coupled plasma-mass spectrometry and batch separation.** Crain, J.S. (Argonne National Lab., IL (United States)); Yaeger, J.S.; Alvarado, J.A.; Smith, L.L.; Kiely, J.T.; Smith, F.G. Argonne National Lab., IL (United States). [1995]. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950402–9-Vugraphs: 209. American Chemical Society (ACS) national meeting, Anaheim, CA (United States), 2-6 Apr 1995). Order Number DE95011822. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this report is to show the use of ICP-MS in combination with appropriate preparative techniques for the determination of actinide elements in the environment. It examines and identifies the sample introduction and preparation techniques necessary to achieve required detection limits and mitigate interferences. This volume contains a set of viewgraphs.

2286 (ANL/CMT-ACL/VU–87803) **Actinides at the crossroads: ICP-MS or alpha spectrometry?.** Crain, J.S.; Yaeger, J.S.; Smith, F.P.; Alvarado, J.A.; Smith, L.L.; Kiely, J.T.; Graczyk, D.G. Argonne National Lab., IL (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9511102–1-Vugraphs: 4. annual meeting of the Coucil on Ionising Radiation Measurements and Standards: advanced techniques in ionising radiation measurements, Gaithersburg, MD (United States), 28-30 Nov 1995). Order Number DE96004175. Source: OSTI; NTIS; INIS; GPO Dep.

The report contains viewgraphs only that summarize the following: Why turn to mass spectrometry for radiochemical measurements; What might be some advantages of using ICP mass spectrometry; Sensitivity of ETV-ICP-MS relative to decay counting (versus half-life); ICP-MS instrument detection limits for dissolved actinide isotopes; Effect of dissolved solids on USN-ICP-MS analysis; Polyatomic ion interferences in ICP-MS actinide measurements; Effect of operating conditions on uranium and protonated uranium signal; ICP mass spectrometry performance in actinide determinations; Determination of actinide elements in soil; Leachable Th-230 and Pu-239 in soil as determined by ICP-MS and alpha spectrometry; Leachable U-234 and U-238 in soil by ICP-MS and alpha spectrometry; Determination of uranium isotopic composition on smears; Activity ratios (U-234/U-238) as determined by mass spectrometry and alpha spectrometry; Uranium isotopic abundances as determined by TIMS and ICP-MS; and Comparison of uranium atom percentages determined by TIMS and ICP-MS. It is concluded that isotope dilution and radiochemical preparative techniques work well in radioanalytical applications of ICP-MS; radioanalytical ICP-MS data are equivalent to data from standard methods (TIMS, alpha spectrometry); and applications in radiation protection and earth sciences are certain to expand further.

2287 (ANL/CMT/CP–86433) **Developing innovative environmental technologies for DOE needs.** Devgun, J.S. (Argonne National Lab., IL (United States)); Sewell, I.O.; DeGregory, J. Argonne National Lab., IL (United States). [1995]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950729–7: 30. Intersociety energy conversion conference, Orlando, FL (United States), 30 Jul - 5 Aug 1995). Order Number DE95014242. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental restoration and waste management activities at US Department of Energy (DOE) facilities are diverse and complex. Contamination at DOE sites and facilities includes radionuclides, chlorinated hydrocarbons, volatile organic compounds, non-aqueous phase liquids, and heavy metals, among others. Soil and groundwater contamination are major areas of concern and DOE has focused very significant efforts in these areas. Relevant technology development activities are being conducted at DOE's own national laboratories, as well as through collaborative efforts with other federal agencies and the private sector. These activities span research and development (R&D) of new concepts and techniques to demonstration and commercialization of mature technologies. Since 1990, DOE has also supported R&D of innovative technologies through interagency agreements with US Environmental Protection Agency (EPA), US Department of Defense, the National Science Foundation, and others.

2288 (ANL/EA/CP–84904) **Sensitivities to source-term parameters of emergency planning zone boundaries for waste management facilities.** Mueller, C.J. Argonne National Lab., IL (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950430–8: 5. ANS topical meeting on emergency preparedness and response, Savannah, GA (United States), 18-21 Apr 1995). Order Number DE95013683. Source: OSTI; NTIS; INIS; GPO Dep.

This paper reviews the key parameters comprising airborne radiological and chemical release source terms, discusses the ranges over which values of these parameters occur for plausible but severe waste management facility accidents, and relates the concomitant sensitivities of emergency planning zone boundaries predicted on calculated distances to early severe health effects.

2289 (ANL/EA/CP–86614) **Applying RESRAD-CHEM for chemical risk assessment.** Cheng, J.J. (Argonne National Lab., IL (United States). Environmental Assessment Div.); Yu, C. Argonne National Lab., IL (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9506222–2: MACPAC 95: Mid-America Chinese Professional annual convention, Itasca, IL (United States), 23-25 Jun 1995). Order Number DE95013740. Source: OSTI; NTIS; INIS; GPO Dep.

RESRAD-CHEM is a multiple pathway analysis computer code to evaluate chemically contaminated sites; it was developed at Argonne National Laboratory for the US Department of Energy. The code is designed to predict human health risks from exposure to hazardous chemicals and to derive cleanup criteria for chemically contaminated soils. It consists of environmental fate and transport models and is capable of predicting chemical concentrations over time in different environmental media. The methodology used in RESRAD-CHEM for exposure assessment and risk characterization follows the US Environmental Protection Agency's guidance on Human Health Evaluation for Superfund. A user-friendly interface is incorporated for entering data, operating the code, and displaying results. RESRAD-CHEM is easy to use and is a powerful tool to assess chemical risk from environmental exposure.

2290 (ANL/EA/CP–88577) **Efficient data exchange: Integrating a vector GIS with an object-oriented, 3-D visualization system.** Kuiper, J. (Argonne National Lab., IL (United States)); Ayers, A.; Johnson, R.; Tolbert-Smith, M. Argonne National Lab., IL (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960164–2: 3. international conference/workshop on integrating GIS and environmental modeling, Santa Fe, NM (United States), 21-25 Jan 1996). Order Number DE96006755. Source: OSTI; NTIS; INIS; GPO Dep.

A common problem encountered in Geographic Information System (GIS) modeling is the exchange of data between different software packages to best utilize the unique features of each package. This paper describes a project to integrate two systems through efficient data exchange. The first is a widely used GIS based on a relational data model. This system has a broad set of data input, processing, and output capabilities, but lacks three-dimensional (3-D) visualization and certain modeling functions. The second system is a specialized object-oriented package designed for 3-D visualization and modeling. Although this second system is useful for subsurface modeling and hazardous waste site characterization, it does not provide many of the, capabilities of a complete GIS. The system-integration project resulted in an easy-to-use program to transfer information between the systems, making many of the more complex conversion issues transparent to the user. The strengths of both systems are accessible, allowing the scientist more time to focus on analysis. This paper details the capabilities of the two systems, explains the technical issues associated with data exchange and how they were solved, and outlines an example analysis project that used the integrated systems.

2291 (ANL/EMO/CP–86349) **Action-oriented characterization at Argonne National Laboratory.** Moos, L.P.; Swale, R.E. Argonne National Lab., IL (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9505101–3: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE95013444. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory-East and the US Department of Energy have initiated a voluntary corrective action strategy to characterize and clean up some of the on-site solid waste management units that are subject to the Resource Conservation and Recovery Act Corrective Action process. This strategy is designed for the current atmosphere of reduced funding levels and, increased demands for cleanup actions. A focused characterization program is used to identify and roughly delineate the areas of greatest risk, relying as much as possible on existing data about the site; then, removal or interim remedial actions are implemented, where appropriate. Two interim cleanup operations were completed in 1994. Two additional interim actions are planned for 1995.

Future actions may include decontamination operations, soil remediation, and construction of containment barriers.

2292 (ANL/ER/CP--84542) **Argonne's Expedited Site Characterization: An integrated approach to cost- and time-effective remedial investigation.** Burton, J.C.; Walker, J.L.; Aggarwal, P.K.; Meyer, W.T. Argonne National Lab., IL (United States). [1995]. 27p. Sponsored by USDOE, Washington, DC (United States);Department of Agriculture, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950646--26: Air and Waste Management Association meeting, San Antonio, TX (United States), 18-23 Jun 1995). Order Number DE95013717. Source: OSTI; NTIS; INIS; GPO Dep.

Argonne National Laboratory has developed a methodology for remedial site investigation that has proven to be both technically superior to and more cost- and time-effective than traditional methods. This methodology is referred to as the Argonne Expedited Site Characterization (ESC). Quality is the driving force within the process. The Argonne ESC process is abbreviated only in time and cost and never in terms of quality. More usable data are produced with the Argonne ESC process than with traditional site characterization methods that are based on statistical-grid sampling and multiple monitoring wells. This paper given an overview of the Argonne ESC process and compares it with traditional methods for site characterization. Two examples of implementation of the Argonne ESC process are discussed to illustrate the effectiveness of the process in CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act) and RCRA (Resource Conservation and Recovery Act) programs.

2293 (ANL/ER/CP--85995) **The greening of PCB analytical methods.** Erickson, M.D. (and others); Alvarado, J.S.; Aldstadt, J.H. Argonne National Lab., IL (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-9508190--1: PCB seminar, Boston, MA (United States), 29-31 Aug 1995). Order Number DE96002694. Source: OSTI; NTIS; GPO Dep.

Green chemistry incorporates waste minimization, pollution prevention and solvent substitution. The primary focus of green chemistry over the past decade has been within the chemical industry; adoption by routine environmental laboratories has been slow because regulatory standard methods must be followed. A related paradigm, microscale chemistry has gained acceptance in undergraduate teaching laboratories, but has not been broadly applied to routine environmental analytical chemistry. We are developing green and microscale techniques for routine polychlorinated biphenyl (PCB) analyses as an example of the overall potential within the environmental analytical community. Initial work has focused on adaptation of commonly used routine EPA methods for soils and oils. Results of our method development and validation demonstrate that: (1) Solvent substitution can achieve comparable results and eliminate environmentally less-desirable solvents, (2) Microscale extractions can cut the scale of the analysis by at least a factor of ten, (3) We can better match the amount of sample used with the amount needed for the GC determination step, (4) The volume of waste generated can be cut by at least a factor of ten, and (5) Costs are reduced significantly in apparatus, reagent consumption, and labor.

2294 (ANL/ER/CP--87350) **Improved radioanalytical methods.** Erickson, M.D.; Aldstadt, J.H.; Alvarado, J.S.; Crain, J.S.; Orlandini, K.A.; Smith, L.L. Argonne National Lab., IL (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. (CONF-950868--42: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96006641. Source: OSTI; NTIS; INIS; GPO Dep.

Methods for the chemical characterization of the environment are being developed under a multitask project for the Analytical Services Division (EM-263) within the US Department of Energy (DOE) Office of Environmental Management. This project focuses on improvement of radioanalytical methods with an emphasis on faster and cheaper routine methods. We have developed improved methods, for separation of environmental levels of technetium-99 and strontium-89/90, radium, and actinides from soil and water; and for separation of actinides from soil and water matrix interferences. Among the novel separation techniques being used are element- and class-specific resins and membranes. (The 3M Corporation is commercializing Empore ™ membranes under a cooperative research and development agreement [CRADA] initiated under this project). We have also developed methods for simultaneous detection of multiple isotopes using inductively coupled plasma-mass spectrometry (ICP-MS). The ICP-MS method requires less rigorous chemical separations than traditional radiochemical analyses because of its mass-selective mode of detection. Actinides and their progeny have been isolated and concentrated from a variety of natural water matrices by using automated batch separation incorporating selective resins prior to ICP-MS analyses. In addition, improvements in detection limits, sample volume, and time of analysis were obtained by using other sample introduction techniques, such as ultrasonic nebulization and electrothermal vaporization. Integration and automation of the separation methods with the ICP-MS methodology by using flow injection analysis is underway, with an objective of automating methods to achieve more reproducible results, reduce labor costs, cut analysis time, and minimize secondary waste generation through miniaturization of the process.

2295 (ANL/ER/CP--89080) **Pollution prevention in the analytical laboratory--Microscale and other techniques do add up.** Erickson, M.D.; Alvarado, J.S.; Lu, C.-S.; Peterson, D.P.; Silzer, J. Argonne National Lab., IL (United States). [1996]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960741--5: Pollution prevention conference, Chicago, IL (United States), 9-11 Jul 1996). Order Number DE96012689. Source: OSTI; NTIS; INIS; GPO Dep.

The principles of pollution prevention in the analytical laboratory have not been addressed sufficiently. Although the amount of reagent used per sample is often only a few milliliters, the aggregate of many routine test each day in thousands of laboratories becomes significant. Current recycling practices are not practical with small streams. Therefore, we have adopted the principles of microscale chemistry, along with other modern analytical approaches, to develop routine analytical methods that significantly curtail waste but still maintain acceptable analytical figures of merit and achieve cost savings through reduced reagent consumption and reduced labor cost.

2296 (ANL/ES/CP--86380) **Advances in the development of FTIR continuous emission monitor for incinerators.** Mao, Zhouxiong; Demirgian, J.C.; Hwang, E. Argonne National Lab., IL (United States). [1995]. 14p.

Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-950542–3: 14. international symposium on thermal treatment technologies: incineration conference, Seattle, WA (United States), 8-12 May 1995). Order Number DE95013445. Source: OSTI; NTIS; GPO Dep.

The integrated, transportable FTIR-CEM was successfully tested from September 13 to 21, 1994, at the K-25 TSCA incinerator, in Oak Ridge, Tennessee. the field test followed the requirements of a procedure, which was submitted to the EPA for approval. The test results met all the requirement listed in the proposed procedure. Extensive spiking tests were conducted during the field test. The FTIR-CEM quantitatively detected all spiked analytes measured the stack emission variation during the ignition period of the incinerator. For the stack samples obtained under normal incineration conditions, no target analytes were detected at concentrations above the instrument detection limits, except for methane, which was occasionally detected at 4-5 ppM. Future work will involve making the master control software more robust to use, improving the accuracy of the analytical methods, and testing system effectiveness for various emission sources. A commercial version of the system is currently being developed.

2297 (ANL/ES/PP–80277) **Development of an ultrasonic process for soil remediation.** Wu, J.M.; Huang, H.S.; Livengood, C.D. Argonne National Lab., IL (United States). [1995]. 32p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE95012208. Source: OSTI; NTIS; INIS; GPO Dep.

An ultrasonic process for the detoxification of carbon tetrachloride- (CCl_4^-) contaminated soil was investigated in the laboratory by using a batch irradiation reactor equipped with a 600-W ultrasonic power supply operated at a frequency of 20 kHz. Key parameters studied included soil characteristics, irradiation time, CCl_4 concentration, steady-state operating temperature, applied ultrasonic-wave energy, and the ratio of soil to water in the system. The results of the experiments showed that (1) residual CCl_4 concentrations could be decreased with longer irradiation periods and (2) detoxification efficiency was proportional to steady-state operating temperature and applied ultrasonic-wave energy. The characteristics of the contaminated soil were found to be an important factor in the design of an ultrasonic detoxification system. A soil-phase CCl_4 concentration below 1 ppm (initial concentration of 56 ppm) was achieved through this process, indicating that the application of ultrasonic irradiation is feasible and effective in the detoxification of soil contaminated by organic compounds. On the basis of the experimental results, a schematic of a full-scale ultrasonic soil-detoxification system was developed. Improvements to this novel process are discussed.

2298 (BHI–00162) **Sampling and analysis plan for the characterization of eight drums at the 200-BP-5 pump-and-treat systems.** Laws, J.R. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005052. Source: OSTI; NTIS; INIS; GPO Dep.

Samples will be collected and analyzed to provide sufficient information for characterization of mercury and aluminum contamination in drums from the final rinse of the tanks in the two pump-and-treat systems supporting the 200-BP-5 Operable Unit. The data will be used to determine the type of contamination in the drums to properly designate the waste for disposal or treatment. This sampling plan does not substitute the sampling requirements but is a separate sampling event to manage eight drums containing waste generated during an unanticipated contamination of the process water with mercury and aluminum nitrate nonahydrate (ANN). The Toxicity Characteristic Leaching Procedure (TCLP) will be used for extraction, and standard US Environmental Protection Agency (EPA) methods will be used for analysis.

2299 (BHI–00196-Rev.1) **Strategy paper. Remedial design/remedial action 100 Area. Revision 1.** Donahoe, R.L. Bechtel National, Inc., Richland, WA (United States). Jul 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005875. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this planning document is to identify and define the approach for remedial design and remedial action (RD/RA) in the 100 Area of the Hanford Site, located in southeastern Washington State. Additionally, this document will support the Hanford Site Environmental Restoration Contract (ERC) team, the US Department of Energy (DOE), and regulatory agencies in identifying and agreeing upon the complete process for expedited cleanup of the 100 Area.

2300 (BHI–00196-Rev.2) **Strategy paper. Remedial design/remedial action 100 Area. Revision 2.** Donahoe, R.L. Bechtel National, Inc., Richland, WA (United States). Oct 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005874. Source: OSTI; NTIS; INIS; GPO Dep.

This strategy paper identifies and defines the approach for remedial design and remedial action (RD/RA) for source waste sites in the 100 Area of the Hanford Site, located in southeastern Washington State. This paper provides the basis for the US Department of Energy (DOE) to assess and approve the Environmental Restoration Contractor's (ERC) approach to RD/RA. Additionally, DOE is requesting review/agreement from the US Environmental Protection Agency (EPA) and Washington State Department of Ecology (Ecology) on the strategy presented in this document in order to expedite remedial activities.

2301 (BHI–00230) **Geologic field inspection of the sedimentary sequence at the environmental restoration disposal facility.** Fecht, K.R.; Weekes, D.C. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012118. Source: OSTI; NTIS; INIS; GPO Dep.

The sedimentary sequence in the Environmental Restoration Disposal Facility (ERDF) excavation was examined during construction (1) to document the geologic features identified during site characterization and (2) to determine if additional engineering measures to this vase design would be required. Periodic field inspections were made of vertical exposures created by earth-moving equipment during excavation of the disposal cells Inspections were also made of the trench sidewalls in the final excavation. This report presents the results of the field inspections of the sedimentary sequence at the ERDF.

2302 (BHI–00232) **Readiness evaluation plan for operation of the 200-ZP-1 pump-and-treat system.** Lehrschall, R.R. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 39p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009917. Source: OSTI; NTIS; INIS; GPO Dep.

The Project Readiness Evaluation (RE) process will show that the 200-ZP-1 Phase 2 and Phase 3 Interim Response Measure (IRM) remedial activity is prepared to safely and effectively commence work activities. In order to ensure readiness to commence the 200-ZP-1 Pump-and-Treat (P and T) activities, a formal RE will be performed in accordance with this plan. A Readiness Evaluation Team (RET) will evaluate and confirm readiness by reviewing the work activities and by conducting field verifications. The Project Final Hazard Classification (FHC) prepared for the 200-ZP-1 P and T IRM has determined that the operation is a Non-Nuclear Low Hazard activity. The goal of this IRM is to reduce further migration of the carbon tetrachloride, chloroform, and trichloroethylene (TCE) in the groundwater of the 200 West Area. The Phase 2 and Phase 3 IRM treatment system will be designed to initiate hydraulic containment of the contaminant mass in the high-concentration portion (i.e., the 2,000- to 3,000-ppb contour) of the CCl_4 plume. This system will be located just north of the Plutonium Finishing Plant in the 200 West Area and will utilize air stripping and vapor-phase granular activated carbon (GAC) adsorption of the CCl_4. Air stripping is performed by forcing clean air through the contaminated groundwater stream. Based on chemical equilibrium, volatile organic compounds are transferred from the groundwater stream into the air stream. The air stream, containing the contamination in vapor phase, will be passed through vapor-phase GAC columns to remove and collect the organic contaminants. Saturated GAC will then be shipped offsite for carbon regeneration, where the contamination will be destroyed at a permitted facility.

2303 (BHI–00317) **Environmental restoration disposal facility applicable or relevant and appropriate requirements study report. Revision 00.** Roeck, F.V. (and others); Vedder, B.L.; Rugg, J.E. Bechtel Hanford, Inc., Richland, WA (United States). Oct 1995. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008196. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration Disposal Facility (ERDF) will be a landfill authorized under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and will comply with the Resource Conservation and Recovery Act of 1976 (RCRA) substantive requirements. The facility will also comply with applicable or relevant and appropriate requirements (ARAR), including portions of the U.S. Environmental Protection Agency (EPA) regulations, Washington Administrative Code (WAC), and to-be-considered (TBC) elements such as U.S. Department of Energy (DOE) Orders. In considering the requirements of CERCLA, a detailed analysis of various alternatives for ERDF was completed using the nine CERCLA criteria, National Environmental Policy Act of 1969 (NEPA), and public comments. The ERDF record of decision (ROD) selected an alternative that includes a RCRA-compliant double-lined trench for the disposal of radioactive, hazardous, and mixed wastes resulting from the remediation of operable units (OU) within the National Priorities List (NPL) sites in the 100, 200, and 300 Areas. Only wastes resulting from the remediation of Hanford NPL sites will be allowed in the ERDF. Of the various siting and design alternatives proposed for ERDF, the selected alternative provides the best combination of features by balancing the nine CERCLA criteria, ARAR compliance, environmentally protective site, and various stakeholder and public recommendations. The ERDF trench design, compliant with RCRA Subtitle C minimum technical requirements (MTR), will be double lined and equipped with a leachate collection system. This design provides a more reliable system to protect groundwater than other proposed alternatives. The ERDF is located on the Hanford Site Central Plateau, southeast of the 200 West Area.

2304 (BHI–00466) **Sampling and analysis plan for the 116-C-5 retention basins characteristic dangerous waste determination.** Bauer, R.G.; Dunks, K.L. Bechtel Hanford, Inc., Richland, WA (United States). Mar 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96009918. Source: OSTI; NTIS; INIS; GPO Dep.

Cooling water flow from the rear face of the 100-B and 100-C reactors was diverted to large retention basins prior to discharge to the Columbia River. These retention basins delayed the release of the reactor coolant for decay of the short-lived activation products and for thermal cooling. Some of the activation products were deposited in sludge that settled in the basins and discharge lines. In addition, some contamination was deposited in soil around the basins and associated piping. The sampling objective of this project is to determine if regulated levels of leachable lead are present in the abrasive materials used to decontaminate the retention basin tank walls, in the material between the tank base plate and the concrete foundation, and in the soils immediately surrounding the perimeter of the retention basins. Sampling details, including sampling locations, frequencies, and analytical requirements, are discussed. Also described is the quality assurance plan for this project.

2305 (BHI–00532) **1330-N Waste Handling Facility waste designation sampling requirements.** Bryant, D.L. Bechtel Hanford, Inc., Richland, WA (United States). Dec 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005877. Source: OSTI; NTIS; INIS; GPO Dep.

This sampling and analysis requirements document details the protocols and responsibilities required to perform sampling and field screening for waste designation purposes. This Sampling and Analysis Plan (SAP) covers sample collection, field screening, sample analysis, sample shipping, and final report preparation for the characterization and designation of waste at the 1330-N Waste Handling Facility. At the direction of Field Support Waste Management (FSWM), this SAP may be used for sampling/field screening efforts at locations other than the 1330-N Waste Handling Facility.

2306 (BHI–00545) **Characterization plan for routine waste from surveillance and maintenance of 221-U and associated facilities.** Encke, D.B. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008014. Source: OSTI; NTIS; INIS; GPO Dep.

This characterization plan describes how to collect samples, gather radiological survey information, and identify what chemical/radiological analyses are necessary to characterize routine waste generated during surveillance and maintenance of 221-U and associated facilities.

2307 (BHI–00618) **Sample activity report for cobalt sampling at the 300-FF-1 South Process Pond.** Carlson, R.A. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013572. Source: OSTI; NTIS; INIS; GPO Dep.

This report has been prepared to summarize the sampling conducted under the Cobalt Sampling Plan for the South

Process Pond (SPP). The sampling plan was prepared to support near-term decisions being made with respect to cleanup criteria for cobalt-60 in the SPP within the 300-FF-1 Operable Unit. Statistically based sampling was designed to provide sufficient data to state confidence and error in estimating the mean of cobalt-60 concentrations in the SPP surface soils. Process knowledge and sample data taken in 1987 and 1991 indicate that the major SPP contaminants are cobalt-60 and uranium with some metals at low concentrations. Specifically, the cobalt-60 data indicate the current average concentration of cobalt-60 in the surface soils of the pond as near 8 pCi/g based on eight surface samples. The sampling event was designed to verify the average cobalt-60 concentration by taking enough randomly located samples to make statistical statements regarding the data. Sampling procedures conformed to the requirements established by the Environmental Restoration Contractor Team Environmental Investigations Procedures. The sampling plan called for only four biased samples. During the sampling, additional biased samples were taken to investigate several hot spots in the SPP.

2308 (BHI–00624) **100 Areas soil washing tradeoff study.** Belden, R.D. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013570. Source: OSTI; NTIS; INIS; GPO Dep.

The complex nature of cost analysis and systems work demands a level of effort to ensure that decisions made support the best interests of all parties. This tradeoff study will act as a formal decision analysis method for the evaluation of many variables. The documentation of the decision rationale and system design is essential for successful planning and implementation of any system. The Hanford Site offers unique problems for economic analysis of remediation alternatives. The variations in the size of sites, geographic locations, and possible cleanup scenarios all add to the complexity of the tradeoff analysis. A thorough examination of all alternatives must be held to a level of detail appropriate to current regulatory and budgetary considerations. This study will compare the economics of two specific alternatives for remediation of soils at the Hanford Site. Remove and dispose is compared to remove, treat, and dispose. The treatment analyzed in this study is volume reduction through soil washing.

2309 (BHI–00626) **Summary analysis of a Monte Carlo simulation of ecology's statistical guidance and a proposed alternative.** Petersen, S.W. Bechtel Hanford, Inc., Richland, WA (United States). Nov 1995. 173p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013571. Source: OSTI; NTIS; INIS; GPO Dep.

The State of Washington has recommended a specific statistical test procedure for identifying soil contamination at a potential waste site, referred to here as the State test. An alternative to this test has been presented (DOE/RL 1994), which uses the Wilcoxon Rank Sum, Quantile, and Hot Measurement Comparison tests (WQH). These same tests are recommended by the U.S. Environmental Protection Agency (EPA) to determine if soils from a waste site differ from site-specific, reference-based standards.

2310 (BHI–00713) **300-FF-1 operable unit predesign report.** Hadley, J.T. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012137. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this report is to provide a brief overview of the 300-FF-1 Operable Unit remediation project and package all pertinent project information to effectively transfer the project to the remedial design subcontractor. This is achieved by summarizing the following: site description; Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and Resource Conservation and Recovery Act (RCRA) documents; proposed remedy; and general design criteria. The 300-FF-1 Operable Unit is a source/vadose zone operable unit for the northeast portion of the 300 Area near the Columbia River. The 300-FF-1 Operable Unit contains CERCLA sites and a RCRA site.

2311 (BHI–00715) **Geophysical investigation of the 116-H-1 liquid waste disposal trench, 100-HR-1 operable unit.** Bergstrom, K.A.; Mitchell, T.H. Bechtel Hanford, Inc., Richland, WA (United States). Apr 1996. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013562. Source: OSTI; NTIS; INIS; GPO Dep.

A geophysical investigation and data integration were conducted for the 116-H-1 Liquid Waste Disposal Trench, which is located in the 100-HR-1 Operable Unit. The 116-H-1 Liquid Waste Disposal Trench is also known as the 107-H Liquid Waste Disposal Trench, the 107-H Rupture Effluent Trench, and the 107-H Trench (Deford and Einan 1995). The trench was primarily used to hold effluent from the 107-H Retention Basin that had become radioactive from contact with ruptured fuel elements. The effluent may include debris from the ruptured fuel elements (Koop 1964). The 116-H-1 Liquid Waste Disposal Trench was also used to hold water and sludge from the 107-H Retention Basin during the basin's deactivation in 1965.

2312 (BHI–00716) **Geophysical investigation of the 116-C-5 Retention Basin 100-BC-1, Operable Unit.** Bergstrom, K.A.; Mitchell, T.H. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 67p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005709. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the results of geophysical investigations and data integration conducted for the 116-C-5 Retention Basin. The retention basin and the surrounding terrain have changed significantly since they were in operation. The walls of the retention basins have been completely removed and the bottom of the basins have been covered with 1 to 5 ft of fill. The expansion boxes/diversion boxes near the edges of the basin have been partially destroyed with only the subsurface portion of the structures still intact. Numerous piles of soil and debris, that appear to be related to the removal of the walls, are found throughout the site. The objectives of this investigation include the following: locate and accurately map the perimeter of the two retention basins; locate and accurately map any unknown features (e.g. , major concentration of debris, pipelines, and utilities) that could be a factor during subsurface remediation work; and determine optimum locations for cone penetrometers and test pits that are to be used to assess the presence of subsurface contamination.

2313 (BHI–00717) **Geophysical investigation of the 116-B-11 retention basin, 116-B-1 liquid waste disposal trench, and 116-B-13 sludge trench, 100-BC-1 Operable**

Unit. Bergstrom, K.A.; Mitchell, T.H. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 52p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008043. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the results of geophysical investigations and data integration conducted for the 116-B-1 liquid waste disposal trench, the 116-B-11 retention basin, and the 116-B-13 sludge trench, which are all located at the 100-BC-1 Operable Unit (Figure 1). The objectives of this investigation include the following: Map the extent of 116-B-1 trench and any anomalous debris/material that may have been buried in it; Locate and accurately map the walls and pipelines associated with the 116-B-11 retention basin; and Locate and map the 116-B-13 sludge trench.

2314 (BHI–00720) **Performance evaluation report for soil vapor extraction system operations at the carbon tetrachloride site, February 1992–June 1995.** Rohay, V.J. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008035. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this report is to review carbon tetrachloride soil vapor extraction (SVE) operating data and to provide a summary of the effectiveness of SVE operations in addressing unsaturated zone (vadose zone) contamination based on the existing design. The report covers the operating period from February 25, 1992 through June 30, 1995. The scope of the report includes the history of SVE operations, the efficiency of those operations over time, the volume of vapor processed per system, the change in carbon tetrachloride concentrations with time, and the mass of carbon tetrachloride removed per site.

2315 (BHI–00722) **100 Area rock screening study.** Belden, R.D. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 153p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008961. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the activities and results of the 100-Area rock screening study performed on 116-C-1 Trench soils. The study was designed to provide sufficient information for evaluating the effectiveness of bulk screening rocks as a volume reduction technique during soil remediation. Therefore, the intent of this report is to provide valuable information that may be used to assess the feasibility of rock screening waste sites in the 100-BC Area as well as other waste sites in the 100 Area of the Hanford site. Rock screening, as a method of volume reduction, is the physical separation of cleaner, larger rocks, cobbles, and gravels from the finer more contaminated sands and silts without the use of water as a washing agent and without scrubbing or abrasion of any particle surfaces. A detailed cost analysis was performed to determine the cost effectiveness of rock screening versus direct disposal. The cost comparison indicated that rock screening could be cost effective if a substantial volume reduction (at least 41%) could be achieved; however, the cost difference with direct disposal was extremely small. And this study indicates that a 41% volume reduction cannot be achieved with the soils used in the study. Based on the results from this study, dry sieving of the samples was not successful in removing a sufficient amount of contamination from the larger material. Although better results may be achieved on soils with lower levels of contamination, further study of this reduced volume is not warranted at this time.

2316 (BHI–00724) **Technical basis to describe and document the parameters under which the electra ratemeter with DP-6 can be operated.** Wade, C.D. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012136. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this technical basis document is to describe the parameters under which the electra ratemeter with DP-6 probe can be operated at a 95% confidence level in support of characterization and release surveys.

2317 (BHI–00731-Rev.) **Disposal of sediments from the 1300-N Emergency Dump Basin.** Keen, R.; Duncan, G.M. Bechtel Hanford, Inc., Richland, WA (United States). Jan 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96005928. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes the characterization of the 1300-N Emergency Dump Basin (EDB) sediments, summarizes the data obtained, the resultant waste categorization, and the preferred disposal method. The EDB is an outdoor, concrete storage pond with a 3/16-in. carbon steel liner. The basin (completed in 1963) originally served as a quenching pool for reactor blowdown in the event of a primary coolant leak. Later, the basin received blowdown from the N Reactor steam generators. The steam generator blowdowns and leading isolation valves allowed radioactively contaminated water (from primary and secondary reactor coolant leaks) to enter the basin. Windblown dust and sand have settled in the basin over the years (because of its outdoor location), causing the present layer of sediments. To minimize potential airborne contamination, the water level was kept constant by adding water. However, the addition of water was stopped to minimize the amount of contaminated water needing disposal. To ensure that the surfaces exposed as a result of evaporation pose no immediate airborne contaminant problem, the contamination levels are monitored by Radiation Control Technicians. As part of the deactivation of N Reactor facilities, the EDB will be stabilized for long-term surveillance and maintenance prior to final decontamination and demolition.

2318 (BHI–00786) **Geophysical investigations in the group II sites 100-D area.** Bergstrom, K.A.; Mitchell, T.H. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 68p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96013566. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the results of a geophysical investigation of nine Group II sites: (1) 116-D-7 and 116-DR-9 Retention Basins (2) 116-DR- 1 and 116-DR-2 Liquid Effluent Trenches (3) 107-D-1, 107-D-2, 107-D-3, 107-D-4, and 107-D-5 Sludge trenches. All nine sites were directly associated with the operation of the retention basins which are located in the 100-DR-1 Operable Unit. An area south of 116-D-7 was also investigated as an area that may have contained buried debris. The objectives of this investigation include the following: (1) Locate, map, and/or verify locations of subsurface pipelines and utilities. (2) Locate and map five sludge disposal trenches. (3) Map the extent of 116-DR-1 and 116-DR-2 liquid disposal trenches. (4) Locate and accurately map any unknown features (e.g., major concentration of debris, pipelines, and utilities) that could be a factor during subsurface remediation work.

2319 (BHI–00810) **Radiological characterization survey methodology and sampling and analysis strategy for the 104-B-1 Tritium Vault and 104-B-2 Tritium Laboratory.** Harris, R.A. Bechtel Hanford, Inc., Richland, WA (United States). May 1996. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96012130. Source: OSTI; NTIS; INIS; GPO Dep.

This document describes the radiological characterization survey and sample collection and sample analysis for the 104-B-1 Tritium Vault and 104-B-2 Tritium Laboratory. The analytical data will be used to identify the radiological contamination and presence of hazardous materials to allow for disposal of the demolition debris.

2320 (CONF-9201182–Summ.) **Low-level waste forum meeting reports.** Sternwheeler, W.D.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 1992. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. From Low level radioactive waste winter meeting; San Diego, CA (United States); 29-31 Jan 1992. Order Number DE96013283. Source: OSTI; NTIS; INIS; GPO Dep.

This paper provides highlights from the 1992 winter meeting of the Low Level Radioactive Wastes Forum. Topics of discussion included: legal information; state and compact reports; freedom of information requests; and storage.

2321 (CONF-950209–8) **Assays and screening of alpha contaminated soils using low-resolution alpha spectroscopy of thick soil samples.** Meyer, K.E. (Oak Ridge National Lab., TN (United States)); Lucas, A.C.; Padovan, S. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. TTP/OR158102. From 4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995. Order Number DE95008969. Source: OSTI; NTIS; INIS; GPO Dep.

A new approach to estimating concentrations of alpha-emitting contaminants (e.g. U, Th, Ra, Pu, Am) in soil samples has been evaluated. The Victoreen Alpha Activity Monitor has been designed to empirically assay soil samples using low-resolution alpha spectroscopy, of thick soil samples. Pre-processing of the soil samples is minimal, involving only drying the soils and milling them to reduce inhomoceneities. Several laboratory tests of the instrument have been conducted. It has been shown that the instrument obeys simple counting statistics with measurement reproducibility improving with the inverse square root of the counting time. Using acquisition times of 1 to 24 hours the instrument Generated alpha assays of eighteen reference and field soil samples which were in good agreement with radiochemical analyses. It was observed that the alpha activity due to a 10pCi/g ^{239}Pu spike added to a clean soil could be very readily distinguished from the 14pCi/g background activity of the soil. In a mock field screening test of 100 Pu-contaminated soils, the instrument demonstrated screening success rates ranging from 70% (at a screening level of 5pCi/g) to greater than 90% (at a screening level of 30pCi/g).

2322 (CONF-950209–10) **Non-conventional passive sensors for monitoring tritium on surfaces.** Gammage, R.B. (Oak Ridge National Lab., TN (United States). Health Sciences Research Div.); Brock, J.L.; Meyer, K.E. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995. Order Number DE95013356. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/OR158102.

The authors describe development of small passive, solid-state detectors for in-situ measurements of tritium, or other weak beta-emitting radionuclides, on surfaces. One form of detector operates on the principle of thermally stimulated exoelectron emission (TSEE), the other by discharge of an electret ion chamber (EIC). There are currently two specific types of commercially available detector systems that lend themselves to making surface measurements. One is the thin-film BeO on a graphite disc, and the other is the Teflon EIC. Two other types of TSEE dosimeters (ceramic BeO and carbon doped alumina) are described but lack either a suitable commercially available reader or standardized methods of fabrication. The small size of these detectors allows deployment in locations difficult to access with conventional windowless gas-flow proportional counters. Preliminary testing shows that quantitative measurements are realized with exposure times of 1–10 hours for the TSEE dosimeters (at the DOE release guideline of 5,000 dpm/100 cm^2 for fixed beta contamination). The EIC detectors exhibit an MDA of 26,000 dpm/100 cm^2 for a 24 hour exposure. Both types of integrating device are inexpensive and reusable. Measurements can, therefore, be made that are faster, cheaper, safer, and better than those possible with baseline monitoring technology.

2323 (CONF-950209–11) **Use of passive alpha detectors to screen for uranium contamination in a field at Fernald, Ohio.** Dudney, C.S. (Oak Ridge National Lab., TN (United States)); Meyer, K.E.; Gammage, R.B.; Wheeler, R.V.; Salasky, M.; Kotrappa, P. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995. Order Number DE95013353. Source: OSTI; NTIS; INIS; GPO Dep.

TTP/OR158102.

This paper reports the results from a field test of newly developed techniques for inexpensive, in situ screening of soil for alpha contamination. Passive alpha detectors that are commercially available for the detection indoor airborne alpha activity (i.e., ^{222}Rn) have been modified so they can be applied to the detection of alpha contamination on surfaces or in soils. Results reported here are from an intercomparison involving several different techniques with all measurements being made at the same sites in a field near the formerly used uranium processing facility at Fernald, Ohio, during the summer of 1994. The results for two types of passive alpha detector show that the quality of calibration is improved if soils samples are milled to increase homogeneity within the soil matrices. The correlation between laboratory based radiochemical analyses and quick, field-based screening measurements is acceptable and can be improved if the passive devices are left for longer exposure times in the field. The total cost per measurement for either type of passive alpha detector is probably less than $25 and should provide a cost-effective means for site managers to develop the information needed to find areas with remaining alpha contamination so resources can be allocated efficiently.

2324 (CONF-9503121-2) **Characterization of sediments in the Clinch River, Tennessee, using remote sensing and multi-dimensional GIS techniques.** Levine, D.A.; Hargrove, W.W.; Hoffman, F. Oak Ridge National Lab., TN (United States). 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Geographic Information System (GIS); Vancouver (Canada); 27-30 Mar 1995. Order Number DE96004558. Source: OSTI; NTIS; INIS; GPO Dep.

Remotely-sensed hydro-acoustic data were used as input to spatial extrapolation tools in a GIS to develop two- and three-dimensional models of sediment densities in the Clinch River arm of Watts Bar Reservoir, Tennessee. This work delineated sediment deposition zones to streamline sediment sampling and to provide a tool for estimating sediment volumes and extrapolating contaminant concentrations throughout the system. The Clinch River arm of Watts Bar Reservoir has been accumulating sediment-bound contaminants from three Department of Energy (DOE) facilities on the Oak Ridge Reservation, Tennessee. Public concern regarding human and ecological health resulted in Watts Bar Reservoir being placed on the National Priorities List for SUPERFUND. As a result, DOE initiated and is funding the Clinch River Environmental Restoration Program (CR-ERP) to perform a remedial investigation to determine the nature and extent of sediment contamination in the Watts Bar Reservoir and the Clinch River and to quantify any human or ecological health risks. The first step in characterizing Clinch River sediments was to determine the locations of deposition zones. It was also important to know the sediment type distribution within deposition zones because most sediment-bound contaminants are preferentially associated to fine particles. A dual-frequency hydro-acoustic survey was performed to determine: (1) depth to the sediment water interface, (2) depth of the sediment layer, and (3) sediment characteristics (density) with depth (approximately 0.5-foot intervals). An array of geophysical instruments was used to meet the objectives of this investigation.

2325 (CONF-9503121-3) **Interpolation of bottom bathymetry and potential erosion in a large Tennessee reservoir system using GRASS.** Hargrove, W.W. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Hoffman, F.M.; Levine, D.A. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Geographic Information System (GIS); Vancouver (Canada); 27-30 Mar 1995. Order Number DE96004557. Source: OSTI; NTIS; INIS; GPO Dep.

A regularized spline with tension was used to interpolate a bathymetric bottom surface for the Watts Bar reservoir just south of Oak Ridge, TN as part of an effort to predict the spatial distribution of radionuclide contaminants. Cesium 137 was released as a by-product of the production of fissionable materials during the mid-1950s. Cesium is strongly adsorbed onto clay and silt particles in the water column, and tends to settle to the bottom. An understanding of the shape and contours of the bottom is important for understanding and prediction of the location and extent of contaminated sediments. The results of the investigations are available on the World Wide Web (WWW) at URL: http://www.esd.ornl.gov/programs/CRERP/INDEX.HTM. The Waterways Experiment Station (WES) of the US Army Corps of Engineers conducted a hydro-acoustic study of the Clinch River arm of Watts Bar Reservoir to determine the distribution, thickness, and type of bottom sediments that had accumulated since completion of Watts Bar Dam in 1942. WES has developed a rapid geophysical technique to determine material characteristics of bottom and subbottom sediments. Acoustic impedance values determined from seismic reflection data are directly related to the density and material type of the subbottom sediments. The objective was to quantify with depth the density and type of bottom and subbottom sediments up to depths of 15 ft below the bottom surface along the Clinch River and Poplar Creek, TN.

2326 (CONF-950483-10) **Phospholipid anaysis of extant microbiota for monitoring in situ bioremediation effectiveness.** Pinkart, H.C.; Ringelberg, D.B.; Stair, J.O.; Sutton, S.D..; Pfiffner, S.M.; White, D.C. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 3. international in situ and on-site bioreclamation symposium; San Diego, CA (United States); 24-27 Apr 1995. Order Number DE96005646. Source: OSTI; NTIS; INIS; GPO Dep.

Two sites undergoing bioremediation were studied using the signature lipid biomarker (SLB) technique. This technique isolates microbial lipid moieties specifically related to viable biomass and to both prokaryotic and eukaryotic biosynthetic pathways. The first site was a South Pacific atoll heavily contaminated with petroleum hydrocarbons. The second site was a mine waste reclamation area. The SLB technique was applied to quantitate directly the viable biomass, community structure, and nutritional/physiological status of the microbiota in the soils and subsurface sediments of these sites. All depths sampled at the Kwajalein Atoll site showed an increase in biomass that correlated with the co-addition of air, water, and nutrients. Monoenoic fatty acids increased in abundance with the nutrient amendment, which suggested an increase in gram-negative bacterial population. Ratios of specific phospholipid fatty acids indicative of nutritional stress decreased with the nutrient amendment. Samples taken from the mine reclamation site showed increases in total microbial biomass and in Thiobacillus biomass in the plots treated with lime and bactericide, especially when a cover soil was added. The plot treated with bactericide and buffered lime without the cover soil showed some decrease in Thiobacillus numbers, but was still slightly higher than that observed in the control plots.

2327 (CONF-9509287-1) **Evaluation of metal and radionuclide data from neutron activation and acid-digestion-based spectrometry analyses of background soils: Significance in environmental restoration.** Lee, S.Y. (Oak Ridge National Lab., TN (United States)); Watkins, D.R.; Jackson, B.L.; Schmoyer, R.L.; Lietzke, D.A.; Burgoa, B.B.; Branson, J.T.; Ammons, J.T. Oak Ridge National Lab., TN (United States). [1995]. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. international conference on modern trends in activation analysis; Seoul (Korea, Republic of); 24-30 Sep 1995. Order Number DE96004929. Source: OSTI; NTIS; INIS; GPO Dep.

A faster, more cost-effective, and higher-quality data acquisition procedure for natural background-level metals and radionuclides in soils is needed for remedial investigations of contaminated sites. In this project, a total of 120 soil samples were collected from uncontaminated areas on and near the Oak Ridge Reservation. The samples were taken at three different depths and from three different geologic groups to establish background concentrations of metals and radionuclides. The objective of this presentation is to discuss the advantages and disadvantages of neutron activation analysis (NAA) compared with those of acid-digestion-based spectrometry (ADS) methods; the advantages and disadvantages were evaluated from Al, Sb, As, Cr, Co, Fe, Mg, Mn, Hg, K, Ag, ^{232}Th, ^{235}U, ^{238}U, V, and Zn data. The ADS methods used for this project were inductively coupled plasma (ICP), ICP-mass spectrometry (ICP-MS), and alpha spectrometry. The scatter plots showed that the NAA results for As, Co, Fe, Mn, ^{232}Th, and ^{238}U are reasonably correlated with the results from the other analytical methods. Compared to NAA, however, the ADS methods underestimated Al, Cr, Mg, K, V, and Zn. The skew distributions were caused by incomplete dissolution of the analytes during acid digestion of the soil samples. Because of the high detection limits of the spectrometric methods, the NAA results and the ADS results for some elements, including Sb, Hg, and Ag, did not show a definite relationship. The NAA results were highly correlated with the alpha spectrometry results for ^{232}Th and ^{238}U but poorly correlated for ^{235}U, probably because of a larger counting error associated with the lower activity of the isotope. The NAA methods, including the delayed neutron counting method, were far superior techniques for quantifying background levels of radionuclides (^{232}Th, ^{235}U, and ^{238}U) and metals (Al, Cr, Mg, K, V, and Zn) in soils.

2328 (CONF-951057–7) **Investigation of electrokinetic decontamination of concrete.** DePaoli, D.W.; Harris, M.T.; Morgan, I.L.; Ally, M.R. Oak Ridge National Lab., TN (United States). [1995]. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. symposium on separation science and technology for energy applications; Gatlinburg, TN (United States); 22-26 Oct 1995. Order Number DE96005751. Source: OSTI; NTIS; INIS; GPO Dep.

Experiments have been conducted to investigate the capabilities of electrokinetic decontamination of concrete. Batch equilibration studies have determined that the loading of cesium and strontium on concrete may be decreased using electrolyte solutions containing competing cations, while solubilization of uranium and cobalt, that precipitate at high pH, will require lixiviants containing complexing agents. Dynamic electrokinetic experiments showed greater mobility of cesium than strontium, while some positive results were obtained for the transport of cobalt through concrete using EDTA and for uranium using carbonate.

2329 (CONF-951091–) **Nondestructive assay and nondestructive examination waste characterization conference: Proceedings.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Idaho State Univ., Pocatello, ID (United States). [1995]. 550p. Sponsored by USDOE, Washington, DC (United States);Idaho State Univ., Pocatello, ID (United States). DOE Contract AC07-94ID13223. From 4. nondestructive assay and nondestructive examination waste characterization conference; Salt Lake City, UT (United States); 24-26 Oct 1995. Order Number DE96002403. Source: OSTI; NTIS; INIS; GPO Dep.

The 4th Nondestructive Assay and Nondestructive Examination Waste Characterization Conference is provided as a forum for the communication of current and projected nondestructive waste assay and examination (NDA/NDE) issues. Evolving waste management policies, requirements, and schedules are pressing the field of waste NDA/NDE to its attainable level of technological maturity. This naturally requires the technology to reconcile its capabilities and limitations with respect to the actuality for the waste form configurations and their characterizations. Individual papers have been indexed separately for the database.

2330 (CONF-951091–10) **Source imaging of drums in the APNEA system.** Hensley, D. Oak Ridge National Lab., TN (United States). [1995]. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. nondestructive assay and nondestructive examination waste characterization conference; Salt Lake City, UT (United States); 24-26 Oct 1995. Order Number DE96005981. Source: OSTI; NTIS; INIS; GPO Dep.

The APNea System is a neutron assay device utilizing both a passive mode and a differential-dieaway active mode. The total detection efficiency is not spatially uniform, even for an empty chamber, and a drum matrix in the chamber can severely distort this response. In order to achieve a response which is independent of the way the source material is distributed in a drum, an imaging procedure has been developed which treats the drum as a number of virtual (sub)volumes. Since each virtual volume of source material is weighted with the appropriate instrument parameters (detection efficiency and thermal flux), the final assay result is essentially independent of the actual distribution of the source material throughout the drum and its matrix.

2331 (CONF-951091–11) **Autonomous identification of matrices in the APNea system.** Hensley, D. Oak Ridge National Lab., TN (United States). 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 4. nondestructive assay and nondestructive examination waste characterization conference; Salt Lake City, UT (United States); 24-26 Oct 1995. Order Number DE96005980. Source: OSTI; NTIS; INIS; GPO Dep.

The APNea System is a passive and active neutron assay device which features imaging to correct for nonuniform distributions of source material. Since the imaging procedure requires a detailed knowledge of both the detection efficiency and the thermal neutron flux for (sub)volumes of the drum of interest, it is necessary to identify which mocked-up matrix, to be used for detailed characterization studies, best matches the matrix of interest. A methodology referred to as the external matrix probe (EMP) has been established which links external measures of a drum matrix to those of mocked-up matrices. These measures by themselves are sufficient to identify the appropriate mock matrix, from which the necessary characterization data are obtained. This independent matrix identification leads to an autonomous determination of the required system response parameters for the assay analysis.

2332 (CONF-9510125–1) **In situ techniques for the characterization and monitoring of a radioactively contaminated site for in situ vitrification.** Cline, S.R.; Bogle, M.A.; Spalding, B.P.; Naney, M.T. Oak Ridge National Lab., TN (United States). [1995]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International symposium on environmental technologies: plasma systems and applications; Atlanta, GA (United States); 8-11 Oct 1995. Order Number DE95012896. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study was in October 1993 to evaluate the application of in situ vitrification (ISV) to an old seepage pit used for the disposal of radioactive liquid waste at the Oak Ridge National Laboratory (ORNL). This pit is one of seven inactive seepage pits and trenches at ORNL. During the 3 months that the pit was operated as a disposal facility, it is estimated to have received approximately 398 curies of mixed fission products, primarily ^{137}Cs, ^{90}Sr, and ^{106}Ru. Based on data from analysis of sludge from another pit, the activities for waste sludge in Pit 1 decay corrected to 1993 have been roughly estimated to be 71 and 17.5 curies of ^{137}Cs, and ^{90}Sr, respectively. The ^{106}Ru, with a half-life of 367 days, has decayed completely in the 42 years since its disposal in the pit Earthen fill material was added to the pit in 1981, and the pit area was then covered with an approximately 4–6 inch thick asphalt surface. Because so little information necessary for the effective and safe ISV of Pit 1 was available, the first phasm of the treatability study focused on site characterization activities. Several in-situ techniques were developed and used during characterization to ascertain the pit's lateral and vertical dimensions hydraulic and hydrologic properties, soil composition, contaminant inventory, and lateral and vertical distribution of radionuclides. At the end of the treatability study, this characterization effort will be evaluated to determine which properties were the most useful for designing and controlling the ISV process. Such information will be invaluable in efficiently and safely gathering characterization data for the remediation of the other seepage pits and trenilim at ORNL via ISV or alternative remediation techniques. This abstract briefly describes some of the major components of the field characterization activities and their results.

2333 (CONF-9510319–2) **Use of remote sensing to identify waste sources at ORNL's SWSA 4.** Huff, D.D. (and others); Doll, W.E.; Nyquist, J.E. Oak Ridge National Lab., TN (United States). 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 11. annual model conference; Oak Ridge, TN (United States); 16-18 Oct 1995. Order Number DE96010591. Source: OSTI; NTIS; INIS; GPO Dep.

Solid waste storage area (SWSA) 4, at Oak Ridge National Laboratory (ORNL), contributes 25% of the ^{90}Sr release from the ORNL complex. Disposal records were destroyed in a fire, thus limiting the ability to locate waste sources contributing to the releases. The use of remote sensing products, including photos and thermal spectra images, provided the needed information to allow field work to progress in an efficient and cost-effective manner. As a result, four major sources were identified. Preliminary estimates suggest that cost avoidance in excess of $5 million will be possible because of the detailed source location knowledge.

2334 (CONF-951271–1) **Performance of immunoassay kits for site characterization and remediation.** Waters, L.C.; Palausky, A.; Counts, R.W.; Jenkins, R.A. Oak Ridge National Lab., TN (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From On-site analysis: when is it the viable option?; Arlington, VA (United States); 11-12 Dec 1995. Order Number DE96005971. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) is supporting efforts to identify, validate and implement the use of effective, low-cost alternatives to currently used analytical methods for environmental management. As part of that program, we have evaluated the performances of a number of immunoassay (IA) kits with specificities for environmental contaminants of concern to the DOE. The studies were done in the laboratory using both spiked and field test samples. The analyte specificity and manufacturers of the kits evaluated were the following: mercury, BioNebraska; polychlorinated biphenyls (PCBs), EnSys and Millipore; petroleum fuel hydrocarbons, Millipore and Ohmicron; and polyaromatic hydrocarbons (PAHs), Ohmicron and Millipore. The kits were used in either a semiquantitative or quantitative format according to the preference of the manufacturers.

2335 (CONF-960212–80) **Underground radioactive waste tank remote inspection and sampling.** Bzorgi, F.M.; Kelsey, A.P.; Van Hoesen, S.D.; Wiles, C.O. Oak Ridge National Lab., TN (United States). 1996. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment; Tucson, AZ (United States); 25-29 Feb 1996. Order Number DE96008803. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization is a critical step in the remediation of contaminated materials and facilities. Severe physical- and radiological-access restrictions made the task of characterizing the World War II-era underground radioactive storage tanks at the Oak Ridge National Laboratory (ORNL) particularly challenging. The innovative and inexpensive tank characterization system (TCS) developed to meet this challenge at ORNL is worthy of consideration for use in similar remediation projects. The TCS is a floating system that uses the existing water in the tank as a platform that supports instruments and samplers mounted on a floating boom. TCS operators feed the unit into an existing port of the tank to be characterized. Once inserted, the system's position is controlled by rotation and by insertion and withdrawal of the boom. The major components of the TCS system include the following: (1) boom support system that consists of a boom support structure and a floating boom, (2) video camera and lights, (3) sludge grab sampler, (4) wall chip sampler, and (5) sonar depth finder. This simple design allows access to all parts of a tank. Moreover, the use of off-the-shelf components keeps the system inexpensive and minimizes maintenance costs. The TCS proved invaluable in negotiating the hazards of ORNL's Gunite and Associated Tanks, which typically contain a layer of radioactive sludge, have only one to three access ports that are usually only 12- or 24-in. in diameter, and range from 12 to 50 ft in diameter. This paper reviews both the successes and the difficulties encountered in using the TCS for treatability studies at ORNL and discusses the prospects for its wider application in remediation activities.

2336 (CONF-960477–1) **Clean enough for industry? An airborne geophysical case study.** Nyquist, J.E.; Beard, L.P. Oak Ridge National Lab., TN (United States). [1996]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From 9. annual symposium on the application of geophysics to engineering and environmental problems; Denver, CO (United States); 15 Apr - 1 May 1996. Order Number DE96005483. Source: OSTI; NTIS; INIS; GPO Dep.

Data from two airborne geophysical surveys of the Department of Energy's Oak Ridge Reservation (ORR) were extremely valuable in deciding whether a 1000-acre (400 hectare) parcel of the ORR should be released to the City of Oak Ridge for industrial development. Our findings, based on electromagnetic and magnetic data, were incorporated in the federally mandated Environmental Assessment Statement (EAS), and in general supported claims that this land was never used as a hazardous waste disposal site. We estimated the amount of iron required to produce each anomaly using a simple dipole model. All anomalies with equivalent sources greater than approximately 1000 kg of iron were checked in the field, and the source of all but one identified as either a bridge, reinforced concrete debris, or a similarly benign object. Additionally, some smaller anomalies (equivalent sources of roughly 500 kg) have been checked; thus far, these also have innocuous sources. Airborne video proved invaluable in identifying logging equipment as the source of some of these anomalies. Geologic noise may account for some of the remaining anomalies. Naturally occurring accumulations of magnetic minerals in the soil on the ORR have been shown to produce anomalies which, at a sensor height of 30 m, are comparable to the anomaly produced by about 500 kg of iron. By comparison, the electronic noise of the magnetic gradiometer, 0.01–0.02 nT/m, is equivalent to only about 50–100 kg of iron at a 30 m sensor height. The electromagnetic data, combined with field mapping of karst structures, provided evidence of a northeast-southwest striking conduit spanning the parcel. The possible existence of a karst conduit led the EAS authors to conclude that this is a "sensitive hydrologic setting." We conclude that aerial geophysics is an extremely cost-effective, and efficient technique for screening large tracts of land for environmental characterization.

2337 (CONF-9606116–7) **Characterization of the molten salt reactor experiment fuel and flush salts.** Williams, D.F.; Peretz, F.J. Oak Ridge National Lab., TN (United States). 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual meeting of the American Nuclear Society (ANS); Reno, NV (United States); 16-20 Jun 1996. Order Number DE96008657. Source: OSTI; NTIS; INIS; GPO Dep.

Wise decisions about the handling and disposition of spent fuel from the Molten Salt Reactor Experiment (MSRE) must be based upon an understanding of the physical, chemical, and radiological properties of the frozen fuel and flush salts. These "static" properties can be inferred from the extensive documentation of process history maintained during reactor operation and the knowledge gained in laboratory development studies. Just as important as the description of the salt itself is an understanding of the dynamic processes which continue to transform the salt composition and govern its present and potential physicochemical behavior. A complete characterization must include a phenomenological characterization in addition to the typical summary of properties. This paper reports on the current state of characterization of the fuel and flush salts needed to support waste management decisions.

2338 (CONF-960804–6) **Methodology for development of treatment and disposal options for compressed gas cylinders contaminated with radionuclides.** Conley, T.B. (Oak Ridge National Lab., TN (United States)); Czor, K.R.; Wright, W.T. Oak Ridge National Lab., TN (United States). 1996. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009625. Source: OSTI; NTIS; INIS; GPO Dep.

Compressed gas cylinders contaminated with radionuclides are a unique waste item that may become a Resource Conservation and Recovery Act (RCRA) hazardous waste through two mechanisms: either the contents of the compressed gas cylinder are regulated under RCRA or the internal pressure of the compressed gas cylinder gives it the characteristic of reactivity. The characteristic of reactivity is defined by RCRA in 40 Code of Federal Regulations (CFR) 261.23(a)(6) as a waste that is capable of detonation or explosive reaction if it is subjected to a strong initiating source or heated under confinement. In a letter dated September 1, 1989, the U.S. Environmental Protection Agency (EPA) Office of Solid Waste referred the interpretation of the definition of reactivity to the EPA Regional Office and/or the state (if the state has primacy). The Tennessee Department of Environment and Conservation (TDEC) has made the interpretation that to meet the definition of reactive as specified in 40 CFR 261.23(a)(6) there must be a chemical reaction that causes the explosion or detonation. This interpretation limits the compressed gas cylinders that have to be treated as RCRA hazardous waste to those that have other RCRA characteristic codes or contain listed wastes. The difficulty in treating compressed gas cylinders is heightened in the case of radiologically contaminated compressed gas cylinders because the internal pressure and possible hazardous constituents must be treated in most cases before decontamination of the cylinder is possible. Special procedures must be followed to ensure that radiological contamination is not transferred to clean gas cylinders or released into the environment.

2339 (CONF-960804–7) **Estimating surface water risk at Oak Ridge National Laboratory: Effects of site conditions on modeling results.** Curtis, A.H. III. Oak Ridge National Lab., TN (United States). Aug 1996. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. From SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996. Order Number DE96009634. Source: OSTI; NTIS; INIS; GPO Dep.

Multiple source term and groundwater modeling runs were executed to estimate surface water ^{90}Sr concentrations resulting from leaching of sludges in five 180,000 gallon Gunite™ tanks at Oak Ridge National Laboratory. Four release scenarios were analyzed: (1) leaching of unstabilized sludge with immediate tank failure; (2) leaching of unstabilized sludge with delayed tank failure due to chemical degradation; (3) leaching of stabilized sludge with immediate tank failure; and (4) leaching of residual contamination out of the shells of empty tanks. Source terms and concentrations of ^{90}Sr in the stream directly downgradient of the tanks were calculated under these release scenarios. The following conclusions were drawn from the results of the modeling: (1) small changes in soil path length resulted in relatively large changes in the modeled ^{90}Sr concentrations in the stream; (2) there was a linear relationship between the amount of sludge remaining in a tank and the peak concentration of ^{90}Sr in the stream; (3) there was a linear relationship between the cumulative ^{90}Sr release from a tank and the peak concentration of ^{90}Sr in the stream; (4) sludge stabilization resulted in significantly reduced peak concentrations of ^{90}Sr in the stream; and (5) although radioactive decay of ^{90}Sr during the period of tank degradation resulted in incrementally lower peak ^{90}Sr concentrations in surface water than under the immediate tank failure scenarios these concentrations were equivalent under the two scenarios after about 90 years.

2340 (DOE/CAO–95-1076) **Performance demonstration program plan for analysis of simulated headspace gases.** USDOE Carlsbad Area Office, NM (United States). Jun 1995. 36p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96003981. Source: OSTI; NTIS; INIS; GPO Dep.

The Performance Demonstration Program (PDP) for analysis of headspace gases will consist of regular distribution and analyses of test standards to evaluate the capability for analyzing VOCs, hydrogen, and methane in the headspace of transuranic (TRU) waste throughout the Department of Energy (DOE) complex. Each distribution is termed a PDP cycle. These evaluation cycles will provide an objective measure of the reliability of measurements performed for TRU waste characterization. Laboratory performance will be demonstrated by the successful analysis of blind audit samples of simulated TRU waste drum headspace gases according to the criteria set within the text of this Program Plan. Blind audit samples (hereinafter referred to as PDP samples) will be used as an independent means to assess laboratory performance regarding compliance with the QAPP QAOs. The concentration of analytes in the PDP samples will encompass the range of concentrations anticipated in actual waste characterization gas samples. Analyses which are required by the WIPP to demonstrate compliance with various regulatory requirements and which are included in the PDP must be performed by laboratories which have demonstrated acceptable performance in the PDP.

2341 (DOE/CH/10575–T5) **Application of modern diagnostic methods to environmental improvement. Annual progress report, October 1994–September 1995.** Shepard, W.S. Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab. Dec 1995. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG02-93CH10575. Order Number DE96003939. Source: OSTI; NTIS; INIS; GPO Dep.

The Diagnostic Instrumentation and Analysis Laboratory (DIAL), an interdisciplinary research department in the College of Engineering at Mississippi State University (MSU), is under contract with the US Department of Energy (DOE) to develop and apply advanced diagnostic instrumentation and analysis techniques to aid in solving DOE's nuclear waste problem. The program is a comprehensive effort which includes five focus areas: advanced diagnostic systems; development/application; torch operation and test facilities; process development; on-site field measurement and analysis; technology transfer/commercialization. As part of this program, diagnostic methods will be developed and evaluated for characterization, monitoring and process control. Also, the measured parameters, will be employed to improve, optimize and control the operation of the plasma torch and the overall plasma treatment process. Moreover, on-site field measurements at various DOE facilities are carried out to aid in the rapid demonstration and implementation of modern fieldable diagnostic methods. Such efforts also provide a basis for technology transfer.

2342 (DOE/EA–1030) **Characterization of stored defense production spent nulcear fuel and associated materials at Hanford Site, Richland Washington: Environmental assessment.** USDOE, Washington, DC (United States). Mar 1995. 62p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012247. Source: OSTI; NTIS; INIS; GPO Dep.

There are about 2,100 tonnes (2,300 tons) of defense production spent nuclear fuel stored in the 100-K Area Basins located along the south shore of the Columbia River in the northern part of the Hanford Site. Some of the fuel which has been in storage for a number of years is in poor condition and continues to deteriorate. The basins also contain fuel fragments and radioactively contaminated sludge. The DOE needs to characterize defense production spent nuclear fuel and associated materials stored on the Hanford Site. In order to satisfy that need, the Department of Energy (DOE) proposes to select, collect and transport samples of spent nuclear fuel and associated materials to the 327 Building for characterization. As a result of that characterization, modes of interim storage can be determined that would be compatible with the material in its present state and alternative treatment processes could be developed to permit a broader selection of storage modes. Environmental impacts of the proposed action were determined to be limited principally to radiation exposure of workers, which, however, were found to be small. No health effects among workers or the general public would be expected under routine operations. Implementation of the proposed action would not result in any impacts on cultural resources, threatened, endangered and candidate species, air or water quality, socioeconomic conditions, or waste management.

2343 (DOE/EM–0232-Vol.2) **Estimating the cold war mortgage: The 1995 baseline environmental management report. Volume II: Site summaries.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Mar 1995. 740p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95012533. Source: OSTI; NTIS; INIS; GPO Dep.

This volume, Volume II presents the site data that was used to generate the Department of Energy's (DOE) initial Baseline Environmental Management Report (BEMR). The raw data was obtained by DOE field personnel from existing information sources and anticipated environmental management strategies for their sites and was tempered by general assumptions and guidance developed by DOE Headquarters personnel. This data was then integrated by DOE Headquarters personnel and modified to ensure that overall constraints such as funding and waste management capacity were addressed. The site summaries are presented by State and broken out by discrete activities and projects. The Volume I Glossary has been repeated to facilitate the reader's review of Volume II. The information presented in the site summaries represents the best data and assumptions available as of February 1, 1995. Assumptions that have not been mandated by formal agreement with appropriate regulators and other stakeholders do not constitute decisions by the Department nor do they supersede existing agreements. In addition, actions requiring decisions from external sources regarding unknowns such as future land use and funding/scheduling alternatives, as well as internal actions such as the Department's Strategic Realignment initiative, will alter the basis and general assumptions used to generate the results for this report. Consequently, the numbers presented in the site summaries do not represent outyear budget requests by the field installations.

2344 (DOE/EM–0238) **Cost Quality Management Assessment for the Oakland Operations Office. Final report.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of

Engineering and Cost Management. Jun 1995. 114p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95013582. Source: OSTI; NTIS; INIS; GPO Dep.

The prime contractor of Lawrence Livermore National Laboratory (LLNL), University of California, is responsible for conducting environmental restoration (ER) and waste management (WM) activities at LLNL under the direction of the Oakland Operations Office (DOE-OAK). This report examines the overall DOE-OAK and LLNL process with respect to cost quality management for EM-30, EM-40, and EM-60 activities. The Round II Cost Quality Management Assessment (CQMA) conducted October 17–28, 1994, reviewed DOE-LAK's cost and cost-related management practices against Performance Objective and Criteria (POCs) contained in the CQMA Handbook (Rev. 3). Three subteams (Cost- and Schedule-Estimating Process, Independent Cost Review, and Management and Technical Evaluation) conducted interviews and reviewed documentation to assess cost and cost-related practices associated with EM-30, -40, and -60 activities. The detailed reports of the subteams are presented in section III. Included in the appendices are organizational charts of the Oakland Operations Office and Lawrence Livermore National Laboratory.

2345 (DOE/EM–0254) **Characterization, monitoring, and sensor technology crosscutting program: Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Office of the Deputy Assistant Secretary for Technology Development. Jun 1995. 155p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016175. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) is to deliver appropriate characterization, monitoring, and sensor technology (CMST) to the Office of Waste Management (EM-30), the Office of Environmental Restoration (EM-40), and the Office of Facility Transition and Management (EM-60). The technology development must also be cost effective and appropriate to EM-30/40/60 needs. Furthermore, the required technologies must be delivered and implemented when needed. Accordingly, and to ensure that available DOE and other national resources are focused an the most pressing needs, management of the technology development is concentrated on the following Focus Areas: Contaminant Plume Containment and Remediation (PFA); Landfill Stabilization (LSFA); High-Level Waste Tank Remediation (TFA); Mixed Waste Characterization, Treatment, and Disposal (MWFA); and Facility Deactivation, Decommissioning, and Material Disposition (FDDMDFA). Brief descriptions of CMST-CP projects funded in FY95 are presented.

2346 (DOE/EM–0276) **Annual report on waste generation and waste minimization progress 1993.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Dec 1995. 206p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009319. Source: OSTI; NTIS; INIS; GPO Dep.

This Report presents and analyzes 1993 DOE waste generation information and efforts to minimize all waste types. This is the second annual report and covers 55 reporting sites in 25 states. The purpose of this Report is to document and track waste generation and waste minimization activities within the DOE complex.

2347 (DOE/EM–0287) **Flameless thermal oxidation. Innovative technology summary report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Sep 1995. 19p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96009312. Source: OSTI; NTIS; INIS; GPO Dep.

The Flameless Thermal Oxidizer (FTO) is a commercial technology offered by Thermatrix, Inc. The FTO has been demonstrated to be an effective destructive technology for process and waste stream off-gas treatment of volatile organic compounds (VOCs), and in the treatment of VOC and chlorinated volatile organic compounds (CVOCs) off-gases generated during site remediation using either baseline or innovative in situ environmental technologies. The FTO process efficiently converts VOCs and CVOCs to carbon dioxide, water, and hydrogen chloride. When FTO is coupled with a baseline technology, such as soil vapor extraction (SVE), an efficient in situ soil remediation system is produced. The innovation is in using a simple, reliable, scalable, and robust technology for the destruction of VOC and CVOC off-gases based on a design that generates a uniform thermal reaction zone that prevents flame propagation and efficiently oxidizes off-gases without forming products of incomplete combustion (PICs).

2348 (DOE/EM–0288) **SEAMIST™. Innovative technology summary report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Aug 1995. 23p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI; GPO Dep.

SEAMIST has been demonstrated and deployed as an innovative tool to better access the subsurface for characterization and monitoring of contaminants in both vertical and horizontal boreholes. The technology has been developed by industry with assistance from DOE's Office of Technology Development to ensure it meets the needs of the environmental restoration market.

2349 (DOE/EM–0289) **In situ enhanced soil mixing. Innovative technology summary report.** USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Feb 1996. 25p. Sponsored by USDOE, Washington, DC (United States). Source: OSTI; GPO Dep.

In Situ Enhanced Soil Mixing (ISESM) is a treatment technology that has been demonstrated and deployed to remediate soils contaminated with volatile organic compounds (VOCs). The technology has been developed by industry and has been demonstrated with the assistance of the U.S. Department of Energy's Office of Science and Technology and the Office of Environmental Restoration. The technology is particularly suited to shallow applications, above the water table, but can be used at greater depths. ISESM technologies demonstrated for this project include: (1) Soil mixing with vapor extraction combined with ambient air injection. [Contaminated soil is mixed with ambient air to vaporize volatile organic compounds (VOCs). The mixing auger is moved up and down to assist in removal of contaminated vapors. The vapors are collected in a shroud covering the treatment area and run through a treatment unit containing a carbon filter or a catalytic oxidation unit with a wet scrubber system and a high efficiency particulate air (HEPA) filter.] (2) soil mixing with vapor extraction combined with hot air injection [This process is the same as the ambient air injection except that hot air or steam is injected.] (3) soil mixing with hydrogen peroxide injection [Contaminated soil is mixed with ambient air that contains a mist of diluted hydrogen peroxide

(H_2O_2) solution. The H_2O_2 solution chemically oxidizes the VOCs to carbon dioxide (CO_2) and water.] (4) soil mixing with grout injection for solidification/stabilization [Contaminated soil is mixed as a cement grout is injected under pressure to solidify and immobilize the contaminated soil in a concrete-like form.] The soils are mixed with a single-blade auger or with a combination of augers ranging in diameter from 3 to 12 feet.

2350 (DOE/EM–0298) **Characterization monitoring & sensor technology crosscutting program.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 154p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013520. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the Characterization, Monitoring, and Sensor Technology Crosscutting Program (CMST-CP) is to deliver appropriate characterization, monitoring, and sensor technology (CMST) to the OFfice of Waste Management (EM-30), the Office of Environmental Restoration (EM-40), and the Office of Facility Transition and Management (EM-60).

2351 (DOE/EM–0302) **Documenting cost and performance for environmental remediation projects: Department of Energy Office of Environmental Management.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). 8 Aug 1996. 44p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013716. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this DOE guide is to facilitate the use of consistent procedures to document cost and performance information for projects involving the remediation of media contaminated with hazardous and radioactive wastes. It provides remedial action project managers with a standardized set of data to document completed remediation projects. Standardized reporting of data will broaden the utility of the information, increase confidence in the effectiveness of future remedial technologies, and enhance the organization, storage and retrieval of relevant information for future cleanup projects. The foundation for this guide was laid down by the Federal Remediation Technologies Roundtable (FRTR) in their publication, Guide to Documenting Cost and Performance for Remediation Projects, EPA-542-B- 95-002. Member agencies of the FRTR include the US EPA, the US DOD, the US DOE, and the US DOI. All the member agencies are involved in site remediation projects and anticipate following the guidance provided in the above reference. Therefore, there is much to be gained for DOE to be consistent with the other member agencies as it will be easier to compare projects across different agencies and also to learn from the experiences of a wider spectrum of prior completed projects.

2352 (DOE/HWP–153) **Chemometrics review for chemical sensor development, task 7 report.** Oak Ridge National Lab., TN (United States); Advanced Sciences, Inc., Albuquerque, NM (United States). May 1994. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014025. Source: OSTI; NTIS; INIS; GPO Dep.

This report, the seventh in a series on the evaluation of several chemical sensors for use in the U.S. Department of Energy's (DOE's) site characterization and monitoring programs, concentrates on the potential use of chemometrics techniques in analysis of sensor data. Chemometrics is the chemical discipline that uses mathematical, statistical, and other methods that employ formal logic to: design or select optimal measurement procedures and experiments and provide maximum relevant chemical information by analyzing chemical data. The report emphasizes the latter aspect. In a formal sense, two distinct phases are in chemometrics applications to analytical chemistry problems: (1) the exploratory data analysis phase and (2) the calibration and prediction phase. For use in real-world problems, it is wise to add a third aspect - the independent validation and verification phase. In practical applications, such as the ERWM work, and in order of decreasing difficulties, the most difficult tasks in chemometrics are: establishing the necessary infrastructure (to manage sampling records, data handling, and data storage and related aspects), exploring data analysis, and solving calibration problems, especially for nonlinear models. Chemometrics techniques are different for what are called zeroth-, first-, and second-order systems, and the details depend on the form of the assumed functional relationship between the measured response and the concentrations of components in mixtures. In general, linear relationships can be handled relatively easily, but nonlinear relationships can be difficult.

2353 (DOE/ID–10516) **Air emission inventory for the Idaho National Engineering Laboratory: 1994 emissions report.** USDOE Idaho Field Office, Idaho Falls, ID (United States). Jul 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003533. Source: OSTI; NTIS; INIS; GPO Dep.

This report Presents the 1994 update of the Air Emission inventory for the Idaho National Engineering Laboratory (INEL). The INEL Air Emission Inventory documents sources and emissions of non-radionuclide pollutants from operations at the INEL. The report describes the emission inventory process and all of the sources at the INEL, and provides non-radionuclide emissions estimates for stationary sources.

2354 (DOE/ID/12735–1) **Existing air sparging model and literature review for the development of an air sparging optimization decision tool.** MSE, Inc., Butte, MT (United States); MSE Technologies Applications, Inc., Butte, MT (United States); Parsons Engineering Science, Inc., Cleveland, OH (United States). Aug 1995. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE96012447. Source: OSTI; NTIS; GPO Dep.

The objectives of this Report are two-fold: (1) to provide overviews of the state-of-the-art and state-of-the-practice with respect to air sparging technology, air sparging models and related or augmentation technologies (e.g., soil vapor extraction); and (2) to provide the basis for the development of the conceptual Decision Tool. The Project Team conducted an exhaustive review of available literature. The complete listing of the documents, numbering several hundred and reviewed as a part of this task, is included in Appendix A. Even with the large amount of material written regarding the development and application of air sparging, there still are significant gaps in the technical community's understanding of the remediation technology. The results of the literature review are provided in Section 2. In Section 3, an overview of seventeen conceptual, theoretical, mathematical and empirical models is presented. Detailed descriptions of each of the models reviewed is provided in Appendix B. Included in Appendix D is a copy of the questionnaire used to compile information about the models. The remaining sections of the document reflect the analysis and synthesis of the information gleaned during the literature and model reviews. The results of these efforts provide the basis for development of the decision tree and conceptual decision tool for determining applicability and optimization of air sparging. The preliminary decision tree and accompanying information provided in Section 6 describe a three-tiered approach for determining air sparging applicability: comparison with established scenarios; calculation of conceptual design parameters; and the conducting of pilot-scale studies to confirm applicability. The final two sections of this document provide listings of the key success factors which will be used for evaluating the utility of the Decision Tool and descriptions of potential applications for Decision Tool use.

2355 (DOE/ID/12735-2) **Conceptual air sparging decision tool in support of the development of an air sparging optimization decision tool.** Parsons Engineering Science, Inc., Cleveland, OH (United States); MSE Technologies Applications, Inc., Butte, MT (United States). Sep 1995. 196p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC22-88ID12735. Order Number DE96012448. Source: OSTI; NTIS; GPO Dep.

The enclosed document describes a conceptual decision tool (hereinafter, Tool) for determining applicability of and for optimizing air sparging systems. The Tool was developed by a multi-disciplinary team of internationally recognized experts in air sparging technology, lead by a group of project and task managers at Parsons Engineering Science, Inc. (Parsons ES). The team included Mr. Douglas Downey and Dr. Robert Hinchee of Parsons ES, Dr. Paul Johnson of Arizona State University, Dr. Richard Johnson of Oregon Graduate Institute, and Mr. Michael Marley of Envirogen, Inc. User Community Panel Review was coordinated by Dr. Robert Siegrist of Colorado School of Mines (also of Oak Ridge National Laboratory) and Dr. Thomas Brouns of Battelle/Pacific Northwest Laboratory. The Tool is intended to provide guidance to field practitioners and environmental managers for evaluating the applicability and optimization of air sparging as remedial action technique.

2356 (DOE/LLW-219) **Mixed Waste Management Options: 1995 Update. National Low-Level Waste Management Program.** Kirner, N. (Foster Wheeler Environmental Corp. (United States)); Kelly, J.; Faison, G.; Johnson, D. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). May 1995. 371p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE95014020. Source: OSTI; NTIS; INIS; GPO Dep.

In the original mixed Waste Management Options (DOE/LLW-134) issued in December 1991, the question was posed, "Can mixed waste be managed out of existence?" That study found that most, but not all, of the Nation's mixed waste can theoretically be managed out of existence. Four years later, the Nation is still faced with a lack of disposal options for commercially generated mixed waste. However, since publication of the original Mixed Waste Management Options report in 1991, limited disposal capacity and new technologies to treat mixed waste have become available. A more detailed estimate of the Nation's mixed waste also became available when the US Environmental Protection Agency (EPA) and the US Nuclear Regulatory Commission (NRC) published their comprehensive assessment, titled National Profile on Commercially Generated Low-Level Radioactive Mixed Waste (National Profile). These advancements in our knowledge about mixed waste inventories and generation, coupled with greater treatment and disposal options, lead to a more applied question posed for this updated report: "Which mixed waste has no treatment option?" Beyond estimating the volume of mixed waste requiring jointly regulated disposal, this report also provides a general background on the Atomic Energy Act (AEA) and the Resource Conservation and Recovery Act (RCRA). It also presents a methodical approach for generators to use when deciding how to manage their mixed waste. The volume of mixed waste that may require land disposal in a jointly regulated facility each year was estimated through the application of this methodology.

2357 (DOE/MC/28245-4072) **Soil treatment to remove uranium and related mixed radioactive heavy metal contaminants. Ninth quarterly technical and financial progress report, January 1, 1995–March 31, 1995.** Atomic Energy of Canada Ltd., Chalk River, ON (Canada). May 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FC21-92MC28245. Order Number DE95009718. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this project is to design and develop a physico-chemical treatment process for the removal of uranium and heavy metals from contaminated soil to achieve target contamination levels below 35 pCi/g of soil and a target for non-radioactive heavy metals below concentration levels permissible for release of the soil. The work will involve bench-scale and pilot-scale tests, using chelation-flotation, chemical leaching and ultrasonic leaching techniques, in conjunction with cross-flow microfiltration and filter-press operations. The effectiveness of an integrated process to treat leachates generated from soil processing will be demonstrated. Process flow-sheets suitable for in-situ and ex-situ applications will be developed and preliminary costs will be provided for the soil and leachate treatment technologies. In accordance with 10CFR 600.31 (d)(i), an extension of the project period including final report submission to 31 July 1995 was made in anticipation of potential delays in receiving Fernald soil samples at Chalk River Laboratories for the planned pilot-scale verification tests. Ex-situ pilot-scale soil decontamination and leachate treatment tests using Chalk River Chemical Pit soil are nearing completion. Soil decontamination tests using Fernald Incinerator Area soil originally scheduled for February 1995 was postponed to May 1995 as result of unexpected delays in the preparation of two drums of soils (~416 kg) by FERMCO and paperwork required to arrange for export/import licenses.

2358 (DOE/MC/29101-96/CO564) **The LASI high-frequency ellipticity system.** Sternberg, B.K.; Poulton, M.M. Arizona Univ., Tucson, AZ (United States). Lab. for Advanced Subsurface Imaging. 1995. 15p. Sponsored by USDOE, Washington, DC (United States);Electric Power Research Inst., Palo Alto, CA (United States);Department of the Interior, Washington, DC (United States);Department of Defense, Washington, DC (United States);Arizona Univ., Tucson, AZ (Uni DOE Contract AC21-92MC29101. (CONF-9510108-35: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003687. Source: OSTI; NTIS; GPO Dep.

A high-frequency, high-resolution, electromagnetic (EM) imaging system has been developed for environmental geophysics surveys. Some key features of this system include: (1) rapid surveying to allow dense spatial sampling over a large area, (2) high-accuracy measurements which are used to produce a high-resolution image of the subsurface, (3) measurements which have excellent signal-to-noise ratio over a wide bandwidth (31 kHz to 32 MHz), (4) large-scale physical modeling to produce accurate theoretical responses over targets of interest in environmental geophysics surveys, (5) rapid neural network interpretation at the field site, and (6) visualization of complex structures during the survey.

2359 (DOE/MC–29103-95/C0459) **Lightguide-coupled sensor for in-situ radiation monitoring.** Reed, S.E.; Berthold, J.W. Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div. [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29103. (CONF-9506183–1: Optics for environmental and public safety, Munich (Germany), 19-23 Jun 1995). Order Number DE95012313. Source: OSTI; NTIS; INIS; GPO Dep.

The authors are developing a multi-point radiation monitoring system for long-term, continuous monitoring of radiation levels in the vadose zone of radioactive waste sites. The system is based on gamma detection with a lightguide-coupled scintillator built into a probe buried in the ground. The lightguide transmits the visible light pulses produced by the scintillator to the surface where detection and signal multiplexing take place. The system is to be capable of monitoring large numbers of such passive probes which are to be permanently installed throughout the waste site. The authors have recently completed tests of a prototype single-probe system. In this paper, they report on the development and testing of the single-probe system.

2360 (DOE/MC/29108–95/C0417) **Field Raman spectrograph for environmental analysis.** Carrabba, M.M. EIC Labs., Inc., Norwood, MA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29108. (CONF-9411149–28: Opportunity 95: environmental technology through small business, Morgantown, WV (United States), 16-17 Nov 1994). Order Number DE95007969. Source: OSTI; NTIS; INIS; GPO Dep.

The use of Raman Spectroscopy in the screening of soils, ground water, and surface waters for pollutants is described. A probe accessory for conducting surface enhanced Raman Spectroscopy is undergoing testing for dilute chlorinated solvents.

2361 (DOE/MC/29108–96/CO568) **Field Raman spectrograph for environmental analysis.** Haas, J.W. III; Forney, R.W.; Carrabba, M.M.; Rauh, R.D. EIC Labs., Inc., Norwood, MA (United States). 1995. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29108. (CONF-9510108–5: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003447. Source: OSTI; NTIS; INIS; GPO Dep.

The enormous cost for chemical analysis at DOE facilities predicates that cost-saving measures be implemented. Many approaches, ranging from increasing laboratory sample throughput by reducing preparation time to the development of field instrumentation, are being explored to meet this need. Because of the presence of radioactive materials at many DOE sites, there is also a need for methods that are safer for site personnel and analysts. This project entails the development of a compact Raman spectrograph for field screening and monitoring of a wide variety of wastes, pollutants, and corrosion products in storage tanks, soils, and ground and surface waters. Analytical advantages of the Raman technique include its ability to produce a unique, spectral fingerprint for each contaminant and its ability to analyze both solids and liquids directly, without the need for isolation or cleanup.

2362 (DOE/MC/29109–96/CO569) **Road Transportable Analytical Laboratory (RTAL) system.** Finger, S.M. Engineering Computer Opteconomics, Inc., Annapolis, MD (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. (CONF-9510108–19: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003441. Source: OSTI; NTIS; INIS; GPO Dep.

U.S. Department of Energy (DOE) facilities around the country have, over the years, become contaminated with radionuclides and a range of organic and inorganic wastes. Many of the DOE sites encompass large land areas and were originally sited in relatively unpopulated regions of the country to minimize risk to surrounding populations. In addition, wastes were sometimes stored underground at the sites in 55-gallon drums, wood boxes or other containers until final disposal methods could be determined. Over the years, these containers have deteriorated, releasing contaminants into the surrounding environment. This contamination has spread, in some cases polluting extensive areas. Remediation of these sites requires extensive sampling to determine the extent of the contamination, to monitor clean-up and remediation progress, and for post-closure monitoring of facilities. The DOE would benefit greatly if it had reliable, road transportable, fully independent laboratory systems that could perform on-site the full range of analyses required. Such systems would accelerate and thereby reduce the cost of clean-up and remediation efforts by (1) providing critical analytical data more rapidly, and (2) eliminating the handling, shipping and manpower associated with sample shipments. The goal of the Road Transportable Analytical Laboratory (RTAL) Project is the development and demonstration of a system to meet the unique needs of the DOE for rapid, accurate analysis of a wide variety of hazardous and radioactive contaminants in soil, groundwater, and surface waters. This laboratory system has been designed to provide the field and laboratory analytical equipment necessary to detect and quantify radionuclides, organics, heavy metals and other inorganic compounds. The laboratory system consists of a set of individual laboratory modules deployable independently or as an interconnected group to meet each DOE site's specific needs.

2363 (DOE/MC/29109–5013) **Road Transportable Analytical (RTAL) laboratory system. Quarterly report, February 1995–April 1995.** Engineering Computer Opteconomics, Inc., Annapolis, MD (United States). May 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE96000585. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) facilities around the country have, over the years, become contaminated with radionuclides and a range of organic and inorganic wastes. The major types of contamination found at the various sites have been summarized in the 'Environmental Restoration and Management Five Year Plan' and, except for radionuclides (at most locations) and high explosives (at a few locations), are representative of the types of wastes found at many industrial facilities. The DOE faces additional unique challenges in cleaning up this contamination. Many of the DOE sites encompass large land areas and were originally sited in relatively unpopulated regions of the country to minimize risk to surrounding populations. In addition, many times wastes were stored underground at the sites in 55-gallon drums, wood boxes or other containers until final disposal methods could be determined. Over the years, these containers have deteriorated, releasing contaminants into the surrounding environment. This contamination has spread, in some cases polluting extensive areas.

2364 (DOE/MC/29109–5074) **Road Transportable Analytical Laboratory (RTAL) system. Quarterly report, May–July 1995.** Engineering Computer Optecnomics, Inc., Annapolis, MD (United States). Aug 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29109. Order Number DE96000605. Source: OSTI; NTIS; GPO Dep.

Goal is to develop and demonstrate a system for rapid, accurate analysis of hazardous and radioactive contaminants in soil, groundwater, and surface waters. Goal throughput is 20 samples per day, within 16 hours on each sample (after sample preparation). Purpose is to improve the efficiency of cleanup and remediation throughout the DOE complex. During this period, the tasks on prototype system construction and on-site prototype demonstration were worked on; progress is reported.

2365 (DOE/MC/29118–96/CO572) **Field-usable portable analyzer for chlorinated organic compounds.** Buttner, W.J.; Penrose, W.R.; Stetter, J.R. Transducer Research, Inc., Naperville, IL (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29118. (CONF-9510108–7: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003450. Source: OSTI; NTIS; GPO Dep.

Transducer Research, Inc. (TRI) has been working with the DOE Morgantown Energy Technology Center to develop a new chemical monitor based on a unique sensor which responds selectively to vapors of chlorinated solvents. We are also developing field applications for the monitor in actual DOE cleanup operations. During the initial phase, prototype instruments were built and field tested. Because of the high degree of selectivity that is obtained, no response was observed with common hydrocarbon organic compounds such as BTX (benzene, toluene, xylene) or POLs (petroleum, oil, lubricants), and in fact, no non-halogen-containing chemical has been identified which induces a measurable response. By the end of the Phase I effort, a finished instrument system was developed and test marketed. This instrument, called the RCL MONITOR, was designed to analyze individual samples or monitor an area with automated repetitive analyses. Vapor levels between 0 and 500 ppm can be determined in 90 s with a lower detection limit of 0.2 ppm using the hand-portable instrument. In addition to the development of the RCL MONITOR, advanced sampler systems are being developed to: (1) extend the dynamic range of the instrument through autodilution of the vapor and (2) allow chemical analyses to be performed on aqueous samples. When interfaced to the samplers, the RCL MONITOR is capable of measuring chlorinated solvent contamination in the vapor phase up to 5000 ppm and in water and other condensed media from 10 to over 10,000 ppb(wt)–without hydrocarbon and other organic interferences.

2366 (DOE/MC/29118–5014) **Field-usable portable analyzer for chlorinated organic compounds. Topical report, September 1992–May 1994.** Buttner, W.J.; Williams, R.D. Science Applications International Corp., Arlington, VA (United States). Center for Seismic Studies. May 1995. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29118. Order Number DE96000584. Source: OSTI; NTIS; GPO Dep.

Through a U.S. DOE-funded program, an advanced chlorinated organic (RCL) vapor monitor has been built and tested in actual hazardous waste site operations. The monitor exploits the analytical capabilities of a solid-state sensor which was recently developed and has remarkable selectivity for chlorinated organic vapors at sub-parts-per-million sensitivity. The basic design goal of a user-friendly, reliable, instrument with a broad dynamic range for the selective detection of chlorinated solvent vapors was demonstrated. To date, no non-halogen-containing compound has been identified that induces a measurable response on the sensor, including commonly encountered contaminants such as BTXs (benzene, toluene, and xylenes) or POLs (petroleum, oils, lubricants). In addition to the development of the RCL MONITOR, advanced sampler systems were developed to further extend the analytical capability of this instrument, allowing chemical analyses to be performed for both vapor phase and condensed contamination. The sampling methods include fixed dilution, preconcentration, and closed-loop air stripping for condensed media. With uniform success, these different series of field tests were conducted at DOE facilities on several types of samples. Independent cost-benefit analysis has concluded that significant cost savings can be achieved using the RCL MONITOR in DOE applications. This effort provides a sound fundamental technology base for the development of advanced analytical methods that are needed by the US DOE. In addition, advanced methods for detecting chlorinated hydrocarbons that are made possible by this technology will save time, reduce costs, and improve human health and safety in restoration operations. To fully achieve all possible cost savings, continued effort is necessary to develop validated methods for the use of the RCL MONITOR. The development of methods through case studies is the theme of the Phase II effort, which is currently underway.

2367 (DOE/MC/29120–96/CO573) **Innovative vitrification for soil remediation.** Jetta, N.W.; Patten, J.S.; Hart, J.G. Vortec Corp., Collegeville, PA (United States). 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29120. (CONF-9510108–28: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003431. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this DOE demonstration program is to validate the performance and operation of the Vortec Cyclone Melting System (CMS™) for the processing of LLW contaminated soils found at DOE sites. This DOE vitrification demonstration project has successfully progressed through the first two phases. Phase 1 consisted of pilot scale testing with surrogate wastes and the conceptual design of a process plant operating at a generic DOE site. The objective of Phase 2, which is scheduled to be completed the end of FY 95, is to develop a definitive process plant design for the treatment of wastes at a specific DOE facility. During Phase 2, a site specific design was developed for the processing of LLW soils and muds containing TSCA organics and RCRA metal contaminants. Phase 3 will consist of a full scale demonstration at the DOE gaseous diffusion plant located in Paducah, KY. Several DOE sites were evaluated for potential application of the technology. Paducah was selected for the demonstration program because of their urgent waste remediation needs as well as their strong management and cost sharing financial support for the project. During Phase 2, the basic nitrification process design was modified to meet the specific needs of the new waste streams available at Paducah. The system design developed for Paducah has significantly enhanced the processing capabilities of the Vortec vitrification process. The overall system design now includes the capability to shred entire drums and drum packs containing mud, concrete, plastics and PCB's as well as bulk waste materials. This enhanced processing capability will substantially expand the total DOE waste remediation applications of the technology.

2368 (DOE/MC/30172—96/C0582) **Alpha detection in pipes using an inverting membrane scintillator.** Kendrick, D.T.; Cremer, C.D.; Lowry, W.; Cramer, E. Science and Engineering Associates, Inc., Albuquerque, NM (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30172. (CONF-9510108–49: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004622. Source: OSTI; NTIS; INIS; GPO Dep.

Characterization of surface alpha emitting contamination inside enclosed spaces such as piping systems presents an interesting radiological measurement challenge. Detection of these alpha particles from the exterior of the pipe is impossible since the alpha particles are completely absorbed by the pipe wall. Traditional survey techniques, using hand-held instruments, simply can not be used effectively inside pipes. Science and Engineering Associates, Inc. is currently developing an enhancement to its Pipe Explorer™ system that will address this challenge. The Pipe Explorer™ uses a unique sensor deployment method where an inverted tubular membrane is propagated through complex pipe runs via air pressure. The inversion process causes the membrane to fold out against the pipe wall, such that no part of the membrane drags along the pipe wall. This deployment methodology has been successfully demonstrated at several DOE sites to transport specially designed beta and gamma scintillation detectors into pipes ranging in length up to 250 ft. The measurement methodology under development overcomes the limitations associated with conventional hand-held survey instruments by remotely emplacing an alpha scintillator in direct contact with the interior pipe surface over the entire length to be characterized. This is accomplished by incorporating a suitable scintillator into the otherwise clear membrane material. Alpha particles emitted from the interior pipe surface will intersect the membrane, resulting in the emission of light pulses from the scintillator. A photodetector, towed by the inverting membrane, is used to count these light pulses as a function of distance into the pipe, thereby producing a log of the surface alpha contamination levels. It is anticipated that the resulting system will be able to perform measurements in pipes as small as two inches in diameter, and several hundred feet in length.

2369 (DOE/MC/30172–96/C0583) **Characterization of radioactive contamination inside pipes with the Pipe Explorer™ system.** Kendrick, D.T.; Cremer, C.D.; Lowry, W.; Cramer, E. Science and Engineering Associates, Inc., Albuquerque, NM (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30172. (CONF-9510108–50: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004621. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy's nuclear facility decommissioning program needs to characterize radiological contamination inside piping systems before the pipe can be recycled, remediated, or disposed. Science and Engineering associates, Inc. under contract with the DOE Morgantown Energy Technology Center has developed and demonstrated the Pipe Explorer™ system, which uses an inverting membrane to transport various characterization sensors into pipes. The basic process involves inverting (turning inside out) a tubular impermeable membrane under air pressure. A characterization sensor is towed down the interior of the pipe by the membrane. Advantages of this approach include the capability of deploying through constrictions in the pipe, around 90° bends, vertically up and down, and in slippery conditions. Because the detector is transported inside the membrane (which is inexpensive and disposable), it is protected from contamination, which eliminates cross-contamination. Characterization sensors that have been demonstrated with the system thus far include: gamma detectors, beta detectors, video cameras, and pipe locators. Alpha measurement capability is currently under development. A remotely operable Pipe Explorer™ system has been developed and demonstrated for use in DOE facilities in the decommissioning stage. The system is capable of deployment in pipes as small as 2-inch-diameter and up to 250 feet long. This paper describes the technology and presents measurement results of a field demonstration conducted with the Pipe Explorer™ system at a DOE site. These measurements identify surface activity levels of U-238 contamination as a function of location in drain lines. Cost savings to the DOE of approximately $1.5 million dollars were realized from this one demonstration.

2370 (DOE/MC/30174–96/CO585) **Rapid surface sampling and archival record system.** Barren, E.; Berdahl, D.R.; Penney, C.M.; Sheldon, R.B. General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center. 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30174. (CONF-9510108–13: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003463. Source: OSTI; NTIS; GPO Dep.

A number of contamination sites exist in this country where the area and volume of material to be remediated is very large, approaching or exceeding 10^6 M^2 and 10^6 M^3. Typically, only a small fraction of this material is actually contaminated. In such cases there is a strong economic motivation to test the material with a sufficient density of measurements to identify which portions are uncontaminated, so extensively they be left in place or be disposed of as uncontaminated waste. Unfortunately, since contamination often varies rapidly from position to position, this procedure can involve upwards of one million measurements per site. The situation is complicated further in many cases by the difficulties of sampling porous surfaces, such as concrete. For example, on concrete the standard wipe test provides results that are strongly operator- and surface condition-dependent. The results are not usually available real time, because the wipe samples are sent to a remote laboratory for analysis, entailing a delay of days to weeks between sampling and results. Further, the cost of analysis of a clean sample is usually the same as that of a contaminated sample; analysis of clean samples thereby increases the total analysis costs considerably. Another method for surface/subsurface characterization is to obtain a boring or a drilling. This method also involves the off-site analysis of the drilled material, incorporating the time and economic penalties described above. Other disadvantages of drilling techniques are disfiguration of the surface and distribution of contamination through byproduct dust. It is for the above reasons that we have chosen to develop thermal sampling methods for characterization of concrete, transite, and contaminated bulk debris. The sampling system we describe has been designed to greatly reduce the economic penalty posed by these difficulties.

2371 (DOE/MC/30175–96/CO588) **Portable sensor for hazardous waste.** Piper, L.G.; Fraser, M.E.; Davis, S.J. Physical Sciences, Inc., Andover, MA (United States). 1995. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30175. (CONF-9510108–6: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003456. Source: OSTI; NTIS; GPO Dep.

We are beginning the second phase of a three and a half year program designed to develop a portable monitor for sensitive hazardous waste detection. The ultimate goal of the program is to develop our concept to the prototype instrument level. Our monitor will be a compact, portable instrument that will allow real-time, in situ, monitoring of hazardous wastes. Further, our instrument can show whether cleanup technologies are successful at reducing hazardous materials concentrations below regulated levels, and will provide feedback to allow changes in remediation operations, if necessary, to enhance their efficacy. Our approach is to excite atomic and molecular fluorescence by the technique of active nitrogen energy transfer (ANET). The active nitrogen is made in a dielectric-barrier (D-B) discharge in nitrogen at atmospheric pressure. Only a few emission lines or bands are excited for each hazardous species, so spectral resolution requirements are greatly simplified over those of other spectroscopic techniques. The dielectric-barrier discharge is compact, 1 to 2 cm in diameter and 1 to 10 cm long. During the first phase of the program we demonstrated that a variety of hazardous species could be detected by the technique of active nitrogen energy transfer (ANET) excitation of atomic and molecular fluorescence. Species investigated included heavy metals, Hg, Cr, and Se, both chlorinated and non-chlorinated organics, and uranyl compounds. For most of these species we demonstrated sensitivity limits for their detection at parts per billion (ppb) levels. Our principal goals for this second phase of the program are to develop and breadboard test instrument components and to design a prototype instrument suitable for construction and evaluation in the final phase of the program. A secondary goal is to extend the ANET technology to encompass a greater number of hazardous species, primarily additional heavy metals and radionuclides.

2372 (DOE/MC/30175–5033) **Portable sensor for hazardous waste. Topical report, October 1993–September 1994.** Piper, L.G. Physical Sciences, Inc., Andover, MA (United States). Oct 1994. 64p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30175. Order Number DE96000569. Source: OSTI; NTIS; INIS; GPO Dep.

We describe an innovative technique to detect hazardous materials at sub part-per-billion levels. Our approach exploits active nitrogen energy-transfer (ANET) to excite atomic and molecular fluorescence characteristic of various hazardous species. ANET excitation is very state specific, generating simple spectra that are easily detected with instrumentation of modest resolution. Typical spectral features include 254 nm emission from Hg, 388 and 420 nm emission from CN when organics are sampled, and 278 nm emission from M when chlorinated organics are sampled. We also observe several broadbands between 450 and 540 nm where uranium compounds are added to the D-B discharge region. We attribute this spectrum to electronic transitions of uranium oxide, probably UO. Additionally, we have used ANET to detect a number of heavy metals such as Cr, Se, Cd, Pb, and Cu. Dielectric-barrier (D-B) discharge technology generates the active nitrogen. This approach affords atmospheric-pressure operation, fluorescence excitation in gaseous, particulate, and aqueous sample matrices, and is amenable to field operation because the discharge and associated electronics are compact and can be powered by 12V batteries. This report details the results of the first phase of a three and a half year program designed to develop a portable monitor for sensitive hazardous waste detection. The ultimate goal of the program is to develop our concept to the prototype instrument level. In this first phase we have demonstrated the applicability of the ANET technology to a variety of hazardous species, and have determined detection sensitivity limits for Hg, Se, organics, and chlorinated organics to be at part-per-billion levels or below.

2373 (DOE/MC/30176–96/CO589) **Three dimensional characterization and archiving system.** Sebastian, R.L. (and others); Clark, R.; Gallman, P. Coleman Research Corp., Springfield, VA (United States). 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30176. (CONF-9510108–20: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003439. Source: OSTI; NTIS; INIS; GPO Dep.

The Three Dimensional Characterization and Archiving System (3D-ICAS) is being developed as a remote system to perform rapid in situ analysis of hazardous organics and radionuclide contamination on structural materials. Coleman Research and its subcontractors, Thermedics Detection, Inc. (TD) and the University of Idaho (UI) are in the second phase of a three phase program to develop 3D-ICAS to support Decontamination and Decommissioning (D&D) operations. Accurate physical characterization of surfaces and the radioactive and organic is a critical D&D task. Surface characterization includes identification of potentially dangerous inorganic materials, such as asbestos and transite. Real-time remotely operable characterization instrumentation will significantly advance the analysis capabilities beyond those currently employed. Chemical analysis is a primary area where the characterization process will be improved. Chemical analysis plays a vital role throughout the process of decontamination. Before clean-up operations can begin the site must be characterized with respect to the type and concentration of contaminants, and detailed site mapping must clarify areas of both high and low risk. During remediation activities chemical analysis provides a means to measure progress and to adjust clean-up strategy. Once the clean-up process has been completed the results of chemical analysis will verify that the site is in compliance with federal and local regulations.

2374 (DOE/MC/30177–5047) **Treatability study using prompt gamma neutron activation analysis (PGNAA) technology, Phase I. Topical report.** Congedo, T.V. (and others); Dulloo, A.R.; Ruddy, F.H. Westinghouse Electric

Corp., Pittsburgh, PA (United States). Science and Technology Center. Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-93MC30177. Order Number DE96000588. Source: OSTI; NTIS; INIS; GPO Dep.

This report reviews the progress accomplished during Phase I of a two-phase project intended to demonstrate the use of Prompt Gamma Neutron Activation Analysis (PGNAA) as a technology for the characterization of hazardous and radioactive contaminants in concrete floors. A comprehensive experimental program was undertaken using the N-SCAN™ PGNAA system, which was initially developed by Westinghouse for soil characterization, to determine the sensitivity of PGNAA for several contaminants in concrete. The experiments were performed in a test facility specially designed and constructed for this project. The lower limits of detection derived from the experimental data were encouraging for mercury, cadmium, uranium-238, thorium-232, technetium-99, chlorine, uranium-235 and chromium. These limits were achieved after modifications made to the original N-SCAN system significantly improved its sensitivity for elements located at or near the surface of concrete. With the implementation of additional performance-enhancing modifications scheduled in Phase II, the detection sensitivity of N-SCAN at the end of this project is expected to be at least one order of magnitude higher, allowing N-SCAN to become an effective characterization tool. N-SCAN has several important advantages over current characterization methods and technologies.

2375 (DOE/MC/30357–96/C0592) **Three-dimensional subsurface imaging synthetic aperture radar.** Wuenschel, E. Mirage Systems, Sunnyvale, CA (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30357. (CONF-9510108–: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004620. Source: OSTI; NTIS; INIS; GPO Dep.

Inadequate resources, aggravated by the limited capabilities of existing site characterization technologies, require that new systems be developed to effectively aid site cleanup. The quantity, condition, and the precise location of buried waste storage containers is often unknown, and is always difficult to assess. Significant safety hazards may also be present at these sites. Therefore, new non-invasive detection techniques are needed that will be cost effective, user friendly, and have a growth path toward a system capable of accessing remote terrain. These detection methods must be economical to use and be capable of exploring large land areas quickly with minimal personnel risk. They should provide the precision for identifying the size, depth, type, and possibly the condition of the waste containers.

2376 (DOE/MC/30358–96/CO593) **Geophex Airborne Unmanned Survey System.** Won, I.L.; Keiswetter, D. Geophex Ltd., Raleigh, NC (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-93MC30358. (CONF-9510108–44: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003738. Source: OSTI; NTIS; INIS; GPO Dep.

Ground-based surveys place personnel at risk due to the proximity of buried unexploded ordnance (UXO) items or by exposure to radioactive materials and hazardous chemicals. The purpose of this effort is to design, construct, and evaluate a portable, remotely-piloted, airborne, geophysical survey system. This non-intrusive system will provide stand-off capability to conduct surveys and detect buried objects, structures, and conditions of interest at hazardous locations. During a survey, the operators remain remote from, but within visual distance of, the site. The sensor system never contacts the Earth, but can be positioned near the ground so that weak geophysical anomalies can be detected. The Geophex Airborne Unmanned Survey System (GAUSS) is designed to detect and locate small-scale anomalies at hazardous sites using magnetic and electromagnetic survey techniques. The system consists of a remotely-piloted, radio-controlled, model helicopter (RCH) with flight computer, light-weight geophysical sensors, an electronic positioning system, a data telemetry system, and a computer base-station. The report describes GAUSS and its test results.

2377 (DOE/MC/31186–96/CO628) **Measuring fuel contamination using high speed gas chromotography and cone penetration techniques.** Farrington, S.P.; Bratton, W.L.; Akard, M.L.; Klemp, M. Applied Research Associates, Inc., South Royalton, VT (United States). 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC31186. (CONF-9510108–41: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003690. Source: OSTI; NTIS; GPO Dep.

Decision processes during characterization and cleanup of hazardous waste sites are greatly retarded by the turnaround time and expense incurred through the use of conventional sampling and laboratory analyses. Furthermore, conventional soil and groundwater sampling procedures present many opportunities for loss of volatile organic compounds (VOC) by exposing sample media to the atmosphere during transfers between and among sampling devices and containers. While on-site analysis by conventional gas chromatography (GC) can reduce analytical turnaround time, time-consuming sample preparation procedures are still often required, and the potential for loss of VOC is not reduced.

2378 (DOE/MC/32087–96/CO631) **An advanced open-path atmospheric pollution monitor for large areas.** Taylor, L. Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center. 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32087. (CONF-9510108–39: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003740. Source: OSTI; NTIS; INIS; GPO Dep.

Large amounts of toxic waste materials, generated in manufacturing fuel for nuclear reactors, are stored in tanks buried over large areas at DOE sites. Flammable and hazardous gases are continually generated by chemical reactions in the waste materials. To prevent explosive concentrations of these gases, the gases are automatically vented to the atmosphere when the pressure exceeds a preset value. Real-time monitoring of the atmosphere above the tanks with automatic alarming is needed to prevent exposing workers to unsafe conditions when venting occurs. This project is to design, develop, and test an atmospheric pollution monitor which can measure concentrations of DOE-specified and EPA-specified hazardous gases over ranges as long as 4km. A CO_2 laser to measure absorption spectra and to determine the distance over which the measurements are made, is combined with an acousto-optic tunable filter (AOTF) to measure thermal emission spectra.

2379 (DOE/MC/32089–96/CO615) **Fiber optic/cone penetrometer system for subsurface heavy metals detection.** Saggese, S.; Greenwell, R. Science and Engineering Associates, Inc., Albuquerque, NM (United States). 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32089. (CONF-9510108–10: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003454. Source: OSTI; NTIS; GPO Dep.

This document describes a project designed to develop an intergrated fiber optic sensor/cone penetrometer system to analyze the heavy metals content of the subsurface as a site characterization tool.

2380 (DOE/MC/32090–96/C0622) **Radioactivity measurements using storage phosphor technology.** Cheng, Y.T.; Hwang, J.; Hutchinson, M.R. NeuTek, Darnestown, MD (United States). 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32090. (CONF-9510108–48: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96004623. Source: OSTI; NTIS; INIS; GPO Dep.

We propose to apply a recently developed charged particle radiation imaging concept in bio-medical research for fast, cost-effective characterization of radionuclides in contaminated sites and environmental samples. This concept utilizes sensors with storage photostimulable phosphor (SPP) technology as radiation detectors. They exhibit high sensitivity for all types of radiation and the response is linear over a wide dynamic range ($>10^5$), essential for quantitative analysis. These new sensors have an active area of up to 35 cm x 43 cm in size and a spatial resolution as fine as 50 μm. They offer considerable promise as large area detectors for fast characterization of radionuclides with an added ability to locate and identify hot spots.

2381 (DOE/MC/32109–96/CO613) **Barometric pumping with a twist: VOC containment and remediation without boreholes.** Lowry, W.; Dunn, S.D.; Walsh, R.; Zakian, P. Science and Engineering Associates, Inc., Santa Fe, NM (United States). 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32109. (CONF-9510108–33: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003685. Source: OSTI; NTIS; INIS; GPO Dep.

A large national cost is incurred in remediating near-surface contamination such as surface spills, leaking buried pipelines, and underground storage tank sites. Many of these sites can be contained and remediated using enhanced natural venting, capitalizing on barometric pumping. Barometric pumping is the cyclic movement experienced by soil gas due to oscillations in atmospheric pressure. Daily variations of 5 millibars are typical, while changes of 25 to 50 millibars can occur due to major weather front passage. The fluctuations can cause bulk vertical movement in soil gas ranging from centimeters to meters, depending on the amplitude of the pressure oscillation, soil gas permeability, and depth to an impermeable boundary such as the water table. Since the bulk gas movement is cyclic, under natural conditions no net advective vertical movement occurs over time. Science and Engineering Associates, Inc., is developing an engineered system to capitalize on the oscillatory flow for soil contaminant remediation and containment. By design, the system allows normal upward movement of soil gas but restricts the downward movement during barometric highs. The earth's surface is modified with a sealant and vent valve such that the soil gas flow is literally "ratcheted" to cause a net upward flow over time. A key feature of the design is that it does not require boreholes, resulting in a very low cost remediation effort and reduced personnel exposure risk. In the current phase (Phase I) the system's performance is being evaluated. Static and transient analysis results are presented which illustrate the relative magnitude of this advective movement compared to downward contaminant diffusion rates. Calculations also indicate the depth of influence for various surface and soil configurations. The system design will be presented, as well as a cost assessment compared to conventional techniques.

2382 (DOE/MC/32110–96/C0626) **Measurement of radionuclides using ion chromatography and flow-cell scintillation counting with pulse shape discrimination.** DeVol, T.A.; Fjeld, R.A. South Carolina Universities Research and Education Foundation, Clemson, SC (United States). Strom Thurman Inst. [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32110. (CONF-9510108–52: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96005242. Source: OSTI; NTIS; INIS; GPO Dep.

A project has been initiated at Clemson Univ. to develop a HPLC/flow- cell system for analysis of non-gamma emitting radionuclides in environmental samples; an important component is development of a low background flow-cell detector that counts alpha and beta particles separately through pulse shape discrimination. Objective of the work presented here is to provide preliminary results of an evaluation of the following scintillators: CaF_2:Eu, scintillating glass, and BaF_2. Slightly acidic aqueous solutions of the alpha emitter ^{233}U and the beta emitter ^{45}Ca were used. Detection efficiencies and minimum detectable activities were determined.

2383 (DOE/MC/32111–5193) **Integrated optic chemical sensor for the simultaneous detection and quantification of multiple ions. Final report, March–September 1995.** Mendoza, E. Physical Optics Corp., Torrance, CA (United States). Sep 1995. 93p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32111. Order Number DE96004474. Source: OSTI; NTIS; GPO Dep.

This final report summarizes the work performed by Physical Optics Corporation (POC) on the DOE contract entitled "Integrated Optic Chemical Sensor for the Simultaneous Detection and Quantification of Multiple Metal Ions". This project successfully demonstrated a multi-element integrated optic chemical sensor (IOCS) system capable of simultaneous detection and quantification of metal ions in a water flow stream. POC's innovative integrated optic chemical sensor technology uses an array of chemically active optical waveguides integrated in parallel in a single small IOCS chip. The IOCS technique uses commonly available materials and straightforward processing to produce channel waveguides in porous glass, each channel treated with a chemical indicator that responds optically to heavy metal ions in a water flow stream. The porosity of the glass allows metal ions present in the water to diffuse into the glass and interact with the immobilized indicators, producing a measurable optical chance. For the "proof-of-concept" demonstration, POC designed and fabricated two types of IOCS chips. Type I uses an array of four straight channel waveguides, three of which are doped with a metal sensitive indicator, an ionophore. The undoped fourth channel is used as the reference channel. Type II uses a 1 x 4 star coupler structure with three sensing channels and a reference channel. Successful implementation of the IOCS technology is expected to have a broad impact on water quality control as well as in the commercial environmental monitoring market. Because of the self-referenced, multidetection capability of the IOCS technique, POC's water quality sensors are expected to find markets in environmental monitoring and protection, ground water monitoring, and in-line process control. Specific applications include monitoring of chromium, copper, and iron ions in water discharged by the metal plating industry.

2384 (DOE/MC/32116–96/CO617) **Analyze imagery and other data collected at the Los Alamos National Laboratory.** David, N.; Ginsberg, I. Environmental Research Inst. of Michigan, Ann Arbor, MI (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32116. (CONF-9510108–17: Environmental technology development through industry partnership, Morgantown, WV (United States), 3-5 Oct 1995). Order Number DE96003467. Source: OSTI; NTIS; INIS; GPO Dep.

Unfortunately, areas of waste disposal at DOE sites are not all documented and located. There are a number of reasons for this situation: records have been lost or destroyed, the locations were not documented, and memories have been lost. The search of large areas at these sites for buried waste and buried-waste containers is a difficult and expensive problem when using conventional, ground-based methods. Typical conventional methods involve the drilling of wells/boreholes (point sampling), and interpolation is required to obtain the needed a real information. Drilling for buried waste is expensive, potentially hazardous, and time-consuming, yet accurate interpolation can require a large number of holes per-unit-area. A similar problem is encountered in gaining current information about: the boundaries of toxic waste plumes in the ground, transport pathways, and the composition and concentration of toxic materials. The purpose of this effort is to analyze existing imagery data collected under various Department of Energy and other programs. This analysis will be useful for screening, characterization, and monitoring work in the waste site remediation process.

2385 (DOE/MC/32116–5148) **Imaging data analyses for hazardous waste applications. Final report.** David, N.; Ginsberg, I.W. Environmental Research Inst. of Michigan, Ann Arbor, MI (United States). Dec 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AR21-95MC32116. Order Number DE96004368. Source: OSTI; NTIS; INIS; GPO Dep.

The paper presents some examples of the use of remote sensing products for characterization of hazardous waste sites. The sites are located at the Los Alamos National Laboratory (LANL) where materials associated with past weapons testing are buried. Problems of interest include delineation of strata for soil sampling, detection and delineation of buried trenches containing contaminants, seepage from capped areas and old septic drain fields, and location of faults and fractures relative to hazardous waste areas. Merging of site map and other geographic information with imagery was found by site managers to produce useful products. Merging of hydrographic and soil contaminant data aided soil sampling strategists. Overlays of suspected trench on multispectral and thermal images showed correlation between image signatures and trenches. Overlays of engineering drawings on recent and historical photos showed error in trench location and extent. A thermal image showed warm anomalies suspected to be areas of water seepage through an asphalt cap. Overlays of engineering drawings on multispectral and thermal images showed correlation between image signatures and drain fields. Analysis of aerial photography and spectral signatures of faults/fractures improved geologic maps of mixed waste areas.

2386 (DOE/NV/10833–33) **Application of EPA quality assurance procedures to a soil characterization study at the DOE Nevada Test Site.** Snyder, K.E. (Lockheed-Martin Environmental Systems and Technologies Co., Las Vegas, NV (United States)); Byers, G.E.; Van Remortel, R.D.; Gustafson, D.L. Raytheon Services Nevada, Las Vegas, NV (United States). Dec 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC08-91NV10833. (CONF-960212–95: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96012337. Source: OSTI; NTIS; INIS; GPO Dep.

The transfer, modification, and application of well formulated and tested quality assurance (QA) procedures from one project to another deserves consideration. The use of a proven QA program design could result in cost savings and the collection of data with a greater degree of confidence. To test this thesis, a QA program, originally developed for large nationwide Environmental Protection Agency (EPA) programs, was adapted and implemented in a site characterization study at the Department of Energy (DOE) Nevada Test Site to ensure that laboratory data satisfied predetermined measurement quality objectives (MQOs). The QA Program was adapted from EPA programs such as the National Acid Precipitation Assessment Program, the Environmental Monitoring and Assessment Program, and to a lesser degree, the Comprehensive Environmental Recovery, Compensation and Liability Act (CERCLA) Program. The QA design adopted the batch or lot concept, in which samples are organized into groups of quality samples (non-blinds, blinds, and double-blinds), which were included in each batch to evaluate and control measurement uncertainty and to address sample preparation. Detectability was assessed using instrument detection limits and precision data for low-concentration samples. Precision was assessed using data from reference samples under a two-tiered system based on concentration ranges. Accuracy was investigated in terms of bias with respect to reference values. The results showed that QA concepts developed for previous nationwide EPA programs were successfully adapted for the site-specific DOE project.

2387 (DOE/OR–01-1179-D2) **Phase I remedial investigation report of Waste Area Grouping 2 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Miller, D.E. (ed.). Oak Ridge National Lab., TN (United States). Jul 1995. 141p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016109. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the activities and findings of the first phase of a three-phase remedial investigation (RI) of Waste Area Grouping (WAG) 2 at Oak Ridge National Laboratory

(ORNL) in Oak Ridge, Tennessee, and updates the scope and strategy for WAG-2-related efforts. WAG 2 contains White Oak Creek (WOC) and its tributaries downstream of the ORNL main plant area, White Oak Lake, White Oak Creek Embayment on the Clinch River, and the associated floodplain and subsurface environment. Water, sediment, soil, and biota in WAG 2 are contaminated and continue to receive contaminants from upgradient WAGs. This report includes field activities completed through October 1992. The remediation of WAG 2 is scheduled to follow the cessation of contaminant input from hydrologically upgradient WAGs. While upgradient areas are being remediated, the strategy for WAG 2 is to conduct a long-term monitoring and investigation program that takes full advantage of WAG 2's role as an integrator of contaminant fluxes from other ORNL WAGs and focuses on four key goals: (1) Implement, in concert with other programs, long-term, multimedia environmental monitoring and tracking of contaminants leaving other WAGs, entering WAG 2, and being transported off-site. (2) Provide a conceptual framework to integrate and develop information at the watershed-level for pathways and processes that are key to contaminant movement, and so support remedial efforts at ORNL. (3) Provide periodic updates of estimates of potential risk (both human health and ecological) associated with contaminants accumulating in and moving through WAG 2 to off-site areas. (4) Support the ORNL Environmental Restoration Program efforts to prioritize, remediate, and verify remedial effectiveness for contaminated sites at ORNL, through long-term monitoring and continually updated risk assessments.

2388 (DOE/OR–01-1192&D2) **Environmental monitoring plan for Waste Area Grouping 6 at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** USDOE Oak Ridge Operations Office, TN (United States). Sep 1995. 110p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-158&D2). Order Number DE96006228. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents an Environmental Monitoring Plan (EMP) for Waste Area Grouping (WAG 6) at Oak Ridge National Laboratory (ORNL). This document updates a draft monitoring plan developed in 1993. The draft plan was never finalized awaiting resolution of the mechanisms for addressing RCRA concerns at a site where the CERCLA process resulted in a decision to defer action, i.e., postpone closure indefinitely. Over the past two years the Tennessee Department of Environment and Conservation (TDEC), US Department of Energy (DOE), and US Environmental Protection Agency (EPA) Region IV, have agreed that RCRA authority at the site will be maintained through a post- closure permit; "closure" in this case referring to deferred action. Both a Revised Closure Plan (DOE 1995a) and a Post-Closure Permit Application (DOE 1995b) have been developed to document this agreement; relevant portions of the EMP will be included in the RCRA Post-Closure Permit Application. As the RCRA issues were being negotiated, DOE initiated monitoring at WAG 6. The purpose of the monitoring activities was to (1) continue to comply with RCRA groundwater quality assessment requirements, (2) install new monitoring equipment, and (3) establish the baseline conditions at WAG 6 against which changes in contaminant releases could be measured. Baseline monitoring is scheduled to end September 30, 1995. Activities that have taken place over the past two years are summarized in this document.

2389 (DOE/OR–01-1273/V1&D2/A1) **Addendum to the remedial investigation report on Bear Creek Valley Operable Unit 2 (Rust Spoil Area, Spoil Area 1, and SY-200 Yard) at the Oak Ridge Y-12 Plant Oak Ridge, Tennessee. Volume 1: Main text.** Oak Ridge Y-12 Plant, TN (United States); Science Applications International Corp., Oak Ridge, TN (United States). Apr 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER–182/V1&D2/A1). Order Number DE96003471. Source: OSTI; NTIS; INIS; GPO Dep.

This addendum to the Remedial Investigation (RI) Report on Bear Creek Valley Operable Unit (OU) 2 at the Oak Ridge Y-12 Plant was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for reporting the results of a site characterization for public review. This addendum is a supplement to a document that was previously issued in January 1995 and that provided the Environmental Restoration Program with information about the results of the 1993 investigation performed at OU 2. The January 1995 D2 version of the RI Report on Bear Creek Valley OU 2 included information on risk assessments that have evaluated impacts to human health and the environment. Information provided in the document formed the basis for the development of the Feasibility Study Report. This addendum includes revisions to four chapters of information that were a part of the document issued in January 1995. Specifically, it includes revisions to Chaps. 2, 3, 4, and 9. Volume 1 of this document is not being reissued in its entirety as a D3 version because only the four chapters just mentioned have been affected by requested changes. Note also that Volume 2 of this RI Report on Bear Creek Valley OU 2 is not being reissued in conjunction with Volume 1 of this document because there have been no changes requested or made to the previously issued version of Volume 2 of this document.

2390 (DOE/OR–01-1326-D1/V2) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 2, Appendix A: Characterization methods and data summary.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Mar 1995. 335p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–284-D1/V2; ORNL/ER/Sub–87-99053/76/V2). Order Number DE95012490. Source: OSTI; NTIS; INIS; GPO Dep.

This appendix presents background regulatory and technical information regarding the solid waste management units (SWMUs) at Waste Area Grouping (WAG) 5 to address requirements established by the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). The Department of energy (DOE) agreed to conduct remedial investigations (RIs) under the FFA at various sites at Oak Ridge National Laboratory (ORNL), including SWMUs and other areas of concern on WAG 5. The appendix gives an overview of the regulatory background to provide the context in which the WAG 5 RI was planned and implemented and documents how historical sources of data, many of which are SWMU-specific, were evaluated and used.

2391 (DOE/OR–01-1326-D1/V3) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 3,**

Appendix B, Technical findings and conclusions. Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Mar 1995. 433p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-284-D1/V3; ORNL/ER/Sub-87-99053/76/V3). Order Number DE95012492. Source: OSTI; NTIS; INIS; GPO Dep.

This Remedial Investigation Report on Waste Area Grouping, (NVAG) 5 at Oak Ridge National Laboratory was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for reporting, the results of a site chacterization for public review. This work was performed under Work Breakdown Structure 1.4.12.6.1.05.40.02 (Activity Data Sheet 3305, "WAG 5"). Publication of this document meets a Federal Facility Agreement milestone of March 31, 1995. This document provides the Environmental Restoration Program with information about the results of investigations performed at WAG 5. It includes information on risk assessments that have evaluated long-term impacts to human health and the environment. Information provided in this document forms the basis for decisions regarding, the need for subsequent remediation work at WAG 5.

2392 (DOE/OR-01-1326-D1/V4) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 4: Appendix C, Risk assessment.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Mar 1995. 959p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Subcontract 95B-99053C. (ORNL/ER-284-D1/V4; ORNL/ER/Sub-87-99053/76/V4). Order Number DE95012540. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Area Grouping (WAG) 5 is part of Oak Ridge National Laboratory (ORNL) and is located on the United States Department of Energy's Oak Ridge Reservation (DOE-ORR). The site lies southeast of Haw Ridge in Melton Valley and comprises approximately 32 ha (80 ac) [12 ha (30 ac) of forested area and the balance in grassed fields]. The western and southern boundaries of WAG are contiguous with the WAG 2 area which includes White Oak Creek and Melton Branch and associated floodplains. Waste Area Grouping 5 consists of several contaminant source areas for the disposal of low-level radioactive, transuranic (TRU), and fissile wastes (1959 to 1973) as well as inorganic and organic chemical wastes. Wastes were buried in trenches and auger holes. Radionuclides from buried wastes are being transported by shallow groundwater to Melton Branch and White Oak Creek. Different chemicals of potential concern (COPCS) were identified (e.g., cesium-137, strontium-90, radium-226, thorium-228, etc.); other constituents and chemicals, such as vinyl chloride, bis(2-ethylhexyl)phthalate, trichloroethene, were also identified as COPCS. Based on the results of this assessment contaminants of concern (COCS) were subsequently identified. The human health risk assessment methodology used in this risk assessment is based on Risk Assessment Guidance for Superfund (RAGS) (EPA 1989). First, the data for the different media are evaluated to determine usability for risk assessment. Second, through the process of selecting COPCS, contaminants to be considered in the BHHRA are identified for each media, and the representative concentrations for these contaminants are determined. Third, an assessment of exposure potential is performed, and exposure pathways are identified. Subsequently, exposure is estimated quantitatively, and the toxicity of each of the COPCs is determined. The results of the exposure and toxicity assessments are combined and summarized in the risk characterization section.

2393 (DOE/OR-01-1326&D2/V1) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 1: Technical summary.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Sep 1995. 170p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-284&D2/V1; ORNL/ER/Sub-87-99053/76/D2/V1). Order Number DE96004371. Source: OSTI; NTIS; INIS; GPO Dep.

A remedial investigation (RI) was performed to support environmental restoration activities for Waste Area Grouping (WAG) 5 at the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee. The WAG 5 RI made use of the observational approach, which concentrates on collecting only information needed to assess site risks and support future cleanup work. This information was interpreted and is presented using the framework of the site conceptual model, which relates contaminant sources and release mechanisms to migration pathways and exposure points that are keyed to current and future environmental risks for both human and ecological receptors. The site conceptual model forms the basis of the WAG 5 remedial action strategy and remedial action objectives. The RI provided the data necessary to verify this model and allows recommendations to be made to accomplish those objectives.

2394 (DOE/OR-01-1326&D2/V2) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 2 – Appendix A: Characterization methods and data summary.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Sep 1995. 420p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER-284&D2/V2; ORNL/ER/Sub-87-99053/76/D2/V2). Order Number DE96004372. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Environmental Restoration Program with information about the results of investigations performed at Waste Area Grouping (WAG) 5. It includes information on risk assessments that have evaluated long-term impacts to human health and the environment. Information provided in this document forms the basis for decisions regarding the need for subsequent remediation work at WAG 5. This appendix presents background regulatory and technical information regarding the solid waste management units (SWMUs) at WAG 5 to address requirements established by the Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR). The US Department of Energy (DOE) agreed to conduct remedial investigations (RIs) under the FFA at various sites at Oak Ridge National

Laboratory (ORNL), including SWMUs and other areas of concern on WAG 5. The appendix gives an overview of the regulatory background to provide the context in which the WAG 5 RI was planned and implemented and documents how historical sources of data, many of which are SWMU-specific, were evaluated and used.

2395 (DOE/OR--01-1326&D2/V3) **Remedial investigation report on Waste Area Grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 3 – Appendix B: Technical findings and conclusions.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States). Sep 1995. 420p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER--284&D2/V3; ORNL/ER/Sub--87-99053/76/D2/V3). Order Number DE96004373. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides the Environmental Restoration Program with information about the results of investigations performed at Waste Area Grouping (WAG) 5. It includes information on risk assessments that have evaluated long-term impacts to human health and the environment. Information provided in this document forms the basis for decisions regarding the need for subsequent remediation work at WAG 5. Sections B1.1 through B1.4 present an overview of the environmental setting of WAG 5, including location, population, land uses, ecology, and climate, and Sects. B1.5 through B1.7 give site-specific details (e.g., topography, soils, geology, and hydrology). The remediation investigation (RI) of WAG 5 did not entail en exhaustive characterization of all physical attributes of the site; the information presented here focuses on those most relevant to the development and verification of the WAG 5 conceptual model. Most of the information presented in this appendix was derived from the RI field investigation, which was designed to complement the existing data base from earlier, site-specific studies of Solid Waste Storage Area (SWSA) 5 and related areas.

2396 (DOE/OR--01-1326&D2/V4) **Remedial investigation report on waste area grouping 5 at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Volume 4, Appendix C, Risk assessment.** Oak Ridge National Lab., TN (United States); CH2M Hill Southeast, Inc., Oak Ridge, TN (United States); Peer Consultants, Inc., Oak Ridge, TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States); Ogden Environmental and Energy Services Co., Oak Ridge, TN (United States). Sep 1995. 900p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER--284&D2/V4; ORNL/ER/Sub--87-99053/76/D2/V4). Order Number DE96004374. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Area Grouping (WAG) 5 is part of Oak Ridge National Laboratory (ORNL) and is located on the United States Department of Energy's Oak Ridge Reservation (DOE-ORR). The site lies southeast of Haw Ridge in Melton Valley and comprises approximately 32 ha (80 ac) [12 ha (30 ac) of forested area and the balance in grassed fields]. Waste Area Grouping 5 consists of several contaminant source areas for the disposal of low-level radioactive, transuranic (TRU), and fissile wastes (1959 to 1973) as well as inorganic and organic chemical wastes. Wastes were buried in trenches and auger holes. Radionuclides from buried wastes are being transported by shallow groundwater to Melton Branch and White Oak Creek. Different chemicals of potential concern (COPCs) were identified (e.g., cesium-137, strontium-90, radium-226, thorium-228, etc.); other constituents and chemicals, such as vinyl chloride, bis(2-ethylhexyl)phthalate, trichloroethene, were also identified as COPCs. Based on the results of this assessment contaminants of concern (COCs) were subsequently identified. The objectives of the WAG 5 Baseline Human Health Risk Assessment (BHHRA) are to document the potential health hazards (i.e., risks) that may result from contaminants on or released from the site and provide information necessary for reaching informed remedial decisions. As part of the DOE-Oak Ridge Operations (ORO), ORNL and its associated waste/contamination sites fall under the auspices of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), also known as Superfund under the Superfund Amendments and Reauthorization Act (SARA). The results of the BHHRA will (1) document and evaluate risks to human health, (2) help determine the need for remedial action, (3) determine chemical concentrations protective of current and future human receptors, and (4) help select and compare various remedial alternatives.

2397 (DOE/OR--01-1337-D1) **Waste Area Grouping 4 Site Investigation Sampling and Analysis Plan, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Dec 1994. 54p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER--292). Order Number DE96007106. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

Waste Area Grouping (WAG) 4 is one of 17 WAGs within and associated with Oak Ridge National Laboratory (ORNL), on the Oak Ridge Reservation in Oak Ridge, Tennessee. WAG 4 is located along Lagoon Road south of the main facility at ORNL. WAG 4 is a shallow-waste burial site consisting of three separate areas: (1) Solid Waste Storage Area (SWSA) 4, a shallow-land burial ground containing radioactive and potentially hazardous wastes; (2) an experimental Pilot Pit Area, including a pilot-scale testing pit; and (3) sections of two abandoned underground pipelines formerly used for transporting liquid, low-level radioactive waste. In the 1950s, SWSA 4 received a variety of low-and high-activity wastes, including transuranic wastes, all buried in trenches and auger holes. Recent surface water data indicate that a significant amount of ^{90}Sr is being released from the old burial trenches in SWSA 4. This release represents a significant portion of the ORNL off-site risk. In an effort to control the sources of the ^{90}Sr release and to reduce the off-site risk, a site investigation is being implemented to locate the trenches containing the most prominent ^{90}Sr sources. This investigation has been designed to gather site-specific data to confirm the locations of ^{90}Sr sources responsible for most off-site releases, and to provide data to be used in evaluating potential interim remedial alternatives prepared to direct the site investigation of the SWSA 4 area at WAG 4.

2398 (DOE/OR--01-1393V1&D1) **Remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit. Volume 1. Main text.** Oak Ridge National Lab., TN (United States). Sep 1995. 554p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER--315/V1&D1). Order Number DE96010201. Source: OSTI; NTIS; INIS; GPO Dep.

This is the combined Remedial Investigation/Feasibility Study Report for the Clinch River/Poplar Crack (CR/PC) Operable Unit (OU). The CR/PC OU is located in Anderson and Roane Counties, Tennessee and consists of the Clinch River and several of its embayments in Melton Hill and Watts Bar Reservoirs. These waters have received hazardous substances released over a period of 50 years from the US Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act. A remedial investigation has been conducted to determine the current nature and extent of any contamination and to assess the resulting risk to human health and the environment. The feasibility study evaluates remedial action alternatives to identify any that are feasible for implementation and that would effectively reduce risk. Historical studies had indicated that current problems would likely include ^{137}Cs in sediment of the Clinch River, mercury in sediment and fish of Poplar Creek and PCBs and pesticides in fish from throughout the OU. Peak releases of mercury and ^{137}Cs occurred over 35 years ago, and current releases are low. Past releases of PCBs from the ORR are poorly quantified, and current releases are difficult to quantify because levels are so low. The site characterization focused on contaminants in surface water, sediment, and biota. Contaminants in surface water were all found to be below Ambient Water Quality Criteria. Other findings included the following: elevated metals including cesium 137 and mercury in McCoy Branch sediments; PCBs and chlordane elevated in several fish species, presenting the only major human health risk, significant ecological risks in Poplar Creek but not in the Clinch River.

2399 (DOE/OR–01-1393/V2&D1) **Remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit. Volume 2. Appendixes A, B, C, D.** Oak Ridge National Lab., TN (United States). Sep 1995. 390p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–315/V2&D1). Order Number DE96010202. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains appendices A (water characterization), B (sediment characterization), C (biota Characterization), D (applicable or relevant and appropriate requirements) from the combined Remedial Investigation/ Feasibility Study Report for the Clinch River/Poplar Crack (CR/PC) Operable Unit (OU). The CR/PC OU is located in Anderson and Roane Counties, Tennessee and consists of the Clinch River and several of its embayments in Melton Hill and Watts Bar Reservoirs. These waters have received hazardous substances released over a period of 50 years from the US Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act. A remedial investigation has been conducted to determine the current nature and extent of any contamination and to assess the resulting risk to human health and the environment. The feasibility study evaluates remedial action alternatives to identify any that are feasible for implementation and that would effectively reduce risk. Historical studies had indicated that current problems would likely include ^{137}Cs in sediment of the Clinch River, mercury in sediment and fish of Poplar Creek and PCBs and pesticides in fish from throughout the OU. Peak releases of mercury and ^{137}Cs occurred over 35 years ago, and current releases are low. Past releases of PCBs from the ORR are poorly quantified, and current releases are difficult to quantify because levels are so low. The site characterization focused on contaminants in surface water, sediment, and biota. Contaminants in surface water were all found to be below Ambient Water Quality Criteria. Other findings included the following: elevated metals including cesium 137 and mercury in McCoy Branch sediments; PCBs and chlordane elevated in several fish species, presenting the only major human health risk, significant ecological risks in Poplar Creek but not in the Clinch River.

2400 (DOE/OR–01-1393/V2&D2) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek Operable Unit. Volume 2. Biota and representative concentrations of contaminants. Appendixes A, B, C, D.** Oak Ridge National Lab., TN (United States). Mar 1996. 370p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER–315/V2&D2). Order Number DE96013718. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OU's). This document is the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

2401 (DOE/OR–01-1393/V2&D3) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek Operable Unit. Volume 2. Appendixes A, B, C, and D-Biota and representative concentrations of contaminants.** Oak Ridge National Lab., TN (United States). Jun 1996. 373p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER–315/V2&D3). Order Number DE96014012. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OUs). This document is Volume 2 of the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

2402 (DOE/OR–01-1393/V4&D1) **Remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit. Volume 4. Appendix F.** Oak Ridge National Lab., TN (United States). Sep 1995. 513p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–315/V4&D1). Order Number DE96010204. Source: OSTI; NTIS; INIS; GPO Dep.

This section contains ecotoxicological profiles for the COPECs for the combined Remedial Investigation/Feasibility Study Report for the Clinch River/Poplar Crack (CR/PC) Operable Unit (OU). The ecotoxicological information is presented for only those endpoints for which the chemicals are COPECs. The CR/PC OU is located in Anderson and Roane Counties, Tennessee and consists of the Clinch River and several of its embayments in Melton Hill and Watts Bar Reservoirs. These waters have received hazardous substances released over a period of 50 years from the US Department of Energy's Oak Ridge Reservation (ORR), a National Priority List site established under the Comprehensive Environmental Response, Compensation, and Liability Act. A remedial investigation has been conducted to determine the current nature and extent of any contamination and to assess the resulting risk to human health and the environment. The feasibility study evaluates remedial action alternatives to identify any that are feasible for implementation and that would effectively reduce risk. Historical studies had indicated that current problems would likely include ^{137}Cs in sediment of the Clinch River, mercury in sediment and fish of Poplar Creek and PCBs and pesticides in fish from throughout the OU. Peak releases of mercury and ^{137}Cs occurred over 35 years ago, and current releases are low. Past releases of PCBs from the ORR are poorly quantified, and current releases are difficult to quantify because levels are so low. The site characterization focused on contaminants in surface water, sediment, and biota. Contaminants in surface water were all found to be below Ambient Water Quality Criteria. Other findings included the following: elevated metals including cesium 137 and mercury in McCoy Branch sediments; PCBs and chlordane elevated in several fish species, presenting the only major human health risk, significant ecological risks in Poplar Creek but not in the Clinch River.

2403 (DOE/OR–01-1393/V4&D2) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek operable unit. Volume 4. Information related to the feasibility study and ARARs. Appendixes G, H, I.** Oak Ridge National Lab., TN (United States). Mar 1996. 72p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER–315/V4&D2). Order Number DE96013720. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OUs). This document is the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

2404 (DOE/OR–01-1393/V4&D3) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek Operable Unit. Volume 4. Appendixes G, H, and I and information related to the feasibility study and ARARs.** Oak Ridge National Lab., TN (United States); Jacobs Engineering Group, Inc., Oak Ridge, TN (United States). Jun 1996. 73p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER–315/V4&D3). Order Number DE96014007. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OUs). This document is Volume 4 of the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

2405 (DOE/OR–01-1393/V5&D1) **Remedial investigation/feasibility study for the Clinch River/Poplar Creek operable unit. Volume 5. Appendixes G, H, I, J.** Oak Ridge National Lab., TN (United States). Sep 1995. 142p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/ER–315/V5&D1). Order Number DE96010205. Source: OSTI; NTIS; INIS; GPO Dep.

The Quality Assurance/Quality Control (QA/QC) Program for Phase 2 of the Clinch River Remedial Investigation (CRRI) was designed to comply with both Department of Energy (DOE) Order 5700.6C and Environmental Protection Agency (EPA) QAMS-005/80 (EPA 1980a) guidelines. QA requirements and the general QA objectives for Phase 2 data were defined in the Phase 2 Sampling and Analysis Plan (SAP)-Quality Assurance Project Plan, and scope changes noted in the Phase 2 Sampling and Analysis Plan Addendum. The QA objectives for Phase 2 data were the following: (1) Scientific data generated will withstand scientific and legal scrutiny. (2) Data will be gathered using appropriate procedures for sample collection, sample handling and security, chain of custody (COC), laboratory analyses, and data reporting. (3) Data will be of known precision and accuracy. (4) Data will meet data quality objectives (DQOs) defined in the Phase 2 SAP.

2406 (DOE/OR–01-1393/V5&D2) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek operable unit. Volume 5.** Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States). Mar 1996. 204p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER-315/V5&D2). Order Number DE96013721. Source: OSTI; NTIS; INIS; GPO Dep.

This volume is in support of the findings of an investigation into contamination of the Clinch River and Poplar Creek near the Oak Ridge Reservation (for more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities there). It addresses the quality assurance objectives for measuring the data, presents selected historical data, contains data from several discrete water characterization studies, provides data supporting the sediment characterization, and contains data related to several biota characterization studies.

2407 (DOE/OR–01-1393/V5&D3) **Remedial investigation/feasibility study of the Clinch River/Poplar Creek Operable Unit. Volume 5. Appendixes J, K, L, M, and N-other supporting information.** Oak Ridge National Lab., TN (United States). Jun 1996. 196p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. (ORNL/ER–315/V5&D3). Order Number DE96014009. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of an investigation into contamination of the Clinch River and Poplar Creek near the U.S. Department of Energy's (DOE's) Oak Ridge Reservation (ORR) in eastern Tennessee. For more than 50 years, various hazardous and radioactive substances have been released to the environment as a result of operations and waste management activities at the ORR. In 1989, the ORR was placed on the National Priorities List (NPL), established and maintained under the federal Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). Under CERCLA, NPL sites must be investigated to determine the nature and extent of contamination at the site, assess the risk to human health and the environment posed by the site, and, if necessary, identify feasible remedial alternatives that could be used to clean the site and reduce risk. To facilitate the overall environmental restoration effort at the ORR, CERCLA activities are being implemented individually as distinct operable units (OUs). This document is Volume 5 of the combined Remedial Investigation and Feasibility Study Report for the Clinch River/Poplar Creek OU.

2408 (DOE/OR–01-1395&D1) **Remedial design work plan for Lower East Fork Poplar Creek Operable Unit, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States). Oct 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER–248). Order Number DE96003971. Source: OSTI; NTIS; INIS; GPO Dep.

The Remedial Design Work Plan (RDWP) for Lower East Fork Poplar Creek (EFPC) Operable Unit (OU) in Oak Ridge, Tennessee. This remedial action fits into the overall Oak Ridge Reservation (ORR) cleanup strategy by addressing contaminated floodplain soil. The objective of this remedial action is to minimize the risk to human health and the environment from contaminated soil in the Lower EFPC floodplain pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Federal Facility Agreement (FFA) (1992). In accordance with the FFA, a remedial investigation (RI) (DOE 1994a) and a feasibility study (DOE 1994b) were conducted to assess contamination of the Lower EFPC and propose remediation alternatives. The remedial investigation determined that the principal contaminant is mercury, which originated from releases during Y-12 Plant operations, primarily between 1953 and 1963. The recommended alternative by the feasibility study was to excavate and dispose of floodplain soils contaminated with mercury above the remedial goal option. Following the remedial investigation/feasibility study, and also in accordance with the FFA, a proposed plan was prepared to more fully describe the proposed remedy.

2409 (DOE/OR–01-1396&D1) **Remedial investigation work plan for the Upper East Fork Poplar Creek characterization area, Oak Ridge Y-12 Plant, Oak Ridge, Tennessee.** Oak Ridge Y-12 Plant, TN (United States); CDM Federal Programs Corp., Oak Ridge, TN (United States). Sep 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (Y/ER–230&D1). Order Number DE96003469. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge Y-12 Plant, located within the Oak Ridge Reservation (ORR), is owned by the US Department of Energy (DOE) and managed by Lockheed Martin Energy Systems, Inc. The entire ORR was placed on the National Priorities List (NPL) of CERCLA sites in November 1989. Following CERCLA guidelines, sites under investigation require a remedial investigation (RI) to define the nature and extent of contamination, evaluate the risks to public health and the environment, and determine the goals for a feasibility study (FS) of potential remedial actions. The need to complete RIs in a timely manner resulted in the establishment of the Upper East Fork Poplar Creek (UEFPC) Characterization Area (CA) and the Bear Creek CA. The CA approach considers the entire watershed and examines all appropriate media within it. The UEFPC CA, which includes the main Y-12 Plant area, is an operationally and hydrogeologically complex area that contains numerous contaminants and containment sources, as well as ongoing industrial and defense-related activities. The UEFPC CA also is the suspected point of origin for off-site groundwater and surface-water contamination. The UEFPC CA RI also will address a carbon-tetrachloride/chloroform-dominated groundwater plume that extends east of the DOE property line into Union Valley, which appears to be connected with springs in the valley. In addition, surface water in UEFPC to the Lower East Fork Poplar Creek CA boundary will be addressed. Through investigation of the entire watershed as one "site," data gaps and contaminated areas will be identified and prioritized more efficiently than through separate investigations of many discrete units.

2410 (DOE/OR–01-1441/V1) **Oak Ridge Reservation Federal Facility Agreement for the Environmental Restoration Program. Volume 1, Quarterly report, October–December 1995.** Oak Ridge National Lab., TN (United States). Jan 1996. 115p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006081. Source: OSTI; NTIS; GPO Dep.

This Oak Ridge Reservation Federal Facility Agreement Quarterly Report for the Environmental Restoration Program was prepared to satisfy requirements for progress reporting on Environmental Restoration Program (ER) activities as specified in the Oak Ridge Reservation Federal Facility Agreement (FFA) established between the US Department of Energy (DOE), the US Environmental Protection Agency, and the Tennessee Department of Environment and Conservation. The reporting period covered in this document is October through December 1995. This work was performed under Work Breakdown Structure 1.4.12.2.3.04 (Activity Data Sheet 8304). Publication of this document meets two FFA milestones. The FFA Quarterly Report meets an FFA milestone defined as 30 days following the end of the applicable reporting period. Appendix A of this report meets the FFA milestone for the Annual Removal Action Report for the period FYs 1991–95. This document provides information about ER Program activities conducted on the Oak Ridge Reservation under the FFA. Specifically, it includes information on milestones scheduled for completion during the reporting period, as well as scheduled for completion during the next reporting period (quarter); accomplishments of the ER Program; concerns related to program work; and scheduled activities for the next quarter. It also provides a listing of the identity and assigned tasks of contractors performing ER Program work under the FFA.

2411 (DOE/OR–07-1414-D1) **Project plan for the background soils project for the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.** Oak Ridge National Lab., TN (United States). Sep 1995. 152p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. (ES/ER/TM–155-D1). Order Number DE96006670. Source: OSTI; NTIS; INIS; GPO Dep.

ESD Publication 4419.

The Background Soils Project for the Paducah Gaseous Diffusion Plant (BSPP) will determine the background concentration levels of selected naturally occurring metals, other inorganics, and radionuclides in soils from uncontaminated areas in proximity to the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky. The data will be used for comparison with characterization and compliance data for soils, with significant differences being indicative of contamination. All data collected as part of this project will be in addition to other background databases established for the PGDP. The BSPP will address the variability of surface and near-surface concentration levels with respect to (1) soil taxonomical types (series) and (2) soil sampling depths within a specific soil profile. The BSPP will also address the variability of concentration levels in deeper geologic formations by collecting samples of geologic materials. The BSPP will establish a database, with recommendations on how to use the data for contaminated site assessment, and provide data to estimate the potential human and health and ecological risk associated with background level concentrations of potentially hazardous constituents. BSPP data will be used or applied as follows.

2412 (DOE/OR/21400–T483) **Final report on the Vitro CRADA.** Oak Ridge National Lab., TN (United States). Feb 1994. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000664. Source: OSTI; NTIS; INIS; GPO Dep.

ORNL and Vitro investigated the application of advanced Geographic Information System (GIS) technologies to site characterization and environmental remediation work. The six tasks were to do feasibility studies for integrating GIS tools with DBMS, graphics, and other packages to aid in environmental analyses, develop environmental and geographic data standards and guidelines including data structures/quality assurance practices/metadata, investigate environmental and remediation predictive modeling and their integration with GIS, study remote sensing techniques including Global Positioning Systems techniques, and investigate display enhancement techniques including 2D/3D visualization coupled with GIS data bases.

2413 (DOE/OR/22160–T17) **Demonstration testing and evaluation of in situ soil heating. Management Plan, Revision 2.** Dev, H. IIT Research Inst., Chicago, IL (United States). 6 Mar 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE95007851. Source: OSTI; NTIS; INIS; GPO Dep.

This is the second revision to the Management Plan for US DOE contract entitled, "Demonstration Testing and Evaluation of In Situ Soil Heating," Contract Number DE-AC05-93OR22160, IITRI Project Number C06787. The cost plan and schedule have been revised herein. The Management Plan was revised once before, in March 1994. In this project IITRI will demonstrate its in situ soil heating and decontamination technology which uses 60 Hz AC power to heat soil to a temperature of about 900C. This technology is aimed at the decontamination of soil by the removal of organic hazardous constituents by the action of heat and a vacuum gas collection system.

2414 (DOE/OR/22160–T22-Vol.1) **Demonstration, testing, & evaluation of in situ heating of soil. Draft final report, Volume I.** Dev, H.; Enk, J.; Jones, D.; Saboto, W. IIT Research Inst., Chicago, IL (United States). 12 Feb 1996. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE96006051. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a draft final report (Volume 1) for US DOE contract entitled, "Demonstration Testing and Evaluation of In Situ Soil Heating," Contract No. DE-AC05-93OR22160, IITRI Project No. C06787. This report is presented in two volumes. Volume I contains the technical report and Volume II contains appendices with background information and data. In this project approximately 300 cu. yd. of clayey soil containing a low concentration plume of volatile organic chemicals was heated in situ by the application of electrical energy. It was shown that as a result of heating the effective permeability of soil to air flow was increased such that in situ soil vapor extraction could be performed. The initial permeability of soil was so low that the soil gas flow rate was immeasurably small even at high vacuum levels. When scaled up, this process can be used for the environmental clean up and restoration of DOE sites contaminated with VOCs and other organic chemicals boiling up to 120° to 130°C in the vadose zone. Although it may applied to many types of soil formations, it is particularly attractive for low permeability clayey soil where conventional in situ venting techniques are limited by low air flow.

2415 (DOE/OR/22160–T22-Vol.2) **Demonstration, testing, & evaluation of in situ heating of soil. Draft final report, Volume II: Appendices A to E.** Dev, H.; Enk, J.; Jones, D.; Saboto, W. IIT Research Inst., Chicago, IL (United States). 12 Feb 1996. 340p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE96005711. Source: OSTI; NTIS; INIS; GPO Dep.

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2416 (DOE/OR/22160–T23-Vol.1) **Demonstration, testing, and evaluation of in situ heating of soil. Volume 1, Final report.** Dev, H.; Enk, J.; Jones, D.; Sabato, W. IIT Research Inst., Chicago, IL (United States). 5 Apr 1996. 186p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE96009599. Source: OSTI; NTIS; INIS; GPO Dep.

This document is a final reports in two volumes. Volume I contains the technical report and Volume II contains appendices with background information and data. In this project approximately 300 cubic yards of clayey soil containing a low concentration plume of volatile organic chemicals was heated in situ by the application of electrical energy. It was shown that as a result of heating the effective permeability of soil to air flow was increased such that in situ soil vapor extraction could be performed. The initial permeability of soil was so low that the soil gas flow rate was immeasurably small even at high vacuum levels. It was demonstrated that the mass flow rate of the volatile organic chemicals was enhanced in the recovered soil gas as a result of heating.

2417 (DOE/OR/22160–T23-Vol.2) **Demonstration, testing, and evaluation of in situ heating of soil. Final report, Volume 2, Appendices A to E.** Dev, H.; Enk, J.; Jones, D.; Sabato, W. IIT Research Inst., Chicago, IL (United States). 5 Apr 1996. 336p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-93OR22160. Order Number DE96009600. Source: OSTI; NTIS; INIS; GPO Dep.

This is a final report presented in two volumes. Volume I contains the technical report and Volume II contains appendices with background information and data. In this project approximately 300 cubic yards of clayey soil containing a low concentration plume of volatile organic chemicals was heated in situ by the application of electrical energy. It was shown that as a result of heating the effective permeability of soil to air flow was increased such that in situ soil vapor extraction could be performed. The initial permeability of soil was so low that the soil gas flow rate was immeasurably small even at high vacuum levels. It was demonstrated that the mass flow rate of the volatile organic chemicals was enhanced in the recovered soil gas as a result of heating. When scaled up, this process can be used for the environmental clean up and restoration of DOE sites contaminated with VOC's and other organic chemicals. Although it may be applied to many types of soil formations, it is particularly attractive for low permeability clayey soil where conventional in situ venting techniques are limited by air flow.

2418 (DOE/ORO–2033) **Benchmarking analysis of three multimedia models: RESRAD, MMSOILS, and MEPAS.** Cheng, J.J. (and others); Faillace, E.R.; Gnanapragasam, E.K. Oak Ridge National Lab., TN (United States); Argonne National Lab., IL (United States); Pacific Northwest Lab., Richland, WA (United States); Tetra Tech, Inc., Lafayette, CA (United States); Environmental Protection Agency, Athens, GA (United States). Environmental Research Lab.; Tennessee Univ., Knoxville, TN (United States). Nov 1995. 300p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AC05-84OR21400. (ORNL/M–4922). Order Number DE96006086. Source: OSTI; NTIS; INIS; GPO Dep.

Multimedia modelers from the United States Environmental Protection Agency (EPA) and the United States Department of Energy (DOE) collaborated to conduct a comprehensive and quantitative benchmarking analysis of three multimedia models. The three models-RESRAD (DOE), MMSOILS (EPA), and MEPAS (DOE)-represent analytically based tools that are used by the respective agencies for performing human exposure and health risk assessments. The study is performed by individuals who participate directly in the ongoing design, development, and application of the models. A list of physical/chemical/biological processes related to multimedia-based exposure and risk assessment is first presented as a basis for comparing the overall capabilities of RESRAD, MMSOILS, and MEPAS. Model design, formulation, and function are then examined by applying the models to a series of hypothetical problems. Major components of the models (e.g., atmospheric, surface water, groundwater) are evaluated separately and then studied as part of an integrated system for the assessment of a multimedia release scenario to determine effects due to linking components of the models. Seven modeling scenarios are used in the conduct of this benchmarking study: (1) direct biosphere exposure, (2) direct release to the air, (3) direct release to the vadose zone, (4) direct release to the saturated zone, (5) direct release to surface water, (6) surface water hydrology, and (7) multimedia release. Study results show that the models differ with respect to (1) environmental processes included (i.e., model features) and (2) the mathematical formulation and assumptions related to the implementation of solutions (i.e., parameterization).

2419 (DOE/RF/00646–T1) **Wind tunnel evaluation of the RAAMP sampler. Final report.** Vanderpool, R.W.; Peters, T.M. Research Triangle Inst., Research Triangle Park, NC (United States). Center for Environmental Technology. Nov 1994. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AI34-93RF00646. Order Number DE96010070. Source: OSTI; NTIS; INIS; GPO Dep.

Wind tunnel tests of the Department of Energy RAAMP (Radioactive Atmospheric Aerosol Monitoring Program) monitor have been conducted at wind speeds of 2 km/hr and 24 km/hr. The RAAMP sampler was developed based on three specific performance objectives: (1) meet EPA PM10 performance criteria, (2) representatively sample and retain particles larger than 10 { micro} m for later isotopic analysis, (3) be capable of continuous, unattended operation for time periods up to 2 months. In this first phase of the evaluation, wind tunnel tests were performed to evaluate the sampler as a potential candidate for EPA PM10 reference or equivalency status. As an integral part of the project, the EPA wind tunnel facility was fully characterized at wind speeds of 2 km/hr and 24 km/hr in conjunction with liquid test aerosols of 10 { micro} m aerodynamic diameter. Results showed that the facility and its operating protocols met or exceeded all 40 CFR Part 53 acceptance criteria regarding PM10 size-selective performance evaluation. Analytical procedures for quantitation of collected mass deposits also met 40 CFR Part 53 criteria. Modifications were made to the tunnel's test section to accommodate the large dimensions of the RAAMP sampler's instrument case.

2420 (DOE/RL–93-46-Rev.2) **RCRA Facility investigation/corrective measures study work plan for the 100-DR-2 Operable Unit, Hanford Site, Richland, Washington. Revision 2.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). May 1995. 440p. Sponsored by USDOE, Washington, DC (United States);Environmental Protection Agency, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95012048. Source: OSTI; NTIS; INIS; GPO Dep.

This work plant establishes the operable unit setting and the objectives, approach, tasks, and schedule for conducting the Resource Conservation Recovery Act Facility Investigation/Corrective Measure Study for the Hanford 100-DR-2 Operable Unit, which contains liquid, sludge, and solid waste units used in support of DR Reactor operation, and also the (100-DR-3) solid waste burial grounds. The work plan is focused on limited field investigation activities.

2421 (DOE/RL–94-53) **Limited field investigation report for the 100-HR-2 Operable Unit.** Bechtel National, Inc., Richland, WA (United States). Jul 1995. 125p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017533. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes the data collection and analysis activities conducted during the 100-HR-2 Operable Unit investigative phase and the associated qualitative risk assessment. The 100-HR-2 Operable Unit contains solid waste burial grounds, an ash pit, burn pits, electrical facilities, septic systems, and support facilities. All known and suspected areas of contamination were classified as solid waste burial grounds or low-priority waste sites based on the collective knowledge of the operable unit managers (representatives from the US Department of Energy, the US Environmental Protection Agency, and Washington State Department of Ecology during the preparation of the 100-HR-2 Operable Unit Work Plan (DOE-RL 1993f). Solid waste burial grounds were judged to pose sufficient risk(s), through one or more pathways, to require evaluation for an interim remedial measure as per the Hanford Past-Practice Strategy (DOE-RL 1991) and negotiations with the Department of Energy, US Environmental Protection Agency, and Washington State Department of Ecology. An interim remedial measure is intended to achieve remedies that are likely to lead to a final record of decision. Low-priority sites are those judged not to pose significant risk to require the streamlined evaluation. There were six low-priority waste sites and seven solid waste burial grounds identified. The purpose of this report is to: (1) provide a summary of site investigative activities; (2) refine the conceptual exposure model (as needed); (3) identify chemical- and location-specific corrective action requirements; and 4) provide a human health and ecological QRA associated with solid waste burial grounds.

2422 (DOE/RL–94-61-Vol.2) **100 Area Source Operable Unit focused feasibility study. Volume 2.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Aug 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017537. Source: OSTI; NTIS; INIS; GPO Dep.

This 100-KR-1 Operable Unit Focused Feasibility Study (FFS) is prepared in support of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) remedial investigation/feasibility study (RI/FS) process for the 100 Areas. This 100-KR-1 FFS, evaluates the remedial alternatives for interim action at high-priority waste sites within the 100-KR-1 Operable Unit, and provides the information needed for the timely selection of the most appropriate interim action at each waste site. The FFS process for the 100 Areas is conducted in two stages: an evaluation of remedial alternatives for waste-site groups and an evaluation of the remedial alternatives for individual waste sites. Whenever the characteristics of the individual waste-sites are sufficiently similar to the characteristics of the waste-site groups, the evaluation of alternatives in the Process Document is used. This approach, referred to as the "plug-in" approach, is used because there are many waste sites within the 100 Areas that are similar to each other.

2423 (DOE/RL–94-99) **Proposed plan for interim remedial measures at the 100-BC-1 Operable Units.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017538. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan identifies the preferred alternative for interim remedial measures for remedial action of radioactive liquid waste disposal sites that include contaminated soils and structures at the 100-BC-1 Operable Unit, located at the Hanford Site. It also summarizes other remedial alternatives evaluated for interim remedial measures in this Operable Unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that pose potential threats to human health and the environment. The preferred alternative presented in this Proposed Plan is to remove, treat as appropriate or required, and dispose of the contaminated soil and associated structures from nine source areas within the 100-BC-1 Operable Unit. Treatment would be conducted as necessary or appropriate for cost effective operations. The preferred alternative will reduce potential threats to human health and the environment at 100-BC-1 Operable Unit radioactive liquid waste disposal sites. The remedial actions described are intended to reduce potential human health and ecological risks and to ensure that contaminants present at these waste sites will not adversely impact groundwater beneath the sites or the Columbia River.

2424 (DOE/RL–94-100) **Proposed plan for interim remedial measures at the 100-DR-1 Operable Unit.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jun 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017540. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for interim remedial measures for remedial action of radioactive liquid waste disposal sites that include contaminated soils and structures at the 100-DR-1 Operable Unit, located at the Hanford Site. It also summarizes other remedial alternatives evaluated for interim remedial measures in this Operable

Unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that pose potential threats to human health and the environment. The preferred alternative presented in this Proposed Plan is to remove, treat as appropriate or required, and dispose of the contaminated soil and associated structures from twelve source areas within the 100-DR-1 Operable Unit. The preferred alternative will reduce potential threats to human health and the environment at 100-DR-1 Operable Unit radioactive liquid waste disposal sites. The remedial actions described are intended to reduce potential human health and ecological risks and to ensure that contaminants present at these waste sites will not adversely impact groundwater beneath the sites or the Columbia River.

2425 (DOE/RL–94-101) **Proposed plan for interim remedial measures at the 100-HR-1 Operable Unit, Hanford Site, Richland, Washington.** USDOE Richland Operations Office, WA (United States). [1995]. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017539. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for interim remedial measures for remedial action of radioactive liquid waste disposal sites at the 100-HR-1 Operable Unit, located at the Hanford Site. It also summarizes other remedial alternatives evaluated for interim remedial measures in this operable unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that historically received radioactive liquid waste discharges that pose a potential threat to human health and the environment. This proposed plan is being issued by the Washington State Department of Ecology (Ecology), the lead regulatory agency; the US Environmental Protection Agency (EPA), the support regulatory agency; and the US Department of Energy (DOE), the responsible agency. Ecology, EPA, and DOE are issuing this proposed plan as part of their public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), commonly known as the "Superfund Program." The proposed plan is intended to be a fact sheet for public review that (1) briefly describes the remedial alternatives analyzed; (2) proposes a preferred alternative; (3) summarizes the information relied upon to recommend the preferred alternative; and (4) provides a basis for an interim action record of decision (ROD). The preferred alternative presented in this proposed plan is removal, treatment (as appropriate), and disposal of contaminated soil and associated structures. Treatment will be conducted if there is cost benefit.

2426 (DOE/RL–94-101-Rev.1) **Proposed plan for interim remedial measures at the 100-HR-1 Operable Unit. Revision 1.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Jun 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017541. Source: OSTI; NTIS; INIS; GPO Dep.

This Proposed Plan identifies the preferred alternative for interim remedial measures for remedial action of radioactive liquid waste disposal sites that include contaminated soils and structures at the 100-HR-1 Operable Unit, located at the Hanford Site. It also summarizes other remedial alternatives evaluated for interim remedial measures in this Operable Unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that pose potential threats to human health and the environment. The preferred alternative presented in this Proposed Plan is to remove, treat (as appropriate or required), and dispose of the contaminated soil and associated structures from three source areas within the 100-HR-1 Operable Unit. These are the 116-H-1 Process Effluent Trench, the 116-H-7 Retention Basin, and the 100-H Buried Process Effluent Pipelines. The preferred alternative will reduce potential threats to human health and the environment at 100-HR-1 Operable Unit radioactive liquid waste disposal sites. The remedial actions described are intended to reduce potential human health and ecological risks and to ensure that contaminants present at these waste sites will not adversely impact groundwater beneath the sites or the Columbia River.

2427 (DOE/RL–94-104) **Description of work for vadose zone characterization of the 1301-N and 1325-N liquid waste disposal facilities.** USDOE Richland Operations Office, WA (United States); Bechtel National, Inc., Richland, WA (United States). Sep 1995. 60p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96000284. Source: OSTI; NTIS; INIS; GPO Dep.

This description of work (DOW) details the field activities associated with a limited field investigation (LFI) of soil contamination beneath the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDFs), and will serve as a field guide for those performing the work. These activities are undertaken pursuant to the Hanford Federal Facility Agreement and consent Order (Tri-Party Agreement) (Ecology et al. 1994a) Milestone M-16-94-01H-T1 and the June 30, 1994, Milestone Change Request M-16-94-02 (Ecology et al. 1994b). The scope of these activities was defined during a Streamlined Approach for Environmental Restoration (SAFER) workshop and a US Department of Energy, Richland Operations Office (RL) workshop where data quality objectives (DQOs) and technical criteria for the LFI were developed. Results of the SAFER workshop are discussed in Section 1.1. the locations of the 1301-N and 1325-N LWDFs (116-N-1 and 116-N-3) are shown in Figure 1. Both the 1301-N and 1325-N LWDFs consist o a crib and a trench. Both LWDFs were used to receive and dispose of the cooling water originating from the 100-N Reactor and are classified as RCRA treatment, storage, and/or disposal (TSD) units. The LWDFs are no longer receiving waste effluent. Although these facilities are classified as RCRA TSD units, the RL and regulatory agencies have determined that this LFI will be conducted as a past-practice investigation under the auspices of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), in accordance with the Hanford Site Past-Practice Investigation Strategy (DOE-RL 1991) and the 100-NR-1 Operable Unit RFI/CMS Work Plan (DOE-RL 1994).

2428 (DOE/RL–94-104-Rev.1) **Description of work for vadose zone characterization of the 1301-N and 1325-N liquid waste disposal facilities, Revision 1.** Department of Energy, Richland, WA (United States). Richland Operations Office. Dec 1995. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96004132. Source: OSTI; NTIS; INIS; GPO Dep.

This description of work (DOW) details the field activities associated with a limited field investigation (LFI) of soil contamination beneath the 1301-N and 1325-N Liquid Waste Disposal Facilities (LWDFs), and will serve as a field guide for those performing the work. These activities are undertaken pursuant to the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) Milestone M-16-94-01H-TI and the June 30, 1994, Milestone Change Request M-16-94-02. The scope of these activities was defined during a Streamlined Approach for Environmental Restoration (SAFER) workshop and a U.S. Department of Energy, Richland Operations Office (RL) workshop where data quality objectives (DQOs) and technical criteria for the LFI were developed. Results of the SAFER workshop and the RL workshop are discussed in Section 1.1. Other supporting documents to be used in conjunction with the DOW include the RCRA Facility Investigational Corrective Measures Study Work Plan for the 100-NR-1 Operable Unit, Hanford Site, Richland, Washington (DOE-RL 1994) for operable unit-scale investigation strategy and the Environmental Investigations Procedures (BH1 1995c) for specific procedures. The 1301-N and 1325-N LWDFs are identified as the 116-N-1 and 116-N-3 sites in the 100-NR-1 Operable Unit Resource Conservation and Recovery Act of 1976 (RCRA) Facility Investigation/Corrective Measures Study (RFI/CMS) Work Plan (DOE-RL 1994). The locations of the 1301-N and 1325-N LWDFs (116-N-1 and 116-N-3) arc shown in Figure 1. Both the 1301-N and 1325-N LWDFs consist of a crib and a trench. Both LWDFs were used to receive and dispose of the cooling water originating from the 100-N Reactor and are classified as RCRA treatment, storage, and/or disposal (TSD) units. The LWDFs are no longer receiving waste effluent.

2429 (DOE/RL--94-113-Rev.1) **Proposed plan for interim remedial measure at the 100-KR-4 operable unit, Revision 1.** USDOE Richland Operations Office, WA (United States). Sep 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017496. Source: OSTI; NTIS; INIS; GPO Dep.

This proposed plan identifies the preferred alternative for an interim remedial action plan for the 100-KR-4 Operable Unit at the Hanford Site. The alternative presented is to remove contaminated groundwater from the Unit, treat it by ion exchange, and then dispose of treated groundwater by using upgradient injection wells to return it to the acquifer. This will protect the Columbia River environment from toxic hexavalent chromium. This alternative is the initial recommendation of the EPA, Ecology, and the DOE. Public comment on this plan is invited.

2430 (DOE/RL--95-34) **118-B-1 burial ground excavation treatability test report.** Bechtel National, Inc., Richland, WA (United States). Aug 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017515. Source: OSTI; NTIS; INIS; GPO Dep.

This treatability investigation focused on the feasibility of excavating, analytical screening, and handling waste materials from the 118-B-1 Burial Ground located in the 100 B/C Area of the Hanford Site. The 118-B-1 Burial Ground consists of approximately 24 trenches on a 7-acre parcel. Solid low-level radioactive wastes and other debris and trash associated with reactor operations were disposed in 28 burial grounds in the 100 Area between 1944 and 1973. The majority of waste generated from routine reactor operations was placed in seven primary burial grounds, including 118-B-1. The 118-B-1 Burial Ground was selected as the location to perform this treatability test based on the availability of historical data for this site, and because it was thought to be representative of other primary-use burial grounds in the 100 Area. Geophysical surveys were conducted over the burial ground to map the concentrations of waste and aid in the selection of test pit excavation locations. The test plan developed for this study integrated the Streamlined Approach for Environmental Restoration (SAFER), a US Department of Energy (DOE) initiative based on both the Data Quality Objective (DQO) process and the observational approach. This treatability test is the first one at the Hanford Site to use the SAFER approach. The purpose of this study was (1) to support development of the Proposed Plan and Record of Decision, which would identify the approach to be used for burial ground remediation and (2) to provide specific engineering information for receiving waste generated from the 100 Area removal actions. The results of the treatability test can be used to determine the feasibility of performing excavation, analytical screening, and handling of burial ground materials from similar burial grounds.

2431 (DOE/RL--95-52) **Nonradioactive air emissions notice of construction for the stabilization of the 1300-N emergency dump basin.** Bechtel National, Inc., Richland, WA (United States). May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017500. Source: OSTI; NTIS; INIS; GPO Dep.

The 1300-N Emergency Dump Basin (EDB) is a carbon steel lined retention basin with a one million gallon capacity (3.7 million liters) (Figure 1). It was originally designed to receive primary coolant water during an emergency from the 100-N Reactor, although it was never used for that purpose. However, the EDB was later used as a holding basin for water periodically generated during the N Reactor steam generator blowdown operations until 1987 when N Reactor was shut down. In 1991, approximately 20,000 gallons (75,750 liters) of water was transferred to the EDB from the Lift Station. There is currently 400,000 gallons of water in the basin which consists mainly of filtered water which was added to control contamination. Wind-blown dust and debris has created a sediment layer on the bottom of the basin. This sediment has been classified as mixed waste and has a wet, settled volume estimated at 1664 ft^3($47m^3$). As part of the stabilization process, the majority of the remaining EDB water will be pumped to the 109-N sumps for later treatment and disposal. Sediment will be removed with the remaining water using a slurry process (similar to a vacuum process), and will be packaged in a moist condition in order to prevent potential airborne releases. The liner will then be stabilized and left intact until area remediation has begun. Periodic surveillance and maintenance will be conducted until the site is remediated.

2432 (DOE/RL--95-55) **Hanford Site background: Evaluation of existing soil radionuclide data.** Bechtel National, Inc., Richland, WA (United States). Jul 1995. 160p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE95017498. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an evaluation of the existing data on radiological background for soils in the vicinity of the Hanford Site. The primary purpose of this report is to assess the adequacy of the existing data to serve as a radiological background baseline for use in environmental restoration and remediation activities at the Hanford Site. The soil background data compiled and evaluated in this report were collected by the Pacific Northwest Laboratory (PNL) and Washington State Department of Health (DOH) radiation surveillance programs in southeastern Washington. These two programs provide the largest well-documented, quantitative data sets available to evaluate background conditions at the Hanford Site. The data quality objectives (DQOs) considered in this evaluation include the amount of data, number of sampling localities, spatial coverage, number and types of radionuclides reported, frequency of reporting, documentation and traceability of sampling and laboratory methods used, and comparability between sets of data. Although other data on soil radionuclide abundances around the Hanford Site exist, they are generally limited in scope and lack the DQOs necessary for consideration with the PNL and DOH data sets. Collectively, these two sources provide data on the activities of 25 radionuclides and four other parameters (gross alpha, gross beta, total uranium, and total thorium). These measurements were made on samples from the upper 2.5 cm of soil at over 70 localities within the region.

2433 (DOE/WIPP–91-043-Rev.) **Transuranic waste characterization sampling and analysis methods manual.** Westinghouse Electric Corp., Carlsbad, NM (United States). May 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96004514. Source: OSTI; NTIS; INIS; GPO Dep.

The Transuranic Waste Characterization Sampling and Analysis Methods Manual (Methods Manual) provides a unified source of information on the sampling and analytical techniques that enable Department of Energy (DOE) facilities to comply with the requirements established in the current revision of the Transuranic Waste Characterization Quality Assurance Program Plan (QAPP) for the Waste Isolation Pilot Plant (WIPP) Transuranic (TRU) Waste Characterization Program (the Program). This Methods Manual includes all of the testing, sampling, and analytical methodologies accepted by DOE for use in implementing the Program requirements specified in the QAPP.

2434 (DOE/WIPP–91-043-Rev.1) **Transuranic waste characterization sampling and analysis methods manual. Revision 1.** Suermann, J.F. USDOE Carlsbad Area Office, NM (United States). Apr 1996. 339p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013556. Source: OSTI; NTIS; INIS; GPO Dep.

This Methods Manual provides a unified source of information on the sampling and analytical techniques that enable Department of Energy (DOE) facilities to comply with the requirements established in the current revision of the Transuranic Waste Characterization Quality Assurance Program Plan (QAPP) for the Waste Isolation Pilot Plant (WIPP) Transuranic (TRU) Waste Characterization Program (the Program) and the WIPP Waste Analysis Plan. This Methods Manual includes all of the testing, sampling, and analytical methodologies accepted by DOE for use in implementing the Program requirements specified in the QAPP and the WIPP Waste Analysis Plan. The procedures in this Methods Manual are comprehensive and detailed and are designed to provide the necessary guidance for the preparation of site-specific procedures. With some analytical methods, such as Gas Chromatography/Mass Spectrometry, the Methods Manual procedures may be used directly. With other methods, such as nondestructive characterization, the Methods Manual provides guidance rather than a step-by-step procedure. Sites must meet all of the specified quality control requirements of the applicable procedure. Each DOE site must document the details of the procedures it will use and demonstrate the efficacy of such procedures to the Manager, National TRU Program Waste Characterization, during Waste Characterization and Certification audits.

2435 (DOE/WIPP–95-2094) **Waste Isolation Pilot Plant site environmental report for calendar year 1994.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Jun 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96003975. Source: OSTI; NTIS; INIS; GPO Dep.

US Department of Energy (DOE) Order 5400.1 General Environmental Protection Program, requires each DOE facility that conducts significant environmental protection programs to prepare an Annual Site Environmental Report (ASER). The purpose of the ASER is to summarize environmental data in order to characterize site environmental management performance, to confirm compliance with environmental standards and requirements, and to highlight significant programs and efforts. This ASER not only documents the required data, it also documents new and continued monitoring and compliance activities during the 1994 calendar year. Data contained in this report are derived from those monitoring programs directed by the Waste Isolation Pilot Plant (WIPP) Environmental Monitoring Plan (EMP) (DOE/WIPP 94-024). The EMP defines a comprehensive set of parameters that must be monitored to detect potential impacts to the environment and to establish baseline measurements for future environmental evaluations. Surface water, groundwater, air, soil, and biotics are monitored for radiological and nonradiological activity levels. The baseline radiological surveillance program covers the broader geographic area that encompasses nearby ranches, villages, and cities. Nonradiological studies focus on the area immediately surrounding the WIPP site.

2436 (DOE/WIPP–95-2100) **Geotechnical analysis report for July 1993–June 1994.** Westinghouse Electric Corp., Carlsbad, NM (United States). Waste Isolation Div. Aug 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. Order Number DE96003982. Source: OSTI; NTIS; INIS; GPO Dep.

The geotechnical data from the underground excavations at the WIPP are interpreted and presented in this Geotechnical Analysis Report. The data are used to characterize conditions, assess design assumptions, and understand and predict the performance of the underground excavations during operations. The data are obtained as part of a regular monitoring program. The format of the Geotechnical Analysis Report was selected to meet the needs of several audiences. This report focuses on the geotechnical performance of the various underground facilities including the shafts, shaft stations, access drifts, experimental rooms, and waste storage areas. The results of excavation effects, investigations, stratigraphic mapping, and other geologic studies are also included. The report provides an evaluation of the geotechnical aspects of performance in the context of the relevant design criteria and also describes the techniques used to acquire the data and the performance history of the instruments. The depth and breadth of the evaluation for the different underground facilities varies according to the types and quantities of data that are available, and the complexity of the recorded geotechnical responses.

2437 (DOE/WIPP–95-2129) **Underground mining and deep geologic disposal - Two compatible and complementary activities.** Rempe, N.T. Westinghouse Electric Corp., Carlsbad, NM (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-86AL31950. (CONF-960911–1: Canadian Nuclear Society (CNS) international conference on deep geological disposal of radioactive waste, Winnipeg (Canada), 15-18 Sep 1996). Order Number DE96014294. Source: OSTI; NTIS; INIS; GPO Dep.

Active and mature underground mining districts offer conditions favorable to deep geologic disposal because their geology is known in more detail, the feasibility of underground excavations has already been demonstrated, mining leaves distinctive footprints and records that alert subsequent generations to the anthropogenic alterations of the underground environment, and subsequent exploration and production proceeds with great care and accuracy to locate and generally to avoid old mine workings. Compatibility of mining with deep geologic waste disposal has been proven by decades of experience with safe storage and disposal in former mines and in the mined-out areas of still active mining operations. Mineral extraction around an intended repository reduces the incentive for future disturbance. Incidental features of mineral exploration and extraction such as lost circulation zones, allochthonous backfill, and permanent surface markers can deter future intrusion into a repository. Thus exploration and production of mineral resources should be compatible with, and complementary to, deep geologic waste disposal.

2438 (ES/ER/TM–106/R1) **Preliminary remediation goals for use at the US Department of Energy Oak Ridge Operations Office. Revision 1.** Oak Ridge K-25 Site, TN (United States). May 1996. 959p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96010693. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

This technical memorandum presents Preliminary Remediation Goals (PRGs) for use in human health risk assessment efforts under the United States Department of Energy, Oak Ridge Operations Office Environmental Restoration (ER) Division. This document provides the ER Division with standardized PRGs which are integral to the Remedial Investigation/Feasibility Study process. They are used during project scooping (Data Quality Objectives development), in screening level risk assessments to support early action or No Further Investigation decisions, and in the baselines risk assessment where they are employed in the selection of chemicals of potential concern. The primary objective of this document is to standardize these values and eliminate any duplication of effort by providing PRGs to all contractors involved in risk activities. In addition, by managing the assumptions and systems used in PRG derivation, the ER Risk Assessment Program will be able to control the level of quality assurance associated with these risk-based guideline values.

2439 (ES/ER/TM–162/R1) **Preliminary remediation goals for ecological endpoints.** Efroymson, R.A.; Suter, G.W. II; Sample, B.E.; Jones, D.S. Oak Ridge National Lab., TN (United States). Jul 1996. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96013229. Source: OSTI; NTIS; INIS; GPO Dep.

Preliminary remediation goals (PRGs) are useful for risk assessment and decision making at Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites. PRGs are upper concentration limits for specific chemicals in specific environmental media that are anticipated to protect human health or the environment. They can be used for multiple remedial investigations at multiple facilities. In addition to media and chemicals of potential concern, the development of PRGs generally requires some knowledge or anticipation of future land use. In Preliminary Remediation Goals for Use at the U.S. Department of Energy Oak Ridge Operations Office (Energy Systems 1995), PRGs intended to protect human health were developed with guidance from Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual, Part B (RAGS) (EPA 1991). However, no guidance was given for PRGs based on ecological risk. The numbers that appear in this volume have, for the most part, been extracted from toxicological benchmarks documents for Oak Ridge National Laboratory (ORNL) and have previously been developed by ORNL. The sources of the quantities, and many of the uncertainties associated with their derivation, are described in this technical memorandum.

2440 (ES/ER/TM–170) **Daytime multispectral scanner aerial surveys of the Oak Ridge Reservation, 1992–1994: Overview of data processing and analysis by the Environmental Restoration Remote Sensing Program, Fiscal year 1995.** Smyre, J.L.; Hodgson, M.E.; Moll, B.W.; King, A.L.; Cheng, Yang. Oak Ridge National Lab., TN (United States). Nov 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006095. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration (ER) Remote Sensing and Special Surveys Program was in 1992 to apply the benefits of remote sensing technologies to Environmental Restoration Management (ERWM) programs at all of the five United States Department of Energy facilities operated and managed by Martin Marietta Energy Systems, Inc. (now Lockheed Martin Energy Systems)-the three Oak Ridge Reservation (ORR) facilities, the Paducah Gaseous Diffusion Plant (PGDP), the Portsmouth Gaseous Diffusion Plant (PORTS)-and adjacent off-site areas. The Remote Sensing Program includes the management of routine and special surveys at these sites, application of state-of-the-art remote sensing and geophysical technologies, and data transformation, integration, and analyses required to make the information valuable to ER. Remotely-sensed data collected of the ORR include natural color and color infrared (IR) aerial photography, 12-band multispectral scanner imagery, predawn thermal IR sensor imagery, magnetic and electromagnetic geophysical surveys, and gamma radiological data.

2441 (ES/ER/TM–173) **Gamma radiological surveys of the Oak Ridge Reservation, Paducah Gaseous Diffusion Plant, and Portsmouth Gaseous Diffusion Plant, 1990-1993, and overview of data processing and analysis by the Environmental Restoration Remote Sensing Program, Fiscal Year 1995.** Smyre, J.L.; Moll, B.W.; King, A.L. Oak Ridge National Lab., TN (United States). Jun 1996. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96012841. Source: OSTI; NTIS; INIS; GPO Dep.

Three gamma radiological surveys have been conducted under auspices of the ER Remote Sensing Program: (1) Oak Ridge Reservation (ORR) (1992), (2) Clinch River (1992), and (3) Portsmouth Gaseous Diffusion Plant (PORTS) (1993). In addition, the Remote Sensing Program has acquired the results of earlier surveys at Paducah Gaseous Diffusion Plant (PGDP) (1990) and PORTS (1990). These radiological surveys provide data for characterization and long-term monitoring of U.S. Department of Energy (DOE) contamination areas since many of the radioactive materials processed or handled on the ORR, PGDP, and

PORTS are direct gamma radiation emitters or have gamma emitting daughter radionuclides. High resolution airborne gamma radiation surveys require a helicopter outfitted with one or two detector pods, a computer-based data acquisition system, and an accurate navigational positioning system for relating collected data to ground location. Sensors measure the ground-level gamma energy spectrum in the 38 to 3,026 KeV range. Analysis can provide gamma emission strength in counts per second for either gross or total man-made gamma emissions. Gross count gamma radiation includes natural background radiation from terrestrial sources (radionuclides present in small amounts in the earth's soil and bedrock), from radon gas, and from cosmic rays from outer space as well as radiation from man-made radionuclides. Man-made count gamma data include only the portion of the gross count that can be directly attributed to gamma rays from man-made radionuclides. Interpretation of the gamma energy spectra can make possible the determination of which specific radioisotopes contribute to the observed man-made gamma radiation, either as direct or as indirect (i.e., daughter) gamma energy from specific radionuclides (e.g., cesium-137, cobalt-60, uranium-238).

2442 (GA–C22131(1-96)) **E-SMART system for in-situ detection of environmental contaminants. Quarterly progress report.** General Atomics, San Diego, CA (United States). Jan 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96006532. Source: OSTI; NTIS; GPO Dep.

Environmental Systems Management, Analysis and Reporting neTwork (E-SMART) is a comprehensive, fully-integrated approach to in-situ, real-time detection and monitoring of environmental contaminants. E-SMART will provide new class of smart, highly sensitive, chemically-specific, in-situ, multichannel microsensors utilizing integrated optical interferometry technology, large, commercially viable set of E-SMART-compatible sensors, samplers, and network management components, and user-friendly graphical user interface for data evaluation and visualization.

2443 (INEL–94/00066) **Treatability studies and large-scale treatment of aqueous mixed waste containing heavy metals.** Haefner, D.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9508198–1: Mixed waste symposium, Baltimore, MD (United States), 7-11 Aug 1995). Order Number DE96003512. Source: OSTI; NTIS; INIS; GPO Dep.

Wastes have accumulated at the Idaho National Engineering Laboratory through routine laboratory practices, experimental engineering operations, and decommissioning and decontamination of nuclear reactor facilities. A storage tank at the Test Area North held approximately 129,000 L of acidic wastewater and contained prohibited levels of lead and mercury. Radioactive constituents were also present; the most predominant being radiocesium Cs-137 and radiocobalt Co-60. Bench-scale studio were undertaken to evaluate ion exchange as a means of removing the contaminants. A set of breakthrough curves was obtained and identified capacity constraints, selectivities, and operating requirements of candidate resins. Treatment studies indicated that Purolite S-920 resin could effectively remove mercury, while Rohm and Haas' Amberlite 200-CH was used for lead and radionuclide removal. Based on these laboratory tests a full-scale facility, using multiple ion exchange columns, was designed and operated in the spring of 1994. The liquid effluents were discharged to an onsite evaporation pond and met RCRA disposal limits for hazardous metals and self-imposed radionuclide limits. All secondary wastes and residues were sampled and subjected to the to)dc characteristic leaching procedure. The resulting leachate concentrations were below RCRA discharge limits and, therefore, these will be disposed of at the onsite low-level disposal facility. After concluding the tank wastewater operations, enough reserve resin capacity was available to treat three additional mixed wastes residing onsite. These totaled about 1,900 L (500 gal) and contained prohibited levels of chromium, cadmium, and barium. Laboratory studies demonstrated that these heavy metals could also be removed by the existing resins. Treatment was performed at the full-scale facility with the effluents discharged to the evaporation pond.

2444 (INEL–94/0080) **Virtual environmental applications for buried waste characterization technology evaluation report.** National Renewable Energy Lab., Golden, CO (United States). May 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001179. Source: OSTI; NTIS; INIS; GPO Dep.

The project, Virtual Environment Applications for Buried Waste Characterization, was initiated in the Buried Waste Integrated Demonstration Program in fiscal year 1994. This project is a research and development effort that supports the remediation of buried waste by identifying and examining the issues, needs, and feasibility of creating virtual environments using available characterization and other data. This document describes the progress and results from this project during the past year.

2445 (INEL–94/0098) **INEL metal recycle radioactive scrap metal survey report.** Funk, D.M. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1994. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002942. Source: OSTI; NTIS; INIS; GPO Dep.

DOE requested that inventory and characterization of radioactive scrap metal (RSM) be conducted across the DOE complex. Past studies have estimated the metal available from unsubstantiated sources. In meetings held in FY-1993, with seven DOE sites represented and several DOE-HQ personnel present, INEL personnel discovered that these numbers were not reliable and that large stockpiles did not exist. INEL proposed doing in-field measurements to ascertain the amount of RSM actually available. This information was necessary to determine the economic viability of recycling and to identify feed stock that could be used to produce containers for radioactive waste. This inventory measured the amount of RSM available at the selected DOE sites. Information gathered included radionuclide content and chemical form, general radiation field, alloy type, and mass of metal.

2446 (INEL–94/00148) **Method of estimating maximum VOC concentration in void volume of vented waste drums using limited sampling data: Application in transuranic waste drums.** Liekhus, K.J.; Connolly, M.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950877–23: 3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium, Baltimore, MD

(United States), 7-11 Aug 1995). Order Number DE96003506. Source: OSTI; NTIS; INIS; GPO Dep.

A test program has been conducted at the Idaho National Engineering Laboratory to demonstrate that the concentration of volatile organic compounds (VOCs) within the innermost layer of confinement in a vented waste drum can be estimated using a model incorporating diffusion and permeation transport principles as well as limited waste drum sampling data. The model consists of a series of material balance equations describing steady-state VOC transport from each distinct void volume in the drum. The primary model input is the measured drum headspace VOC concentration. Model parameters are determined or estimated based on available process knowledge. The model effectiveness in estimating VOC concentration in the headspace of the innermost layer of confinement was examined for vented waste drums containing different waste types and configurations. This paper summarizes the experimental measurements and model predictions in vented transuranic waste drums containing solidified sludges and solid waste.

2447 (INEL–94/0162) **Remote measurement of corrosion using ultrasonic techniques.** Garcia, K.M.; Porter, A.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Feb 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001194. Source: OSTI; NTIS; INIS; GPO Dep.

Supercritical water oxidation (SCWO) technology has the potential of meeting the US Department of Energy's treatment requirements for mixed radioactive waste. A major technical constraint of the SCWO process is corrosion. Safe operation of a pilot plant requires monitoring of the corrosion rate of the materials of construction. A method is needed for measurement of the corrosion rate taking place during operation. One approach is to directly measure the change in wall thickness or growth of oxide layer at critical points in the SCWO process. In FY-93, a brief survey of the industry was performed to evaluate nondestructive evaluation (NDE) methods for remote corrosion monitoring in supercritical vessels. As a result of this survey, it was determined that ultrasonic testing (UT) methods would be the most cost-effective and suitable method of achieving this. Therefore, the objective for FY-94 was to prove the feasibility of using UT to monitor corrosion of supercritical vessels remotely during operation without removal of the insulation.

2448 (INEL–94/0251) **A review of the current state-of-the-art methodology for handling bias and uncertainty in performing criticality safety evaluations. Final report.** Disney, R.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002933. Source: OSTI; NTIS; INIS; GPO Dep.

The methodology for handling bias and uncertainty when calculational methods are used in criticality safety evaluations (CSE's) is a rapidly evolving technology. The changes in the methodology are driven by a number of factors. One factor responsible for changes in the methodology for handling bias and uncertainty in CSE's within the overview of the US Department of Energy (DOE) is a shift in the overview function from a "site" perception to a more uniform or "national" perception. Other causes for change or improvement in the methodology for handling calculational bias and uncertainty are; (1) an increased demand for benchmark criticals data to expand the area (range) of applicability of existing data, (2) a demand for new data to supplement existing benchmark criticals data, (3) the increased reliance on (or need for) computational benchmarks which supplement (or replace) experimental measurements in critical assemblies, and (4) an increased demand for benchmark data applicable to the expanded range of conditions and configurations encountered in DOE site restoration and remediation.

2449 (INEL–95/0015-Rev.1) **Waste management facilities cost information for transuranic waste.** Shropshire, D.; Sherick, M.; Biagi, C. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jun 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001371. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains preconceptual designs and planning level life-cycle cost estimates for managing transuranic waste. The report's information on treatment and storage modules can be integrated to develop total life-cycle costs for various waste management options. A procedure to guide the U.S. Department of Energy and its contractor personnel in the use of cost estimation data is also summarized in this report.

2450 (INEL–95/0036) **Results of performance tests on chemical and radiation measurement systems for use at a dig-face.** Gehrke, R.J.; Lawrence, R.S.; Pawelko, R.J. Idaho National Engineering Lab., Idaho Falls, ID (United States). Apr 1995. 120p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001183. Source: OSTI; NTIS; INIS; GPO Dep.

Chemical and radiation measurement systems are being developed for use at a dig-face to provide sensing capability during the excavation of previously buried waste. it is believed that on-line dig-face characterization will reduce environmental, health, and safety risks during the cleanup of buried waste sites as well as improve the efficiency of the cleanup process. This report describes progress in the development of three measurement systems: (a) a γ/neutron monitor that scans the dig-face for high levels of radiation prior to excavation, (b) a Ge spectrometer that identifies specific radionuclides located with the γ/neutron monitor, and (c) a prompt γ neutron activation analysis (PGNAA) system that measures the presence of chlorine and chlorinated compounds often associated with hazardous waste. The Ge spectrometer and PGNAA system also will provide off-line but on-site capability of radionuclide and elemental identification of excavated waste prior to handling, treatment, transportation, or disposal.

2451 (INEL–95/00040) **Multiphased use of an X-MET 880 XRF to survey lead in soil at the Idaho National Engineering Laboratory.** Gianotto, D.F.; Anderson, I.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950209–12: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE96001628. Source: OSTI; NTIS; INIS; GPO Dep.

An X-ray fluorescence spectrometer was used in a multiphased approach to analyze soil samples for lead contamination. The objectives of this investigation were to characterize the spatial distribution of lead contamination, identify two areas of surficial soil with elevated lead concentrations (hot-spots), and quantify subsurface soil contamination at the hot-spots to evaluate the vertical migration of lead. Phase I consisted of using non-site-specific standards to calibrate the XRF instrument to qualitatively and semi-quantitatively assess lead contamination (Type I XRF analysis). Phase III involved selecting soil samples for off-site SW-846 analysis and using the results to develop a calibration model based on site-specific calibration standards (SSCS). The XRF was used in Phase III to obtained quantitative results (Type II XRF analysis).

2452 (INEL–95/0051) **The status of soil mapping for the Idaho National Engineering Laboratory.** Olson, G.L. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Lee, R.D.; Jeppesen, D.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Jan 1995. 180p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002354. Source: OSTI; NTIS; INIS; GPO Dep.

This report discusses the production of a revised version of the general soil map of the 2304-km^2 (890-mi^2) Idaho National Engineering Laboratory (INEL) site in southeastern Idaho and the production of a geographic information system (GIS) soil map and supporting database. The revised general soil map replaces an INEL soil map produced in 1978 and incorporates the most current information on INEL soils. The general soil map delineates large soil associations based on National Resources Conservation Services [formerly the Soil Conservation Service (SCS)] principles of soil mapping. The GIS map incorporates detailed information that could not be presented on the general soil map and is linked to a database that contains the soil map unit descriptions, surficial geology codes, and other pertinent information.

2453 (INEL–95/0076) **Test plan guidance for transuranic-contaminated arid landfill remedial technology development.** Evans, J.; Shaw, P. EG and G Idaho, Inc., Idaho Falls, ID (United States). May 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001348. Source: OSTI; NTIS; INIS; GPO Dep.

This document provides guidance for preparing plans to test or demonstrate buried waste assessment or remediation technologies supported by the U.S. Department of Energy's Landfill Stabilization Focus Area, Transuranic-Contaminated Arid Landfill Product Line. This document also provides guidance for development of data quality objectives, along with the necessary data to meet the project objectives. The purpose is to ensure that useful data of known quality are collected to support conclusions associated with the designated demonstration or test. A properly prepared test plan will integrate specific and appropriate objectives with needed measurements to ensure data will reflect the Department of Energy Office of Technology Development's mission, be consistent with Landfill Stabilization Focus Area test goals, and be useful for the Department of Energy Environmental Restoration and Waste Management programs and other potential partners (e.g., commercial concerns). The test plan becomes the planning and working document for the demonstration or test to be conducted ensuring procedures are followed that will allow data of sufficient quality to be collected for comparison and evaluation.

2454 (INEL–95/0089) **Buried Waste Integrated Demonstration FY-95 Deployment Plan.** Stacey, D.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001195. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste Integrated Demonstration (BWID) is a program funded by the U.S. Department of Energy Office of Technology Development. BWID supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that together form a comprehensive remediation system for the effective and efficient remediation of buried waste. The FY-95 effort will fund 24 technologies in five areas of buried waste site remediation: site characterization, waste characterization, retrieval, treatment, and containment/stabilization. Ten of these technologies will take part in the integrated field demonstration that will take place at the Idaho National Engineering Laboratory (INEL) facilities in the summer of 1995. This document is the basic operational planning document for deployment of all BWID projects funded in FY-95. Discussed in this document are the BWID preparations for the INEL integrated field demonstration, INEL research and development (R&D) demonstrations, non-INEL R&D demonstrations, and office research and technical review meetings. Each project will have a test plan detailing the specific procedures, objectives, and tasks of the test. Therefore, information that is specific to testing each technology is intentionally limited in this document.

2455 (INEL–95/0171) **Test plan for a live drum survey using the gamma-neutron sensor.** Gehrke, R.J.; Roybal, L.G.; Thompson, D.N. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1995. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003550. Source: OSTI; NTIS; INIS; GPO Dep.

This plan describes performance tests to be made with the Gamma/Neutron Sensor (GNS), which that was designed and built for infield assay at an excavation site. The performance tests will be performed in Building WMF-628 in the Transuranic Storage Area of the Radioactive Waste Management Complex at the Idaho National Engineering Laboratory on stored 55-gal drums of transuranic waste from the Rocky Flats Plant. The GNS is mounted on a wooden pallet that will allow horizontal and vertical scans of the stacked drums. Scanning speed and GNS sensitivity for gamma and neutron radiation fields will be estimated. Effects of temperature, electronic, and acoustic noise will be evaluated. Two- and three-dimensional plots of radiation field as a function of position will be developed from the data.

2456 (INEL–95/0233) **Field test plan: Buried waste technologies, Fiscal Year 1995.** Heard, R.E. (Lockheed Idaho Technologies Co., Idaho Falls, ID (United States)); Hyde, R.A.; Engleman, V.S.; Evans, J.D.; Jackson, T.W. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001561. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy, Office of Technology Development, supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that, when integrated with commercially available baseline technologies, form a comprehensive remediation system for the effective and efficient remediation of buried waste. The Fiscal Year 1995 effort is to deploy and test multiple technologies from four functional areas of buried waste remediation: site characterization, waste characterization, retrieval, and treatment. This document is the basic operational planning document for the deployment and testing of the technologies that support the field testing in Fiscal Year 1995. Discussed in this document are the scope of the tests; purpose and objective of the tests; organization and responsibilities; contingency plans; sequence of activities; sampling and data collection; document control; analytical methods; data reduction, validation, and verification; quality assurance; equipment and instruments; facilities and utilities; health and safety; residuals management; and regulatory management.

2457 (INEL–95/00235) **The results of an ecological risk assessment screening at the Idaho National Engineering's waste area group 2.** VanHorn, R. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950868–30: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96004006. Source: OSTI; NTIS; INIS; GPO; GPO Dep.

The Idaho National Engineering Laboratory (INEL) is a Department of Energy (DOE) facility located in southeastern Idaho and occupies approximately 890 square miles on the northwestern portion of the eastern Snake River Plain. INEL has been devoted to nuclear energy research and related activities since its establishment in 1949. In the process of fulfilling this mission, wastes were generated, including radioactive and hazardous materials. Most materials were effectively stored or disposed of, however, some release of contaminants to the environment has occurred. For this reason, the INEL was listed by the US environmental Protection Agency on the National Priorities List (NPL), in November, 1989. This report describes the results of an ecological risk assessment performed for the Waste Area Groups 2 (WAG 2) at the INEL. It also summarizes the performance of screening level ecological risk assessments (SLERA).

2458 (INEL–95/00263) **Neural network utility in nondestructive transuranic waste assay, initial investigations.** Becker, G. EG and G Idaho, Inc., Idaho Falls, ID (United States); Pacific Northwest Lab., Richland, WA (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830 ; AC07-94ID13223. (CONF-9503132–3: 74. annual Gas Processors Association (GPA) meeting, San Antonio, TX (United States), 13-15 Mar 1995). Order Number DE96002525. Source: OSTI; NTIS; INIS; GPO Dep.

The determination of transuranic (TRU) and associated radioactive material quantities entrained in waste forms is a necessary component of waste characterization. Measurement performance requirements are specified in the National TRU Waste Characterization Program quality assurance plan for which compliance must be demonstrated prior to the transportation and disposition of wastes. With respect to this criterion, the existing TRU nondestructive waste assay (NDA) capability is inadequate for a significant fraction of the US Department of Energy (DOE) complex waste inventory. This is a result of the general application of safeguard-type measurement and calibration schemes to waste form configurations. Incompatibilities between such measurement methods and actual waste form configurations complicate regulation. compliance demonstration processes and illustrate the need for an alternate measurement interpretation paradigm. Hence, it appears necessary to supplement or perhaps restructure the perceived solution and approach to the waste NDA problem. The first step is to understand the magnitude of the waste matrix/source attribute space associated with those waste form configurations in inventory and how this creates complexities and unknowns with respect to existing NDA methods. Once defined and/or bounded, a conceptual method must be developed that specifies the necessary tools and the framework in which the tools are used. A promising framework is a hybridized neural network structure. Discussed are some typical complications associated with conventional waste NDA techniques and how improvements can be obtained through the application of neural networks.

2459 (INEL–95/0269) **Environment, safety, health, and quality plan for the TRU- Contaminated Arid Soils Project of the Landfill Stabilization Focus Area Program.** Watson, L.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96003483. Source: OSTI; NTIS; INIS; GPO Dep.

The Landfill Stabilization Focus Area (LSFA) is a program funded by the US Department of Energy Office of Technology Development. LSFA supports the applied research, development, demonstration, testing, and evaluation of a suite of advanced technologies that together form a comprehensive remediation system for the effective and efficient remediation of buried waste. The TRU-Contaminated Arid Soils project is being conducted under the auspices of the LSFA Program. This document describes the Environment, Safety, Health, and Quality requirements for conducting LSFA/Arid Soils activities at the Idaho National Engineering Laboratory. Topics discussed in this report, as they apply to LSFA/Arid Soils operations, include Federal, State of Idaho, and Environmental Protection Agency regulations, Health and Safety Plans, Quality Program, Data Quality Objectives, and training and job hazard analysis. Finally, a discussion is given on CERCLA criteria and system and performance audits as they apply to the LSFA Program.

2460 (INEL–95/00269) **Vitrification of surrogate mixed wastes in a graphite electrode arc melter.** Soelberg, N.R. (and others); Chambers, A.G.; Ball, L. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-950542–5: 14. international symposium on thermal treatment technologies: incineration conference, Seattle, WA (United States), 8-12 May 1995). Order Number DE96001927. Source: OSTI; NTIS; INIS; GPO Dep.

Demonstration tests for vitrifying mixed wastes and contaminated soils have been conducted using a small (800 kVA), industrial-scale, three-phase AC, graphite electrode furnace located at the Albany Research Center of the United States Bureau of Mines (USBM). The feed mixtures were non-radioactive surrogates of various types of mixed (radioactive and hazardous), transuranic-contaminated wastes stored and buried at the Idaho National Engineering Laboratory (INEL). The feed mixtures were processed with added soil from the INEL. Objectives being evaluated include (1) equipment capability to achieve desired process conditions and vitrification products for different feed compositions, (2) slag and metals tapping capability, (3) partitioning of transuranic elements and toxic metals among the furnace products, (4) slag, fume, and metal products characteristics, and (5) performance of the feed, furnace and air pollution control systems. The tests were successfully completed in mid-April 1995. A very comprehensive process monitoring, sampling and analysis program was included in the test program. Sample analysis, data reduction, and results evaluation are currently underway. Initial results indicate that the furnace readily processed around 20,000 lb of widely ranging feed mixtures at feedrates of up to 1,100 lb/hr. Continuous feeding and slag tapping was achieved. Molten metal was also tapped twice during the test program. Offgas emissions were efficiently controlled as expected by a modified air pollution control system.

2461 (INEL–95/0281) **Idaho National Engineering Laboratory code assessment of the Rocky Flats transuranic waste.** Lockheed Idaho Technologies Co., Idaho Falls, ID (United States); Wastren, Inc., Idaho Falls, ID (United States). Jul 1995. 475p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001548. Source: OSTI; NTIS; INIS; GPO Dep.

This report is an assessment of the content codes associated with transuranic waste shipped from the Rocky Flats Plant in Golden, Colorado, to INEL. The primary objective of this document is to characterize and describe the transuranic wastes shipped to INEL from Rocky Flats by item description code (IDC). This information will aid INEL in determining if the waste meets the waste acceptance criteria (WAC) of the Waste Isolation Pilot Plant (WIPP). The waste covered by this content code assessment was shipped from Rocky Flats between 1985 and 1989. These years coincide with the dates for information available in the Rocky Flats Solid Waste Information Management System (SWIMS). The majority of waste shipped during this time was certified to the existing WIPP WAC. This waste is referred to as precertified waste. Reassessment of these precertified waste containers is necessary because of changes in the WIPP WAC. To accomplish this assessment, the analytical and process knowledge available on the various IDCs used at Rocky Flats were evaluated. Rocky Flats sources for this information include employee interviews, SWIMS, Transuranic Waste Certification Program, Transuranic Waste Inspection Procedure, Backlog Waste Baseline Books, WIPP Experimental Waste Characterization Program (headspace analysis), and other related documents, procedures, and programs. Summaries are provided of: (a) certification information, (b) waste description, (c) generation source, (d) recovery method, (e) waste packaging and handling information, (f) container preparation information, (g) assay information, (h) inspection information, (i) analytical data, and (j) RCRA characterization.

2462 (INEL–95/0291) **Waste streams that preferentially corrode 55-gallon steel storage drums.** Zirker, L.R.; Beitel, G.A.; Reece, C.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001558. Source: OSTI; NTIS; INIS; GPO Dep.

When 55-gal steel drum waste containers fail in service, i.e., leak, corrode or breach, the standard fix has been to overpack the drum. When a drum fails and is overpacked into an 83-gal overpack drum, there are several negative consequences. Identifying waste streams that preferentially corrode steel drums is essential to the pollution prevention philosophy that "an ounce of prevention is worth a pound of cure." It is essential that facilities perform pollution prevention measures at the front end of processes to reduce pollution on the back end. If these waste streams can be identified before they are packaged, the initial drum packaging system could be fortified or increased to eliminate future drum failures, breaches, clean-ups, and the plethora of other consequences. Therefore, a survey was conducted throughout the US Department of Energy complex for information concerning waste streams that have demonstrated preferential corrosion of 55-gal steel drums. From 21 site contacts, 21 waste streams were so identified. The major components of these waste streams include acids, salts, and solvent liquids, sludges, and still bottoms. The solvent-based waste streams typically had the shortest time to failure, 0.5 to 2 years. This report provides the results of this survey and research.

2463 (INEL–95/0302) **Results of the gamma-neutron mapper performance test on 55-gallon drums at the RWMC.** Gehrke, R.J.; Lawrence, R.S.; Roybal, L.G.; Svoboda, J.M.; Harker, D.J.; Thompson, D.N.; Carpenter, M.V.; Josten, N.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001337. Source: OSTI; NTIS; INIS; GPO Dep.

The primary purpose of the gamma-neutron mapper (G@) is to provide accurate and quantitative spatial information of the gamma-ray and neutron radiation fields as a function of position about the excavation of a radioactive waste site. The GNM is designed to operate remotely and can be delivered to any point on an excavation by the robotic gantry crane developed by the dig-face project at the Idaho National Engineering Laboratory (INEL). It can also be easily adapted to other delivery systems. The GNM can be deployed over a waste site at a predetermined scan rate and has sufficient accuracy to identify and quantify radioactive contaminants of importance. The results reported herein are from a performance test conducted at the Transuranic Storage Area, Building 628, of the Radioactive Waste Management Complex located at the INEL. This building is an active interim-storage area for 55-gal drums of transuranic waste from the Department of Energy's Rocky Flats Plant. The performance test consisted of scanning a stack of drums five high by five wide. Prior to the test, radiation fields were measured by a health physicist at the center of the drums and ranged from 0.5 mR/h to 35 mR/h. Scans of the drums using the GNM were taken at standoff distances from the vertical drum stack of 15 cm, 30 cm, 45 cm, and 90 cm. Data were acquired at scan speeds of 7.5 cm/s and 15 cm/s. The results of these scans and a comparison of these results with the manifests of these drums are compared and discussed.

2464 (INEL–95/00311) **Performance test of a gamma/neutron mapper on stored TRU waste drums at the RWMC.** Gehrke, R.J. (and others); Josten, N.E.; Lawrence, R.S. EG and G Idaho, Inc., Idaho Falls, ID (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951091–4: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96002513. Source: OSTI; NTIS; INIS; GPO Dep.

The results from a performance test of a γ- and neutron-radiation measurement instrument used to provide two-dimensional radiation field maps are reported. The performance test was conducted at the Transuranic Storage Area of the Radioactive Waste Management Complex (RWMC) where interim storage is provided for 55-gal. drums of TRU waste from the Department of Energy's Rocky Flats Plant. The performance test consisted of scanning drums stacked five high and five wide to identify high radiation areas and possible discrepancies with the waste manifest. Scans were taken at standoff distances of 15 cm, 30 cm, 45 cm and 90 cm. Data were acquired at scan speeds of 7.5 cm/s and 15 cm/s. The results of these scans are presented as one, two and three dimensional contour plots of the radiation fields. A comparison of these results with manifests of these drums are compared and discussed. While the T-radiation fields as measured by the Health Physicist and by the radiation maps are in general in agreement, the TRU content as given in the manifest did not often correlate with the neutron map.

2465 (INEL–95/00313) **Pulsed eddy current thickness measurements of transuranic waste containers.** O'Brien, T.K.; Kunerth, D.C. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951091–12: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96007704. Source: OSTI; NTIS; INIS; GPO Dep.

Thickness measurements on fifty five gallon waste drums for drum integrity purposes have been traditionally performed at the INEL using ultrasonic testing methods. Ultrasonic methods provide high resolution repeatable thickness measurements in a timely manner, however, the major drawback of using ultrasonic techniques is coupling to the drum. Areas with severe exterior corrosion, debonded paper labels or any other obstacle in the acoustic path will have to be omitted from the ultrasonic scan. We have developed a pulsed eddy current scanning system that can take thickness measurements on fifty five gallon carbon steel drums with wall thicknesses up to 65 mils. This type of measurement is not susceptible to the problems mentioned above. Eddy current measurements in the past have excluded ferromagnetic materials such as carbon steel because of the difficulty in penetrating the material and in compensating for changes in permeability from material to material. New developments in data acquisition electronics as well as advances in personal computers have made a pulsed eddy current system practical and inexpensive. Certain aspects of the pulsed eddy current technique as well as the operation of such a system and features such as real time pass/fail thresholds for overpacking identification and full scan data archiving for future evaluation will be discussed.

2466 (INEL–95/0321) **Buried Waste Integrated Demonstration fiscal Year 1994 close-out report.** Owen, K.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jul 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001335. Source: OSTI; NTIS; INIS; GPO Dep.

The Buried Waste integrated Demonstration (BWID) supports the applied research, development, demonstration, and evaluation of a multitude of advanced technologies. These technologies are being integrated to form a comprehensive remediation system for the effective and efficient remediation of buried waste. These efforts are identified and coordinated in support of the US Department of Energy Environmental Restoration and Waste Management needs and objectives. BWID works with universities and private industry to develop these technologies, which are being transferred to the private sector for use nationally and internationally. A public participation policy has been established to provide stakeholders with timely and accurate information and meaningful opportunities for involvement in the technology development and demonstration process. To accomplish this mission of identifying technological solutions for remediation deficiencies, the Department of Energy Office of Technology Development initiated BMD at the Idaho National Engineering Laboratory. This report summarizes the activities of the BWID program during Fiscal Year 1994. In Fiscal Year 1995, these activities are transitioning into the Landfill Stabilization Focus Area.

2467 (INEL–95/00356) **Innovative technologies for the remediation of transuranic- contaminated landfills.** Kostelnik, K.M. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-9507187–1: International Atomic Energy Agency Research Meeting, Idaho Falls, ID (United States), 24-28 Jul 1995). Order Number DE96001851. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy (DOE) has initiated a comprehensive research,development, demonstration, testing and evaluation program to provide innovative technology systems to achieve its environmental management responsibilities. The Office of Technology Development (OTD) is responsible for this research in support of the Offices of Environmental Restoration and Waste Management efforts. In fiscal year (FY) 1992 the OTD established the Buried Waste Integrated Demonstration (BWID). The BWID mission was to support the development of emerging technologies for their application to the remediation of DOE buried waste site. During FY95, the BWID program was transitioned into a larger program which will focus its attention to DOE Landfills and Contaminated Soils. There search and activities formerly referred to as the BWID will now be associated with the Transuranic-contaminated Arid Landfill Stabilization Program.(TALS). The TALS Program supports these buried waste remediation efforts by seeking out the best talent to solve the technology challenges as identified in baseline remediation strategies. Experts from throughout the DOE complex, universities, private sector, and the international community are being included in this program to solve these challenges and ensure implementation and commercialization of innovative technologies.

2468 (INEL–95/00370) **Feasibility and applications of cone beam x-ray imaging for containerized wastes.** Roney, T. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Galbraith, S.; White, T.; Clack, R.; O'Reilly, M.; Defrise, M.; Noo, F. Idaho National Engineering Lab., Idaho Falls, ID (United States). [1995]. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951091–7: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96002776. Source: OSTI; NTIS; INIS; GPO Dep.

Large area scintillation screens coupled to video and scientific-grade CCD cameras allow high speed digital data acquisition for both single 2-D x-ray projections and tomographic data sets comprised of multiple 2-D projections. While the data cquisition may proceed more rapidly than data acquisition using a linear detector array, there are geometric distortions associated with the projection cone angle long processing times for 3-D tomographic data. This paper reviews issues associated with processing and interpretation of the data and approaches to resolving some of the problems for containerized waste inspection. Results obtained with the Idaho National Engineering Laboratory's Digital Radiography and Computed Tomography scanner are presented.

2469 (INEL–95/0411) **Innovative Technology Development Program. Final summary report.** Beller, J. EG and G Idaho, Inc., Idaho Falls, ID (United States). Aug 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002363. Source: OSTI; NTIS; INIS; GPO Dep.

Through the Office of Technology Development (OTD), the U.S. Department of Energy (DOE) has initiated a national applied research, development, demonstration, testing, and evaluation program, whose goal has been to resolve the major technical issues and rapidly advance technologies for environmental restoration and waste management. The Innovative Technology Development (ITD) Program was established as a part of the DOE, Research, Development, Demonstration, Testing, and Evaluation (RDDT&E) Program. The plan is part of the DOE's program to restore sites impacted by weapons production and to upgrade future waste management operations. On July 10, 1990, DOE issued a Program Research and Development Announcement (PRDA) through the Idaho Operations Office to solicit private sector help in developing innovative technologies to support DOE's clean-up goals. This report presents summaries of each of the seven projects, which developed and tested the technologies proposed by the seven private contractors selected through the PRDA process.

2470 (INEL–95/0445) **CFD model development and data comparison for thermal-hydraulic analysis of HTO pilot scale reactor.** Kochan, R.J.; Oh, C.H. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 31p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002194. Source: OSTI; NTIS; INIS; GPO Dep.

The DOE Hydrothermal Oxidation (HTO) program is validating computational methods for use in scaling up small HTO systems to production scale. As part of that effort, the computational fluid dynamics code FLUENT is being used to calculate the integrated fluid dynamics and chemical reactions in an HTO vessel reactor designed by MODAR, Inc. Previous validation of the code used data from a benchscale reactor. This reports presents the validation of the code using pilotscale (10 times greater throughput than benchscale) data. The model for the pilotscale reactor has been improved based upon the benchscale data by including better fluid thermal properties, a better solution algorithm, addition of external heat transfer, investigation of the effects of turbulent flow, and, although not built into the computer model, a technique for using the calculated adiabatic oxidation temperatures for selecting initial conditions. Thermal results from this model show very good agreement with the limited test data from MODAR Run 920. In addition to the reactor temperatures, flowfield details, including chemical reaction distribution, and simulated salt particle transport were obtained. This model will be very beneficial in designing and evaluating larger commercial scale units. The results of these calculations indicate that for model validation, more accurate boundary conditions need to be measured in future test runs.

2471 (INEL–95/0454) **Version 1.00 programmer's tools used in constructing the INEL RML/analytical radiochemistry sample tracking database and its user interface.** Femec, D.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 190p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002188. Source: OSTI; NTIS; INIS; GPO Dep.

This report describes two code-generating tools used to speed design and implementation of relational databases and user interfaces: CREATE-SCHEMA and BUILD-SCREEN. CREATE-SCHEMA produces the SQL commands that actually create and define the database. BUILD-SCREEN takes templates for data entry screens and generates the screen management system routine calls to display the desired screen. Both tools also generate the related FORTRAN declaration statements and precompiled SQL calls. Included with this report is the source code for a number of FORTRAN routines and functions used by the user interface. This code is broadly applicable to a number of different databases.

2472 (INEL–95/00462) **Mercury retorting of calcine waste, contaminated soils and railroad ballast at the Idaho National Egineering Laboratory.** Cotten, G.B. (Parsons Engineering Science, Inc., Houston, TX (United States)); Rothermel, J.S.; Sherwood, J.; Heath, S.A.; Lo, T.Y.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). 28 Feb 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-960212–30: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96007281. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory (INEL) has been involved in nuclear reactor research and development for over 40 years. One of the earliest major projects involved the development of a nuclear powered aircraft engine, a long-term venture which used mercury as a shielding medium. Over the course of several years, a significant amount of mercury was spilled along the railroad tracks where the test engines were transported and stored. In addition, experiments with volume reduction of waste through a calcine process employing mercury as a catalyst resulted in mercury contaminated calcine waste. Both the calcine and Test Area North wastes have been identified in Department of Energy Action Memorandums to be retorted, thereby separating the mercury from the various contaminated media. Lockheed Idaho Technologies Company awarded the Mercury Retort contract to ETAS Corporation and assigned Parsons Engineering Science, Inc. to manage the treatment field activities. The mercury retort process entails a mobile unit which consists of four trailer-mounted subsystems requiring electricity, propane, and a water supply. This mobile system demonstrates an effective strategy for retorting waste and generating minimal secondary waste.

2473 (INEL–95/0475) **Uncertainty analysis of the SWEPP drum assay system for graphite content code 300.** Harker, Y.D.; Blackwood, L.G.; Meachum, T.R. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 117p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002355. Source: OSTI; NTIS; INIS; GPO Dep.

The Idaho National Engineering Laboratory is being used as a temporary storage facility for transuranic waste generated by the U.S. Nuclear Weapons program at the Rocky Flats Plant (RFP) in Golden, Colorado. Currently, there is a large effort in progress to prepare to ship this waste to the Waste Isolation Pilot Plant (WIPP) in Carlsbad, New Mexico. In order to meet the TRU Waste Characterization Quality Assurance Program Plan nondestructive assay compliance requirements and quality assurance objectives, it is necessary to determine the total uncertainty of the radioassay results produced by the Stored Waste Examination Pilot Plant (SWEPP) Passive Active Neutron (PAN) radioassay system. This paper discusses a modified statistical sampling and verification approach used to determine the total uncertainty of a SWEPP/PAN measurement. In this modified approach the total performance of the SWEPP/PAN nondestructive assay system is simulated using computer models of the assay system and the resultant output is compared with the known input to assess the total uncertainty. The first waste form to be tested using this approach is weapons grade plutonium-contaminated graphite molds contained in 207 liter drums. The validity of the simulation approach is verified by comparing simulated output against results from calibration measurements using known plutonium sources and a graphite waste form calibration drum. For actual graphite waste form conditions, a set of 50 cases covering a statistical sampling of the conditions exhibited in graphite wastes was compiled using a Latin hypercube statistical sampling approach. The distributions from which Latin hypercube sample was drawn was derived from reviews of approximately 100 real-time radiography video tapes of RFP graphite waste drums, results from previous SWEPP/PAN measurements on graphite waste drums, and shipping data from RFP where the graphite waste was generated.

2474 (INEL–95/00503) **Utility of neural networks in nondestructive waste assay measurement methods.** Becker, G.K. (Idaho National Engineering Lab., Idaho Falls, ID (United States)); Roney, T.J.; Watts, C.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951091–5: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96002500. Source: OSTI; NTIS; INIS; GPO Dep.

Concepts devised to utilize nondestructive assay measurement techniques to quantify waste entrained radioactive material mass, transuranic and otherwise, must necessarily contain provisions for complexity. Such complexities are founded in the multi-variate attribute distributions associated with the typical waste form and the inherently limited nature of present-day nondestructive assay (NDA) sensors and detection techniques. For many waste forms, the attribute variables are such that commonly employed NDA techniques do not possess the capability to acquire accurate measures useful in deriving a viable solution using first principle modeling techniques. The existence of limitations in commonly employed NDA instrumentation and techniques logically leads to a search for an alternate view or paradigm for data treatment. The approach addressed in this paper shifts from model-driven algorithmic methods to data-driven empirical methods. Such empirical methods are statistical in nature, and possess desirable characteristics of adaptivity and learning. Examples of modern empirical methods include neural networks, fuzzy logic, genetic algorithms, and combinations thereof. This work provides an investigation into the utility of three neural network architectures for deriving useful information for nondestructive waste assay solutions. To illustrate the inherent capability of these data-driven techniques, a simple waste form classification exercise is performed using radial basis function, counterpropagation, and adaptive resonance theory neural networks. The classifications are derived solely from the self-organizing and adaptation capabilities of the network architectures and associated learning rules. No apriori information or models are assumed during the classification exercises.

2475 (INEL–95/0513) **Bibliography for nuclear criticality accident experience, alarm systems, and emergency management.** Putman, V.L. EG and G Idaho, Inc., Idaho Falls, ID (United States). Sep 1995. 225p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002218. Source: OSTI; NTIS; INIS; GPO Dep.

The characteristics, detection, and emergency management of nuclear criticality accidents outside reactors has been an important component of criticality safety for as long as the need for this specialized safety discipline has been recognized. The general interest and importance of such topics receives special emphasis because of the potentially lethal, albeit highly localized, effects of criticality accidents and because of heightened public and regulatory concerns for any undesirable event in nuclear and radiological fields. This bibliography lists references which are potentially applicable to or interesting for criticality alarm, detection, and warning systems; criticality accident emergency management; and their associated programs. The lists are annotated to assist bibliography users in .dentifying applicable: industry and regulatory guidance and requirements, with historical development information and comments; criticality accident characteristics, consequences, experiences, and responses; hazard-, risk-, or safety-analysis criteria; CAS design and qualification criteria; CAS calibration, maintenance, repair, and testing criteria; experiences of CAS designers and maintainers; criticality accident emergency management (planning, preparedness, response, and recovery) requirements and guidance; criticality accident emergency management experience, plans, and techniques; methods and tools for analysis; and additional bibliographies.

2476 (INEL–96/0014) **Characterization of nuclear decontamination solutions at the Idaho Chemical Processing Plant from 1982-1990.** Zohner, S.K. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1996. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010361. Source: OSTI; NTIS; INIS; GPO Dep.

This report represents possibly the single largest collection of operational decontamination data from a nuclear reprocessing facility at the Idaho National Engineering Laboratory and perhaps anywhere in the world. The uniqueness of this data is due to the Idaho Chemical Processing Plant's (ICPP's) ability to process different types of highly enriched nuclear fuel. The report covers an 8-year period, during which six campaigns were conducted to dissolve nuclear fuel clad in stainless steel, aluminum, graphite, and zirconium. Each fuel type had a separate head-end process with unique dissolution chemistry, but shared the same extraction process equipment. This report presents data about decontamination activities of the ICPP's First Cycle extraction vessels, columns, piping, and aluminum dissolution vessels. Operating data from 1982 through 1990 has been collected, analyzed, and characterized. Chemicals used in the decontamination processes are documented along with quantities used. The chemical solutions are analyzed to compare effectiveness. Radioisotopic analysis is recorded, showing and quantifying what nuclides were removed by the various solutions. The original data is also provided to make it possible for researchers to address questions and test other hypotheses not discussed in this report.

2477 (INEL–96/0068) **A technical review of the SWEPP gamma-ray spectrometer system.** Hartwell, J.K. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1996. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96009904. Source: OSTI; NTIS; INIS; GPO Dep.

The SWEPP Gamma-ray Spectrometer (SGRS) was developed by INEL researchers as a nonintrusive method of determining the isotopic ratios of TRU and U materials in a 208-liter waste drums. The SGRS has been in use at SWEPP since mid-1994. Enough questions have been raised regarding the system reliability and technical capabilities, that, coupled with a desire to procure an additional gamma-ray spectroscopy system in order to increase the drum throughput of SWEPP, have prompted an independent technical review of the SGRS. The author was chosen as the reviewer, and this report documents the results of the review. While the SGRS is accurate in its isotopic ratio results, the system is not calculationally robust. The primary reason for this lack of calculational reliability is the implementation of the attenuation corrections. Suggested changes may improve the system reliability dramatically. The SGRS is a multiple detector spectrometry system. Tests were conducted on various methods for combining the four detector results into a single drum representative value. No clear solution was reached for the cases in which the isotopic ratios are vertically segregated; however, some methods showed promise. These should be investigated further. 14 refs. , 15 figs., 23 tabs.

2478 (INEL–96/0076) **Use of Monte Carlo methods in environmental risk assessments at the INEL: Applications and issues.** Harris, G.; Van Horn, R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jun 1996. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96013294. Source: OSTI; NTIS; INIS; GPO Dep.

The EPA is increasingly considering the use of probabilistic risk assessment techniques as an alternative or refinement of the current point estimate of risk. This report provides an overview of the probabilistic technique called Monte Carlo Analysis. Advantages and disadvantages of implementing a Monte Carlo analysis over a point estimate analysis for environmental risk assessment are discussed. The general methodology is provided along with an example of its implementation. A phased approach to risk analysis that allows iterative refinement of the risk estimates is recommended for use at the INEL.

2479 (INEL–96/0113) **Alternate fluid to improve energy efficiency of supercritical water oxidation process.** Oh, C.H. Idaho National Engineering Lab., Idaho Falls, ID (United States). Mar 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010354. Source: OSTI; NTIS; GPO Dep.

This report discusses the replacement of water by carbon dioxide in both the quench stream and the supercritical water oxidation (SCWO) reactor feed in order to reduce the energy utilization in the process. FLUENT was used to generate the input requirements and ASPEN PLUS was used to model the SCWO process. Simulations were made for normal MODAR operating conditions (baseline case) and two other cases replacing water by carbon dioxide. The basis for and assumptions used in the simulation are given. Economic evaluations were made and costs were compared with the baseline case and a case with 60% replacement of water by carbon dioxide. The equipment cost is almost the same. However, the case with replacement of water by carbon dioxide reduces the energy requirement in the end process by a factor of three, which is a significant energy savings in the operation. Also, the injection of carbon dioxide into the SCWO reactor feed is expected to reduce corrosion and makes salt particles non-sticky. However, these advantages need to be confirmed by experiment.

2480 (INEL–96/0151) **Decomposition of PCBs in oils using gamma radiolysis: A treatability study. Final report.** Mincher, B.J.; Arbon, R.E. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Apr 1996. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96010360. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the results of a treatability study of radiologically and PCB contaminated waste hydraulic oils at the Idaho National Engineering Laboratory (INEL). The goal of the study was to demonstrate that PCBs could be selectively removed from the contaminated oils. The PCBs were selectively decomposed in an in-situ fashion via gamma-ray radiolysis. The gamma-ray source was spent nuclear fuel at the Advanced Test Reactor (ATR) canal at the Test Reactor Area (TRA), of the INEL. Exposure to gamma-rays does not induce radioactivity in the exposed solutions. The treatability study was the culmination of five years of research concerning PCB radiolysis conducted at INEL which investigated the mechanism and kinetics of the reaction in several solvents. The major findings of this research are summarized here. Based upon these findings three INEL waste streams were selected for testing of the process. The Environmental Protection Agency (EPA) treatment standard of 2 mg/kg was successfully achieved in all waste streams. The interference of contaminants other than PCBs is discussed.

2481 (IS-M–840) **Applications of lasers to the solution of environmental problems.** Allen, L.; Pang, H.-M.; Edelson, M.C. Ames Lab., IA (United States). [1995]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-82. (CONF-9511198–1: 3. symposium on laser spectroscopy at the Korean Atomic Energy Research Institute, Taejon (Korea, Republic of), 9 Nov 1995). Order Number DE96006840. Source: OSTI; NTIS; GPO Dep.

This presentation will focus on current work in the Ames Laboratory where laser ablation is being used for both analytical sampling and metal surface cleaning. Examples will be presented demonstrating the utility of optical spectroscopy for monitoring laser ablation processes.

2482 (K/WM–96) **Pollution prevention opportunity assessment for the K-25 Site Toxic Substances Control Act Incinerator Operations, Level III.** Oak Ridge K-25 Site, TN (United States); PAI Corp., Oak Ridge, TN (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96000422. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Management Program.

A Level III pollution prevention opportunity assessment (PPOA) was performed for the Oak Ridge K-25 Site Toxic Substances Control Act (TSCA) Incinerator to evaluate pollution prevention (P2) options for various waste streams: The main objective of this study was to identify and evaluate options to reduce the quantities of each waste stream generated by the TSCA Incinerator operations to realize significant environmental and/or economic benefits from P2. For each of the waste streams, P2 options were evaluated following the US Environmental Protection Agency (EPA) hierarchy to (1) reduce the quantity of waste generated, (2) recycle the waste, and/or (3) use alternate waste treatment or segregation methods. This report provides process descriptions, identification and evaluation of P2 options, and final recommendations.

2483 (LA--12986) **Area G perimeter surface-soil and single-stage water sampling: Environmental surveillance for fiscal year 1993.** Conrad, R.; Childs, M.; Rivera-Dirks, C.; Coriz, F. Los Alamos National Lab., NM (United States). Jul 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE95016707. Source: OSTI; NTIS; INIS; GPO Dep.

Area G, in Technical Area 54, has been the principle facility at Los Alamos National Laboratory for the storage and disposal of low-level and transuranic (TRU) radioactive wastes since 1957. The current environmental investigation consisted of ESH-19 personnel who collected soil and single-stage water samples around the perimeter of Area G to characterize possible contaminant movement through surface-water runoff. These samples were analyzed for tritium, total uranium, isotopic plutonium, americium-241 (soil only), and cesium 137. The metals, mercury, lead, and barium, were analyzed using x-ray fluorescence.

2484 (LA-SUB--95/141) **Assessment of remote sensing technologies to discover and characterize waste sites.** Los Alamos National Lab., NM (United States); Environmental Research Inst. of Michigan, Ann Arbor, MI (United States). 11 Mar 1992. 85p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003258. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents details about waste management practices that are being developed using remote sensing techniques to characterize DOE waste sites. Once the sites and problems have been located and characterized and an achievable restoration and remediation program have been established, efforts to reclaim the environment will begin. Special problems to be considered are: concentrated waste forms in tanks and pits; soil and ground water contamination; ground safety hazards for workers; and requirement for long-term monitoring.

2485 (LA-SUB--95-141-Prelim.) **Assessment of remote sensing technologies to discover and characterize waste sites.** Los Alamos National Lab., NM (United States); Environmental Research Inst. of Michigan, Ann Arbor, MI (United States). 11 Mar 1992. 57p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96003542. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents details about waste management practices that are being developed using remote sensing techniques to characterize DOE waste sites. Once sites and problems have been located and an achievable restoration and remediation program have been established, efforts to reclaim the environment will begin. Special problems to be considered are: concentrated wastes in tanks and pits; soil and ground water contamination; ground safety hazards for workers; and requirements for long-term monitoring.

2486 (LA-SUB--96-2) **Laboratory analysis of soil hydraulic properties of G-5 soil samples.** Los Alamos National Lab., NM (United States); Stephens (Daniel B.) and Associates, Inc., Albuquerque, NM (United States). Jan 1995. 218p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96009520. Source: OSTI; NTIS; GPO Dep.

The Hydrologic Testing Laboratory at DBS&A has completed laboratory tests on TA-54 samples from well G5 as specified by Daniel James and summarized in Table 1. Tables 2 through 8 give the results of the specified analyses. Raw laboratory data and graphical plots of data (where appropriate) are contained in Appendices A through G. Appendix H lists the methods used in these analyses. A detailed description of each method is available upon request. Several sample-specific observations are important for data interpretation. Sample G-5 @ 21.5 was a short core and showed indications of preferential flow. Sample G-5 @ 92.5 developed a visually apparent crack during drying which correlates with the higher air permeabilities observed at lower water contents. Several samples yielded negative estimates of extrapolated intrinsic permeability while measured apparent permeabilities were reasonable. For consistency, however, only intrinsic values are presented. While our defined task is to provide data for interpretation, the following comments are offered as a context for some of the common parameter extraction issues. Further details and a more comprehensive summary of TA-54 data can be found in Unsaturated hydraulic characteristics of the Bandelier tuff at TA-54 dated November 17, 1994.

2487 (LA-SUB--96-10) **EMFLUX® soil-gas survey of Technical Area 54, Los Alamos National Laboratory, New Mexico.** Los Alamos National Lab., NM (United States); Quadrel Services, Inc., Ijamsville, MD (United States). 30 Sep 1993. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96008998. Source: OSTI; NTIS; INIS; GPO Dep.

This EMFLUXR Soil-Gas Survey was conducted on Material Disposal Areas (MDAS) G, J, and L in Technical Area 54 at Los Alamos National Laboratory (LANL), New Mexico. MDA L has been used for disposal of volatile organic compounds (VOCs) and MDA G (comprising sub-areas G-1 through G-8) for disposal of both VOCs and radioactive waste; MDA I has reportedly been used for disposal of waste without either of these contaminants. All three of the sites are currently active. Figure 1 shows the location of the three MDAs within Technical Area 54 of operable Unit 1148. The purpose of the EMFLUX® Soil-Gas Survey was to determine the presence, identities, and relative strengths of contaminants within the three areas of LANL investigated. Quadrel understands that this information will be used in Phase-I assessment of these areas to determine flux rates of -- VOCs emanating from the ground.

2488 (LA-SUB--96-64) **Aerodynamics of the Large-Volume, Flow-Through Detector System. Final report.** Reed, H. (Arizona State Univ., Tempe, AZ (United States).

Aerospace Research Center); Saric, W.; Laananen, D.; Martinez, C.; Carrillo, R.; Myers, J.; Clevenger, D. Los Alamos National Lab., NM (United States); Arizona State Univ., Tempe, AZ (United States). Aerospace Research Center. Mar 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96009556. Source: OSTI; NTIS; INIS; GPO Dep.

The Large-Volume Flow-Through Detector System (LVFTDS) was designed to monitor alpha radiation from Pu, U, and Am in mixed-waste incinerator offgases; however, it can be adapted to other important monitoring uses that span a number of potential markets, including site remediation, indoor air quality, radon testing, and mine shaft monitoring. Goal of this effort was to provide mechanical design information for installation of LVFTDS in an incinerator, with emphasis on ability to withstand the high temperatures and high flow rates expected. The work was successfully carried out in three stages: calculation of pressure drop through the system, materials testing to determine surrogate materials for wind-tunnel testing, and wind-tunnel testing of an actual configuration.

2489 (LA-SUB–96-99-Pt.2) **Air quality impacts analysis for area G. Final report.** Kowalewsky, K. (Radian Corp., Austin, TX (United States)); Eklund, B.; Vold, E.L. Radian Corp., Austin, TX (United States); Los Alamos National Lab., NM (United States). 5 Jul 1995. 77p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013265. Source: OSTI; NTIS; INIS; GPO Dep.

The impact of fugitive radioactive emissions from the disposal site, Area G, was evaluated in support of site characterization for the Performance Assessment and for the Radioactive Air Emissions Management (RAEM) program. Fugitive emissions of tritiated water and contaminated windblown dust were considered. Data from an extensive field measurement program were used to estimate annual emissions of tritiated water. Fugitive dust models were used to calculate estimates of the annual emissions of windblown dust. These estimates were combined with data on contamination levels in surface soils to develop annual emission rates for specific radionuclides: tritium, uranium-238, cesium-137, plutonium-238, plutonium-239,240, and strontium-90. The CAP-88 atmospheric transport model was used to predict areas potentially affected by long-term dust deposition and atmospheric concentrations. The annual emission rate of tritiated water was estimated from the field data to be 14.0 Ci/yr. The emission rate of soil-borne radionuclides from open areas and from soils handling operations totaled less than $1x10^{-4}$ Ci/yr. The CAP-88 results were used to develop effective dose equivalents (EDEs) for receptor locations downwind of Area G. All EDEs were several orders of magnitude below the national standard of 10 mrem/yr. Fugitive air emissions from Area G were found not to pose a health threat to persons living or working downwind of the facility.

2490 (LA-SUB–96-108) **Transuranic waste characterization sampling and analysis plan.** Los Alamos National Lab., NM (United States); Rogers and Associates Engineering Corp., Salt Lake City, UT (United States); Wastren, Inc., Westminster, CO (United States). 31 Dec 1994. 98p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96013684. Source: OSTI; NTIS; INIS; GPO Dep.

Los Alamos National Laboratory (the Laboratory) is located approximately 25 miles northwest of Santa Fe, New Mexico, situated on the Pajarito Plateau. Technical Area 54 (TA-54), one of the Laboratory's many technical areas, is a radioactive and hazardous waste management and disposal area located within the Laboratory's boundaries. The purpose of this transuranic waste characterization, sampling, and analysis plan (CSAP) is to provide a methodology for identifying, characterizing, and sampling approximately 25,000 containers of transuranic waste stored at Pads 1, 2, and 4, Dome 48, and the Fiberglass Reinforced Plywood Box Dome at TA-54, Area G, of the Laboratory. Transuranic waste currently stored at Area G was generated primarily from research and development activities, processing and recovery operations, and decontamination and decommissioning projects. This document was created to facilitate compliance with several regulatory requirements and program drivers that are relevant to waste management at the Laboratory, including concerns of the New Mexico Environment Department.

2491 (LA-UR–95-3382) **Mobile waste inspection real time radiography system.** Vigil, J. (Los Alamos National Lab., NM (United States). Chemical Science and Waste Technology); Taggart, D.; Betts, S.; Rael, C.; Martinez, F.; Mendez, J. Los Alamos National Lab., NM (United States). [1995]. 4p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-951091–1: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96001383. Source: OSTI; NTIS; INIS; GPO Dep.

The 450-KeV Mobile Real Time Radiography System was designed and purchased to inspect containers of radioactive waste produced at Los Alamos National Laboratory (LANL). The Mobile Real Time Radiography System has the capability of inspecting waste containers of various sizes from 5-gal. buckets to standard waste boxes (SWB, dimensions 54.5 in. x 71 in. x 37 in.). The fact that this unit is mobile makes it an attractive alternative to the costly road closures associated with moving waste from the waste generator to storage or disposal facilities.

2492 (LA-UR–95-3644) **Volatile organic compound monitoring by photo acoustic radiometry.** Sollid, J.E.; Trujillo, V.L.; Limback, S.P.; Woloshun, K.A. Los Alamos National Lab., NM (United States). 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9509111–1: Society of Photo-Optical Instrumentation Engineers (SPIE) meeting on environmental monitoring, San Francisco, CA (United States), 25-28 Sep 1995). Order Number DE96002589. Source: OSTI; NTIS; INIS; GPO Dep.

Two methods for sampling and analyzing volatile organics in subsurface pore gas were developed for use at the Hazardous Waste Disposal Site at Los Alamos National Laboratory. One is Thermal Desorption Gas Chromatography Mass Spectrometry (TDGCMS), the other is Photoacoustic Radiometry (PAR). Presented here are two years worth of experience and lessons learned as both techniques matured. The sampling technique is equally as important as the analysis method. PAR is a nondispersive infrared technique utilizing band pass filters in the region from 1 to 15 μm. A commercial instrument, the Model 1302 Multigas Analyzer, made by Bruel and Kjaer, was adapted for field use. To use the PAR there must be some a priori knowledge of the constellation of analytes to be measured. The TDGCMS method is sensitive to 50 analytes. Hence TDGCMS is used in an initial survey of the site to determine what compounds are present and at what concentration. Once the major constituents of the soil-gas vapor plume are known the PAR can be configured to monitor for the five analytes of most interest. The PAR can analyse a sample in minutes, while in the field. The PAR is also quite precise in controlled situations.

2493 (LA-UR–95-4293) **Characterization of waste streams and suspect waste from largest Los Alamos National Laboratory generators.** Soukup, J.D. (Benchmark Environmental Corp., Albuquerque, NM (United States)); Erpenbeck, G.J. Los Alamos National Lab., NM (United States). [1995]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–4: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96005598. Source: OSTI; NTIS; INIS; GPO Dep.

A detailed waste stream characterization of 4 primary generators of low level waste at LANL was performed to aid in waste minimization efforts. Data was compiled for these four generators from 1988 to the present for analyses. Prior waste minimization efforts have focused on identifying waste stream processes and performing source materials substitutions or reductions where applicable. In this historical survey, the generators surveyed included an accelerator facility, the plutonium facility, a chemistry and metallurgy research facility, and a radiochemistry research facility. Of particular interest in waste minimization efforts was the composition of suspect low level waste in which no radioactivity is detected through initial survey. Ultimately, this waste is disposed of in the LANL low level permitted waste disposal pits (thus filling a scarce and expensive resource with sanitary waste). Detailed analyses of the waste streams from these 4 facilities, have revealed that suspect low level waste comprises approximately 50% of the low level waste by volume and 47% by weight. However, there are significant differences in suspect waste density when one considers the radioactive contamination. For the 2 facilities that deal primarily with beta emitting activation and spallation products (the radiochemistry and accelerator facilities), the suspect waste is much lower density than all low level waste coming from those facilities. For the 2 facilities that perform research on transuranics (the chemistry and metallurgy research and plutonium facilities), suspect waste is higher in density than all the low level waste from those facilities. It is theorized that the low density suspect waste is composed primarily of compactable lab trash, most of which is not contaminated but can be easily surveyed. The high density waste is theorized to be contaminated with alpha emitting radionuclides, and in this case, the suspect waste demonstrates fundamental limits in detection.

2494 (LA-UR–96-34) **A new computationally-efficient computer program for simulating spectral gamma-ray logs.** Conaway, J.G. Los Alamos National Lab., NM (United States). 1995. 9p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9510335–1: Minerals and Geotechnical Logging Society conference, Santa Fe, NM (United States), Oct 1995). Order Number DE96007187. Source: OSTI; NTIS; INIS; GPO Dep.

Several techniques to improve the accuracy of radionuclide concentration estimates as a function of depth from gamma-ray logs have appeared in the literature. Much of that work was driven by interest in uranium as an economic mineral. More recently, the problem of mapping and monitoring artificial gamma-emitting contaminants in the ground has rekindled interest in improving the accuracy of radioelement concentration estimates from gamma-ray logs. We are looking at new approaches to accomplishing such improvements. The first step in this effort has been to develop a new computational model of a spectral gamma-ray logging sonde in a borehole environment. The model supports attenuation in any combination of materials arranged in 2-D cylindrical geometry, including any combination of attenuating materials in the borehole, formation, and logging sonde. The model can also handle any distribution of sources in the formation. The model considers unscattered radiation only, as represented by the background-corrected area under a given spectral photopeak as a function of depth. Benchmark calculations using the standard Monte Carlo model MCNP show excellent agreement with total gamma flux estimates with a computation time of about 0.01% of the time required for the MCNP calculations. This model lacks the flexibility of MCNP, although for this application a great deal can be accomplished without that flexibility.

2495 (LA-UR–96-100) **Comparison of photoacoustic radiometry to gas chromatography/mass spectrometry methods for monitoring chlorinated hydrocarbons.** Sollid, J.E.; Trujillo, V.L.; Limback, S.P.; Woloshun, K.A. Los Alamos National Lab., NM (United States). [1996]. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9606125–2: Air and Waste Management (AWM) annual meeting, Nashville, TN (United States), 23-28 Jun 1996). Order Number DE96007170. Source: OSTI; NTIS; INIS; GPO Dep.

A comparison of two methods of gas chromatography mass spectrometry (GCMS) and a nondispersive infrared technique, photoacoustic radiometry (PAR), is presented in the context of field monitoring a disposal site. First is presented an historical account describing the site and early monitoring to provide an overview. The intent and nature of the monitoring program changed when it was proposed to expand the Radiological Waste Site close to the Hazardous Waste Site. Both the sampling methods and analysis techniques were refined in the course of this exercise.

2496 (LA-UR–96-369) **Hydrogeologic analyses in support of the conceptual model for the LANL Area G LLRW performance assessment.** Vold, E.L.; Birdsell, K.; Rogers, D.; Springer, E.; Krier, D.; Turin, H.J. Los Alamos National Lab., NM (United States). [1996]. 11p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–66: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008161. Source: OSTI; NTIS; INIS; GPO Dep.

The Los Alamos National Laboratory low level radioactive waste disposal facility at Area G is currently completing a draft of the site Performance Assessment. Results from previous field studies have estimated a range in recharge rate up to 1 cm/yr. Recent estimates of unsaturated hydraulic conductivity for each stratigraphic layer under a unit gradient assumption show a wide range in recharge rate of 10^{-4} to 1 cm/yr depending upon location. Numerical computations show that a single net infiltration rate at the mesa surface does not match the moisture profile in each stratigraphic layer simultaneously, suggesting local source or sink terms possibly due to surface connected porous regions. The best fit to field data at deeper stratigraphic layers occurs for a net infiltration of about 0.1 cm/yr. A recent detailed analysis evaluated liquid phase vertical moisture flux, based on moisture profiles in several boreholes and van Genuchten fits to the hydraulic properties for each of the stratigraphic units. Results show a near surface infiltration region averages 8m deep, below which is a dry, low moisture content, and low flux region, where liquid phase recharge averages to zero. Analysis shows this low flux region is dominated by vapor movement. Field data from tritium diffusion studies, from pressure fluctuation attenuation studies, and from comparisons of in-situ and core sample permeabilities indicate that the vapor diffusion is enhanced above that expected in the matrix and is presumably due to enhanced flow through the fractures. Below this dry region within the mesa is a moisture spike which analyses show corresponds to a moisture source. The likely physical explanation is seasonal transient infiltration through surface-connected fractures. This anomalous region is being investigated in current field studies, because it is critical in understanding the moisture flux which continues to deeper regions through the unsaturated zone.

2497 (LA-UR–96-578) **Airborne radioactive contamination monitoring.** Whitley, C.R.; Adams, J.R.; Bounds, J.A.; MacArthur, D.W. Los Alamos National Lab., NM (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9603129–2: 1996 New Mexico conference on the environment, Albuquerque, NM (United States), 12-14 Mar 1996). Order Number DE96006966. Source: OSTI; NTIS; INIS; GPO Dep.

Current technologies for the detection of airborne radioactive contamination do not provide real-time capability. Most of these techniques are based on the capture of particulate matter in air onto filters which are then processed in the laboratory; thus, the turnaround time for detection of contamination can be many days. To address this shortcoming, an effort is underway to adapt LRAD (Long-Range-Alpha-Detection) technology for real-time monitoring of airborne releases of alpa-emitting radionuclides. Alpha decays in air create ionization that can be subsequently collected on electrodes, producing a current that is proportional to the amount of radioactive material present. Using external fans on a pipe containing LRAD detectors, controlled samples of ambient air can be continuously tested for the presence of radioactive contamination. Current prototypes include a two-chamber model. Sampled air is drawn through a particulate filter and then through the first chamber, which uses an electrostatic filter at its entrance to remove ambient ionization. At its exit, ionization that occurred due to the presence of radon is collected and recorded. The air then passes through a length of pipe to allow some decay of short-lived radon species. A second chamber identical to the first monitors the remaining activity. Further development is necessary on air samples without the use of particulate filtering, both to distinguish ionization that can pass through the initial electrostatic filter on otherwise inert particulate matter from that produced through the decay of radioactive material and to separate both of these from the radon contribution. The end product could provide a sensitive, cost-effective, real-time method of determining the presence of airborne radioactive contamination.

2498 (LA-UR–96-633) **Migration of Sr-20, Cs-137, and Pu-239/240 in Canyon below Los Alamos outfall.** Murphy, J.M.; Mason, C.F.V.; Boak, J.M.; Longmire, P.A. Los Alamos National Lab., NM (United States). 1996. 14p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960212–72: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96008509. Source: OSTI; NTIS; INIS; GPO Dep.

Technical Area-21 (TA-21) of Los Alamos National Laboratory (LANL) is on a mesa bordered by two canyons DP Canyon and Los Alamos (LA) Canyon. DP Canyon is a small semiarid watershed with a well defined channel system where the stream flow is ephemeral. TA-21 has had a complex history of waste disposal as research to determine the chemical and metallurgical properties of nuclear materials occurred here from 1945-1978. Due to these operations, the TA-21 mesa top and bordering canyons have been monitored and characterized by the LANL Environmental Restoration Program. Results identify radionuclide values at outfall. 21-011 (k) which exceed Screening Action Levels, and points along DP Canyon which exceed regional background levels. The radiocontaminants considered in this study are strontium-90, cesium-137, and plutonium-239. This research examines sediment transport and speciation of radionuclide contaminant migration from a source term named SWMU 21-011 (k) down DP Canyon. Three dimensional surface plots of data from 1977-1994 are used to portray the transport and redistribution of radioactive contaminants in an alluvial stream channel. An overall decrease in contamination concentration since 1983 has been observed which could be due to more stringent laboratory controls and also to the removal of main plutonium processing laboratories to another site.

2499 (LA-UR–96-732) **Contaminant analysis automation, an overview.** Hollen, R.; Ramos, O. Jr. Los Alamos National Lab., NM (United States). [1996]. 3p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9603129–5: 1996 New Mexico conference on the environment, Albuquerque, NM (United States), 12-14 Mar 1996). Order Number DE96009785. Source: OSTI; NTIS; INIS; GPO Dep.

To meet the environmental restoration and waste minimization goals of government and industry, several government laboratories, universities, and private companies have formed the Contaminant Analysis Automation (CAA) team. The goal of this consortium is to design and fabricate robotics systems that standardize and automate the hardware and software of the most common environmental chemical methods. In essence, the CAA team takes conventional, regulatory- approved (EPA Methods) chemical analysis processes and automates them. The automation consists of standard laboratory modules (SLMs) that perform the work in a much more efficient, accurate, and cost-effective manner.

2500 (LA-UR–96-1051) **Mass transfer of SCWO processes: Molecular diffusion and mass transfer coefficients of inorganic nitrate species in sub- and supercritical water.** Goemans, M.G.E. (Univ. of Texas, Austin, TX (United States). Dept. of Civil Engineering); Gloyna, E.F.; Buelow, S.J. Los Alamos National Lab., NM (United States). 1996. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960252–2: 2. international symposium on environmental applications of advanced oxidation technologies, San Francisco, CA (United States), 28 Feb - 1 Mar 1996). Order Number DE96009771. Source: OSTI; NTIS; GPO Dep.

Molecular diffusion coefficients of lithium-, sodium-, potassium-, cesium-, calcium-, and strontium nitrate in subcritical water were determined by analysis of Taylor dispersion profiles. Pressures ranged from 300 to 500 bar at temperatures ranging from 25°C to 300°C. The reported diffusion values were determined at infinite dilution. Molecular diffusion coefficients were 10 to 20 times faster in near-critical subcritical water than in water at ambient temperature and pressure (ATP). These findings implied that the diffusion rates were more liquid like than they were gas like, hence experimental results were correlated with diffusion models for liquids. The subcritical diffusion data presented in this work, and supercritical diffusion results published elsewhere were correlated with hydrodynamic diffusion equations. Both the Wilke-Chang correlation and the Stokes-Einstein equation yielded predictions within 10% of the experimental results if the structure of the diffusing species could be estimated. The effect of the increased diffusion rates on mass transfer rates in supercritical water oxidation applications was quantified, with emphasis on heterogeneous oxidation processes. This study and results published elsewhere showed that diffusion limited conditions are much more likely to be encountered in SCWO processes than commonly acknowledged.

2501 (LA-UR–96-1172) **Environmental waste site characterization utilizing aerial photographs and satellite imagery: Three sites in New Mexico, USA.** Van Eeckhout, E. (Los Alamos National Lab., NM (United States)); Pope, P.; Becker, N.; Wells, B.; Lewis, A.; David, N. Los Alamos National Lab., NM (United States). 1 Apr 1996. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9607107–1: 18. international Society for Photogrammetry and Remote Sensing's congress, Vienna (Austria), 9-19 Jul 1996). Order Number DE96009028. Source: OSTI; NTIS; INIS; GPO Dep.

The proper handling and characterization of past hazardous waste sites is becoming more and more important as world population extends into areas previously deemed undesirable. Historical photographs, past records, current aerial satellite imagery can play an important role in characterizing these sites. These data provide clear insight into defining problem areas which can be surface samples for further detail. Three such areas are discussed in this paper: (1) nuclear wastes buried in trenches at Los Alamos National Laboratory, (2) surface dumping at one site at Los Alamos National Laboratory, and (3) the historical development of a municipal landfill near Las Cruces, New Mexico.

2502 (LA-UR–96-1272) **LANL's mobile nondestructive assay and examination systems for radioactive wastes.** Taggart, D.P. Betts, S.E.; Vigil, J.J. Los Alamos National Lab., NM (United States). 9 Apr 1996. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960804–14: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96009226. Source: OSTI; NTIS; INIS; GPO Dep.

The ability to accurately and rapidly measure nuclear material within drums and examine their contents without having to unpack the drums saves time, reduces characterization costs and minimizes radiation exposure. Over the past two years, Los Alamos National Laboratory (LANL) has developed and fielded a suite of mobile nondestructive assay and examination systems for use primarily on its own transuranic (TRU) waste but that also have application to low level, mixed and hazardous wastes. It has become obvious that systems like these are generally useful and have applications at other Department of Energy (DOE) production and environmental technology sites. Mobile capabilities present a potential cost savings where waste drums have to be transported to a fixed NDA facility. In other cases they fill a void where there is no fixed facility available because construction costs are prohibitive (as in the case of small quantity sites) or the available facilities may not meet current or evolving safety standards. Rather than bringing waste to a facility to be characterized, one can bring the characterization capability to the waste. The three systems described are: (1) mobile radiography system; (2) mobile segmented/tomographic gamma scanner; and (3) mobile passive/active neutron assay system.

2503 (LA-UR–96-1322) **Characterization and immobilization of cesium-137 in soil at Los Alamos National Laboratory.** Lu, Ningping; Mason, C.F.V.; Turney, W.R.J.R. Los Alamos National Lab., NM (United States). 1996. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9606219–1: 3. international conference on precision agriculture, St. Paul, MN (United States), 23-26 Jun 1996). Order Number DE96010480. Source: OSTI; NTIS; INIS; GPO Dep.

At Los Alamos National Laboratory, cesium-137 (^{137}Cs) is a major contaminant in soils of Technical Area 21 (TA-21) and is mainly associated with soil particles $\leq$2.00 mm. Cesium-137 was not leached by synthetic groundwater or acid rainwater. Soil erosion is a primary mechanism of ^{137}Cs transport in TA-21. The methodology that controls soil particle runoff can prevent the transport of ^{137}Cs.

2504 (LA-UR–96-1328) **Cost effectiveness of sonic drilling.** Masten, D.; Booth, S.R. Los Alamos National Lab., NM (United States). Mar 1996. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. Order Number DE96010943. Source: OSTI; NTIS; INIS; GPO Dep.

Sonic drilling (combination of mechanical vibrations and rotary power) is an innovative environmental technology being developed in cooperation with DOE's Arid-Site Volatile Organic Compounds Integrated Demonstration at Hanford and the Mixed Waste Landfill Integrated Demonstration at Sandia. This report studies the cost effectiveness of sonic drilling compared with cable-tool and mud rotary drilling. Benefit of sonic drilling is its ability to drill in all types of formations without introducing a circulating medium, thus producing little secondary waste at hazardous sites. Progress has been made in addressing the early problems of failures and downtime.

2505 (LA-UR–96-1428) **Real-time monitoring for alpha emitters in high-airflow environments.** Koster, J.E.; MacArthur, D.W.; Bounds, J.A.; Rawool-Sullivan, M; Whitley, C.R.; Conaway, J.G.; Steadman, P.A. Los Alamos National Lab., NM (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960804–33: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96010492. Source: OSTI; NTIS; INIS; GPO Dep.

Key problems in detecting alpha contamination for site characterization and decontamination and decommissioning that remain to be solved include measurement of airborne contamination, material holdup within pipes, and leakage of material containers. These problems are very difficult using traditional alpha detectors and systems. The ionization detection method (long-range alpha detection of LRAD) offers a number of specific advantages for these environmental measurements. An LRAD system detects the air molecules ionized by alpha-emitting contamination rather than the alpha particles. Thus, LRAD-based detectors are not limited by the short range of alpha particles and can be used to detect contamination anywhere that air can penetrate. Extending this technology to large enclosures of long pipes requires a system optimized for large airflows. In this paper we will present designs and preliminary results for high-volume flow-through air monitors based on the LRAD technique. In addition, we will discuss the behavior of the monitors and their potential applications.

2506 (LA-UR–96-1566) **A self-directing elastic backscatter lidar system for debris cloud tracking and characterization.** Clark, D.A. (Los Alamos National Lab., NM (United States)); Dighe, K.A.; Tunnell, T.W. Los Alamos National Lab., NM (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960770–2: 18. international laser radar conference, Berlin (Germany), 22-26 Jul 1996). Order Number DE96011257. Source: OSTI; NTIS; GPO Dep.

An elastic backscatter lidar that utilizes the lidar signal itself to direct the system towards fast moving isolated aerosol clouds has been developed. However, detecting and tracking invisible transient effluents from unknown locations, though conceptually straightforward, has still remained experimentally challenging. Accurate cloud volume, cloud density distribution, and track information have been obtained on small, fast moving, subvisible debris clouds resulting from above ground tests in which conventional explosives were detonated.

2507 (LA-UR–96-1970) **Cyclodextrin-based surface acoustic wave chemical microsensors.** Li, D.Q.; Shi, J.X.; Springer, K.; Swanson, B.I. Los Alamos National Lab., NM (United States). [1996]. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-960804–42: SPECTRUM '96: international conference on nuclear and hazardous waste management, Seattle, WA (United States), 18-23 Aug 1996). Order Number DE96012749. Source: OSTI; NTIS; GPO Dep.

Cyclodextrin thin films were fabricated using either self-assembled monolayer (SAM) or solgel techniques. The resulting host receptor thin films on the substrates of surface acoustic wave (SAW) resonators were studied as method of tracking organic toxins in vapor phase. The mass loading of surface-attached host monolayers on SAW resonators gave frequency shifts corresponding to typical monolayer surface coverages for SAM methods and "multilayer" coverages for sol-gel techniques. Subsequent exposure of the coated SAW resonators to organic vapors at various concentrations, typically 5,000 parts per millions (ppm) down to 100 parts per billions (ppb) by mole, gave responses indicating middle-ppb-sensitivity (~50 ppb) for those sensor-host-receptors and organic-toxin pairs with optimum mutual matching of polarity, size, and structural properties.

2508 (LBL–36775) **Methods of constructing a 3D geological model from scatter data.** Horsman, J.; Bethel, W. Lawrence Berkeley Lab., CA (United States). Apr 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-9504204–1: Advanced visual systems conference, Boston, MA (United States), 19-21 Apr 1995). Order Number DE96000131. Source: OSTI; NTIS; GPO Dep.

Most geoscience applications, such as assessment of an oil reservoir or hazardous waste site, require geological characterization of the site. Geological characterization involves analysis of spatial distributions of lithology, porosity, etc. Because of the complexity of the spatial relationships, the authors find that a 3-D model of geology is better suited for integration of many different types of data and provides a better representation of a site than a 2-D one. A 3-D model of geology is constructed from sample data obtained from field measurements, which are usually scattered. To create a volume model from scattered data, interpolation between points is required. The interpolation can be computed using one of several computational algorithms. Alternatively, a manual method may be employed, in which an interactive graphics device is used to input by hand the information that lies between the data points. For example, a mouse can be used to draw lines connecting data points with equal values. The combination of these two methods presents yet another approach. In this study, the authors will compare selected methods of 3-D geological modeling, They used a flow-based, modular visualization environment (AVS) to construct the geological models computationally. Within this system, they used three modules, scat_3d, trivar and scatter_to_ucd, as examples of computational methods. They compare these methods to the combined manual and computational approach. Because there are no tools readily available in AVS for this type of construction, they used a geological modeling system to demonstrate this method.

2509 (LBL–37339) **Electrical resistivity for detecting subsurface non-aqueous phase liquids: A progress report.** Lee, K.H.; Shan, C.; Javandel, I. Lawrence Berkeley Lab., CA (United States). Jun 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. Order Number DE95016527. Source: OSTI; NTIS; INIS; GPO Dep.

Soils and groundwater have been contaminated by hazardous substances at many places in the United States and many other countries. The contaminants are commonly either petroleum products or industrial solvents with very low solubility in water. These contaminants are usually called non-aqueous phase liquids (NAPLs). The cost of cleaning up the affected sites in the United States is estimated to be of the order of 100 billion dollars. In spite of the expenditure of several billion dollars during the last 15 years, to date, very few, if any major contaminated site has been restored. The presence of NAPL pools in the subsurface is believed to be the main cause for the failure of previous cleanup activities. Due to their relatively low water solubility, and depending on their volume, it takes tens or even hundreds of years to deplete the NAPL sources if they are not removed from the subsurface. The intrinsic electrical resistivity of most NAPLs is typically in the range of 10^7 to $10^{12}\Omega$-m, which is several orders of magnitude higher than that of groundwater containing dissolved solids (usually in the range of a few Ω-m to a few thousand Ω-m). Although a dry soil is very resistive, the electrical resistivity of a wet soil is on the order of 100 Ω-m and is dependent on the extent of water saturation. For a given soil, the electrical resistivity increases with decrease of water saturation. Therefore, if part of the pore water is replaced by a NAPL, the electrical resistivity will increase. At many NAPL sites, both the vadose and phreatic zones can be partially occupied by NAPL pools. It is the great contrast in electrical resistivity between the NAPLs and groundwater that may render the method to be effective in detecting subsurface NAPLs at contaminated sites. The following experiments were conducted to investigate the change of the electrical resistivity of porous media when diesel fuel (NAPL) replaces part of the water.

2510 (LBL–37554) **A field test of permeation grouting in heterogeneous soils using a new generation of barrier liquids.** Moridis, G.J. (Lawrence Berkeley Lab., CA (United States)); Persoff, P.; Apps, J.A.; Myer, L.; Pruess, K.; Yen, P. Lawrence Berkeley Lab., CA (United States). Aug 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC03-76SF00098. (CONF-950868–20: ER '95: environmental remediation conference: committed to results, Denver, CO (United States), 13-18 Aug 1995). Order Number DE96001123. Source: OSTI; NTIS; INIS; GPO Dep.

A field demonstration of permeation grouting was conducted at a gravel quarry near Los Banos, California, with the purpose of demonstrating the feasibility of the concept. Two grouts were used: a form of colloidal silica that gels after the addition of a gelling agent, and a polysiloxane that polymerizes after the addition of a catalyst. Both create relatively impermeable barriers in response to the large increase in viscosity during gelation or polymerization, respectively. The grouts were successfully injected at a depth between 10 and 14ft. Subsequent exhumation of the injected gravels revealed that both grouts produced relatively uniform bulbs. Laboratory measurements of the grouted material retrieved from the field showed at least a four order of magnitude reduction in permeability over the ungrouted material.

2511 (ORNL–6882) **Operating and life-cycle costs for uranium-contaminated soil treatment technologies.** Douthat, D.M. (Oak Ridge National Lab., TN (United States). Health Sciences Research Div.); Armstrong, A.Q.; Stewart, R.N. Oak Ridge National Lab., TN (United States). Sep 1995. 150p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006586. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a nuclear industry in the US required mining, milling, and fabricating a large variety of uranium products. One of these products was purified uranium metal which was used in the Savannah River and Hanford Site reactors. Most of this feed material was produced at the US Department of Energy (DOE) facility formerly called the Feed Materials Production Center at Fernald, Ohio. During operation of this facility, soils became contaminated with uranium from a variety of sources. To avoid disposal of these soils in low-level radioactive waste burial sites, increasing emphasis has been placed on the remediating soils contaminated with uranium and other radionuclides. To address remediation and management of uranium-contaminated soils at sites owned by DOE, the DOE Office of Technology Development (OTD) evaluates and compares the versatility, efficiency, and economics of various technologies that may be combined into systems designed to characterize and remediate uranium-contaminated soils. Each technology must be able to (1) characterize the uranium in soil, (2) decontaminate or remove uranium from soil, (3) treat or dispose of resulting waste streams, (4) meet necessary state and federal regulations, and (5) meet performance assessment objectives. The role of the performance assessment objectives is to provide the information necessary to conduct evaluations of the technologies. These performance assessments provide the basis for selecting the optimum system for remediation of large areas contaminated with uranium. One of the performance assessment tasks is to address the economics of full-scale implementation of soil treatment technologies. The cost of treating contaminated soil is one of the criteria used in the decision-making process for selecting remedial alternatives.

2512 (ORNL–6884) **Site health and safety plan/work plan for further characterization of waste drums at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Abston, J.P.; Burman, S.N.; Jones, D.L. Oak Ridge National Lab., TN (United States). Oct 1995. 63p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006583. Source: OSTI; NTIS; INIS; GPO Dep.

The health and safety plan/work plan describes a strategy for characterizing the contents of 172 liquid waste and 33 solid waste drums. It also addresses the control measures that will be taken to (1) prevent or minimize any adverse impact on the environment or personnel safety and health and (2) meet standards that define acceptable management of hazardous and radioactive materials and wastes. When writing this document, the authors considered past experiences, recommendations, and best management practices to minimize possible hazards to human health or the environment from events such as fires, explosions, falls, mechanical hazards, or unplanned releases of hazardous or radioactive materials to air, soil, or surface water.

2513 (ORNL/ER–294) **Readiness review plan for the in situ vitrification demonstration of Seepage Pit 1 in Waste Area Grouping 7.** Oak Ridge National Lab., TN (United States). May 1995. 17p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95014002. Source: OSTI; NTIS; INIS; GPO Dep.

A treatability study is planned that encompasses the application of in situ vitrification (ISV) to at least two segments of the Oak Ridge National Laboratory Seepage Pit I during the third quarter of fiscal year 1995. Before the treatability study can be initiated, the proposed activity must be subjected to an Operational Readiness Review (ORR). ORR is a structured methodology of determining readiness to proceed as outlined in Martin Marietta Energy Systems, Inc. (Energy Systems), Environmental Restoration Waste Management Procedure ER/C-P1610, which provides Energy Systems organizations assurance that the work to be performed is consistent with management's expectations and that the subject activity is ready to proceed safely. The readiness review plan provides details of the review plan overview and the scope of work to be performed. The plan also identifies individuals and position responsibilities for implementing the activity. The management appointed Readiness Review Board (RRB) has been identified. A Field Readiness Review Team (FRT), a management appointed multidisciplinary group, has been established (1) to evaluate the ISV treatability study, (2) to identify and assemble supporting objective evidences of the readiness to proceed, and (3) to assist the team leader in presenting the evidences to the RRB. A major component of RRB is the formulation of readiness review criteria months before the operation. A comprehensive readiness review tree (a positive logic tree) is included, which identifies the activities required for the development of the readiness criteria. The readiness review tree serves as a tool to prevent the omission of an item that could affect system performance. All deficiencies identified in the review will be determined as prestart findings and must be resolved before the project is permitted to proceed. The final approval of the readiness to proceed will be the decision of RRB.

2514 (ORNL/ER–299) **Site characterization summary report for Waste Area Grouping 10 Wells at the Old Hydrofracture Facility, Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Mar 1995. 503p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012486. Source: OSTI; NTIS; INIS; GPO Dep.

The Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee, is operated for the Department of Energy (DOE) by Martin Marietta Energy Systems (Energy Systems). As part of its DOE mission, ORNL has pioneered waste disposal technologies throughout the years of site operations since World War II. In the late 1950s, efforts were made to develop a permanent disposal alternative to the surface impoundments at ORNL at the request of the National Academy of Sciences. One such technology, the hydrofracture process, involved forming fractures in an underlying geologic host formation (a low-permeability shale) at depths of up to 1000 ft and subsequently injecting a grout slurry containing low-level liquid waste, cement, and other additives at an injection pressure of about 2000 psi. The objective of the effort was to develop a grout slurry that could be injected as a liquid but would solidify after injection, thereby immobilizing the radioisotopes contained in the low-level liquid waste. The scope of this site characterization was the access, sampling, logging, and evaluation of observation wells near the Old Hydrofracture Facility (OHF) in preparation for plugging, recompletion, or other final disposition of the wells.

2515 (ORNL/ER–314) **Site Safety and Health Plan (Phase 3) for the treatability study for in situ vitrification at Seepage Pit 1 in Waste Area Grouping 7, Oak Ridge National Laboratory, Oak Ridge, TN.** Spalding, B.P.; Naney, M.T. Oak Ridge National Lab., TN (United States). Jun 1995. 187p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016173. Source: OSTI; NTIS; INIS; GPO Dep. Environmental Restoration Program.

This plan is to be implemented for Phase III ISV operations and post operations sampling. Two previous project phases involving site characterization have been completed and required their own site specific health and safety plans. Project activities will take place at Seepage Pit 1 in Waste Area Grouping 7 at ORNL, Oak Ridge, Tennessee. Purpose of this document is to establish standard health and safety procedures for ORNL project personnel and contractor employees in performance of this work. Site activities shall be performed in accordance with Energy Systems safety and health policies and procedures, DOE orders, Occupational Safety and Health Administration Standards 29 CFR Part 1910 and 1926; applicable United States Environmental Protection Agency requirements; and consensus standards. Where the word "shall" is used, the provisions of this plan are mandatory. Specific requirements of regulations and orders have been incorporated into this plan in accordance with applicability. Included from 29 CFR are 1910.120 Hazardous Waste Operations and Emergency Response; 1910.146, Permit Required - Confined Space; 1910.1200, Hazard Communication; DOE Orders requirements of 5480.4, Environmental Protection, Safety and Health Protection Standards; 5480.11, Radiation Protection; and N5480.6, Radiological Control Manual. In addition, guidance and policy will be followed as described in the Environmental Restoration Program Health and Safety Plan. The levels of personal protection and the procedures specified in this plan are based on the best information available from reference documents and site characterization data. Therefore, these recommendations represent the minimum health and safety requirements to be observed by all personnel engaged in this project.

2516 (ORNL/ER–327) **Surface radiological investigations along State Highway 95, Lagoon Road, and Melton Valley Drive, Oak Ridge Reservation, Oak Ridge, Tennessee.** Tiner, P.F.; Uziel, M.S.; Rice, D.E.; Williams, J.K. Oak Ridge National Lab., TN (United States). Aug 1995. 101p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96007655. Source: OSTI; NTIS; INIS; GPO Dep.

The surface radiological investigation along State Highway 95, Lagoon Road, and Melton Valley Drive at the Oak Ridge Reservation was conducted as part of the Oak Ridge National Laboratory Environmental Restoration Program Surveillance and Maintenance activities. This report was prepared to document results of the investigation and subsequent remedial actions. The report details surface gamma radiation levels including gamma anomalies; surface beta radiation levels including beta anomalies; results of analysis of soil, water, and vegetation samples and smear samples collected from paved surfaces; remediation activities conducted as a result of the survey; and recommendations for further corrective measures.

2517 (ORNL/ER–329/V1) **Site investigation report for Waste Area Grouping 4 at Oak Ridge National Laboratory. Volume 1, Text: Environmental Restoration Program.** Oak Ridge National Lab., TN (United States). Aug 1995. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017189. Source: OSTI; NTIS; INIS; GPO Dep.

Waste Area Grouping (WAG) 4 is one of 17 WAGs within and associated with Oak Ridge National Laboratory (ORNL). WAG 4 is located south of the main facility along Lagoon Road. WAG 4 consists of three separate areas: Solid Waste Storage Area (SWSA) 4, a shallow-land-burial ground containing radioactive and potentially hazardous wastes; an experimental Pilot Pit Area, which includes a pilot-scale testing pit; and sections of two abandoned underground pipelines used for transporting liquid, low-level, radioactive waste. SWSA 4 is the largest site at WAG 4, covering approximately 23 acres. In the 1950s, SWSA 4 received a variety of low- and high-activity wastes, including transuranic wastes, all buried in trenches and auger holes. Recent surface water data, collected during monitoring of the tributary to White Oak Creek as part of WAG 2 investigations as well as during previous studies conducted at WAG 4, indicate that a significant amount of ^{90}Sr is being released from the old burial trenches in SWSA 4. This release represents a significant portion of the ORNL off-site risk (DOE 1993). With recent corrective measures the proportion of the release has increased in 1995. A detailed discussion of the site history and previous investigations is presented in the WAG 4 Preliminary Assessment Report, ORNL/ER-271 (Energy Systems 1994b). In an effort to control the sources of the ^{90}Sr release and to reduce the off-site risk, a site investigation was initiated to pinpoint those trenches that are the most prominent ^{90}Sr sources.

2518 (ORNL/ER–329/V2) **Site investigation report for Waste Area Grouping 4 at Oak Ridge National Laboratory. Volume 2, Appendixes: Environmental Restoration**

Program. Oak Ridge National Lab., TN (United States). Aug 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017190. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the UltraSonic Ranging and Data Systems (USRADS) survey conducted for radiological characterization of approximately 5 acres located at the Oak Ridge National Laboratory (ORNL) Waste Area Grouping (WAG) 4. The survey was conducted by Chemrad Tennessee Corporation under subcontract No. 7908-RS-00902 to CDM Federal Programs Corporation. The field survey began June 23, 1994 (Chemrad survey team was unable to actually enter field until June 24 awaiting sign-off of CDM plans by MMES) and was terminated on June 29, 1994. The designated survey area is located on the DOE X-10 facility and South of the main X-10 building complex. The entire north boundary of the site is adjacent to SWSA 4, with the Bath Tubbing Trench Seep Area (BTT) actually being a part of that SWSA (See Figure 1). Approximately one-third of the designated area was actually surveyed. The BTT area slopes moderately eastward toward a small stream in the WAG 4 area. The area is open and had recently been trimmed for the survey. The balance of the designated survey area lies along the small stream within WAG 4 and is densely wooded with heavy underbrush. The area had not been cleared or brushed. Survey reference points for the BTT area mere directly tied into the X-10 coordinate system while the t bale,ice of the designated survey area mere tied into an existing relative metric grid system. The designated area was surveyed for radiological characterization using near-surface gamma and beta detectors as well as an energy independent dosimeter. This report describes the survey method and presents the survey findings.

2519 (ORNL/ER–335) **Technical report for a fluidless directional drilling system demonstrated at Solid Waste Storage Area 6 shallow buried waste sites.** Oak Ridge National Lab., TN (United States). Sep 1995. 81p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96007393. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the research was to demonstrate a fluidless directional drilling and monitoring system (FDD) specifically tailored to address environmental drilling concerns for shallow buried wasted. The major concerns are related to worker exposure, minimizing waste generation, and confining the spread of contamination. The FDD is potentially applicable to Environmental Restoration (ER) activities for the Oak Ridge National Laboratory Waste Area Grouping 6 (WAG 6) shallow buried waste disposed in unlined trenches. Major ER activities for directional drilling are to develop a drilling system for leachate collection directly beneath trenches, and to provide localized control over leachate release to the environment. Other ER FDD activities could include vadose zone and groundwater monitoring of contaminant transport. The operational constraints pointed the research in the direction of purchasing a steerable impact hammer, or mole, manufactured by Steer-Rite Ltd. of Racine, Wisconsin. This drill was selected due to the very low cost ($25,000) associated with procuring the drill, steering module, instrumentation and service lines. The impact hammer is a self propelled drill which penetrates the soil by compacting cut material along the sidewalls of the borehole. Essentially, it forces its way through the subsurface. Although the pneumatic hammer exhausts compressed air which must be handled at the borehole collar, it does not generate soil cuttings or liquids. This is the basis for the term fluidless. A stub casing muffler was attached to the entrance hole for controlling exhaust gas and any airborne releases. Other environmental compliance modifications made to the equipment included operating the tool without lubrication, and using water instead of hydraulic fluid to actuate the steering fins on the tool.

2520 (ORNL/ER–340) **Determination of the theoretical feasibility for the transmutation of europium isotopes from high flux isotope reactor control cylinders.** Elam, K.R.; Reich, W.J. Oak Ridge National Lab., TN (United States). Sep 1995. 23p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006673. Source: OSTI; NTIS; INIS; GPO Dep.

The High Flux Isotope Reactor (HFIR) at the Oak Ridge National Laboratory (ORNL) is a 100 MWth light-water research reactor designed and built in the 1960s primarily for the production of transuranic isotopes. The HFIR is equipped with two concentric cylindrical blade assemblies, known as control cylinders, that are used to control reactor power. These control cylinders, which become highly radioactive from neutron exposure, are periodically replaced as part of the normal operation of the reactor. The highly radioactive region of the control cylinders is composed of europium oxide in an aluminum matrix. The spent HFIR control cylinders have historically been emplaced in the ORNL Waste Area Grouping (WAG) 6. The control cylinders pose a potential radiological hazard due to the long lived radiotoxic europium isotopes ^{152}Eu, ^{154}Eu, and ^{155}Eu. In a 1991 health evaluation of WAG 6 (ERD 1991) it was shown that these cylinders were a major component of the total radioactivity in WAG 6 and posed a potential exposure hazard to the public in some of the postulated assessment scenarios. These health evaluations, though preliminary and conservative in nature, illustrate the incentive to investigate methods for permanent destruction of the europium radionuclides. When the cost of removing the control cylinders from WAG 6, performing chemical separations and irradiating the material in HFIR are factored in, the option of leaving the control cylinders in place for decay must be considered. Other options, such as construction of an engineered barrier around the disposal silos to reduce the chance of migration, should also be analyzed.

2521 (ORNL/ER–360/R1) **Site characterization summary report for the Old Hydrofracture Facility, Waste Area Grouping 5, at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Apr 1996. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96012610. Source: OSTI; NTIS; INIS; GPO Dep.

This site characterization summary report summarizes the operational history and other information on the Old Hydrofracture Facility located in the Waste Area Grouping 5 at the Oak Ridge National Laboratory. The Old Hydrofracture Facility was a waste disposal facility that operated from the 1960s until 1979. Intermediate-level radioactive waste was mixed with grout and injected deep underground for permanent disposal. Facilities at the site include various buildings, pipes, waste pits, and five underground storage tanks that contain liquid and sludge that have been characterized as low-level, hazardous, and mixed wastes.

2522 (ORNL/ER–361) **Treatability study operational testing program and implementation plan for the Gunite**

and Associated Tanks at Oak Ridge National Laboratory, Oak Ridge, Tennessee. Oak Ridge National Lab., TN (United States); XL Associates, Inc., Oak Ridge, TN (United States). Mar 1996. 87p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96009355. Source: OSTI; NTIS; INIS; GPO Dep.

This Treatability Study (TS) Operational Testing Program and Implementation Plan identifies operational testing to be performed to: (1) Demonstrate the technical feasibility of methods proposed for the removal of radiochemical sludge heels from the underground storage tanks located at Oak Ridge National Laboratory (ORNL), known as the Gunite and Associated Tanks (GAAT) Operable Unit (OU). (The bulk of the radiochemical waste, which was previously stored in the tanks, was removed during the 1980s, and only a sludge heel remains.) (2) Reduce the uncertainty in meeting the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requirements for the GAAT OU. (3) Minimize the overall costs to accomplish the first two objectives. An initial Feasibility Study (FS) effort identified uncertainties in the evaluation of various alternatives for addressing the remediation of the GAAT OU. To support future decision making, the US. Department of Energy is performing a TS to identify cost-effective remediation approaches for the GAAT OU by providing information to reduce cost and technical uncertainty and better define acceptable remediation strategies. The testing activities will be initially conducted in a nonradioactive environment at the Tanks Technology Cold Test Facility (TTCTF) at ORNL. This will permit the design and initial performance testing and training activities to be completed while minimizing the risk, employee exposure, and costs associated with the testing effort. The component design and functional testing and initial system performance testing will be completed in the TTCTF. After the component and initial system performance testing have been completed, the operations testing will continue in the North Tank Farm (NTF). This testing has an associated higher cost and risk, but is necessary to provide results for actual waste heel removal.

2523 (ORNL/ER–363) **Waste Area Grouping 2 Remedial Investigation Phase 1 Seep Task data report: Contaminant source area assessment.** Hicks, D.S. Oak Ridge National Lab., TN (United States). Mar 1996. 176p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96009975. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the findings of the Waste Area Grouping (WAG) 2, Phase 1 Remedial Investigation (RI) Seep Task efforts during 1993 and 1994 at Oak Ridge National Laboratory (ORNL). The results presented here follow results form the first year of sampling, 1992, which are contained in the Phase 1 RI report for WAG 2 (DOE 1995a). The WAG 2 Seep Task efforts focused on contaminants in seeps, tributaries, and main streams within the White Oak Creek (WOC) watershed. This report is designed primarily as a reference for contaminants and a resource for guiding remedial decisions. Additional in-depth assessments of the Seep Task data may provide clearer understandings of contaminant transport from the different source areas in the WOC watershed. WAG 2 consists of WOC and its tributaries downstream of the ORNL main plant area, White Oak Lake, the White Oak Creek Embayment of the Clinch River, and the associated flood plains and subsurface environment. The WOC watershed encompasses ORNL and associated WAGs. WAG 2 acts as an integrator for contaminant releases from the contaminated sites at ORNL and as the conduit transporting contaminants to the Clinch River. The main objectives of the Seep Task were to identify and characterize seeps, tributaries and source areas that are responsible for the contaminant releases to the main streams in WAG 2 and to quantify their input to the total contaminant release from the watershed at White Oak Dam (WOD). Efforts focused on ^{90}Sr, ^{3}H, and ^{137}Cs because these contaminants pose the greatest potential human health risk from water ingestion at WOD. Bimonthly sampling was conducted throughout the WOC watershed beginning in March 1993 and ending in August 1994. Samples were also collected for metals, anions, alkalinity, organics, and other radionuclides.

2524 (ORNL/ER–367) **Waste area Grouping 2 Phase I remedial investigation: Sediment and Cesium-137 transport modeling report.** Clapp, R.B.; Bao, Y.S.; Moore, T.D.; Brenkert, A.L.; Purucker, S.T.; Reece, D.K.; Burgoa, B.B. Oak Ridge National Lab., TN (United States). Jun 1996. 238p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012631. Source: OSTI; NTIS; INIS; GPO Dep.

This report is one of five reports issued in 1996 that provide follow-up information to the Phase I Remedial Investigation (RI) Report for Waste Area Grouping (WAG) 2 at Oak Ridge National Laboratory (ORNL). The five reports address areas of concern that may present immediate risk to public health at the Clinch River and ecological risk within WAG 2 at ORNL. A sixth report, on groundwater, in the series documenting WAG 2 RI Phase I results were part of project activities conducted in FY 1996. The five reports that complete activities conducted as part of Phase I of the Remedial Investigation (RI) for WAG 2 are as follows: (1) Waste Area Grouping 2, Phase I Task Data Report: Seep Data Assessment, (2) Waste Area Grouping 2, Phase I Task Data Report: Tributaries Data Assessment, (3) Waste Area Grouping 2, Phase I Task Data Report: Ecological Risk Assessment, (4) Waste Area Grouping 2, Phase I Task Data Report: Human Health Risk Assessment, (5) Waste Area Grouping 2, Phase I Task Data Report: Sediment and ^{137}Cs Transport Modeling In December 1990, the Remedial Investigation Plan for Waste Area Grouping 2 at Oak Ridge National Laboratory was issued (ORNL 1990). The WAG 2 RI Plan was structured with a short-term component to be conducted while upgradient WAGs are investigated and remediated, and a long-term component that will complete the RI process for WAG 2 following remediation of upgradient WAGs. RI activities for the short-term component were initiated with the approval of the Environmental Protection Agency, Region IV (EPA), and the Tennessee Department of Environment and Conservation (TDEC). This report presents the results of an investigation of the risk associated with possible future releases of ^{137}Cs due to an extreme flood. The results are based on field measurements made during storms and computer model simulations.

2525 (ORNL/ER–374) **Technical evaluation summary of the in situ vitrification melt expulsion at the Oak Ridge National Laboratory on April 21, 1996, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Jul 1996. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012828. Source: OSTI; NTIS; INIS; GPO Dep.

On April 21, 1996, at 6:12 PM, about 20 tons of molten glass were expelled from a 216-ton body of molten (1600 C) radioactively contaminated soil (containing 2.4 Ci ^{137}Cs) at an ORNL site. This was caused by pressurized steam venting rapidly through, rather than around, the molten body.

During the previous 17 days, an old seepage pit was undergoing in situ vitrification to convert porous, leachable soil into an impermeable waste form. Analyses revealed that 0.13 μCi of ^{137}Cs could have been released and would have delivered a hypothetical, unmeasurable dose of 0.02 μrem to the nearest private residence outside the Oak Ridge Reservation. The expelled glass particles, having a uniform specific activity of 1.2E-08 Ci/g, contained no smearable or transferrable activity. Thus, the overall environmental impact was insignificant. Fire damage was completely limited to the off-gas hood. Techniques were identified to minimize the probability of future melt expulsions.

2526 (ORNL/ER–377) **Technical evaluation of the in situ vitrification melt expulsion at the Oak Ridge National Laboratory on April 21, 1996, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States). Aug 1996. 96p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012820. Source: OSTI; NTIS; INIS; GPO Dep.

On April 21, 1996, at 6:12 p.m., approximately 20 tons of molten glass were expelled from a 216-ton body of molten (approximately 1600°C) radioactively contaminated soil (containing 2.4 Ci of ^{137}Cs) at a field site at the Oak Ridge National Laboratory in Oak Ridge, Tennessee. The melt expulsion was caused by pressurized steam venting rapidly through, rather than by the desired path around, the molten body. During the previous 17 days, an old seepage pit was undergoing in situ vitrification (ISV) to convert it from porous, leachable soil into a monolithic, impermeable vitreous waste form. Approximately 2 MW of electrical power was being delivered to the molten body, which was contained in the ground and covered with a stainless steel hood maintained under negative pressure to collect, filter, scrub, and monitor off-gas. Off-gas into the hood was rapidly heated by the melt expulsion from a typical operating temperature of 250°C to over 1000°C with an associated surge of pressure sufficient to lift the 15,000-lb hood approximately 12 in. off the ground. A small pool of molten glass was able to flow up to 3 ft outside the hood while it was raised off the ground. The escaping hot off-gas and molten glass ignited several small fires in combustible components near or attached to the external hood frame (e.g, wire insulation, plastic hose, fiberglass trays). Fire department personnel responded to the emergency notification within minutes but were not needed because the small fires self-extinguished within an hour. Four project personnel were performing tasks at the site at the time of the melt expulsion; none were injured or contaminated during the melt expulsion incident. Air samples taken from the hood perimeter near the small fires failed to detect any airborne contamination.

2527 (ORNL/ER/Sub–87-99053/75) **Site characterization report for the Old Hydrofracture Facility at Oak Ridge National Laboratory, Oak Ridge, Tennessee.** Oak Ridge National Lab., TN (United States); Bechtel National, Inc., Oak Ridge, TN (United States). Jan 1995. 219p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95013228. Source: OSTI; NTIS; INIS; GPO Dep.

Several Old Hydrofracture Facility (OHF) structures (i.e., Building 7852, the bulk storage bins, the pump house, water tank T-5, and pump P-3) are surplus facilities at Oak Ridge National Laboratory (ORNL) slated for decontamination and decommissioning (D and D). OHF was constructed in 1963 to allow experimentation and operations with an integrated solids storage, handling, mixing, and grout injection facility. It was shut down in 1980 and transferred to ORNL's Surveillance and Maintenance Program. The hydrofracture process was a unique disposal method that involved injecting waste materials mixed with grout and additives under pumping pressures of 2,000 psi or greater into a deep, low-permeability shale formation. The injected slurry spread along fractures and bedding planes for hundreds of feet from the injection points, forming thin grout sheets (often less than 1/8 in. thick). The grout ostensibly immobilized and solidified the liquid wastes. Site characterization activities were conducted in the winter and spring of 1994 to collect information necessary to plan the D and D of OHF structures. This site characterization report documents the results of the investigation of OHF D and D structures, presenting data from the field investigation and laboratory analyses in the form of a site description, as-built drawings, summary tables of radiological and chemical contaminant concentrations, and a waste volume estimate. 25 refs., 54 figs., 17 tabs.

2528 (ORNL/GWPO–013) **Lockheed Martin Energy Systems, Inc., Groundwater Program Office. Annual report for fiscal year 1994.** Oak Ridge National Lab., TN (United States). 30 Sep 1994. 99p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96002199. Source: OSTI; NTIS; INIS; GPO Dep.

This edition of the Lockheed Martin Energy Systems, Inc., (Energy Systems) Groundwater Program Annual Report summarizes the work carried out by the Energy Systems Groundwater Program Office (GWPO) for fiscal year (FY) 1994. The GWPO is responsible for coordination and oversight for all components of the groundwater programs at the three Oak Ridge facilities [Oak Ridge National Laboratory (ORNL), the Oak Ridge Y-12 Plant, and the Oak Ridge K-25 Site], as well as the Paducah and Portsmouth Gaseous Diffusion Plants (PGDP and PORTS, respectively.) This report describes the administrative framework of the GWPO including staffing, organization, and funding sources. In addition, summaries are provided of activities involving the Technical Support staff at the five facilities. Finally, the results of basic investigations designed to improve our understanding of the major processes governing groundwater flow and contaminant migration on the Oak Ridge Reservation (ORR) are reported. These investigations are conducted as part of the Oak Ridge Reservation Hydrology and Geology Studies (ORRHAGS) program. The relevance of these studies to the overall remediation responsibilities of Energy Systems is discussed.

2529 (ORNL/TM–12652) **The calibration and characterization of a research x-ray unit.** Johnson, C.M. Oak Ridge National Lab., TN (United States). Jun 1996. 80p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012445. Source: OSTI; NTIS; INIS; GPO Dep.

The proper characterization of an X-ray unit is necessary for the utilization of the source as a dosimetry calibration standard. Upon calibration, the X-ray unit can be used for X-ray calibrations of survey, diagnostic, and reference-class, instruments and for X-ray irradiations of personnel dosimeters. It was the goal of this research to provide the Radiation Calibration Laboratory at Oak Ridge National Laboratory with a characterized research X-ray unit that could be used in reference dosimetry. The energy spectra were characterized by performing half value layer measurements and by performing a spectral analysis. Two spectral reconstruction techniques were investigated and compared. One involved using a previously determined detector response matrix and a backstripping technique. The other reconstruction technique was developed for this research using neural computing. A neural network was designed and trained to reconstruct measured X-ray spectra from data collected with a high- purity germanium spectroscopy system. Five X-ray beams were successfully characterized and found to replicate the ANSI N13.11 and the National Institute of Standards Technology X-ray beam codes. As a result, these prepared X-ray beams have been used for reference dosimetry. It has been shown that a neural network can be used as a spectral reconstruction technique, which contributes less error to the lower energy portion of the spectrum than other techniques.

2530 (ORNL/TM–12790) **Third report on the Oak Ridge K-25 Site Biological Monitoring and Abatement Program for Mitchell Branch.** Hinzman, R.L. (ed.) (Oak Ridge National Lab., TN (United States)); Adams, S.M.; Ashwood, T.L. Oak Ridge National Lab., TN (United States); Oak Ridge K-25 Site, TN (United States). Aug 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96003220. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4305.

As a condition of the modified National Pollutant Discharge Elimination System (NPDES) permit issued to the Oak Ridge Gaseous Diffusion Plant (ORGDP; now referred to as the Oak Ridge K-25 Site) on September 11, 1986, a Biological Monitoring and Abatement Program (BMAP) was developed for the receiving stream (Mitchell Branch or K-1700 stream). On October 1, 1992, a renewed NPDES permit was issued for the K-25 Site. A biological monitoring plan was submitted for Mitchell Branch, Poplar Creek, Poplar Creek Embayment of the Clinch River and any unnamed tributaries of these streams. The objectives of BMAP are to (1) demonstrate that the effluent limitations established for the Oak Ridge K-25 Site protect and maintain the use of Mitchell Branch for growth and propagation of fish and other aquatic life and (2) document the effects on stream biota resulting from operation of major new pollution abatement facilities, including the Central Neutralization Facility (CNF) and the Toxic Substances Control Act (TSCA) incinerator. The BMAP consists of four tasks: (1) toxicity monitoring; (2) bioaccumulation monitoring; (3) assessment of fish health; and (4) instream monitoring of biological communities, including benthic macroinvertebrates and fish. This document, the third in a series, reports on the results of the Oak Ridge K-25 Site BMAP; it describes studies that were conducted over various periods of time between June 1990 and December 1993, although monitoring conducted outside this time period is included, as appropriate.

2531 (ORNL/TM–12884) **Report on the biological monitoring program for Bear Creek at the Oak Ridge Y-12 Plant, Oak Ridge, Tennessee, 1989-1994.** Hinzman, R.L. (ed.) (and others); Beauchamp, J.J.; Cada, G.F.; Peterson, M.J. Oak Ridge National Lab., TN (United States). Apr 1996. 207p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96014271. Source: OSTI; NTIS; INIS; GPO Dep.

The Bear Creek Valley watershed drains the area surrounding several closed Oak Ridge Y-12 Plant waste disposal facilities. Past waste disposal practices in the Bear Creek Valley resulted in the contamination of Bear Creek and consequent ecological damage. Ecological monitoring by the Biological Monitoring and Abatement Program (BMAP) was initiated in the Bear Creek watershed in May 1984 and continues at present. Studies conducted during the first year provided a detailed characterization of the benthic invertebrate and fish communities in Bear Creek. The initial characterization was followed by a biological monitoring phase in which studies were conducted at reduced intensities.

2532 (ORNL/TM–12926) **Strategic Environmental Research and Development Project FY 1994: Assessing national remote sensing technologies for use in US Department of Energy Environmental Restoration Activities, Oak Ridge Solid Waste Storage Area 4 case study.** King, A.L.; Smyre, J.L.; Evers, T.K. Oak Ridge National Lab., TN (United States). Feb 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95008962. Source: OSTI; NTIS; INIS; GPO Dep.

During FY 1994, the Oak Ridge Environmental Restoration (ER) Remote Sensing Program teamed with members of the Oak Ridge National Security Program Office (NSPO), the Environmental Research Institute of Michigan (ERIM) under contract to the National Exploitation Laboratory (NEL), the Oak Ridge Waste Area Group 4 (WAG 4) ER Program, and the US Department of Energy (DOE), Offices of Technology Development, Nonproliferation and National Security, and Environmental Restoration, to conduct a test and demonstration of the uses of national remote sensing technologies at DOE hazardous waste sites located in Oak Ridge, Tennessee. Objectives of the Oak Ridge study were to determine if national remote sensing technologies are useful in conducting prescreening, characterization, and/or monitoring activities to expedite the clean-up process at hazardous waste sites and to cut clean-up costs wherever possible. This project was sponsored by the Strategic Environmental Research and Development Project (SERDP).

2533 (ORNL/TM–12960) **Carbonate and citric acid leaching of uranium from uranium-contaminated soils: Pilot-scale studies (Phase II).** Wilson, J.H. (Oak Ridge National Lab., TN (United States)); Chernikoff, R.; DeMarco, W.D. Oak Ridge National Lab., TN (United States). Oct 1995. 198p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96002360. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this document is to describe the results of the soil decontamination demonstration conducted at the Fernald Environmental Management Project (FEMP) site by the Fernald Environmental Restoration and Management Corporation (FERMCO) and the Oak Ridge National Laboratory (ORNL). This demonstration, which began in November 1993 and ended in October 1994, involved the removal of uranium from contaminated soil sampled from two FEMP sites. The demonstration was conducted so as to meet the requirements of the Fernald Site Integrated Demonstration program, as well as all environmental, safety, and health requirements of the site.

2534 (ORNL/TM–12985) **Cost results from the 1994 Fernald characterization field demonstration for uranium-contaminated soils.** Douthat, D.M.; Stewart, R.N.; Armstrong, A.Q. Oak Ridge National Lab., TN (United States). Apr 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95012541. Source: OSTI; NTIS; INIS; GPO Dep.

One of the principal objectives of the US Department of Energy (DOE) Office of Technology Development is to develop an optimum integrated system of technologies for removing uranium substances from soil. This system of technologies, through demonstration, must be proven in terms of cost reduction, waste minimization, risk reduction, and user applicability. To evaluate the effectiveness of these technologies, a field demonstration was conducted at the Fernald site in the summer of 1994. Fernald was selected as the host site for the demonstration based on environmental problems stemming from past production of uranium metal for defense-related applications. The following six alternative technologies were developed and/or demonstrated by the principal investigators in the Characterization Task Group at the field demonstration: (1) beta scintillation detector by Pacific Northwest Laboratory (PNL), (2) in situ gamma detector by PNL, (3) mobile laser ablation-inductively coupled plasma/atomic emission spectrometry (LA-ICP/AES) laboratory by Ames Laboratory, (4) long-range alpha detector (LRAD) by Los Alamos National Laboratory (LANL), (5) passive radon monitoring by ORNL, and (6) electret ion chamber by ORNL.

2535 (ORNL/TM–13004) **Fixed capital investments for the uranium soils integrated demonstration soil treatment technologies.** Douthat, D.M. (Oak Ridge National Lab., TN (United States)); Armstrong, A.Q.; Stewart, R.N. Oak Ridge National Lab., TN (United States). May 1995. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95016126. Source: OSTI; NTIS; INIS; GPO Dep.

The development of a nuclear industry in the United States required mining, milling, and fabricating a large variety of uranium products. One of these products was purified uranium metal which was used in the Savannah River and Hanford Site reactors. Most of this feed material was produced at the United States Department of Energy (DOE) facility formerly called the Feed Materials Production Center at Fernald, Ohio. During operation of this facility, soils became contaminated with uranium from a variety of sources. To address remediation and management of uranium-contaminated soils at sites owned by DOE, the Uranium Soils Integrated Demonstration (USID) Program was formed to evaluate and compare the versatility, efficiency, and economics of various technologies that may be combined into systems designed to characterize and remediate uranium contaminated soils. The USID Program has five major tasks in developing and demonstrating these technologies. Each must be able to (1) characterize the uranium in soil, (2) decontaminate or remove uranium from soil, (3) treat or dispose of resulting waste streams, (4) meet necessary state and federal regulations, and (5) meet performance assessment objectives. The role of the performance assessment objectives is to provide the information necessary to conduct evaluations of the technologies. These performance assessments provide the basis for selecting the optimum system for remediation of large areas contaminated with uranium. One of the performance assessment tasks is to address the economics of full-scale implementation of soil treatment technologies developed by the USID Program. The cost of treating contaminated soil is one of the criteria used in the decision-making process for selecting remedial alternatives.

2536 (ORNL/TM–13029) **FY94 site characterization and multilevel well installation at a west Bear Creek Valley research site on the Oak Ridge Reservation.** Moline, G.R. (Oak Ridge National Lab., TN (United States). Environmental Sciences Div.); Schreiber, M.E. Oak Ridge National Lab., TN (United States). Mar 1996. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96010347. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication 4427.

The goals of this project are to collect data that will assist in determining what constitutes a representative groundwater sample in fractured shale typical of much of the geology underlying the ORR waste disposal sites, and to determine how monitoring-well construction and sampling methods impact the representativeness of the sample. This report details the FY94 field activities at a research site in west Bear Creek Valley on the Oak Ridge Reservation (ORR). These activities funded by the Energy Systems Groundwater Program Office through the Oak Ridge Reservation Hydrologic and Geologic Studies (ORRHAGS) task, focus on developing appropriate sampling protocols for the type of fractured media that underlies many of the ORR waste disposal sites. Currently accepted protocols were developed for porous media and are likely to result in nonrepresentative samples in fractured systems.

2537 (ORNL/TM–13033) **Wetland survey of selected areas in the K-24 Site Area of responsibility.** Rosensteel, B.A. (JAYCOR, Environmental Division, Oak Ridge, TN (United States)); Awl, D.J. Oak Ridge National Lab., TN (United States). Jul 1995. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95017194. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Sciences Division Publication No. 4429.

In accordance with DOE Regulations for Compliance with Floodplain/Wetlands Environmental Review Requirements, wetland surveys were conducted in selected areas within the K-25 Area of Responsibility during the summer of 1994. These areas are Mitchell Branch, Poplar Creek, the K-770 OU, Duct Island Peninsula, the Powerhouse area, and the K-25 South Corner. Previously surveyed areas included in this report are the main plant area of the K-25 Site, the K-901 OU, the AVLIS site, and the K-25 South Site. Wetland determinations were based on the USACE methodology. Forty-four separate wetland areas, ranging in size from 0.13 to 4.23 ha, were identified. Wetlands were identified in all of the areas surveyed with the exception of the interior of the Duct Island Peninsula and the main plant area of the K-25 Site. Wetlands perform functions such as floodflow alteration, sediment stabilization, sediment and toxicant retention, nutrient transformation, production export, and support of aquatic species and wildlife diversity and abundance. The forested, scrub-shrub, and emergent wetlands identified in the K-25 area perform some or all of these functions to varying degrees.

2538 (ORNL/TM–13113) **W-12 valve pit decontamination demonstration.** Benson, C.E.; Parfitt, J.E.; Patton, B.D. Oak Ridge National Lab., TN (United States). Dec 1995. 13p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006671. Source: OSTI; NTIS; INIS; GPO Dep.

Waste tank W-12 is a tank in the ORNL Low-Level Liquid Waste (LLLW) system that collected waste from Building 3525. Because of a leaking flange in the discharge line from W-12 to the evaporator service tank (W-22) and continual inleakage into the tank from an unknown source, W-12 was removed from service to comply with the Federal Facilities Agreement requirement. The initial response was to decontaminate the valve pit between tank W-12 and the evaporator service tank (W-22) to determine if personnel could enter the pit to attempt repair of the leaking flange.

Preventing the spread of radioactive contamination from the pit to the environment and to other waste systems was of concern during the decontamination. The drain in the pit goes to the process waste system; therefore, if high-level liquid waste were generated during decontamination activities, it would have to be removed from the pit by means other than the available liquid waste connection. Remote decontamination of W-12 was conducted using the General Mills manipulator bridge and telescoping trolley and REMOTEC RM-10 manipulator. The initial objective of repairing the leaking flange was not conducted because of the repair uncertainty and the unknown tank inleakage. Rather, new piping was installed to empty the W-12 tank that would bypass the valve pit and eliminate the need to repair the flange. The radiological surveys indicated that a substantial decontamination factor was achieved.

2539 (ORNL/TM–13156) **Chemically enhanced mixed region vapor stripping of TCE-contaminated saturated peat and silty clay soils.** West, O.R.; Cameron, P.A.; Lucero, A.J.; Koran, L.J. Jr. Oak Ridge National Lab., TN (United States). Jan 1996. 74p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE96006023. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this study was to conduct further testing of MRVS, chemically enhanced with calcium oxide conditioning, on field- contaminated soils collected from beneath the NASA Michoud Rinsewater Impoundment. In this study, residual soil VOC levels as a function of vapor stripping time were measured to quantify VOC removal rates. Physical and chemical soil parameters expected to affect MRVS efficiency were measures. The effects of varying the calcium oxide loadings as well as varying the vapor stripping flow rates on VOC removal were also evaluated. The results of this study will be used to determine whether acceptable removals can be achieved within reasonable treatment times, remediation costs being directly proportional to the latter. The purpose of this report is to document the experimental results of this study, as well as to address issues that were raised after completion of the previous Michoud treatability work.

2540 (PNL–6415-Rev.7) **Hanford Site National Environmental Policy Act (NEPA) characterization. Revision 7.** Cushing, C.E. (ed.) (and others); Baker, D.A.; Chamness, M.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 250p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017595. Source: OSTI; NTIS; GPO Dep.

This seventh revision of the Hanford Site National Environmental Policy (NEPA) Characterization presents current environmental data regarding the Hanford Site and its immediate environs. This information is intended for use in preparing Site-related NEPA documentation. Chapter 4.0 summarizes up-to-date information on climate and meteorology, geology, hydrology, environmental monitoring, ecology, history and archaeology, socioeconomics, land use, and noise levels prepared by Pacific Northwest Laboratory (PNL) staff. More detailed data are available from reference sources cited or from the authors. Chapter 5.0 was not updated from the sixth revision (1994). It describes models, including their principal underlying assumptions, that are to be used in simulating realized or potential impacts from nuclear materials at the Hanford Site. Included are models of radionuclide transport in groundwater and atmospheric pathways, and of radiation dose to populations via all known pathways from known initial conditions. The updated Chapter 6.0 provides the preparer with the federal and state regulations, DOE Orders and permits, and environmental standards directly applicable to the NEPA documents on the Hanford Site, following the structure of Chapter 4.0. No conclusions or recommendations are given in this report. Rather, it is a compilation of information on the Hanford Site environment that can be used directly by Site contractors. This information can also be used by any interested individual seeking baseline data on the Hanford Site and its past activities by which to evaluate projected activities and their impacts.

2541 (PNL–7722-Rev.2-Add.1) **[DOE method for evaluating environmental and waste management samples: Revision 1, Addendum 1].** Goheen, S.C. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 385p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95014291. Source: OSTI; NTIS; INIS; GPO Dep.

The US Dapartment of Energy's (DOE's) environmental and waste management (EM) sampling and analysis activities require that large numbers of samples be analyzed for materials characterization, environmental surveillance, and site-remediation programs. The present document, DOE Methods for Evaluating Environmental and Waste Management Samples (DOE Methods), is a supplemental resource for analyzing many of these samples.

2542 (PNL–9224) **Initial field test of High-Energy Corona process for treating a contaminated soil-offgas stream.** Shah, R.R.; Garcia, R.E.; Jeffs, J.T.; Virden, J.W.; Heath, W.O. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010721. Source: OSTI; NTIS; INIS; GPO Dep.

The High-Energy Corona (HEC) technology for treating process offgases has been under development at Pacific Northwest Laboratory (PNL) since 1991. The HEC process uses high-voltage electrical discharges in air to ionize the air, forming a low-temperature plasma that would be expected to destroy a wide variety of organic compounds in air. The plasma contains strong oxidants, possibly including hydroxyl radicals, hydroperoxy radicals, superoxide radicals, various excited as well as ionized forms of oxygen, high-energy electrons, and ultraviolet (UV) light. Because the high-voltage plasma is produced near ambient temperatures and pressures, yet exhibits extremely rapid destruction kinetics with relatively low power requirements, the HEC technique appears promising as a low-cost treatment technique (Virden et al. 1992). As part of the Volatile Organic Compound (VOC) Nonarid Integrated Demonstration (ID) at the DOE Savannah River Site, research activities were initiated in December 1991 to develop a prototype HEC process for a small-scale field demonstration to treat a soil-offgas stream contaminated with trichloroethylene (TCE) and perchloroethylene (PCE) at varying concentrations. Over an 18-month period, the HEC technology was developed on a fast track, through bench and pilot scales into a trailer-mounted system that was tested at the Nonarid ID. Other national laboratories, universities, and private companies have also participated at the Nonarid ID to demonstrate a number of conventional, emerging and innovative approaches for treating the same soil-offgas stream.

2543 (PNL–10363) **Data fusion analysis of a surface direct-current resistivity and well pick data set.** Clayton, E.A.; Lewis, R.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 42p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000715. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL) has been tasked with testing, debugging, and refining the Hanford Site data fusion workstation (DFW), with the assistance of Coleman Research Corporation (CRC), before delivering the DFW to the environmental restoration client at the Hanford Site. Data fusion is the mathematical combination (or fusion) of disparate data sets into a single interpretation. The data fusion software used in this study was developed by CRC. This report discusses the results of evaluating a surface direct-current (dc) resistivity and well-pick data set using two methods: data fusion technology and commercially available software (i.e., RESIX Plus from Interpex Ltd., Golden, Colorado), the conventional method of analysis. The report compares the two technologies; describes the survey, procedures, and results; and includes conclusions and recommendations. The surface dc resistivity and well-pick data set had been acquired by PNL from a study performed in May 1993 at Eielson Air Force Base near Fairbanks, Alaska. The resistivity survey data were acquired to map the top of permafrost in support of a hydrogeologic study. This data set provided an excellent opportunity to test and refine the dc resistivity capabilities of the DFW; previously, the data fusion software was untested on dc resistivity data. The DFW was used to evaluate the dc resistivity survey data and to produce a 3-dimensional earth model of the study area.

2544 (PNL--10393) **Data fusion qualitative sensitivity analysis.** Clayton, E.A.; Lewis, R.E. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 155p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000810. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory was tasked with testing, debugging, and refining the Hanford Site data fusion workstation (DFW), with the assistance of Coleman Research Corporation (CRC), before delivering the DFW to the environmental restoration client at the Hanford Site. Data fusion is the mathematical combination (or fusion) of disparate data sets into a single interpretation. The data fusion software used in this study was developed by CRC. The data fusion software developed by CRC was initially demonstrated on a data set collected at the Hanford Site where three types of data were combined. These data were (1) seismic reflection, (2) seismic refraction, and (3) depth to geologic horizons. The fused results included a contour map of the top of a low-permeability horizon. This report discusses the results of a sensitivity analysis of data fusion software to variations in its input parameters. The data fusion software developed by CRC has a large number of input parameters that can be varied by the user and that influence the results of data fusion. Many of these parameters are defined as part of the earth model. The earth model is a series of 3-dimensional polynomials with horizontal spatial coordinates as the independent variables and either subsurface layer depth or values of various properties within these layers (e.g., compression wave velocity, resistivity) as the dependent variables.

2545 (PNL--10397) **Concentrations of radionuclides in terrestrial vegetation on the Hanford site of potential interest to Native Americans.** Poston, T.M. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95010422. Source: OSTI; NTIS; INIS; GPO Dep.

Concentrations of ^{90}Sr and ^{137}Cs in Carey's balsamroot (Balsamorhiza careyana) and Gray's desert parsley (Lomatium grayi) were similar to concentrations observed in other plants collected on the Hanford Site and from offsite locations surrounding the Site as part of annual Hanford Site surveillance. Observed concentrations may be attributed to historic fallout more than to Hanford Site emissions, although the observation that 200 Area plants had slightly higher concentrations of ^{137}Cs than 100 Area plants is consistent with other monitoring data of radioactivity in soil and vegetation collected onsite. The present concentrations of ^{90}Sr and ^{137}Cs in balsamroot and parsley fluctuate around background levels with some of the higher observed concentrations of ^{90}Sr found on the Fitzner/Eberhardt Arid Lands Ecology (ALE) Reserve. Analytical results and summary statistics by species and location are presented in the appendixes.

2546 (PNL--10450) **Description of source term data on contaminated sites and buildings compiled for the waste management programmatic environmental impact statement (WMPEIS).** Short, S.M.; Smith, D.E.; Hill, J.G.; Lerchen, M.E. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 500p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002670. Source: OSTI; NTIS; INIS; GPO Dep.

The U.S. Department of Energy (DOE) and its predecessor agencies have historically had responsibility for carrying out various national missions primarily related to nuclear weapons development and energy research. Recently, these missions have been expanded to include remediation of sites and facilities contaminated as a result of past activities. In January 1990, the Secretary of Energy announced that DOE would prepare a Programmatic Environmental Impact Statement on the DOE's environmental restoration and waste management program; the primary focus was the evaluation of (1) strategies for conducting remediation of all DOE contaminated sites and facilities and (2) potential configurations for waste management capabilities. Several different environmental restoration strategies were identified for evaluation, ranging from doing no remediation to strategies where the level of remediation was driven by such factors as final land use and health effects. A quantitative assessment of the costs and health effects of remediation activities and residual contamination levels associated with each remediation strategy was made. These analyses required that information be compiled on each individual contaminated site and structure located at each DOE installation and that the information compiled include quantitative measurements and/or estimates of contamination levels and extent of contamination. This document provides a description of the types of information and data compiled for use in the analyses. Also provided is a description of the database used to manage the data, a detailed discussion of the methodology and assumptions used in compiling the data, and a summary of the data compiled into the database as of March 1995. As of this date, over 10,000 contaminated sites and structures and over 8,000 uncontaminated structures had been identified across the DOE complex of installations.

2547 (PNL--10534) **Uranium characterization at the St. Louis Airport Site.** Schilk, A.J. (Pacific Northwest Lab., Richland, WA (United States)); Hubbard, C.W.; Bowyer, T.W.; Reiman, R.T. Pacific Northwest Lab., Richland, WA (United States). May 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012232. Source: OSTI; NTIS; INIS; GPO Dep.

In support of the Department of Energy/Office of Technology Development's Expedited Site Characterization (ESC) project (coordinated by Ames Laboratory), the Pacific Northwest Laboratory demonstrated two complementary technologies at the St. Louis Airport (SLAP) site that have been designed and optimized for the rapid, in situ quantification of radionuclide contamination in surface soils. The sensors are optimized for the detection of high-energy beta particles or gamma rays emitted from the decay of specific radionuclides of interest. These technologies were demonstrated by measuring the beta and gamma fluxes at several locations within the SLAP site. Measurements were converted to average contamination levels, using detector calibrations performed with spiked samples (beta) or sealed sources (gamma). Additionally, subsurface activity levels were derived from discrete soil samples (provided by the ESC field crew) via gamma-ray spectrometry in a controlled laboratory setting. Since the beta and gamma sensor technologies are intrinsically sensitive to different types of radiation and activity distributions (i.e., surface and shallow subsurface, respectively), the data obtained from the two detectors provide complementary information about the distribution of the contamination. The results reported here suggest that a number of locations within the SLAP site have elevated levels of ^{211}U, and the differences between the beta and gamma activities indicate that the contamination is largely located near the surface of the soil.

2548 (PNL–10550) **Environmental settings for selected US Department of Energy installations - support information for the programmatic environmental impact statement and the baseline environmental management report.** Holdren, G.R.; Glantz, C.S.; Berg, L.K.; Delinger, K.; Fosmire, C.J.; Goodwin, S.M.; Rustad, J.R.; Schalla, R.; Schramke, J.A. Pacific Northwest Lab., Richland, WA (United States). May 1995. 458p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95012478. Source: OSTI; NTIS; INIS; GPO Dep.

This report contains the environmental setting information developed for 25 U.S. Department of Energy (DOE) installations in support of the DOE's Programmatic Environmental Impact Study (PEIS) and the Baseline Environmental Management Report (BEMR). The common objective of the PEIS and the BEMR is to provide the public with information about the environmental contamination problems associated with major DOE facilities across the country, and to assess the relative risks that radiological and hazardous contaminants pose to the public, onsite workers, and the environment. Environmental setting information consists of the site-specific data required to model (using the Multimedia Environmental Pollutant Assessment System) the atmospheric, groundwater, and surface water transport of contaminants within and near the boundaries of the installations. The environmental settings data describes the climate, atmospheric dispersion, hydrogeology, and surface water characteristics of the installations. The number of discrete environmental settings established for each installation was governed by two competing requirements: (1) the risks posed by contaminants released from numerous waste sites were to be modeled as accurately as possible, and (2) the modeling required for numerous release sites and a large number of contaminants had to be completed within the limits imposed by the PEIS and BEMR schedule. The final product is the result of attempts to balance these competing concerns in a way that minimizes the number of settings per installation in order to meet the project schedule while at the same, time providing adequate, if sometimes highly simplified, representations of the different areas within an installation. Environmental settings were developed in conjunction with installation experts in the fields of meteorology, geology, hydrology, and geochemistry.

2549 (PNL–10620) **Tritium radioluminescent devices, Health and Safety Manual.** Traub, R.J.; Jensen, G.A. Pacific Northwest Lab., Richland, WA (United States). Jun 1995. 133p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015815. Source: OSTI; NTIS; INIS; GPO Dep.

This document consolidates available information on the properties of tritium, including its environmental chemistry, its health physics, and safe practices in using tritium-activated RL lighting. It also summarizes relevant government regulations on RL lighting. Chapters are divided into a single-column part, which provides an overview of the topic for readers simply requiring guidance on the safety of tritium RL lighting, and a dual-column part for readers requiring more technical and detailed information.

2550 (PNL–10633) **Geologic, geochemical, microbiologic, and hydrologic characterization at the In Situ Redox Manipulation Test Site.** Vermeul, V.R. (and others); Teel, S.S.; Amonette, J.E. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 159p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95015839. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents results from characterization activities at the In Situ Redox Manipulation (ISRM) Field Test Site which is located within the 100-HR-3 Operable Unit of the US Department of Energy's (DOE's) Hanford Site in Richland, Washington. Information obtained during hydrogeologic characterization of the site included sediment physical properties, geochemical properties, microbiologic population data, and aquifer hydraulic properties. The purpose of obtaining this information was to improve the conceptual understanding of the hydrogeology beneath the ISRM test site and provide detailed, site specific hydrogeologic parameter estimates. The resulting characterization data will be incorporated into a numerical model developed to simulate the physical and chemical processes associated with the field experiment and aid in experiment design and interpretation.

2551 (PNL–10635) **Review of alternative residual contamination guides for the 324 Building B-Cell Cleanout Project. Phase 1.** Vargo, G.J.; Durham, J.S.; Brackenbush, L.W. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000199. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a proposed residual contamination guide (RCG) for the 324 Building B-Cell Cleanout Project, Phase 1, at the Hanford Site. The RCG is expressed as a fraction of the amount of highly dispersible radioactive material that would result in offsite doses equal to the Pacific Northwest Laboratory radiological risk guidelines following the worst credible accident scenario for release of the holdup material. The proposed RCG is 10^{-1} to 10^{-2} of the PNL radiological risk guidelines. As part of the development of the RCG, a number of factors were considered. These include the need to provide an appropriate level of flexibility for other activities within the 324 Building that could contribute to the facility's overall radiological risk, uncertainties inherent in safety analyses, and the possible contribution of other 300 Area facilities to overall radiological risk. Because of these factors and the nature of the cleanout project, the RCG is expressed as a range rather than a point value. This report also provides guidance on determining conformance to the RCG, including inspection and measurement techniques, quality assurance requirements, and consideration of uncertainty.

2552 (PNL–10688) **Subsidence above in situ vitrification: Evaluation for Hanford applications.** Dershowitz, W.S. (Golder Associates, Inc., Redmond, WA (United States)); Plum, R.L.; Luey, J. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017601. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest Laboratory (PNL)is evaluating methods to extend the applicability of the in situ vitrification (ISV) process. One method being evaluated is the initiation of the ISV process in the soil subsurface rather than the traditional start from the surface. The subsurface initiation approach will permit extension of the ISV treatment depth beyond that currently demonstrated and allow selective treatment of contamination in a geologic formation. A potential issue associated with the initiation of the ISV process in the soil subsurface is the degree of subsidence and its effect on the ISV process. The reduction in soil porosity caused by the vitrification process will result in a volume decrease for the vitrified soils. Typical volume reduction observed for ISV melts initiated at the surface are on the order of 20% to 30% of the melt thickness. Movement of in-situ materials into the void space created during an ISV application in the soil subsurface could result in surface settlements that affect the ISV process and the processing equipment. Golder Associates, Inc., of Redmond, Washington investigated the potential for subsidence events during application of ISV in the soil subsurface. Prediction of soil subsidence above an ISV melt required the following analyses: the effect of porosity reduction during ISV, failure of fused materials surrounding the ISV melt, bulking of disturbed materials above the melt, and propagation of strains to the surface.

2553 (PNL–10692) **AREST-CT V1.0 software verification.** Chen, Y.; Engel, D.W.; McGrail, B.P.; Lessor, K.S. Pacific Northwest Lab., Richland, WA (United States). Jul 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95017596. Source: OSTI; NTIS; INIS; GPO Dep.

The Analyzer for Radionuclide Source-Term with Chemical Transport (AREST-CT) is a scientific computer code designed for performance assessments of engineered barrier system (EBS) concepts for the underground storage of nuclear waste, including high-level, intermediate, and low-level wastes. The AREST-CT code has features for analyzing the degradation of and release of radionuclides from the waste form, chemical reactions that depend on time and space, and transport of the waste and other products through the EBS. This document provides a description of the verification testing that has been performed on the initial version of ARESTCT (V1.0). Software verification is the process of confirming that the models and algorithms have been correctly implemented into a computer code. Software verification for V1.0 consisted of testing the individual modules (unit tests) and a test of the fully-coupled model (integration testing). The integration test was done by comparing the results from AREST-CT with the results from the reactive transport code CIRF.A. The test problem consisted of a 1-D analysis of the release, transport, and precipitation of $^{99}T_c$in an idealized LLW disposal system. All verification tests showed that AREST-CT works properly and in accordance with design specifications.

2554 (PNL–10754) **Sedimentation models.** Rector, D.R.; Bunker, B.C. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000748. Source: OSTI; NTIS; INIS; GPO Dep.

The nuclear wastes currently stored in tanks at the Hanford site contain complex mixtures of insoluble sludge particles, salts, and supernatant liquids. Treatment and ultimate disposal of these tank wastes will require that the complex solid-liquid mixtures be dispersed in aqueous solutions for retrieval and transport. The mixtures will then require pretreatment steps that will ultimately require the isolation of insoluble particles from supernatant liquids via solid-liquid separation steps such as settle-decant operations, centrifugation, or filtration. There is a perception that sludge treatment in general, and solid-liquid separations in particular, are relatively trivial operations that can easily be transferred to private industry to initiate tank cleanup. Experiences gained over the past few years at Hanford suggest that waste processing is not as trivial as it seems.

2555 (PNL–10765) **Removal of strontium and transuranics from Hanford waste via hydrothermal processing – FY 1994/95 test results.** Orth, R.J. (Pacific Northwest Lab., Richland, WA (United States)); Schmidt, A.J.; Elmore, M.R.; Hart, T.R.; Neuenschwander, G.G.; Gano, S.R.; Lehmann, R.W.; Momont, J.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 90p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000729. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Tank Waste Remediation System (TWRS) Pretreatment Technology Development Project, Pacific Northwest Laboratory (PNL) is evaluating and developing organic destruction technologies that may be incorporated into the Initial Pretreatment Module (IPM) to treat Hanford tank waste. Organic (and ferrocyanide) destruction removes the compounds responsible for waste safety issues, and conditions the supernatant for low-level waste disposal by removing compounds that may be responsible for promoting strontium and transuranic (TRU) components solubility. Destruction or defunctionalization of complexing organics in tank wastes eliminates organic species that can reduce the efficiency of radionuclide (E.g., ^{90}Sr) separation processes, such as ion exchange, solvent extraction, and precipitation. The technologies being evaluated and tested for organic destruction are low-temperature hydrothermal processing (HTP) and wet air oxidation (WAO). Four activities are described: Batch HTP/WAO testing with Actual Tank Waste (Section 3.0), Batch HTP Testing with Simulant (Section 4.0), Batch WAO testing with Simulant (Section 5.0), and Continuous Bench-scale WAO Testing with Simulant (Section 6.0). For each of these activities, the objectives, test approach, results, status, and direction of future investigations are discussed. The background and history of the HTP/WAO technology is summarized below. Conclusions and Recommendations are provided in Section 2.0. A continuous HTP off-gas safety evaluation conducted in FY 1994 is included as Appendix A.

2556 (PNL–10800) **Calibration models for density borehole logging - construction report.** Engelmann, R.E.; Lewis, R.E.; Stromswold, D.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001888. Source: OSTI; NTIS; INIS; GPO Dep.

Two machined blocks of magnesium and aluminum alloys form the basis for Hanford's density models. The blocks provide known densities of 1.780 $\pm$ 0.002 g/cm^3 and 2.804 $\pm$ 0.002 g/cm^3 for calibrating borehole logging tools that measure density based on gamma-ray scattering from a source in the tool. Each block is approximately 33 x 58 x 91 cm (13 x 23 x 36 in.) with cylindrical grooves cut into the sides of the blocks to hold steel casings of inner diameter 15 cm (6 in.) and 20 cm (8 in.). Spacers that can be inserted between the blocks and casings can create air gaps of thickness 0.64, 1.3, 1.9, and 2.5 cm (0.25, 0.5, 0.75 and 1.0 in.), simulating air gaps that can occur in actual wells from hole enlargements behind the casing.

2557 (PNL–10801) **Calibration models for measuring moisture in unsaturated formations by neutron logging.** Engelman, R.E. (and others); Lewis, R.E.; Stromswold, D.C. Pacific Northwest Lab., Richland, WA (United States). Oct 1995. 30p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96001804. Source: OSTI; NTIS; INIS; GPO Dep.

Calibration models containing known amounts of hydrogen have been constructed to simulate unsaturated earth formations for calibrating neutron well logging tools. The models are made of dry mixtures of hydrated alumina ($Al(OH)_3$) with either silica sand (SiO_2) or aluminum oxide (Al_2O_3). Hydrogen in the hydrated alumina replaces the hydrogen in water for neutron scattering, making it possible to simulate partially saturated formations. The equivalent water contents for the models are 5%, 12%, 20%, and 40% by volume in seven tanks that have a diameter of 1.5 m and a height of 1.8 m. Steel casings of inside diameter 15.4 cm (for three models) and diameter 20.3 cm (for four models) allow logging tool access to simulate logging through cased boreholes.

2558 (PNL-SA–23193) **A tube-excited x-ray fluorescence spectrometer for use in small-diameter boreholes.** Reeves, J.H.; Arthur, R.J.; Brodzinski, R.L.; Shepard, C.L. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-940401–17: International conference on methods and applications of radioanalytical chemistry, Kona, HI (United States), 10-16 Apr 1994). Order Number DE95011411. Source: OSTI; NTIS; GPO Dep.

A portable in-situ x-ray fluorescence analytical system that uses an x-ray tube excitation source and a cooled Si(Li) spectrometer for detecting characteristic emission x rays has been developed for use in small-diameter wells and boreholes. The 15-watt, iron-anode x-ray tube operates up to 30 kV. Three wells at the Sandia National Laboratory Chemical Waste Landfill, lined with 76 μ thick polyethylene, were logged specifically for Cr contamination. Detection limits below 50 ppM were achieved with counting intervals of 600 seconds and with the Si(Li) detector operating at 450-eV resolution (full width at half maximum [FWHM] for the Mn K-alpha x ray).

2559 (PNL-SA–24280) **Deploying in situ bioremediation at the Hanford Site.** Truex, M.J.; Johnson, C.D.; Newcomer, D.R.; Doremus, L.A.; Hooker, B.S.; Peyton, B.M.; Skeen, R.S.; Chilakapati, A. Pacific Northwest Lab., Richland, WA (United States). Nov 1994. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-941124–23: 33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies, Richland, WA (United States), 7-11 Nov 1994). Order Number DE95014625. Source: OSTI; NTIS; INIS; GPO Dep.

An innovative in-situ bioremediation technology was developed by Pacific Northwest Laboratory (PNL) to destroy nitrate and carbon tetrachloride ($CC1_4$) in the Hanford ground water. The goal of this in-situ treatment process is to stimulate native microorganisms to degrade nitrate and CCl_4. Nutrient solutions are distributed in the contaminated aquifer to create a biological treatment zone. This technology is being demonstrated at the US Department of Energy's Hanford Site to provide the design, operating, and cost information needed to assess its effectiveness in contaminated ground water. The process design and field operations for demonstration of this technology are influenced by the physical, chemical, and microbiological properties observed at the site. A description of the technology is presented including the well network design, nutrient injection equipment, and means for controlling the hydraulics and microbial reactions of the treatment process.

2560 (PNL-SA–25501) **Radiation screening of excavated waste at Hanford's 118-B-1 burial site.** Stromswold, D.C. (Pacific Northwest Lab., Richland, WA (United States)); Alvarez, J.L.; Davis, A.I.; Duce, S.W.; Frain, J.; Ludowise, J.D. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 27p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950495–1: 7. national technology information exchange workshop, Cincinnati, OH (United States), 18-20 Apr 1995). Order Number DE95010724. Source: OSTI; NTIS; INIS; GPO Dep.

Radiation measurements on items excavated from a radioactive-waste burial ground were part of a field test of excavation, radiation screening, and waste sorting techniques being evaluated for the cleanup of Hanford burial sites. The radiation measurements investigated techniques for classifying bulk waste for placement into an environmental restoration disposal facility. Hand-held gamma-ray survey instruments measured exposure rates (mR/h) from contaminated dirt and radioactive objects as they were removed by heavy excavation equipment. Gamma-ray detectors mounted on the excavation equipment provided additional data that were transmitted by radio telemetry. Exposure rates from identifiable objects (e.g., specific reactor components) were compared with expected exposure rates calculated from site-disposal records and computer modeling. Selected objects were subjected to additional on-site measurements using a high-purity germanium detector. The germanium detector enabled specific radioisotope identification based on gamma-ray energies. It also provided a measure of the concentration of gamma-ray-emitting contaminants in soils and the activity of specific objects, based on prior calibration for both distributed and point sources. A large-area neutron detector checked for possible transuranic nuclides. Alpha and beta spectrometry also were tested, but their utility for this application was limited due to the short range of the particles and the difficulty of maintaining a repeatable measurement geometry in field measurements.

2561 (PNL-SA-25532) **Changing methodology for measuring airborne radioactive discharges from nuclear facilities.** Glissmeyer, J.A.; Ligotke, M.W. Pacific Northwest Lab., Richland, WA (United States). May 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9505101-8: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE95014184. Source: OSTI; NTIS; INIS; GPO Dep.

The US Environmental Protection Agency (USEPA) requires that measurements of airborne radioactive discharges from nuclear facilities be performed following outdated methods contained in the American National Standards Institute (ANSI) N13.1-1969 Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities. Improved methods are being introduced via two paths. First, the ANSI standard is being revised, and second, EPA's equivalency granting process is being used to implement new technology on a case-by-case or broad basis. The ANSI standard is being revised by a working group under the auspices of the Health Physics Society Standards Committee. The revised standard includes updated methods based on current technology and a performance-based approach to design. The performance-based standard will present new challenges, especially in the area of performance validation. Progress in revising the standard is discussed. The US Department of Energy recently received approval from the USEPA for an alternate approach to complying with air-sampling regulations. The alternate approach is similar to the revised ANSI standard. New design tools include new types of sample extraction probes and a model for estimating line-losses for particles and radioiodine. Wind tunnel tests are being performed on various sample extraction probes for use at small stacks. The data show that single-point sampling probes are superior to ANSI-NI3.1-1969 style multiple-point sample extraction probes.

2562 (PNL-SA-25878) **Pollution prevention electronic design guideline: A tool for identifying pollution prevention in facility design.** Greitzer, F.L. (Pacific Northwest Lab., Richland, WA (United States)); Brown, B.W.; Dorsey, J.A.; Raney, E.A. Pacific Northwest Lab., Richland, WA (United States). Aug 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-9508193-1: 4. American Defense Preparedness Association Air Force pollution prevention conference, San Antonio, TX (United States), 14-17 Aug 1995). Order Number DE96002493. Source: OSTI; NTIS; GPO Dep.

The Pacific Northwest Laboratory has developed a tool to assist in incorporating pollution prevention opportunities into the design of federal facilities. The Pollution Prevention Environmental Design Guide for Engineers (P2-EDGE) was developed for the US Department of Energy (prior to its release this summer it had been referred to as the P2 electronic design guideline. P2-EDGE contains a database of 267 opportunities intended to help a decisionmaker (designer, engineer, or project manager) evaluate the applicability and potential benefits of implementing pollution prevention in a particular project. The P2-EDGE database was derived from both DOE and non-DOE sources including pollution prevention literature, industrial design personnel, and federal, state, and DOE sources. A key feature of the tool is the integration of photos, illustrations, and documentation to provide easy access to technical information on specific waste minimization opportunities in design.

2563 (PNL-SA-25908) **Ultra wide band radar holographic imaging of buried waste at DOE sites.** Collins, H.D.; Gribble, R.P.; Hall, T.E.; Lechelt, W.M. Pacific Northwest Lab., Richland, WA (United States). Apr 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950450-12: 8. annual symposium on the application of geophysics to environmental and engineering problems, Orlando, FL (United States), 23-27 Apr 1995). Order Number DE95014618. Source: OSTI; NTIS; INIS; GPO Dep.

Ultra wideband linear array holography is a unique real-time imaging technique for in-situ inspection of buried waste at various DOE sites. The array can be mounted on various platforms such as crane booms, pickup trucks, ATVs, and scanned generating "3-D" subsurface images in real time. Inspection speeds are 0.5 to 2 meters/sec, if the image is viewed in real time, greater for off-line processing. The Ground Penetrating Holographic (GPH) system developed for inspection of DOE sites employs two 32element arrays of tapered-slot antenna operating at 5-GHz and 2.5-GHz center frequencies. The GPH system, which is mounted on a small trailer with a computer image processor, display, and power supply, is capable of imaging a wide swath (1 to 2 meters) with its linear arrays. The lower frequency array will be used at INEL (for greater depth penetration) because of high soil attenuation. Recent holographic "3-D" images of buried waste container lids and dielectrics obtained in Hanford sand and INEL soils at various depths graphically illustrate the unique image resolution capabilities of the system. Experimental results using the 5-GHz array will be presented showing the excellent holographic image quality of various subsurface targets in sand and INEL soil.

2564 (PNNL-10911) **Possible stakeholder concerns regarding volatile organic compound in arid soils integrated demonstration technologies not evaluated in the stakeholder involvement program.** Peterson, T. (Battelle Seattle Research Center, WA (United States)). Pacific Northwest Lab., Richland, WA (United States). Dec 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (BSRC-800/95/022). Order Number DE96006113. Source: OSTI; NTIS; INIS; GPO Dep.

The Volatile Organic Compounds in Arid Soils Integrated Demonstration (VOC-Arid ID) supported the demonstration of a number of innovative technologies, not all of which were evaluated in the integrated demonstration's stakeholder involvement program. These technologies have been organized into two categories and the first category ranked in order of priority according to interest in the evaluation of the technology. The purpose of this report is to present issues stakeholders would likely raise concerning each of the technologies in light of commentary, insights, data requirements, concerns, and recommendations offered during the VOC-Arid ID's three-year stakeholder involvement, technology evaluation program. A secondary purpose is to provide a closeout status for each of the technologies associated with the VOC-Arid ID. This report concludes with a summary of concerns and requirements that stakeholders have for all innovative technologies.

2565 (PNNL–10915) **Stakeholder acceptance analysis: Passive soil vapor extraction using borehole flux.** Peterson, T.S. Battelle Seattle Research Center, WA (United States). Dec 1995. 25p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (BSRC–800/95/018). Order Number DE96005843. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents evaluations, recommendations, and requirements concerning passive soil vapor extraction (PSVE) derived from a three-year program of stakeholder involvement. PSVE takes advantage of the naturally occurring tendency of soil vapor to leave the subsurface during periods of low barometric pressure. PSVE seeks to expedite the release of volatile contaminants through the use of boreholes and technological enhancements. This report is for technology developers and those responsible for making decisions about the use of technology to remediate contamination by volatile organic compounds. Stakeholders' perspectives help those responsible for technology deployment to make good decisions concerning the acceptability and applicability of PSVE to the remediation problems they face. The report provides: stakeholders' final evaluation of the acceptability of PSVE in light of the technology's field test; stakeholders' principal comments concerning PSVE; requirements that stakeholders have of any remediation technology. Technology decision makers should take these conclusions into account in evaluating the effectiveness and acceptability of any remedial method proposed for their site. In addition, the report presents data requirements for the technology's field demonstration defined by stakeholders associated with the Hanford site in Washington State, as well as detailed comments on PSVE from stakeholders from Sandia National Laboratory, Rocky Flats, Idaho National Engineering Laboratory, and Los Alamos National Laboratory.

2566 (PNNL–10944) **K-Basin spent nuclear fuel characterization data report 2.** Abrefah, J.; Gray, W.J.; Ketner, G.L.; Marschman, S.C.; Pyecha, T.D.; Thornton, T.A. Pacific Northwest National Lab., Richland, WA (United States). Mar 1996. 308p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96010452. Source: OSTI; NTIS; INIS; GPO Dep.

An Integrated Process Strategy has been developed to package, condition, transport, and store in an interim storage facility the spent nuclear fuel (SNF) currently residing in the K-Basins at Hanford. Information required to support the development of the condition process and to support the safety analyses must be obtained from characterization testing activities conducted on fuel samples from the Basins. Some of the information obtained in the testing was reported in PNL-10778, K-Basin Spent Nuclear Fuel Characterization Data Report (Abrefah et al. 1995). That report focused on the physical, dimensional, metallographic examinations of the first K-West (KW) Basin SNF element to be examined in the Postirradiation Testing Laboratory (PTL) hot cells; it also described some of the initial SNF conditioning tests. This second of the series of data reports covers the subsequent series of SNF tests on the first fuel element. These tests included optical microscopy analyses, conditioning (drying and oxidation) tests, ignition tests, and hydrogen content tests.

2567 (PNNL–10979) **Letter report: Evaluation of dryer/calciner technologies for testing.** Sevigny, G. Pacific Northwest Lab., Richland, WA (United States). Feb 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96008026. Source: OSTI; NTIS; INIS; GPO Dep.

This letter report describes some past experiences on the drying and calcination of radioactive materials or corresponding simulants; and the information needed from testing. The report also includes an assessment of informational needs including possible impacts to a full-scale plant. This includes reliability, maintenance, and overall size versus throughput. Much of the material was previously compiled and reported by Mike Elliott of PNL "Melter Performance Assessment" and Larry Eisenstatt of SEG on contract to WHC in a letter to Rod Powell. Also, an annotated bibliography was prepared by Reagan Seymour of WHC. Descriptions of the drying and calciner technologies, development status, advantages and disadvantages of using a WFE or calciner, and recommendations for future testing are discussed in this report.

2568 (SAND–94-2611) **Identification of remediation needs and technology development focus areas for the Environmental Restoration (ER) Project at Sandia National Laboratories/New Mexico (SNL/NM).** Tucker, M.D. (Sandia National Labs., Albuquerque, NM (United States). Site Restoration Technology Program Office); Valdez, J.M.; Khan, M.A. Sandia National Labs., Albuquerque, NM (United States). Jun 1995. 95p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE95015010. Source: OSTI; NTIS; INIS; GPO Dep.

The Environmental Restoration (ER) Project has been tasked with the characterization, assessment, remediation and long-term monitoring of contaminated waste sites at Sandia National Laboratories/New Mexico (SNL/NM). Many of these sites will require remediation which will involve the use of baseline technologies, innovative technologies that are currently under development, and new methods which will be developed in the near future. The Technology Applications Program (TAP) supports the ER Project and is responsible for development of new technologies for use at the contaminated waste sites, including technologies that will be used for remediation and restoration of these sites. The purpose of this report is to define the remediation needs of the ER Project and to identify those remediation needs for which the baseline technologies and the current development efforts are inadequate. The area between the remediation needs and the existing baseline/innovative technology base represents a technology gap which must be filled in order to remediate contaminated waste sites at SNL/NM economically and efficiently. In the first part of this report, the remediation needs of the ER Project are defined by both the ER Project task leaders and by TAP personnel. The next section outlines the baseline technologies, including EPA defined Best Demonstrated Available Technologies (BDATs), that are applicable at SNL/NM ER sites. This is followed by recommendations of innovative technologies that are currently being developed that may also be applicable at SNL/NM ER sites. Finally, the gap between the existing baseline/innovative technology base and the remediation needs is identified. This technology gap will help define the future direction of technology development for the ER Project.

2569 (SAND–95-2087) **Adaption of the Magnetometer Towed Array geophysical system to meet Department of Energy needs for hazardous waste site characterization.** Cochran, J.R. (Sandia National Labs., Albuquerque, NM (United States)); McDonald, J.R.; Russell, R.J.; Robertson, R.; Hensel, E. Sandia National Labs., Albuquerque, NM (United States). Oct 1995. 121p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004551. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents US Department of Energy (DOE)-funded activities that have adapted the US Navy's Surface Towed Ordnance Locator System (STOLS) to meet DOE needs for a "... better, faster, safer and cheaper ..." system for characterizing inactive hazardous waste sites. These activities were undertaken by Sandia National Laboratories (Sandia), the Naval Research Laboratory, Geo-Centers Inc., New Mexico State University and others under the title of the Magnetometer Towed Array (MTA).

2570 (SAND–95-2258C) **Preliminary analysis of NAPL behavior in soil-heated vapor extraction for in-situ environmental restoration.** Webb, S.W.; Phelan, J.M. Sandia National Labs., Albuquerque, NM (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-950828–21: 1995 National heat transfer conference, Portland, OR (United States), 5-9 Aug 1995). Order Number DE96000780. Source: OSTI; NTIS; INIS; GPO Dep.

Simulations of soil-heated vapor extraction have been performed to evaluate the NAPL removal performance as a function of borehole vacuum. The possibility of loss of NAPL containment, or NAPL migration into the unheated soil, is also evaluated in the simulations. A practical warning sign indicating migration of NAPL into the unheated zone is discussed.

2571 (SAND–95-3024) **1994 Fernald field characterization demonstration program data report.** Rautman, C.A. (Sandia National Labs., Albuquerque, NM (United States)); Cromer, M.V.; Newman, G.C.; Beiso, D.A. Sandia National Labs., Albuquerque, NM (United States). Dec 1995. 173p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004549. Source: OSTI; NTIS; INIS; GPO Dep.

The 1994 Fernald field characterization demonstration program, hosted by Fernald Environmental Management Project, was established to investigate technologies that are applicable to the characterization and remediation of soils contaminated with uranium. An important part of this effort was evaluating field-screening tools potentially capable of acquiring high-resolution information on uranium contamination distribution in surface soils. Further-more, the information needed to be obtained in a cost- and time-efficient manner. Seven advanced field-screening technologies were demonstrated at a uranium-contaminated site at Fernald, located 29 kilometers northwest of Cincinnati, Ohio. The seven technologies tested were: (1) alpha-track detectors, (2) a high-energy beta scintillometer, (3) electret ionization chambers, (4) and (5) two variants of gamma-ray spectrometry, (6) laser ablation-inductively coupled plasma-atomic emission spectroscopy, and (7) long-range alpha detection. The goals of this field demonstration were to evaluate the capabilities of the detectors and to demonstrate their utility within the US Department of Energy's Environmental Restoration Program. Identical field studies were conducted using four industry-standard characterization tools: (1) a sodium-iodide scintillometer, (2) a low-energy FIDLER scintillometer, (3) a field-portable x-ray fluorescence detector, and (4) standard soil sampling coupled with laboratory analysis. Another important aspect of this program was the application of a cost/risk decision model to guide characterization of the site. This document is a compilation of raw data submitted by the technologies and converted total uranium data from the 1994 Fernald field characterization demonstration.

2572 (SAND–95-3062) **Characterization, monitoring, and sensor technology catalogue.** Matalucci, R.V. (ed.) (Sandia National Labs., Albuquerque, NM (United States)); Esparza-Baca, C.; Jimenez, R.D. Sandia National Labs., Albuquerque, NM (United States). Dec 1995. 290p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96004896. Source: OSTI; NTIS; INIS; GPO Dep.

This document represents a summary of 58 technologies that are being developed by the Department of Energy's (DOE's) Office of Science and Technology (OST) to provide site, waste, and process characterization and monitoring solutions to the DOE weapons complex. The information was compiled to provide performance data on OST-developed technologies to scientists and engineers responsible for preparing Remedial Investigation/Feasibility Studies (RI/FSs) and preparing plans and compliance documents for DOE cleanup and waste management programs. The information may also be used to identify opportunities for partnering and commercialization with industry, DOE laboratories, other federal and state agencies, and the academic community. Each technology is featured in a format that provides: (1) a description, (2) technical performance data, (3) applicability, (4) development status, (5) regulatory considerations, (6) potential commercial applications, (7) intellectual property, and (8) points-of-contact. Technologies are categorized into the following areas: (1) Bioremediation Monitoring, (2) Decontamination and Decommissioning, (3) Field Analytical Laboratories, (4) Geophysical and Hydrologic Characterization, (5) Hazardous Inorganic Contaminant Analysis, (6) Hazardous Organic Contaminant Analysis, (7) Mixed Waste, (8) Radioactive Contaminant Analysis, (9) Remote Sensing,(10)Sampling and Drilling, (11) Statistically Guided Sampling, and (12) Tank Waste.

2573 (SAND–96-0262) **Evaluation of measurement reproducibility using the standard-sites data, 1994 Fernald field characterization demonstration project.** Rautman, C.A. Sandia National Labs., Albuquerque, NM (United States). Feb 1996. 41p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96006440. Source: OSTI; NTIS; INIS; GPO Dep.

The US Department of Energy conducted the 1994 Fernald (Ohio) field characterization demonstration project to evaluate the performance of a group of both industry-standard and proposed alternative technologies in describing the nature and extent of uranium contamination in surficial soils. Detector stability and measurement reproducibility under actual operating conditions encountered in the field is critical to establishing the credibility of the proposed alternative characterization methods. Comparability of measured uranium activities to those reported by conventional, US Environmental Protection Agency (EPA)-certified laboratory methods is also required. The eleven (11) technologies demonstrated included (1) EPA-standard soil sampling and laboratory mass-spectroscopy analyses, and currently-accepted field-screening techniques using (2) sodium-iodide scintillometers, (3) FIDLER low-energy scintillometers, and (4) a field-portable x-ray fluorescence spectrometer. Proposed advanced characterization techniques included (5) alpha-track detectors, (6) a high-energy beta scintillometer, (7) electret ionization chambers, (8) and (9) a high-resolution gamma-ray spectrometer in two different configurations, (10) a field-adapted laser ablation-inductively coupled plasma-atomic emission spectroscopy (ICP-AES) technique, and (11) a long-range alpha detector. Measurement reproducibility and the accuracy of each method were tested by acquiring numerous replicate measurements of total uranium activity at each of two "standard sites" located within the main field demonstration area. Meteorological variables including temperature, relative humidity. and 24-hour rainfall quantities were also recorded in conjunction with the standard-sites measurements.

2574 (SAND–96-0582) **Three-dimensional electromagnetic modeling and inversion on massively parallel computers.** Newman, G.A. (Sandia National Labs., Albuquerque, NM (United States). Geophysics Dept.); Alumbaugh, D.L. Sandia National Labs., Albuquerque, NM (United States). Mar 1996. 112p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96008728. Source: OSTI; NTIS; GPO Dep.

This report has demonstrated techniques that can be used to construct solutions to the 3-D electromagnetic inverse problem using full wave equation modeling. To this point great progress has been made in developing an inverse solution using the method of conjugate gradients which employs a 3-D finite difference solver to construct model sensitivities and predicted data. The forward modeling code has been developed to incorporate absorbing boundary conditions for high frequency solutions (radar), as well as complex electrical properties, including electrical conductivity, dielectric permittivity and magnetic permeability. In addition both forward and inverse codes have been ported to a massively parallel computer architecture which allows for more realistic solutions that can be achieved with serial machines. While the inversion code has been demonstrated on field data collected at the Richmond field site, techniques for appraising the quality of the reconstructions still need to be developed. Here it is suggested that rather than employing direct matrix inversion to construct the model covariance matrix which would be impossible because of the size of the problem, one can linearize about the 3-D model achieved in the inverse and use Monte-Carlo simulations to construct it. Using these appraisal and construction tools, it is now necessary to demonstrate 3-D inversion for a variety of EM data sets that span the frequency range from induction sounding to radar: below 100 kHz to 100 MHz. Appraised 3-D images of the earth's electrical properties can provide researchers opportunities to infer the flow paths, flow rates and perhaps the chemistry of fluids in geologic mediums. It also offers a means to study the frequency dependence behavior of the properties in situ. This is of significant relevance to the Department of Energy, paramount to characterizing and monitoring of environmental waste sites and oil and gas exploration.

2575 (SAND–96-8213) **Transpiring wall supercritical water oxidation test reactor design report.** Haroldsen, B.L. (Sandia National Labs., Livermore, CA (United States). Engineering for Transportation and Environment Dept.); Ariizumi, D.Y.; Mills, B.E.; Brown, B.G.; Rousar, D.C. Sandia National Labs., Livermore, CA (United States). Feb 1996. 32p. Sponsored by USDOE, Washington, DC (United States);Department of Defense, Washington, DC (United States). DOE Contract AC04-94AL85000. Order Number DE96009912. Source: OSTI; NTIS; INIS; GPO Dep.

Sandia National Laboratories is working with GenCorp, Aerojet and Foster Wheeler Development Corporation to develop a transpiring wall supercritical water oxidation reactor. The transpiring wall reactor promises to mitigate problems of salt deposition and corrosion by forming a protective boundary layer of pure supercritical water. A laboratory scale test reactor has been assembled to demonstrate the concept. A 1/4 scale transpiring wall reactor was designed and fabricated by Aerojet using their platelet technology. Sandia's Engineering Evaluation Reactor serves as a test bed to supply, pressurize and heat the waste; collect, measure and analyze the effluent; and control operation of the system. This report describes the design, test capabilities, and operation of this versatile and unique test system with the transpiring wall reactor.

2576 (UCRL-JC–119707) **Development of multianalyte sensor arrays for continuous monitoring of pollutants.** Milanovich, F.P. (Lawrence Livermore National Lab., CA (United States)); Richards, J.B.; Brown, S.B.; Healey, B.G.; Chadha, S.; Walt, D. Lawrence Livermore National Lab., CA (United States). Jan 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950209–13: 4. international symposium on field screening methods for hazardous wastes and toxic chemicals, Las Vegas, NV (United States), 22-24 Feb 1995). Order Number DE96001728. Source: OSTI; NTIS; GPO Dep.

Industrial development has led to the release of numerous hazardous materials into the environment posing a potential threat to surrounding waters. Environmental analysis of sites contaminated by several chemicals calls for continuous monitoring of multiple analytes. Monitoring can be achieved by using imaging bundles (300–400 { micro} m in diameter), containing several thousand individual optical fibers for the fabrication of sensors. Multiple sensor sites are created at the distal end of the fiber by immobilizing different analyte-specific fluorescent dyes. By coupling these imaging fibers to a charge coupled device (CCD), one has the ability to spatially and spectrally discriminate the multiple sensing sites simultaneously and hence monitor analyte concentrations.

2577 (UCRL-JC–119959) **Waste characterization activities at the Lawrence Livermore National Laboratory.** Roberson, G.P. (and others); Martz, H.E.; Haskins, J.J. Lawrence Livermore National Lab., CA (United States). 28 Jun 1995. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-950787–85: 36. annual meeting of the Institute for Nuclear Materials Management, Palm Desert, CA (United States), 9-12 Jul 1995). Order Number DE96001322. Source: OSTI; NTIS; INIS; GPO Dep.

Radioactive and hazardous wastes are generated at many national laboratories, military sites, fuel fabrication and enrichment plants, reactors, and many other facilities. At all of these sites, wastes must be separated, categorized, possibly treated, and packed into containers for shipment to waste-storage or disposal sites. Prior to treatment, storage or, shipment, the containers must be characterized to determine the ultimate disposition of the contained waste. Comprehensive and accurate nondestructive evaluation (NDE) and nondestructive assay (NDA) methods can be used to characterize most waste containers in a safe and cost-effective manner without opening them. The Lawrence Livermore National Laboratory (LLNL) is investigating and developing the application of x-ray and γ-ray methods to nonintrusively characterize waste containers and/or items.

X-ray NDE methods are being investigated to determine whether they can be used to identify hazardous and nonconforming materials. A γ-ray NDA method is used to identify the radioactive sources within a container and to accurately quantify their strength. In this paper we describe five waste characterization projects being conducted at LLNL that apply both the NDE and NDA methods and present results.

2578 (UCRL-JC–121184) **Nondestructive assay of TRU waste using gamma-ray active and passive computed tomography.** Roberson, G.P.; Decman, D.; Martz, H.; Keto, E.R.; Johansson, E.M. Lawrence Livermore National Lab., CA (United States). 4 Oct 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-951091–13: 4. nondestructive assay and nondestructive examination waste characterization conference, Salt Lake City, UT (United States), 24-26 Oct 1995). Order Number DE96010712. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed an active and passive computed tomography (A and PCT) scanner for assaying radioactive waste drums. Here they describe the hardware components of their system and the software used for data acquisition, gamma-ray spectroscopy analysis, and image reconstruction. They have measured the performance of the system using "mock" waste drums and calibrated radioactive sources. They also describe the results of measurements using this system to assay a real TRU waste drum with relatively low Pu content. The results are compared with X-ray NDE studies of the same TRU waste drum as well as assay results from segmented gamma scanner (SGS) measurements.

2579 (UCRL-JC–123342) **Application of gamma-ray active and passive computed tomography to nondestructively assay TRU waste.** Martz, H.E.; Decman, D.J.; Roberson, G.P.; Johansson, E.M.; Keto, E.R. Lawrence Livermore National Lab., CA (United States). [1996]. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-48. (CONF-960187–1: Nondestructive assay/nondestructive evaluation (NDA/NDE) program review, Pittsburgh, PA (United States), 23-26 Jan 1996). Order Number DE96009253. Source: OSTI; NTIS; INIS; GPO Dep.

The authors have developed an active and passive computed tomography scanner for assaying radioactive waste drums. They describe the hardware and software components of the system used for data acquisition, gamma-ray spectroscopy analysis, and image reconstruction. They have measured the performance of the system using mock waste drums and calibrated radioactive sources. They describe the results of measurements using this system to assay a real TRU waste drum with relatively low Pu content.

2580 (WHC-EP–0125-7) **Summary of radioactive solid waste received in the 200 Areas during calendar year 1994.** Anderson, J.D.; Hagel, D.L. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 356p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017145. Source: OSTI; NTIS; INIS; GPO Dep.

Westinghouse Hanford Company manages and operates the Hanford Site 200 Area radioactive solid waste storage and disposal facilities for the US Department of Energy, Richland Field Office, under contract DE-AC06-87RL10930. These facilities include radioactive solid waste disposal sites and radioactive solid waste storage areas. This document summarizes the amount of radioactive material that has been buried and stored in the 200 Area radioactive solid waste storage and disposal facilities from startup in 1944 through calendar year 1994. This report does not include backlog waste: solid radioactive wastes in storage or disposed of in other areas or facilities such as the underground tank farms. Unless packaged within the scope of WHC-EP-0063, Hanford Site Solid Waste Acceptance Criteria (WHC 1988), liquid waste data are not included in this document.

2581 (WHC-EP–0466-2) **Facility effluent monitoring plan for 242-A evaporator facility.** Crummel, G.M.; Gustavson, R.D. Westinghouse Hanford Co., Richland, WA (United States). Feb 1995. 204p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95008793. Source: OSTI; NTIS; INIS; GPO Dep.

A facility effluent monitoring plan is required by the U.S. Department of Energy in DOE Order 5400.1 for any operations that involve hazardous materials and radioactive substances that could affect employee or public safety or the environment. A facility effluent monitoring plan determination was performed during Calendar Year 1991 and the evaluation showed the need for a facility effluent monitoring plan. This document is prepared using the specific guidelines identified in A Guide for Preparing Hanford Site Facility Effluent Monitoring Plans, WHC-EP-0438-1. This facility effluent monitoring plan assesses effluent monitoring systems and evaluates whether they are adequate to ensure the public health and safety as specified in applicable federal, state, and local requirements. This facility effluent monitoring plan shall ensure long-range integrity of the effluent monitoring systems by requiring an update whenever a new process or operation introduces new hazardous materials or significant radioactive materials. This document must be reviewed annually even if there are no operational changes, and it must be updated, as a minimum, every three years.

2582 (WHC-EP–0497-Rev.1) **Facility effluent monitoring plan for K Area Spent Fuel. Revision 1.** Hunacek, G.S. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001604. Source: OSTI; NTIS; INIS; GPO Dep.

The scope of this document includes program plans for monitoring and characterizing radioactive and nonradioactive hazardous materials discharged in the K Area effluents. This FEMP includes complete documentation for both airborne and liquid effluent monitoring systems that monitor radioactive and nonradioactive hazardous pollutants that could be discharged to the environment under routine and/or upset conditions. This documentation is provided for each K Area facility that uses, generates, releases, or manages significant quantities of radioactive and nonradioactive hazardous materials that could impact public and employee safety and the environment. This FEW describes the airborne and liquid effluent paths and the associated sampling and monitoring systems of the K Area facilities. Sufficient information is provided on the effluent characteristics and the effluent monitoring systems so that a compliance assessment against requirements may be performed. Adequate details are supplied such that radioactive and hazardous material source terms may be related to specific effluent streams which are, in turn, related to discharge points and finally compared to the effluent monitoring system capability.

2583 (WHC-EP–0527-4) **Environmental releases for calendar year 1994.** Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). Jul 1995. 83p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017146. Source: OSTI; NTIS; INIS; GPO Dep.

This report fulfills the annual environmental release reporting requirements of US Department of Energy (DOE) Orders. This report provides supplemental information to the Hanford Site Environmental Report. The Hanford Site Environmental Report provides an update on the environmental status of the entire Hanford Site. The sitewide annual report summarizes the degree of compliance of the Hanford Site with applicable environmental regulations and informs the public about the impact of Hanford operations on the surrounding environment. Like the Hanford Site Environmental Report, this annual report presents a summary of the environmental releases from facilities managed by the Westinghouse Hanford Company (WHC) and monitored by Bechtel Hanford, Incorporated (BHI). In addition to the summary data, this report also includes detailed data on air emissions, liquid effluents, and hazardous substances released to the environment during calendar year 1994 from these facilities.

2584 (WHC-EP–0528-Rev.2) **Effluent monitoring Quality Assurance Project Plan for radioactive airborne emissions data. Revision 2.** Frazier, T.P. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005138. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Project Plan addresses the quality assurance requirements for compiling Hanford Site radioactive airborne emissions data. These data will be reported to the U.S. Environmental Protection Agency, the US Department of Energy, and the Washington State Department of Health. Effluent Monitoring performs compliance assessments on radioactive airborne sampling and monitoring systems. This Quality Assurance Project Plan is prepared in compliance with interim guidelines and specifications. Topics include: project description; project organization and management; quality assurance objectives; sampling procedures; sample custody; calibration procedures; analytical procedures; monitoring and reporting criteria; data reduction, verification, and reporting; internal quality control; performance and system audits; corrective actions; and quality assurance reports.

2585 (WHC-EP–0536-2) **Quality assurance program plan for radionuclide airborne emissions monitoring.** Boom, R.J. Westinghouse Hanford Co., Richland, WA (United States). Mar 1995. 205p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010579. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan identifies quality assurance program requirements and addresses the various Westinghouse Hanford Company organizations and their particular responsibilities in regards to sample and data handling of airborne emissions. The Hanford Site radioactive airborne emissions requirements are defined in National Emissions Standards for Hazardous Air Pollutants (NESHAP), Code of Federal Regulations, Title 40, Part 61, Subpart H (EPA 1991a). Reporting of the emissions to the US Department of Energy is performed in compliance with requirements of US Department of Energy, Richland Operations Office Order 5400.1, General Environmental Protection Program (DOE-RL 1988). This Quality Assurance Program Plan is prepared in accordance with and to the requirements of QAMS-004/80, Guidelines and Specifications for Preparing Quality Assurance Program Plans (EPA 1983). Title 40 CFR Part 61, Appendix B, Method 114, Quality Assurance Methods (EPA 1991b) specifies the quality assurance requirements and that a program plan should be prepared to meet the requirements of this regulation. This Quality Assurance Program Plan identifies NESHAP responsibilities and how the Westinghouse Hanford Company Environmental, Safety, Health, and Quality Assurance Division will verify that the methods are properly implemented.

2586 (WHC-EP–0536-3) **Quality assurance program plan for radionuclide airborne emissions monitoring.** Boom, R.J. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 200p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96005139. Source: OSTI; NTIS; INIS; GPO Dep.

This Quality Assurance Program Plan identifies quality assurance program requirements and addresses the various Westinghouse Hanford Company organizations and their particular responsibilities in regards to sample and data handling of radiological airborne emissions. This Quality Assurance Program Plan is prepared in accordance with and to written requirements.

2587 (WHC-EP–0538-2) **Operational Environmental Monitoring Program Quality Assurance Project Plan.** Perkins, C.J. Westinghouse Hanford Co., Richland, WA (United States). Aug 1994. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95017143. Source: OSTI; NTIS; GPO Dep.

This Quality Assurance Project Plan addresses the quality assurance requirements for the activities associated with the preoperational and operational environmental monitoring performed by Westinghouse Hanford Company as it implements the Operational Environmental Monitoring program. This plan applies to all sampling and monitoring activities performed by Westinghouse Hanford Company in implementing the Operational Environmental Monitoring program at the Hanford Site.

2588 (WHC-EP–0573-3) **Westinghouse Hanford Company operational environmental monitoring annual report, calendar year 1994.** Schmidt, J.; Fassett, J.W.; Johnson, A.R.; Johnson, V.G.; Markes, B.M.; McKinney, S.M.; Moss, K.J.; Perkins, C.J.; Richterich, L.R. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 300p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96001069. Source: OSTI; NTIS; INIS; GPO Dep.

This document presents the results of the Westinghouse Hanford Company near-facility operational environmental monitoring for 1994 in the 100, 200/600, and 300/400 Areas of the Hanford Site, in south-central Washington State. Surveillance activities included sampling and analyses of ambient air surface water, groundwater, soil, sediments, and biota. Also, external radiation measurements and radiological surveys were taken at waste disposal sites, radiologically controlled areas, and roads. These activities were conducted to assess and control the effects of nuclear facilities and waste sites on the local environment. In addition, diffuse sources were monitored to determine compliance with Federal, State, and/or local regulations. In general, although effects from nuclear facilities are still seen on the Hanford Site and radiation levels are slightly elevated when compared to offsite locations, the differences are less than in previous years.

2589 (WHC-EP-0835-1) **Statement of work for services provided by the Waste Sampling and Characterization Facility for Effluent Monitoring during Calendar Year 1996.** Gleckler, B.P. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006833. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents radionuclide air emissions from the Hanford Site and the resulting effective dose equivalent to any member of the public from those emissions. This report complies with the reporting requirements of the Code of Federal Regulations, Title 40, "Protection of the Environment," Part 61, "National Emissions Standards for Hazardous Air Pollutants," Subpart H, "National Emission Standards for Emissions of Radionuclides Other Than Radon From Department of Energy Facilities" (40 CFR 61 Subpart H) and Chapter 246-247 of the Washington Administrative Code (WAC 246-247).

2590 (WHC-EP-0883) **Variability and scaling of hydraulic properties for 200 Area soils, Hanford Site.** Khaleel, R.; Freeman, E.J. Westinghouse Hanford Co., Richland, WA (United States). Oct 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96004634. Source: OSTI; NTIS; INIS; GPO Dep.

Over the years, data have been obtained on soil hydraulic properties at the Hanford Site. Much of these data have been obtained as part of recent site characterization activities for the Environmental Restoration Program. The existing data on vadose zone soil properties are, however, fragmented and documented in reports that have not been formally reviewed and released. This study helps to identify, compile, and interpret all available data for the principal soil types in the 200 Areas plateau. Information on particle-size distribution, moisture retention, and saturated hydraulic conductivity (K_s) is available for 183 samples from 12 sites in the 200 Areas. Data on moisture retention and K_s are corrected for gravel content. After the data are corrected and cataloged, hydraulic parameters are determined by fitting the van Genuchten soil-moisture retention model to the data. A nonlinear parameter estimation code, RETC, is used. The unsaturated hydraulic conductivity relationship can subsequently be predicted using the van Genuchten parameters, Mualem's model, and laboratory-measured saturated hydraulic conductivity estimates. Alternatively, provided unsaturated conductivity measurements are available, the moisture retention curve-fitting parameters, Mualem's model, and a single unsaturated conductivity measurement can be used to predict unsaturated conductivities for the desired range of field moisture regime.

2591 (WHC-EP-0894) **Hanford Site radionuclide national emission standards for hazardous ari pollutants registered and and unregistered stack (powered exhaust) source assessment.** Davis, W.E. Westinghouse Hanford Co., Richland, WA (United States). Dec 1995. 157p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006834. Source: OSTI; NTIS; INIS; GPO Dep.

On February 3, 1993, US DOE Richland Operations Office received a Compliance Order and Information Request from the Director of the Air and Toxics Div. of US EPA, Region X. The compliance order requires the Richland Operations Office to evaluate all radionuclide emission points at the Hanford site to determine which are subject to the continuous emission measurement requirements in Title 40, Code of Federal Regulations (CFR), Part 61, Subpart H, and to continuously measure radionuclide emissions in accordance with 40 CFR 61.93. The Information Request required The provision of a written compliance plan to meet the requirements of the compliance order. A compliance plan was submitted to EPA, Region X, on April 30, 1993. It set as one of the milestones, the complete assessment of the Hanford Site 84 stacks registered with the Washington State Department of Health, by December 17, 1993. This milestone was accomplished. The compliance plan also called for reaching a Federal Facility Compliance Agreement; this was reached on February 7, 1994, between DOE Richland Operations and EPA, Region X. The milestone to assess the unregistered stacks (powered exhaust) by August 31, 1994, was met. This update presents assessments for 72 registered and 22 unregistered stacks with potential emissions > 0.1 mrem/yr.

2592 (WHC-MR-0496) **Comparison of airborne and surface particulate size distributions in specific Hanford Nuclear Facilities.** Ottley, D.B. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 145p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003329. Source: OSTI; NTIS; INIS; GPO Dep.

Settled dust from nuclear operations may be contaminated with radionuclides and become resuspended and subsequently breathed. This is the predominate radionuclide inhalation hazard scenario in nuclear facilities that have been deactivated and no longer have liquid in their process systems that may become directly airborne in accident situations. Comparisons were made between indoor ambient airborne particulate size distribution and that of resuspended dust that could become contaminated and subsequently airborne during decommissioning operations at selected nuclear facilities on the Hanford Site. Results indicate that only 5% of the particles, by count, above the breathing zone are greater than ten (10) μm in size and that the particulates that could be resuspended into the breathing zone had a mean aerodynamic equivalent diameter of four (4) μm or less.

2593 (WHC-MR-0505) **Type C investigation of electrical fabrication projects in ICF Kaiser shops.** Huckfeldt, R.A. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 65p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015810. Source: OSTI; NTIS; INIS; GPO Dep.

A Type C Investigation Board was convened to investigate an electrical miswiring problem found during the operation of the electrical distribution trailer for the TWRS Rotary Mode Core Sampling Truck #2. The trailer was designed by WHC and fabricated ICF KH on site for use in the Characterization Program. This problem resulted in a serious safety hazard since the support truck frame/chassis became electrically energized. This final report provides results of the "Type C Investigation, Electrical Fabrication Projects in ICF KH Shops, June, 1995." It contains the investigation scope, executive summary, relevant facts, analysis, conclusions and corrective actions. DOE Order 5484.1, "Environmental Protection, Safety and Health Protection Information Reporting Requirements," was followed in preparation of this report. Because the incident was electrical in nature and involved both Westinghouse Hanford Company and ICF Kaiser Hanford organizations, the board included members from both contractors and members with considerable electrical expertise.

2594 (WHC-SA–2861) **A method to improve spectral resolution in planar semiconductor gamma-ray detectors.** Keele, B.D. (International Technology Hanford Company, Richland, WA (United States)); Addleman, R.S.; Troyer, G.L. Westinghouse Hanford Co., Richland, WA (United States). May 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-951073–6: IEEE nuclear science symposium and medical imaging conference, San Francisco, CA (United States), 23-28 Oct 1995). Order Number DE95011635. Source: OSTI; NTIS; INIS; GPO Dep.

This paper describes an empirically derived algorithm to compensate for charge trapping in CdTe, CdZnTe, and other planar semiconductor detectors. The method is demonstrated to be an improvement over available systems and application to experimental data is shown.

2595 (WHC-SA–2925-FP) **Evaluation of chromium speciation and transport characteristics in the Hanford Site 100D and 100H areas.** Thornton, E.C. (and others); Amonette, J.E.; Olivier, J. Westinghouse Hanford Co., Richland, WA (United States). Aug 1995. 21p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-9508172–1: 1. symposium on the hydrogeology of Washington state, Olympia, WA (United States), 28-30 Aug 1995). Order Number DE96001102. Source: OSTI; NTIS; INIS; GPO Dep.

Field and laboratory investigations have been conducted to define the fate and transport characteristics of chromium contamination present in the 100D/H Areas of the Hanford Site. This information is relevant to assessing the impact of the release of hexavalent chromium to the Columbia River. Included in this study was the determination of the concentration and aqueous speciation of chromium in the unconfined acquifer and an assessment of potential changes in speciation as groundwater passes through the river/acquifer transition zone and mixes with the Columbia River. The results of this study indicate that chromium present within the Hanford acquifer is predominantly in the oxidized hexavalent state. Chromium is apparently stable in the oxidized form owing to its lack of organic matter within the acquifer. A portion of the chromium is removed as groundwater passes through the transition zone due to reduction and precipitation associated with sediment/water interaction processes. Chemical data collected from seep water samples, however, suggests, that most of the hexavalent chromium ultimately discharges into the Columbia River. Dilution of hexavalent chromium subsequently occurs during the mixing of groundwater and river water, with relatively little change taking place in speciation.

2596 (WHC-SA–2971) **Dose rate visualization of radioisotope thermoelectric generators.** Schwarz, R.A.; Kessler, S.F.; Tomaszewski, T.A. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. (CONF-960109–6: STAIF 96: space technology and applications international forum, Albuquerque, NM (United States), 7-11 Jan 1996). Order Number DE96002798. Source: OSTI; NTIS; INIS; GPO Dep.

Advanced visualization techniques can be used to investigate gamma ray and neutron dose rates around complex dose rate intensive operations. A method has been developed where thousands of dose points are calculated using the MCNP(Monte Carlo N-Particle) computer code and then displayed to create color contour plots of the dose rate for complex geometries. Once these contour plots are created, they are sequenced together creating an animation to dynamically show how the dose rate changes with changes in the geometry or source over time.

2597 (WHC-SD-610-ATR–002) **Project B610 process control configuration acceptance test report.** Silvan, G.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Jun 1995. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015651. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test is to verify the Westinghouse configuration of the MICON A/S Distributed Control System for project B610. The following will be verified: (1) proper assignment and operation of all field inputs to and outputs from the MICON Termination panels; (2) proper operation of all display data on the operators' console; (3) proper operation of all required alarms; and (4) proper operation of all required interlocks. This test only verifies the proper operation of the Westinghouse control configuration (or program). It will not be responsible for verifying proper operation of the MICON hardware or operating software. Neither does it test any of the B610 instrument. The MICON hardware and software has been tested as part of the equipment procurement. Instrumentation and wiring installed under project B620 will be tested under a separate functional test. In some cases, precise transmitter ranges, alarm setpoints, and controller tuning parameters are not available at this time. Therefore, approximate values are used during the test. This should not affect the proper operation of the configuration or the validity of this test. Final values will be assigned during operability testing.

2598 (WHC-SD-CP-OTP–153) **Operability test procedure for PFP wastewater sampling facility.** Hirzel, D.R. Westinghouse Hanford Co., Richland, WA (United States). 27 Apr 1995. 26p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011654. Source: OSTI; NTIS; INIS; GPO Dep.

Document provides instructions for performing the Operability Test of the 225-WC Wastewater Sampling Station which monitors the discharge to the Treated Effluent Disposal Facility from the Plutonium Finishing Plant. This Operability Test Procedure (OTP) has been prepared to verify correct configuration and performance of the PFP Wastewater sampling system installed in Building 225-WC located outside the perimeter fence southeast of the Plutonium Finishing Plant (PFP). The objective of this test is to ensure the equipment in the sampling facility operates in a safe and reliable manner. The sampler consists of two Manning Model S-5000 units which are rate controlled by the Milltronics Ultrasonic flowmeter at manhole No.C4 and from a pH measuring system with the sensor in the stream adjacent to the sample point. The intent of the dual sampling system is to utilize one unit to sample continuously at a rate proportional to the wastewater flow rate so that the aggregate tests are related to the overall flow and thereby eliminate isolated analyses. The second unit will only operate during a high or low pH excursion of the stream (hence the need for a pH control). The major items in this OTP include testing of the Manning Sampler System and associated equipment including the pH measuring and control system, the conductivity monitor, and the flow meter.

2599 (WHC-SD-SNF-ATR–005) **105-KE Isolation Barrier Leak Rate Acceptance Test Report.** McCracken, K.J. Westinghouse Hanford Co., Richland, WA (United States). 14 Jun 1995. 182p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015655. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report (ATR) contains the completed and signed Acceptance Procedure (ATP) for the 105-KE Isolations Barrier Leak Rate Test. The Test Engineer's log, the completed sections of the ATP in the Appendix for Repeat Testing (Appendix K), the approved WHC J-7s (Appendix H), the data logger files (Appendices T and U), and the post test calibration checks (Appendix V) are included.

2600 (WHC-SD-SNF-DGS–001) **K-Basins design guidelines.** Roe, N.R.; Mills, W.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 138p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015820. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of the design guidelines is to enable SNF and K Basin personnel to complete fuel and sludge removal, and basin water mitigation by providing engineering guidance for equipment design for the fuel basin, facility modifications (upgrades), remote tools, and new processes. It is not intended to be a purchase order reference for vendors. The document identifies materials, methods, and components that work at K Basins; it also Provides design input and a technical review process to facilitate project interfaces with operations in K Basins. This document is intended to compliment other engineering documentation used at K Basins and throughout the Spent Nuclear Fuel Project. Significant provisions, which are incorporated, include portions of the following: General Design Criteria (DOE 1989), Standard Engineering Practices (WHC-CM-6-1), Engineering Practices Guidelines (WHC 1994b), Hanford Plant Standards (DOE-RL 1989), Safety Analysis Manual (WHC-CM-4-46), and Radiological Design Guide (WHC 1994f). Documents (requirements) essential to the engineering design projects at K Basins are referenced in the guidelines.

2601 (WHC-SD-SNF-DTP–001) **Test procedure for the Master-Lee and the modified Champion four inch hydraulic cutters.** Crystal, J.B. Westinghouse Hanford Co., Richland, WA (United States). 2 May 1995. 33p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012569. Source: OSTI; NTIS; INIS; GPO Dep.

The Master-Lee and the modified Champion 4 Inch hydraulic cutters are being retested to gather and document information related to the following: determine if the Master-Lee cutters will cut the trunnions of an Aluminum fuel canister and a Stainless Steel fuel canister; determine if the Master-Lee cutters will cut $1\frac{1}{2}$ inch diameter fire hose; determine if the modified Champion 4 inch blade will cut sections of piping; and determine the effectiveness of the centering device for the Champion 4 Inch cutters. Determining the limitations of the hydraulic cutter will aid in the process of debris removal in the K-Basin. Based on a previous test, the cutters were returned to the manufacturer for modifications. The modifications to the Champion 4 Inch Cutter and further testing of the Master-Lee Cutter are the subjects of these feature tests.

2602 (WHC-SD-SNF-PLN–007) **Plan for characterization of K Basin spent nuclear fuel and sludge.** Lawrence, L.A.; Marschman, S.C. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 29p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95015586. Source: OSTI; NTIS; INIS; GPO Dep.

This plan outlines a characterization program that supports the accelerated Path Forward scope and schedules for the Spent Nuclear Fuel stored in the Hanford K Basins. This plan is driven by the schedule to begin fuel transfer by December 1997. The program is structured for 4 years and is limited to in-situ and laboratory examinations of the spent nuclear fuel and sludge in the K East and K West Basins. The program provides bounding behavior of the fuel, and verification and acceptability for three different sludge disposal pathways. Fuel examinations are based on two shipping campaigns for the K West Basin and one from the K East Basin. Laboratory examinations include physical condition, hydride and oxide content, conditioning testing, and dry storage behavior.

2603 (WHC-SD-SNF-TRP–007) **105K West Isolation Barrier Acceptance Test results.** McCracken, K.J. (ICF Kaiser Hanford Co., Richland, WA (United States)); Irwin, J.J. ICF Kaiser Hanford Co., Richland, WA (United States). 18 May 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013343. Source: OSTI; NTIS; INIS; GPO Dep.

The objective of this document is to report and interpret the findings of the isolation barrier acceptance tests performed in 105KW/100K. The tests were performed in accordance with the test plan and acceptance test procedure. The test report contains the test data. This document compares the test data against the criteria. A discussion of the leak rate analytical characterization describes how the flow characteristics flow rate will be determined using the test data from the test report. Two modes of water loss were considered; basin and/or discharge chute leakage, and evaporation. An initial test established baseline leakage data and instrumentation performance. Test 2 evaluated the sealing performance of the isolation barrier by inducing an 11 in. (27.9 cm) level differential across the barrier. The leak rate at this 11 in. (27.9 cm) level is extrapolated to the 16 ft. (4.9 m) level differential postulated in the DBE post seismic event. If the leak rate, adjusted for evaporation and basin leakage (determined from Test 1), is less than the SAR limit of 1,500 gph (5,680 lph) at a 16 ft (4.9 m) level differential, the barriers pass the acceptance test.

2604 (WHC-SD-W007H-OTR–001) **Operability test report for the TK-900 beta/gamma liquid effluent monitoring system.** Weissenfels, R.D. Westinghouse Hanford Co., Richland, WA (United States). 10 Apr 1995. 61p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010810. Source: OSTI; NTIS; INIS; GPO Dep.

This operability test report will verify that the 221-B beta/gamma liquid effluent monitoring system installed near the east end of the six inch chemical sewer header, functions as intended by design. An off-line, skid mounted, beta/gamma radiation monitor and pH monitor was installed near stairwell three in the 221-B electrical gallery by Project W-007H. The skid mounted monitoring system includes two radiation detectors and a pH meter, both with local digital displays. Output signals from each monitor are also received and displayed by the Facility Process Monitor and Control System (FPMCS). Pumps, motors, gauges, valves and transport lines complement the skid monitoring system. The system is part of BAT/AKART for the BCE liquid effluent system.

2605 (WHC-SD-WM-ATP–129) **Void fraction instrument software, Version 1.2: Acceptance test procedure.** Gimera, M. Westinghouse Hanford Co., Richland, WA (United States). 9 May 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013325. Source: OSTI; NTIS; INIS; GPO Dep.

This provides the procedures for the void fraction acceptance test software, Version 1.2. The void fraction instrument will collect data to calculate the amount of gas trapped in Tank 101-SY.

2606 (WHC-SD-WM-ATR–120) **Acceptance Test Report for the 241-AN-107 Enraf Advanced Technology Gauges.** Dowell, J.L.; Enderlin, V.R. Westinghouse Hanford Co., Richland, WA (United States). Jun 1995. 89p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050100. Source: OSTI; NTIS; INIS; GPO Dep.

This Acceptance Test Report covers the results of the execution of the Acceptance Test Procedure for the 241-AN-107 Enraf Advanced Technology Gauges. The test verified the proper operation of the gauges to measure waste density and level in the 241-AN-107 tank.

2607 (WHC-SD-WM-DA–200) **Analysis of the Retained Gas Sample (RGS) Extruder Assembly.** Coverdell, B.L. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 28p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050107. Source: OSTI; NTIS; INIS; GPO Dep.

In order for the Retained Gas Sample (RGS) Extruder Assembly to be safely used it was determined by the cognizant engineer that analysis was necessary. The use of the finite-element analysis (FEA) progarm COSMOS/M version 1.71 permitted a quick, easy, and detailed stress analysis of the RGS Extruder Assembly. The FEA model is a three dimensional model using the SHELL4T element type. From the results of the FEA, the cognizant engineer determined that the RGS extruder would be rated at 10,000 lbf and load tested to 12,000 lbf. The respective input and output files for the model are EXTR02.GFM and EXTR02.OUT and can be found on the attached tape.

2608 (WHC-SD-WM-DRD–002) **Design Requirements Document (DRD) for Surface Moisture Measurement System (SMMS).** Stokes, T. (Westinghouse Hanford Co., Richland, WA (United States)); Watson, T.; Gimera, M.; Russell, J.; Dabiri, A.; Holslin, D.; Johansen, F. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050110. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains the design requirements for the surface moisture measurement system currently under development in the 306E facility.

2609 (WHC-SD-WM-ETP–159) **Improving sample recovery.** Blanchard, R.J. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050206. Source: OSTI; NTIS; INIS; GPO Dep.

This Engineering Task Plan (ETP) describes the tasks, i.e., tests, studies, external support and modifications planned to increase the recovery of the recovery of the waste tank contents using combinations of improved techniques, equipment, knowledge, experience and testing to better the recovery rates presently being experienced.

2610 (WHC-SD-WM-FRD–024) **Functions and requirements for a waste dislodging and conveyance system for the Gunite and Associated Tanks Treatability Study at Oak Ridge National Laboratory.** Potter, J.D.; Mullen, O.D. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 49p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96050211. Source: OSTI; NTIS; INIS; GPO Dep.

Functions and requirements for the Waste Dislodging and Conveyance System to be deployed in Gunite and Associated Tanks (GAAT) and tested and evaluated as a candidate tank waste retrieval technology by the GAAT Treatability Study (GAAT TS).

2611 (WHC-SD-WM-RPT–116) **Summary of FY 1994 Raman spectroscopy technology cold test activities.** Lopez, T. Westinghouse Hanford Co., Richland, WA (United States). 6 Apr 1995. 104p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95010566. Source: OSTI; NTIS; INIS; GPO Dep.

This report documents the development, optimization, and feature testing of a Raman Spectroscopy Characterization Tool in a cold cell environment. The LLNL supplied Raman system was used to evaluate fiber optic probes and to obtain spectra from tank waste simulants.

2612 (WHC-SD-WM-TI–700) **296-B-13 stack monitoring and sampling system: Annual system assessment report.** Ridge, T.M. Westinghouse Hanford Co., Richland, WA (United States). 16 May 1995. 47p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012825. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents the details of the annual system assessment of the air pollution monitoring and sampling system for the 296-13 stack at the Hanford site. Topics discussed include; system description, system status, system aging, spare parts considerations, long term maintenance plan, trends, and items requiring action.

2613 (WHC-SD-WM-TP–169) **Liquid Effluent Monitoring Information System test plans releases 2.0 and 3.0.** Guettler, D.A. Westinghouse Hanford Co., Richland, WA (United States). 26 May 1995. 590p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95014427. Source: OSTI; NTIS; INIS; GPO Dep.

The Liquid Effluent Monitoring Information System (LEMIS) is being developed as the organized information repository facility in support of the liquid effluent monitoring requirements of the Tri-Party Agreement. It is necessary to provide an automated repository into which the results from liquid effluent sampling will be placed. This repository must provide for effective retention, review, and retrieval of selected sample data by authorized persons and organizations. This System Architecture document is the aggregation of the DMR P+ methodology project management deliverables. Together they represent a description of the project and its plan through four Releases, corresponding to the definition and prioritization of requirements defined by the user.

2614 (WHC-SD-WM-TRP-237) **Laboratory testing of geomembrane for waste containment EPA Method 9090, March 1995. Final report.** Whitlock, R.W. (Westinghouse Hanford Co., Richland, WA (United States)). Westinghouse Hanford Co., Richland, WA (United States); TRI/Environmental, Inc., Austin, TX (United States). 15 May 1995. 100p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012589. Source: OSTI; NTIS; GPO Dep.

This report describes the work performed by TRI/ Environmental, Inc. (TRI) to determine the chemical compatibility of one geomembrane and one seamed geomembrane with four synthetically generated leachates. The objective was to determine the resistance of the geomembrane to changes caused by exposure to the leachates. Changes in physical and mechanical properties were measured after exposure to the leachates at 23 C and 50 C for 30, 60, 90 and 120 days. Exposures were performed in accordance with the exposure regimen specified in US Environmental Protection Agency (EPA) Method 9090A. Methods, results and discussion are provided. Test results are also provided in the Tables of Results which accompany this report.

2615 (WHC-SP-0665-16) **Quarterly environmental radiological survey summary: First quarter 1995 100, 200, 300, and 600 Areas.** McKinney, S.M. Westinghouse Hanford Co., Richland, WA (United States). Apr 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95011571. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the radiological surveys performed in support of the operational environmental monitoring program at the Hanford Site. The surveys included in this program consist of inactive waste sites; outdoor radiological control areas; tank farm perimeters and associated diversion boxes, lift stations, and vent stations; perimeters of active or uncovered waste sites such as burial grounds, retention basins, ponds, process trenches, and ditches; and road and rail surfaces. This report provides a summary of the radiological surveys performed during the First Quarter of 1995. The status of corrective actions required from current and past reports are also discussed.

2616 (WHC-SP-0665-18) **Quarterly environmental radiological survey summary. Third quarter 1995 100, 200, 300, and 600 Areas.** McKinney, S.M.; Markes, B.M. Westinghouse Hanford Co., Richland, WA (United States). Sep 1995. 22p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96003335. Source: OSTI; NTIS; INIS; GPO Dep.

Routine radiological surveys are part of the near-facility environmental monitoring program which monitors and helps direct the reduction of the radiologically controlled areas at the Hanford Site. The routine radiological surveys are performed by the Southern Area Remediation Support Group and the Site Surveillance Radiological Control Group as directed by Near-Field Monitoring. The surveys included in this program consist of inactive waste sites; outdoor radiological control areas; tank farm perimeters and associated diversion boxes, lift stations, and vent stations; perimeters of active or uncovered waste sites such as burial grounds, retention basins, ponds, process trenches, and ditches; and road and rail surfaces. This report provides a summary of the radiological surveys performed during the Third Quarter of 1995. The status of corrective actions required from current and past reports are also discussed.

2617 (WHC-SP-0665-19) **Quarterly environmental radiological survey summary. Fourth quarter, 1995 100, 200, 300, and 600 Areas.** McKinney, S.M.; Markes, B.M. Westinghouse Hanford Co., Richland, WA (United States). Jan 1996. 38p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE96006851. Source: OSTI; NTIS; INIS; GPO Dep.

This report provides a summary of the radiological surveys performed in support of the operational environmental monitoring program at the Hanford Site. The Fourth Quarter 1995 survey results and the status of actions required from current and past reports are described.

2618 (WSRC-MS-95-0502) **SRS environmental technology development field test platform.** Riha, B.D. (and others); Rossabi, J.; Eddy-Dilek, C.A. Westinghouse Savannah River Co., Aiken, SC (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-950163-5: 3. international on-site analysis conference, Houston, TX (United States), 22-25 Jan 1995). Order Number DE95017486. Source: OSTI; NTIS; INIS; GPO Dep.

A critical and difficult step in the development and implementation of new technologies for environmental monitoring and characterization is successfully transferring these technologies to industry and government users for routine assessment and compliance activities. The Environmental Sciences Section of the DOE Savannah River Technology Center provides a forum for developers, potential users, and regulatory organizations to evaluate new technologies in comparison with baseline technologies in a well characterized field test bed. The principal objective of this project is to conduct comprehensive, objective field tests of monitoring and characterization technologies that are not currently used in EPA standard methods and evaluate their performance during actual operating conditions against baseline methods. This paper provides an overview of the field test site and a description of some of the technologies demonstrated at the site including their field applications.

2619 (WSRC-MS-96-0005) **Characterization of the Burma Road Rubble Pit at the Savannah River Site, Aiken, South Carolina.** Ward, K.G. (Westinghouse Savannah River Co., Aiken, SC (United States)); Frazier, W.L.; McAdams, T.D.; McFalls, S.L.; Rabin, M.; Voss, L. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960212-87: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96009644. Source: OSTI; NTIS; INIS; GPO Dep.

The Burma Road Rubble Pit (BRRP) is located at the Savannah River Site (SRS). The BRRP unit consists of two unlined earthen pits dug into surficial soil and filled with various waste materials. It was used from 1973–1983 for the disposal of dry inert rubble such as metal, concrete, lumber, poles, light fixtures, and glass. No record of the disposal of hazardous substances at the BRRP has been found. In

1983, the BRRP was closed by covering it with soil. In September 1988, a Ground Penetrating Radar survey detected three disturbed areas of soil near the BRRP, and a detailed and combined RCRA Facility Investigation/ Remedial Investigation was conducted from November 1993 to February 1994 to determine whether hazardous substances were present in the subsurface, to evaluate the nature and extent of contamination, and to evaluate the risks posed to the SRS facility due to activities conducted at the BRRP site. Metals, semi-volatile organic compounds, volatile organic compounds, radionuclides and one pesticide (Aldrin) were detected in soil and groundwater samples collected from seventeen BRRP locations. A baseline risk assessment (BRA) was performed quantitatively to evaluate whether chemical and radionuclide concentrations detected in soil and groundwater at the BRRP posed an unacceptable threat to human health and the environment. The exposure scenarios identifiable for the BRRP were for environmental researchers, future residential and occupational land use. The total site noncancer hazard indices were below unity, and cancer risk levels were below 1.0E-06 for the existing and future case environmental researcher scenario. The future case residential and occupational scenarios showed total hazard and risk levels which exceeded US EPA criterion values relative to groundwater scenarios. For the most part, the total carcinogenic risks were within the 1.0E-04 to 1.0E-06 risk range. Only the future adult residential scenario was associated with risks exceeding 1.0E-04.

2620 (WSRC-MS–96-0022) **Physical sampling for site and waste characterization.** Bonnough, T.L. Westinghouse Savannah River Co., Aiken, SC (United States). [1996]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960421–46: 7. annual international high-level radioactive waste management conference, Las Vegas, NV (United States), 29 Apr - 3 May 1996). Order Number DE96012425. Source: OSTI; NTIS; INIS; GPO Dep.

Physical sampling plays a basic role in high-level radioactive waste management program effort. The term “physical sampling” used here means collecting tangible, physical samples of soil, water, air, waste streams, or other materials. The industry defines the term “physical sampling” broadly to include measurements of physical conditions such as temperature, wind conditions, and pH, which are also often taken in a sample collection effort. Most environmental compliance actions are supported by the results of taking, recording, and analyzing physical samples and the measurements of physical conditions taken in association with sample collecting. Therefore, the when and how to take samples is needed to be known and planned.

2621 (WSRC-TR–94-0344) **Characterization and reclamation assessment for the central shops diesel storage facility at Savannah River Site.** Fliermans, C.B.; Hazen, T.C.; Bledsoe, H.W. Westinghouse Savannah River Co., Aiken, SC (United States). [1994]. 55p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE95017470. Source: OSTI; NTIS; INIS; GPO Dep.

The contamination of subsurface terrestrial environments by organic contaminants is a global phenomenon. The remediation of such environments requires innovative assessment techniques and strategies for successful cleanups. Using innovative approaches, the central Shops Diesel Storage Facility at the Savannah River Site (SRS) was characterized to determine the extent of subsurface diesel fuel contamination. Effective bioremediation techniques for cleaning up of the contaminant plume were established.

2622 (WSRC-TR–95-0183) **Soil washing technology evaluation.** Suer, A. Westinghouse Savannah River Co., Aiken, SC (United States). Apr 1995. 58p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96001693. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Engineering (ERE) continues to review innovative, efficient, and cost effective technologies for SRS soil and/or groundwater remediation. As part of this effort, this technical evaluation provides review and the latest information on the technology for SRS soil remediation. Additional technology evaluation reports will be issued periodically to update these reports. The purpose of this report is to review the soil washing technology and its potential application to SRS soil remediation. To assess whether the Soil Washing technology is a viable option for SRS soil remediation, it is necessary to review the technology/ process, technology advantages/limitations, performance, applications, and cost analysis.

2623 (WSRC-TR–95-0206) **Conceptual Thermal Treatment Technologies Feasibility Study.** Suer, A. Westinghouse Savannah River Co., Aiken, SC (United States). 28 Feb 1996. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. (CONF-960437–2: 8. national technology information exchange workshop, Santa Fe, NM (United States), 16-18 Apr 1996). Order Number DE96060038. Source: OSTI; NTIS; INIS; GPO Dep.

This report presents a conceptual Thermal Treatment Technologies Feasibility Study (FS) for the Savannah River Site (SRS) focusing exclusively on thermal treatment technologies for contaminated soil, sediment, or sludge remediation projects.

2624 (WSRC-TR–95-0232) **Magnetic survey of the Risher Road Open Metal Pit Waste Unit.** Cumbest, R.J. Westinghouse Savannah River Co., Aiken, SC (United States). Jul 1995. 36p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC09-89SR18035. Order Number DE96002954. Source: OSTI; NTIS; INIS; GPO Dep.

The Risher Road Waste Unit is located at the base of a small bluff (approximately 30 ft high) composed of sand and gravel. Due to collapse of the face of the bluff a steep slope of colluvium has formed at the base. The area of investigation is located on the slope of colluvium, and is marked by the presence of two pin flags spaced approximately 25 ft apart parallel to the bluff face. In order to investigate the presence of buried metallic material that might indicate waste containers or other wash beneath the colluvial slope a magnetometer survey was conducted in and around the vicinity of the pin flags. The survey consisted of a 5-ft by 5-ft square grid node pattern in a 40-ft by 60-ft rectangle. Magnetic field and gradient anomalies were detected in the locations of the pin flags and can be attributed to the ferric composition of the pin flag shafts. Other magnetic field and gradient variations are at background levels and do not indicate the presence of buried ferric objects of any significant size.

2625 (Y/ER–237) **Value engineering study report on Lower East Fork Poplar Creek Project. Alternative No. 3.** Oak Ridge Y-12 Plant, TN (United States). Aug 1995. 113p. Sponsored by USDOE, Washington, DC (United

States). DOE Contract AC05-84OR21400. Order Number DE96003712. Source: OSTI; NTIS; INIS; GPO Dep.

Environmental Restoration Program.

The project under study is Alternative No. 3 as identified in the Feasibility Study dated August 1994. This alternative is identified as Excavation and Disposal of Commercial/ DOE, Other, and Residential Remedial Unit Soil. The assumptions used for generating baseline costs are discussed in site associated costs. It is further described as follows: Soils with mercury concentrations greater than 200 ppM in the Commercial/DOE and Other Remedial Units and greater than 180 ppM in the Residential Remedial Unit [41,300m^3 (54,000yd^3 a volume equivalent to approximately 6,750 dump truck loads)] would be excavated and disposed of in an approved, lined landfill at Y-12 with leachate collection and possible pretreatment of the leachate before discharge. Because 0.6 ha (1.5 acres) of wetland would be destroyed, wetlands banking would occur, whereby a 1.8-ha (4.5-acre) wetland would be constructed on DOE-owned land near K-25. Borrow soil would be obtained from the Y-12 West End Borrow Area or from excess soil located at Y-12 landfills to fill the excavation. It is estimated that 7.3 ha (18.2 acres, and area about the size of 17 football fields) of habitat would be adversely affected. This alternative would use BMPs to minimize any adverse affects and to comply substantively with regulatory requirements.

EFFICIENT SEPARATIONS

Refer also to citation(s) 356, 494, 1008, 1079, 1144, 1209, 1215, 1516, 1517, 1697

2626 (ANL–95/34) **Aqueous biphasic extraction of uranium and thorium from contaminated soils. Final report.** Chaiko, D.J.; Gartelmann, J.; Henriksen, J.L.; Krause, T.R.; Deepak; Vojta, Y.; Thuillet, E.; Mertz, C.J. Argonne National Lab., IL (United States). Jul 1995. 78p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31-109-ENG-38. Order Number DE96002931. Source: OSTI; NTIS; INIS; GPO Dep.

The aqueous biphasic extraction (ABE) process for soil decontamination involves the selective partitioning of solutes and fine particulates between two immiscible aqueous phases. The biphase system is generated by the appropriate combination of a water-soluble polymer (e.g., polyethlene glycol) with an inorganic salt (e.g., sodium carbonate). Selective partitioning results in 99 to 99.5% of the soil being recovered in the cleaned-soil fraction, while only 0.5 to 1% is recovered in the contaminant concentrate. The ABE process is best suited to the recovery of ultrafine, refractory material from the silt and clay fractions of soils. During continuous countercurrent extraction tests with soil samples from the Fernald Environmental Management Project site (Fernald, OH), particulate thorium was extracted and concentrated between 6- and 16-fold, while the uranium concentration was reduced from about 500 mg/kg to about 77 mg/kg. Carbonate leaching alone was able to reduce the uranium concentration only to 146 mg/kg. Preliminary estimates for treatment costs are approximately $160 per ton of dry soil. A detailed flowsheet of the ABE process is provided.

2627 (ANL/CMT/CP–85955) **Metal separations using aqueous biphasic partitioning systems.** Chaiko, D.J. (Argonne National Lab., IL (United States). Chemical Technology Div.); Zaslavsky, B.; Rollins, A.N.; Vojta, Y.; Gartelmann, J.; Mego, W. Argonne National Lab., IL (United States). [1996]. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-31109-ENG-38. (CONF-960631–2: Engineering Foundation conference on emerging separation technologies, Kona, HI (United States), 16-21 Jun 1996). Order Number DE96010815. Source: OSTI; NTIS; INIS; GPO Dep.

Aqueous biphasic extraction (ABE) processes offer the potential for low-cost, highly selective separations. This countercurrent extraction technique involves selective partitioning of either dissolved solutes or ultrafine particulates between two immiscible aqueous phases. The extraction systems that the authors have studied are generated by combining an aqueous salt solution with an aqueous polymer solution. They have examined a wide range of applications for ABE, including the treatment of solid and liquid nuclear wastes, decontamination of soils, and processing of mineral ores. They have also conducted fundamental studies of solution microstructure using small angle neutron scattering (SANS). In this report they review the physicochemical fundamentals of aqueous biphase formation and discuss the development and scaleup of ABE processes for environmental remediation.

2628 (BHI–00739) **Subproject plan for demonstration of 3M technology for treatment of N Basin water.** Plastino, J.C. Bechtel Hanford, Inc., Richland, WA (United States). Feb 1996. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-93RL12367. Order Number DE96008044. Source: OSTI; NTIS; INIS; GPO Dep.

A dissolved radionuclides removal demonstration is being conducted at the 105-N Basin as part of the 100-N Area Projects' policy of aggressively integrating innovative technologies to achieve more cost effective, faster, and/or safer deactivation operations. This subproject plan demonstrates new technology (marketed by the 3M™ Company) that absorbs specific ions from water. The demonstration will take place at the spent fuel basin at the N Reactor facility. The 105-N Basin contains 1 million gal of water consisting of approximately 32 Ci of dissolved ^{90}Sr at a concentration of 8.4 uCi/L and 7.3 Ci of dissolved ^{137}Cs at a concentration of 1.92 uCi/L. The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement [Ecology et al. 1990]) Milestone M-16-01E-T2 requires the initiation of pretreatment and removal of all N Reactor fuel storage basin waters by September 30, 1996, pursuant to the N Reactor Deactivation Program Plan (WHC 1993). 105-N Basin dewatering is on the critical path for overall deactivation of N Reactor by March 1997. The 105-N Basin Deactivation Program Plan (BHI 1995) includes removing debris, hardware, algae and sediment from the basin, followed by pretreatment (filtration) and removal of the 1005-N Basin water. Final water removal is currently scheduled for September 30, 1996. The recommended method of the 105-N Basin water is the treatment of the water at the Effluent Treatment Facility (ETF) in the 200 East Area. The demonstration of the 3M technology could be a feasible treatment alternative to the ETF if the ETF is not available to meet the project schedule or if additional pretreatment is needed to reduce the inventory of radioactive species to be handled at the ETF. Demonstration of this technology could be of value for other fuel basins at the Hanford Site and possibly other US Department of Energy (DOE) sites and non- DOE nuclear power plants.

2629 (CONF-9505101–6) **Removal of technetium from alkaline nuclear-waste media by a solvent-extraction process using crown ethers.** Bonnesen, P.V.

(Oak Ridge National Lab., TN (United States). Chemical and Analytical Sciences Div.); Presley, D.J.; Haverlock, T.J.; Moyer, B.A. Oak Ridge National Lab., TN (United States). [1995]. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Conference on challenges and innovations in the management of hazardous waste; Washington, DC (United States); 10-12 May 1995. Order Number DE95014200. Source: OSTI; NTIS; INIS; GPO Dep.

Crown ethers dissolved in suitably modified aliphatic kerosene diluents can be employed to extract technetium as pertechnetate anion (TcO_4^-) with good extraction ratios from realistic simulants of radioactive alkaline nitrate waste. The modifiers utilized are non-halogenated and non-volatile, and the technetium can be removed from the solvent by stripping using water. The crown ethers bis-4,4′(5′)[(tert-butyl)cyclohexano]-18-crown-6 (di-t-BuCH18C6) and dicyclohexano-18-crown-6 (DCH18C6) provide stronger TcO_4^- extraction than dicyclohexano-21-crown-7 and 4-tert-butylcyclohexano 15-crown-5. Whereas DCH18C6 provides somewhat higher TcO_4^- extraction ratios than the more lipophilic di-t-BuCH18C6 derivative, the latter was selected for further study owing to its lower distribution to the aqueous phase. Particularly good extraction and stripping results were obtained with di-t-BuCH 18C6 at 0.02 M in a 2:1 vol/vol blend of tributyl phosphate and Isopar® M. Using this solvent, 98.9% of the technetium contained (at 6×10^{-5} M) in a Double-Shell Slurry Feed (DSSF) Hanford tank waste simulant was removed following two cross-current extraction contacts. Two cross-current stripping contacts with deionized water afforded removal of 99.1% of the technetium from the organic solvent.

2630 (CONF-9507119–9) **Mercury separation from aqueous wastes.** Taylor, P.A.; Klasson, K.T.; Corder, S.L. Oak Ridge National Lab., TN (United States). Jul 1995. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Summer national meeting of the American Institute of Chemical Engineers; Boston, MA (United States); 30 Jul - 2 Aug 1995. Order Number DE96003778. Source: OSTI; NTIS; INIS; GPO Dep.

This project is providing an assessment of new sorbents for removing mercury from wastes at US Department of Energy sites. Four aqueous wastes were chosen for lab-scale testing; a high-salt, acidic waste currently stored at Idaho National Engineering Laboratory (INEL); a high-salt, alkaline waste stored at the Savannah River Site (SRS); a dilute lithium hydroxide solution stored at the Oak Ridge Y-12 Plant; and a low-salt, neutral groundwater generated at the Y-12 Plant. Eight adsorbents have been identified for testing, covering a wide range of cost and capability. Screening tests have been completed, which identified the most promising adsorbents for each waste stream. Batch isotherm tests have been completed using the most promising adsorbents, and column tests are in progress. Because of the wide range of waste compositions tested, no one adsorbent is effective in all of these waste streams. Based on loading capacity and compatibility with the waste solutions. the most effective adsorbents identified to date are SuperLig 618 for the INEL tank waste stimulant; Mersorb followed by Ionac SR-3 for the SRS tank waste stimulant; Durasil 70 and Ionac SR-3) for the LIOH solution; and Ionac SR-3 followed by Ionac SR-4 and Mersorb for the Y-12 groundwater.

2631 (CONF-951180–3) **Present and future roles of solvent extraction in treatment of nuclear wastes.** Watson, J.S. Oak Ridge National Lab., TN (United States). [1995]. 6p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Annual meeting of the American Institute of Chemical Engineers; Miami Beach, FL (United States); 12-17 Nov 1995. Order Number DE96005464. Source: OSTI; NTIS; INIS; GPO Dep.

Solvent extraction has played a major role in development of the nuclear industry and has recovered much of the uranium from raw materials and essentially all of the plutonium and uranium from spent fuels. These operations produced a wide variety of radioactive wastes as well as the uranium and plutonium products. Solvent extraction worked well in the earlier nuclear facilities and should play a significant role in future cleanup operations.

2632 (CONF-960158–4) **Development and testing of inorganic sorbents made by the internal gelation process for radionuclide and heavy metal separations.** Egan, B.Z. (Oak Ridge National Lab., TN (United States). Chemical Technology Div.); Collins, J.L.; Anderson, K.K.; Chase, C.W. Oak Ridge National Lab., TN (United States). 29 Nov 1995. 5p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From Efficient separations and processing crosscutting program 1996 technical meeting; Gaithersburg, MD (United States); 16-19 Jan 1996. Order Number DE96005660. Source: OSTI; NTIS; INIS; GPO Dep.

The objectives of this task are to develop, prepare, and test microspheres and granular forms of inorganic ion exchangers to remove radionuclides and heavy metals from waste streams occurring at various sites. Several inorganic materials, such as hexacyanoferrates, titanates, phosphates, and oxides have high selectivities and efficiencies for separating and removing radionuclides such as uranium, technetium, cesium, and strontium, and metals such as cobalt, silver, zinc, and zirconium from aqueous waste streams. However, these sorbents frequently exist only as powders and consequently are not readily adaptable to continuous processing such as column chromatography. Making these inorganic ion exchangers as microspheres or granular forms improves the flow dynamics for column operations and expands their practical applications. Microspheres of several materials have been prepared at ORNL, and the effectiveness of zirconium monohydrogen phosphate and hydrous titanium oxide microspheres for removing radionuclides from hot cell waste solutions has been demonstrated.

2633 (CONF-960314–3) **Solvent extraction of technetium from alkaline waste media using bis-4,4′(5′)[(tert-butyl)cyclohexano]-18-crown-6.** Bonnesen, P.V.; Presley, D.J.; Moyer, B.A. Oak Ridge National Lab., TN (United States). [1995]. 7p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. From International solvent extraction conference; Melbourne (Australia); 17-21 Mar 1996. Order Number DE95013989. Source: OSTI; NTIS; INIS; GPO Dep.

The crown ether bis-4,4′(5′)[(tert-butyl)cyclohexano]-18-crown-6 can be utilized in a solvent-extraction process for the removal of technetium as pertechnetate ion, TcO_4^- from solutions simulating highly radioactive alkaline defense wastes ("tank wastes") stored at several sites in the United States. The process employs non-halogenated and non-volatile diluents and modifiers and includes an efficient stripping procedure using only water. More than 95% of the pertechnetate present at 6×10^{-5} M in Melton Valley (Oak Ridge, TN) and Hanford (Washington) tank-waste simulants was removed following two cross-current extraction contacts using 0.02 M bis-4,4′(5′)[(tertbutyl)cyclohexano]- 18-crown-6 in 2:1 vol/vol TBP/Isopar® M diluent at 25 C. Similarly, for both simulants, more than 98% of the pertechnetate contained in the solvent was back-extracted following two cross-current stripping contacts using deionized water.

2634 (DOE/EM–0249) **Efficient Separations and Processing Crosscutting Program. Technology summary.** USDOE Assistant Secretary for Environmental Management, Washington, DC (United States). Jun 1995. 101p. Sponsored by USDOE, Washington, DC (United States). Order Number DE95016004. Source: OSTI; NTIS; INIS; GPO Dep.

The Efficient Separations and Processing (ESP) Crosscutting Program was created in 1991 to identify, develop, and perfect separations technologies and processes to treat wastes and address environmental problems throughout the DOE Complex. The ESP funds several multi-year tasks that address high-priority waste remediation problems involving high-level, low-level, transuranic, hazardous, and mixed (radioactive and hazardous) wastes. The ESP supports applied research and development (R and D) leading to demonstration or use of these separations technologies by other organizations within DOE-EM. Treating essentially all DOE defense wastes requires separation methods that concentrate the contaminants and/or purify waste streams for release to the environment or for downgrading to a waste form less difficult and expensive to dispose of. Initially, ESP R and D efforts focused on treatment of high-level waste (HLW) from underground storage tanks (USTs) because of the potential for large reductions in disposal costs and hazards. As further separations needs emerge and as waste management and environmental restoration priorities change, the program has evolved to encompass the breadth of waste management and environmental remediation problems.

2635 (DOE/EM–0294) **Efficient separations & processing crosscutting program.** USDOE Office of Science and Technology, Washington, DC (United States). Office of Program Analysis. Aug 1996. 155p. Sponsored by USDOE, Washington, DC (United States). Order Number DE96013517. Source: OSTI; NTIS; INIS; GPO Dep.

The Efficient Separations and Processing Crosscutting Program (ESP) was created in 1991 to identify, develop, and perfect chemical and physical separations technologies and chemical processes which treat wastes and address environmental problems throughout the DOE complex. The ESP funds several multiyear tasks that address high-priority waste remediation problems involving high-level, low-level, transuranic, hazardous, and mixed (radioactive and hazardous) wastes. The ESP supports applied research and development (R & D) leading to the demonstration or use of these separations technologies by other organizations within the Department of Energy (DOE), Office of Environmental Management.

2636 (DOE/MC/29105–5199) **Conceptual design for a full-scale VAC*TRAX vacuum thermal desorption unit. Final report, September 1992–December 1995.** Palmer, C.R. Rust Federal Services, Inc., Anderson, SC (United States). Apr 1996. 135p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC21-92MC29105. Order Number DE96004480. Source: OSTI; NTIS; GPO Dep.

Rust Federal Services is pleased to present this topical report on the results of our Phase II conceptual design work of the PRDA VAC*TRAX^{SM} mobile vacuum thermal desorption technology demonstration program. Through the present Phase II conceptual design activities, Rust has developed an equipment design and permitting strategy that retains the flexibility of a mobile treatment system with the long term value and ease of access of a central facility. The process is designed to remove volatile matter from solid matrices by thermal desorption. The system is also designed with superior emission controls, making it an ideal system for the treatment of radioactive wastes.

2637 (INEL–94/0028) **Removal of cesium from a high-level calcined waste by high temperature volatilization.** Del Debbio, J.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). Nov 1994. 16p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002943. Source: OSTI; NTIS; INIS; GPO Dep.

Pyrochemical methods are being evaluated for the separation of actinides and fission products from inert material in high-level waste calcine. Separation processes have the potential of reducing waste disposal costs by reducing the volume of high-level waste requiring final disposal in a repository. Tests were conducted to evaluate high temperature volatilization for removing ^{137}Cs from four types of calcines. The results for pilot plant calcines indicate greater than 99% cesium removal for alumina and fluorinel/sodium calcines heated at 1000°C and 99% removal for zirconia calcine heated at 1100°C. Tests with actual calcine generated at the New Waste Calcining Facility (NWCF) from a blend of aluminium, sodium and zirconium/fluorinel wastes resulted in 96% cesium removal at 1000°C and greater than 99% removal at 1170°C.

2638 (INEL–94/0040) **The use of selective extraction chromatographic columns as an alternative to solvent extraction for the separation of uranium followed by the use of Arsenazo III as a calorimetric reagent for uranium determination.** Miller, C.J.; Del Mastro, J.R. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Oct 1994. 18p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96002849. Source: OSTI; NTIS; INIS; GPO Dep.

The use of U/TEVA® Spec columns as an alternative to solvent extraction for separation of uranium prior to its determination by various techniques (calorimetric, phosphorescence, and mass spectroscopy) was investigated. U/TEVA® Spec columns have several advantages over the widely used 4-methyl-2-pentanone solvent extraction method. Among the advantages are: (1) no hazardous liquid organic waste, that creates regulatory waste disposal problems, is generated; (2) a clean separation of U from Zr, F, and fission products is obtained; (3) the sample preparation time is reduced; and (4) the exposure of analysts to ionizing radiation is reduced because the entire procedure may be performed in a hot cell using remote operations. This study also investigated the use of Arsenazo III (1,8-dihydroxynapthalene-3,6-disulfonic acid-2,7-bis [<-azo-2>-phenylarsonic acid]) as a calorimetric reagent to determine uranium concentrations over a wide range in waste streams and product streams at the Idaho Chemical Processing Plant. Process and waste stream samples were passed through a U/TEVA® Spec column to selectively remove the uranium. The uranium bearing fraction is compatible with the pH range for color development with Arsenazo III. Arsenazo III may be added to the uranium fraction, at a 3:1 mole ratio (Arsenazo:Uranium) at the high end of the method (10 μ/mL). Arsenazo III forms a highly stable complex with uranium. Stability tests from this and other studies show that the colored complex of Arsenazo III with U(VI) forms within one minute and remains stable for several hours. The complex with U(VI) varies in color with pH. However, with excess reagent, the color is varying shades of purple. Since the samples were passed through a highly selective extraction chromatographic column prior to adding the calorimetric reagent, no interferences were observed.

2639 (INEL–95/00241) **Mercury extraction by the TRUEX process solvent: I. Kinetics, extractable species, dependence on nitric acid concentration and stoichiometry.** Herbst, R.S.; Brewer, K.N.; Tranter, T.J.; Todd, T.A. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-81ID12345. (CONF-9505164–1: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE96002524. Source: OSTI; NTIS; INIS; GPO Dep.

Mercury extraction from acidic aqueous solutions by the TRUEX process solvent (0.2 M CMPO, 1.4 M TBP in n-dodecane) has not extensively been examined. Research at the Idaho Chemical Processing Plant is currently in progress to evaluate the TRUEX process for actinide removal from several acidic waste streams, including liquid sodium-bearing waste (SBW), which contains significant quantities of mercury. Preliminary experiments were performed involving the extraction of Hg^{203}, added as $HgCl_2$, from 0.01 to 10 M HNO_3 solutions. Mercury distribution coefficients (D_{Hg}) range between 3 and 60 from 0.01 M to 2 M HNO_3. At higher nitric acid concentrations, i.e. 5 M HNO_3 or greater, D_{Hg} significantly decreases to values less than 1. These results indicate mercury is extracted from acidic solutions $\leq\sim$2 M HNO_3 and stripped with nitric acid solutions $\geq\sim$5 M HNO_3. Experimental results indicate the extractable species is $HgCl_2$ from nitrate media, i.e., chloride must be present in the nitrate feed to extract mercury. Extractions from $Hg(NO_3)_2$ solutions indicated substantially reduced distribution ratios, typically $D_{Hg} < 1$, for the range of nitric acid concentrations examined (0.01 to 8 M HNO_3). Extraction of mercury, as $HgCl_2$, by the individual components of the TRUEX solvent was also examined from 2 M HNO_3. The diluent, n-dodecane, does not measurably extract mercury. With a 1.4 M TBP/n-dodecane solvent, D_{Hg} ~3.4 compared with D_{Hg} ~7 for the TRUEX solvent. Classical slope analysis techniques were utilized to evaluate the stoichiometric coefficients of Hg extraction independently for both CMPO and TBP.

2640 (INEL–95/00243) **Selective partitioning of mercury from co-extracted actinides in a simulated acidic ICPP waste stream.** Brewer, K.N. (and others); Herbst, R.S.; Tranter, T.J. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract FG07-81ID12345. (CONF-9505164–2: Conference on challenges and innovations in the management of hazardous waste, Washington, DC (United States), 10-12 May 1995). Order Number DE96002523. Source: OSTI; NTIS; INIS; GPO Dep.

The TRUEX process is being evaluated at the Idaho Chemical Processing Plant (ICPP) as a means to partition the actinides from acidic sodium-bearing waste (SBW). The mercury content of this waste averages 1 g/l. Because the chemistry of mercury has not been extensively evaluated in the TRUEX process, mercury was singled out as an element of interest. Radioactive mercury, ^{203}Hg, was spiked into a simulated solution of SBW containing 1 g/l mercury. Successive extraction batch contacts with the mercury spiked waste simulant and successive scrubbing and stripping batch contacts of the mercury loaded TRUEX solvent (0.2 M CMPO-1.4 M TBP in dodecane) show that mercury will extract into and strip from the solvent. The extraction distribution coefficient for mercury, as $HgCl_2$ from SBW having a nitric acid concentration of 1.4 M and a chloride concentration of 0.035 M was found to be 3. The stripping distribution coefficient was found to be 0.5 with 5 M HNO_3 and 0.077 with 0.25 M Na_2CO_3. An experimental flowsheet was designed from the batch contact tests and tested counter-currently using 5.5 cm centrifugal contactors. Results from the counter-current test show that mercury can be removed from the acidic mixed SBW simulant and recovered separately from the actinides.

2641 (INEL–95/0248) **Cesium removal from liquid acidic wastes with the primary focus on ammonium molybdophosphate as an ion exchanger: A literature review.** Miller, C.J. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Mar 1995. 20p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96001350. Source: OSTI; NTIS; INIS; GPO Dep.

Many articles have been written concerning the selective removal of cesium from both acidic and alkaline defense wastes. The majority of the work performed for cesium removal from defense wastes involves alkaline feed solutions. Several different techniques for cesium removal from acidic solutions have been evaluated such as precipitation, solvent extraction, and ion exchange. The purpose of this paper is to briefly review various techniques for cesium removal from acidic solutions. The main focus of the review will be on ion exchange techniques, particularly those involving ammonium molybdophosphate as the exchanger. The pertinent literature sources are condensed into a single document for quick reference. The information contained in this document was used as an aid in determining techniques to evaluate cesium removal from the acidic Idaho Chemical Processing Plant waste matrices. 47 refs., 2 tabs.

2642 (INEL–95/00516) **Cesium absorption from acidic solutions using ammonium molybdophosphate on a polyacrylonitrile support (AMP-PAN).** Miller, C.J.; Olson, A.L.; Johnson, C.K. EG and G Idaho, Inc., Idaho Falls, ID (United States). 1995. 12p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. (CONF-951057–1: 9. symposium on separation science and technology for energy applications, Gatlinburg, TN (United States), 22-26 Oct 1995). Order Number DE96002512. Source: OSTI; NTIS; INIS; GPO Dep.

Recent efforts at the Idaho Chemical Processing Plant (ICPP) have included evaluation of cesium removal technologies as applied to ICPP acidic radioactive waste streams. Ammonium molybdophosphate (AMP) immobilized on a polyacrylonitrile support (AMP-PAN) has been studied as an ion exchange agent for cesium removal from acidic waste solutions. Capacities, distribution coefficients, elutability, and kinetics of cesium-extraction have been evaluated. Exchange breakthrough curves using small columns have been determined from 1M HNO_3 and simulated waste solutions. The theoretical capacity of AMP is 213 g Cs/kg AMP. The average experimental capacity in batch contacts with various acidic solutions was 150 g Cs/kg AMP. The measured cesium distribution coefficients from actual waste solutions were 3287 mL/g for dissolved zirconia calcines, and 2679 mL/g for sodium-bearing waste. The cesium in the dissolved alumina calcines was analyzed for; however, the concentration was below analytical detectable limits resulting in inconclusive results. The reaction kinetics are very rapid (2-10 minutes). Cesium absorption appears to be independent of acid concentration over the range tested (0.1 M to 5 M HNO_3).

2643 (INEL–96/0021) **Actinide partitioning studies using dihexyl-N,N-diethycarbamolymehtyl phosphonate and dissolved zirconium calcine.** Brewer, K.N.; Herbst, R.S.; Law, J.D.; Garn, T.G.; Tillotson, R.D.; Todd, T.A. Lockheed Idaho Technologies Co., Idaho Falls, ID (United States). Jan 1996. 43p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96007525. Source: OSTI; NTIS; INIS; GPO Dep.

A baseline flowsheet capable of partitioning the transuranic (TRU) elements from dissolved zirconium calcines has been developed. The goal of the TRU partitioning process is to remove the TRUs from solutions of dissolved zirconium calcines to below the 10 CFR 61.55 Class A waste limit of 10 nCi/g. Extraction, scrub, strip, and wash distribution coefficients for several elements, including the actinides, were measured in the laboratory by performing equal volume batch contacts. A solvent containing diheyl-N, N- diethylcarbamoylmethyl phosphonate (CMP), tributylphosphate (TBP), and a branched chain hydrocarbon as the diluent were used to develop this process. A non-radioactive zirconium pilot-plant calcine was spiked with the TRUs, U, Tc, or a radioactive isotope of zirconium to simulate the behavior of these elements in actual dissolved zirconium calcine feed. Distribution coefficient data obtained from laboratory testing were used to recommend: (1) solvent composition, (2) scrub solutions capable of selectively removing extracted zirconium while minimizing actinide recycle, (3) optimized strip solutions which quantitatively recover extracted actinides, and (4) feed adjustments necessary for flowsheet efficiency. Laboratory distribution coefficients were used in conjunction with the Generic TRUEX Model (GTM) to develop and recommend a flowsheet for testing in the 5.5-cm Centrifugal Contractor Mockup. GTM results indicate that the recommended flowsheet should remove the actinides from dissolved zirconium calcine feed to below the Class A waste limit of 10 nCi/g. Less than 0.01 wt% of the extracted zirconium will report to the high- activity waste (HAW) fraction using the 0.05 M $H_2C_2O_4$ in 3.0 M HNO_3 scrub, and greater than 99% of the extracted actinides are recovered with 0.001 M HEDPA.

2644 (INEL–96/0229) **Application of ultrasound in solvent extraction of nickel and gallium.** Pesic, B. Aerojet Nuclear Co., Idaho Falls, ID (United States). Idaho National Engineering Lab. Jul 1996. 88p. Sponsored by USDOE, Washington, DC (United States);Department of the Interior, Washington, DC (United States). DOE Contract AC07-94ID13223. Order Number DE96014095. Source: OSTI; NTIS; GPO Dep.

The effects of ultrasound on the rate of solvent extraction of nickel with Lix 65N and Lix 70, and gallium with Kelex 100 were investigated. These solvent extraction systems are noted by their sluggish nature. Low frequency (20 kHz) ultrasound increased the rates of extraction of nickel by factors of four to seven. The ultrasound had no effect on the final chemical equilibrium. Gallium extraction rates were enhanced with the use of ultrasound by as much as a factor of 15. Again, the ultrasound had no effect on extraction equilibrium. For both nickel and gallium, the enhanced rates were attributed to increased interfacial surface area associated with ultrasonically induced cavitation and microdroplet formation. The stability of the microdroplets permitted intermittent application of ultrasound with corresponding decreases in ultrasonic energy requirements. The lowest energy consumption was observed with short (0.25 to 5 s) bursts of high power (41 to 61 W) ultrasonic inputs. The study also provided insight into the factors that affect the complex extraction of gallium from sodium aluminate solutions. The rate controlling step was found to be the dehydration of the gallate ion, Ga(OH)4, and the first complex formation between gallium and Kelex 100. Sodium was found to enhance the extraction rate up to a point, beyond which increased concentration was detrimental. Increasing aluminum concentration was found to slow extraction rates. Modifiers and diluents were shown to markedly affect extraction rates even without ultrasound. Ketone modifiers, particularly 2-undecanone, when used with Kermac 470B or Escaid 200 diluents enhanced extraction rates of gallium to the point that the use of ultrasound provided no additional benefits. The positive effects of ketone modifiers for the solvent extraction of gallium had not been previously reported.

2645 (LA-UR–95-1868) **Design, synthesis, and evaluation of polyhydroxamate chelators for selective complexation of actinides.** Gopalan, A. (New Mexico State Univ., Las Cruces, NM (United States)); Jacobs, H.; Koshti, N.; Stark, P.; Huber, V.; Dasaradhi, L.; Caswell, W.; Smith, P.; Jarvinen, G. Los Alamos National Lab., NM (United States). [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract W-7405-ENG-36. (CONF-9504135–3: 5. annual waste-management education and research consortium (WERC) technology development conference, Las Cruces, NM (United States), 18-20 Apr 1995). Order Number DE95016429. Source: OSTI; NTIS; INIS; GPO Dep.

Specific chelating polymers targeted for actinides have much relevance to problems involving remediation of nuclear waste. Goal is to develop polymer supported, ion specific extraction systems for removing actinides and other hazardous metal ions from wastewaters. This is part of an effort to develop chelators for removing actinide ions such as Pu from soils and waste streams. Selected ligands are being attached to polymeric backbones to create novel chelating polymers. These polymers and other water soluble and insoluble polymers have been synthesized and are being evaluated for ability to selectively remove target metal ions from process waste streams.

2646 (ORNL/TM–12938) **Evaluation of selected ion exchangers for the removal of cesium from MVST W-25 supernate.** Collins, J.L.; Egan, B.Z.; Anderson, K.K.; Chase, C.W.; Mrochek, J.E.; Bell, J.T.; Jernigan, G.E. Oak Ridge National Lab., TN (United States). Apr 1995. 48p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-84OR21400. Order Number DE95013798. Source: OSTI; NTIS; INIS; GPO Dep.

The goal of this batch-test equilibration study was to evaluate the effectiveness of certain ion exchangers for removing cesium from supernate taken from tank W-25 of the Melton Valley Storage Tank (MVST) Facility located at the Oak Ridge National Laboratory (ORNL). These exchangers were selective for removing cesium from alkaline supernatant solutions with high salt concentrations. Since the supernates of evaporator concentrates stored in tanks at the MVST facility have compositions similar to some of those stored in tanks at Hanford, the data generated in this study should prove useful in the overall evaluation of the ion exchangers for applications to Hanford and other US Department of Energy (USDOE) sites. A goal of the waste processing effort at Hanford is to remove enough cesium to ensure that the resulting LLW will meet the Nuclear Regulatory Commission (NRC) 10 CFR 61 class A limit for ^{137}Cs (1 Ci/m^3 or 1 μCi/mL). The separated cesium may be concentrated and vitrified for disposal in the high-level waste repository. The decontaminated effluent would be solidified for near-surface disposal.

2647 (ORNL/TM–13201) **Evaluation of the ACT*DE*CON^{SM} process for treating gunite tank sludge.** Spencer, B.B.; Chase, C.W.; Egan, B.Z. Oak Ridge National Lab., TN (United States). May 1996. 34p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96014273. Source: OSTI; NTIS; INIS; GPO Dep.

A test was conducted to evaluate this process for selectively removing actinides from Gunite tank sludge. Mixed waste sludge from Gunite tank W-6 was subjected to the ACT*DE*CON selective leaching process. (Nearly all the TRU content was attributed to Pu.) The sludge sample was first washed with 0.01M NaOH to remove excess sodium and nitrate in the interstitial liquid supernatant. The washed wet solids were treated with the ACT*DE*CON solvent (aqueous carbonate solution containing a chelating agent and an oxidant), using a ratio of 20 ml solvent per gram wet solids. Sludge and solvent were separated by centrifugation, and the ACT*DE*CON treatment was repeated twice. Analyses showed that 71% of the solids in the sludge were dissolved while 80% of the TRU-waste components dissolved. Low separation of the TRU-waste components from other components of the sludge mixture is indicated. Almost all the U and Ca were removed from the sludge. For sludges where most of the TRU content is Pu, the ACT*DE*CON process as tested is not effective in rendering the sludge a non-TRU waste. It is recommended that ACT*DE*CON be optimized for this specific application and that other processes using different chelating and oxidizing agents be tested. Also, the ACT*DE*CON process should be tested on TRU mixed waste in which most of the TRU elements are not Pu.

2648 (ORNL/TM–13241) **Alkaline-side extraction of technetium from tank waste using crown ethers and other extractants.** Bonnesen, P.V.; Moyer, B.A.; Presley, D.J.; Armstrong, V.S.; Haverlock, T.J.; Counce, R.M.; Sachleben, R.A. Oak Ridge National Lab., TN (United States). Jun 1996. 105p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC05-96OR22464. Order Number DE96012272. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical development of a new crown-ether-based solvent-extraction process for the separation of (Tc) from alkaline tank-waste supernate is ready for counter-current testing. The process addresses a priority need in the proposed cleanup of Hanford and other tank wastes. This need has arisen from concerns due to the volatility of Tc during vitrification, as well as ^{99}Tc's long half-life and environmental mobility. The new process offers several key advantages that direct treatability–no adjustment of the waste composition is needed; economical stripping with water; high efficiency–few stages needed; non-RCRA chemicals–no generation of hazardous or mixed wastes; co-extraction of ^{90}Sr; and optional concentration on a resin. A key concept advanced in this work entails the use of tandem techniques: solvent extraction offers high selectivity, while a subsequent column sorption process on the aqueous stripping solution serves to greatly concentrate the Tc. Optionally, the stripping solution can be evaporated to a small volume. Batch tests of the solvent-extraction and stripping components of the process have been conducted on actual melton Valley Storage Tank (MVST) waste as well as simulants of MVST and Hanford waste. The tandem process was demonstrated on MVST waste simulants using the three solvents that were selected the final candidates for the process. The solvents are 0.04 M bis-4,4′(5′)[(tert-butyl)cyclohexano]-18-crown-6 (abbreviated di-t-BuCH18C6) in a 1:1 vol/vol blend of tributyl phosphate and Isopar® M (an isoparaffinic kerosene); 0.02 M di-t-BuCH18C6 in 2:1 vol/vol TBP/Isopar M and pure TBP. The process is now ready for counter-current testing on actual Hanford tank supernates.

2649 (PNL–10460) **Inorganic ion exchange evaluation and design: Silicotitanate ion exchange waste conversion.** Balmer, M.L.; Bunker, B.C. Pacific Northwest Lab., Richland, WA (United States). Mar 1995. 45p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE95011683. Source: OSTI; NTIS; INIS; GPO Dep.

Ion exchange materials are being evaluated for removing Cs, SR from tank waste. Thermal conversion of a variety of compositions within the Cs_2O-TiO_2-SiO_2 phase diagram yielded both glass and crystalline materials, some of which show low leach rates and negligible Cs losses during heat treatment. A new material, $CsTiSi_20_6$, with a structure isomorphous to pollucite ($CsAlSi_20_6$) has been identified. This material represents a new class of crystalline zeolite materials which contain large amounts of titanium. Direct conversion of Cs loaded silicotitanate ion exchangers to $CsTiSi_2O_6$ is an excellent alternative to dissolving the Cs-loaded or Cs-eluted exchangers in borosilicate glass because: $CsTiSi_2O_6$ is formed using a simple, one step heat treatment. The unique crystalline pollucite-like structure of $CsTiSi_2O_6$ traps Cs, and exhibits extremely low Cs leach rates. $CsTiSi_2O_6$ is converted to solid waste at a low processing temperature of 700 to 800 C (nominal melter operating temperatures are 1150 C). $CsTiSi_20_6$ concentrates the waste, thus generating lower volumes of expensive HLW. Cs losses due to volatilization during processing of $CsTiSi_2O_6$ are extremely low.

2650 (PNL–10750) **Efficient separations and processing crosscutting program: Develop and test sorbents.** Bray, L.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 70p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96000807. Source: OSTI; NTIS; INIS; GPO Dep.

This report summarizes work performed during FY 1995 under the task "Develop and Test Sorbents," the purpose of which is to develop high-capacity, selective solid extractants to recover cesium, strontium, and technetium from nuclear wastes. This work is being done for the Efficient Separations and Processing Crosscutting Program (ESP), operated by the U.S. Department of Energy's Office of Environmental Management's Office of Technology Development. The task is under the direction of staff at Pacific Northwest Laboratory (PNL) with key participation from industrial and university staff at 3M, St. Paul, Minnesota; IBC Advanced Technologies, Inc., American Forks, Utah; AlliedSignal, Inc., Des Plaines, Illinois, and Texas A&M University, College Station, Texas. 3M and IBC are responsible for ligand and membrane technology development; AlliedSignal and Texas A&M are developing sodium titanate powders; and PNL is testing the materials developed by the industry/university team members. Major accomplishments for FY 1995 are summarized in this report.

2651 (PNL–10767) **Radiation testing of organic ion exchange resins.** Carlson, C.D. (and others); Bray, L.A.; Bryan, S.A. Pacific Northwest Lab., Richland, WA (United States). Sep 1995. 40p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96002212. Source: OSTI; NTIS; INIS; GPO Dep.

A number of ion exchange materials are being evaluated as part of the Tank Waste Remediation System (TWRS) Pacific Northwest Laboratory (PNL) Pretreatment Project for the removal of ^{137}Cs from aqueous tank wastes. Two of these materials are organic resins; a phenol-formaldehyde resin (Duolite CS-100) produced by Rohm and Haas Co. (Philadelphia, Pennsylvania) and a resorcinol-formaldehyde (RF) resin produced by Boulder Scientific Co. (Mead, Colorado). One of the key parameters in the assessment of the organic based ion exchange materials is its useful lifetime in the radioactive and chemical environment that will be encountered during waste processing. The focus of the work presented in this report is the radiation stability of the CS-100 and the RF resins. The scope of the testing included one test with a sample of the CS-100 resin and testing of two batches of the RF resin (BSC-187 and BSC-210). Samples of the exchangers were irradiated with a ^{60}Co source to a total absorbed dose of 10^9 R over a period of 5 months in a static (no flow) and a flowing configuration with neutralized current acid waste (NCAW) simulant as a feed. Based on a maximum concentration of ^{137}Cs on the resin that would result from processing NCAW, this dose represents an operational period of at least 150 days for the RF resin and at least 1260 days for the CS-100 resin. Gas generation in the static experiment was continuously monitored and G values (molecules of gas per 100 eV) were determined for each species. Resin samples were obtained periodically and the equilibrium behavior of the resins was assessed by determining the distribution coefficients (K_ds). Structural information was also obtained by ^{13}C cross polarization magic angle (CPMAS) nuclear magnetic resonance (NMR) spectrometry and Fourier Transform Infrared (FTIR) spectroscopy so that changes to the chemical structure could be correlated with changes in K_d.

2652 (PNL–10920) **Comparison of organic and inorganic ion exchangers for removal of cesium and strontium from simulated and actual Hanford 241-AW-101 DSSF tank waste.** Brown, G.N. (and others); Bray, L.A.; Carlson, C.D. Pacific Northwest Lab., Richland, WA (United States). Jan 1996. 84p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96005840. Source: OSTI; NTIS; INIS; GPO Dep.

Pacific Northwest National Laboratory (Northwest National Laboratory) conducted this study as a joint effort between the "Develop and Test Sorbents" task for the Efficient Separations and Processing Cross-Cutting Program (ESP) and the "Batch Testing of Crystalline Silico-Titanates (CSTs)" subtask, which is part of the Northwest National Laboratory Tank Waste Remediation System (TWRS) Pretreatment Technology Development Project. The objective of the study is to investigate radionuclide uptake of the newly produced CST materials under a variety of solution conditions and to compare the results obtained for this material with those obtained for other commercial and experimental exchangers.

2653 (PNL-SA–25603) **Proceedings of the Efficient Separations and Processing Cross-Cutting Program Annual Technical Exchange Meeting.** Pacific Northwest Lab., Richland, WA (United States). [1995]. 79p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-950171–: Efficient Separations and Processing Integrated Program (ESPIP) technical integration and exchange (TIE) meeting, Gaithersburg, MD (United States), 24-26 Jan 1995). Order Number DE95007261. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains summaries of technology development presented at the 1995 Efficient Separations and Processing Cross-Cutting Program (ESP) Annual Technical Exchange Meeting. The ESP is sponsored by the US Department of Energy's Office of Environmental Management (EM), Office of Technology Development. The meeting is held annually to promote a free exchange of ideas among technology developers, potential users (for example, EM focus areas), and other interested parties within EM. During this meeting, developers of ESP-funded technologies describe the problems and needs addressed by their technologies; the technical approach, accomplishments, and resolution of issues; the strategy and schedule for commercialization; and evolving potential applications. Presenters are asked to address the following areas: Target waste management problem, waste stream, or data need; scientific background and technical approach; technical accomplishments and resolution of technical issues; schedule and strategy for commercializing and implementing the technology or acquiring needed data; potential alternate applications of the technology or data, including outside of DOE/EM. The meeting is not a program review of the individual tasks or subtasks; but instead focuses on the technical aspects and implementation of ESP-sponsored technology or data. The meeting is also attended by members of the ESP Technical Review Team, who have the opportunity at that time to review the ESP as a whole.

2654 (PNNL–11121) **Assessment of commercially available ion exchange materials for cesium removal from highly alkaline wastes.** Brooks, K.P.; Kim, A.Y.; Kurath, D.E. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 62p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011241. Source: OSTI; NTIS; INIS; GPO Dep.

Approximately 61 million gallons of nuclear waste generated in plutonium production, radionuclide removal campaigns, and research and development activities is stored on the Department of Energy's Hanford Site, near Richland, Washington. Although the pretreatment process and disposal requirements are still being defined, most pretreatment scenarios include removal of cesium from the aqueous streams. In many cases, after cesium is removed, the dissolved salt cakes and supernates can be disposed of as LLW. Ion exchange has been a leading candidate for this separation. Ion exchange systems have the advantage of simplicity of equipment and operation and provide many theoretical stages in a small space. The organic ion exchange material Duolite™ CS-100 has been selected as the baseline exchanger for conceptual design of the Initial Pretreatment Module (IPM). Use of CS-100 was chosen because it is considered a conservative, technologically feasible approach. During FY 96, final resin down-selection will occur for IPM

Title 1 design. Alternate ion exchange materials for cesium exchange will be considered at that time. The purpose of this report is to conduct a search for commercially available ion exchange materials which could potentially replace CS-100. This report will provide where possible a comparison of these resin in their ability to remove low concentrations of cesium from highly alkaline solutions. Materials which show promise can be studied further, while less encouraging resins can be eliminated from consideration.

2655 (PNNL–11124) **Initial evaluation of two organic resins and their ion exchange column performance for the recovery of cesium from Hanford alkaline wastes.** Bray, L.A.; Carson, K.J.; Elovich, R.J.; Carlson, C.D.; DeSchane, J.R.; Kurath, D.E. Pacific Northwest National Lab., Richland, WA (United States). Apr 1996. 46p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. Order Number DE96011240. Source: OSTI; NTIS; INIS; GPO Dep.

The contents of Hanford's 177 underground storage tanks include a mixture of sludge, salt cake and alkaline supernatant liquids. Most of the cesium is expected to be in the aqueous liquids and it is these solutions that are the focus of the cesium ion exchange removal process. This process is being designed with the goal of removing enough cesium so that the resulting low-level waste (LLW) will meet the NRC 10CFR61 class A limits for ^{137}Cs (1 Ci/m^3). The overall objective of the WHC program is (1) to evaluate ion exchange materials for the recovery of cesium from alkaline wastes, (2) to determine their loading and elution capacities, (3) to determine the physical life cycle (including radiation and chemical stability) for selected ion exchangers, (4) to determine if basic ion exchange data can be applied to a broad range of tank wastes, and (5) to provide credible laboratory data for engineering-scale evaluation and ion exchange media selection. The goal will be to provide the technology to produce a Class A waste. The results presented in this document provide initial test cesium loading and elution results for ion exchange column operations for two selected ion exchange resins under a limited range of conditions. Data in this report can be found in PNL laboratory record books BNW 54705 and BNW 55026.

2656 (PNNL-SA–27105) **Efficient separations and processing crosscutting program 1996 technical exchange meeting. Proceedings.** Pacific Northwest Lab., Richland, WA (United States). [1996]. 143p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-76RL01830. (CONF-960158–: Efficient separations and processing crosscutting program 1996 technical meeting, Gaithersburg, MD (United States), 16-19 Jan 1996). Order Number DE96005494. Source: OSTI; NTIS; INIS; GPO Dep.

This document contains summaries of technology development presented at the 1996 Efficient Separations and Processing Crosscutting Program Technical Exchange Meeting. This meeting is held annually to promote a free exchange of ideas among technology developers, potential users and other interested parties within the EM community. During this meeting the following many separation processes technologies were discussed such as ion exchange, membrane separation, vacuum distillation, selective sorption, and solvent extraction. Other topics discussed include: waste forms; testing or inorganic sorbents for radionuclide and heavy metal removal; selective crystallization; and electrochemical treatment of liquid wastes. This is the leading abstract, individual papers have been indexed separately for the databases.

2657 (SAND–95-1601C) **Development and design of a high pressure carbon dioxide system for the separation of hazardous contaminants from non-hazardous debris.** Adkins, C.L.J. (Sandia National Labs., Albuquerque, NM (United States)); Russick, E.M.; Smith, H.M.; Olson, R.B. Sandia National Labs., Albuquerque, NM (United States); Allied-Signal Aerospace Co., Kansas City, MO (United States). Kansas City Div. [1995]. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000 ; AC04-76DP00613. (KCP–613-5649; CONF-951033–14: 27. international technical conference of the Society for the Advancement of Material and Process Engineering (SAMPE): diversity into the next century, Albuquerque, NM (United States), 9-12 Oct 1995). Order Number DE95015431. Source: OSTI; NTIS; INIS; GPO Dep.

Under the Department of Energy (DOE)/United States Air Force (USAF) Memorandum of Understanding, a system is being designed that will use high pressure carbon dioxide for the separation of oils, greases, and solvents from non-hazardous solid waste. The contaminants are dissolved into the high pressure carbon dioxide and precipitated out upon depressurization. The carbon dioxide solvent can then be recycled for continued use. Excellent extraction capability for common manufacturing oils, greases, and solvents has been measured. It has been observed that extraction performance follows the dilution model if a constant flow system is used. The solvents tested are extremely soluble and have been extracted to 100% under both liquid and mild supercritical carbon dioxide conditions. These data are being used to design a 200 liter extraction system.

2658 (SAND–95-2379C) **SNL-1, a highly selective inorganic crystalline ion exchange material for Sr^{2+} in acidic solutions.** Nenoff, T.M.; Thoma, S.G.; Miller, J.E.; Trudell, D.E. Sandia National Labs., Albuquerque, NM (United States). 1995. 8p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-951155–2: Fall meeting of the Materials Research Society (MRS), Boston, MA (United States), 27 Nov - 1 Dec 1995). Order Number DE96002120. Source: OSTI; NTIS; INIS; GPO Dep.

A new inorganic ion exchange material, called SNL-1, has been prepared at Sandia National Laboratories. Developmental samples of SNL-1 have been determined to have high selectivity for the adsorption of Strontium from highly acidic solutions (1 M HNO_3). This paper presents results obtained for the material in batch ion exchange tests conducted at various solution pH values and in the presence of a number of competing cations. Results from a continuous flow column ion exchange experiment are also presented.

2659 (SAND–95-2729) **Evaluation of polyacrylonitrile (PAN) as a binding polymer for absorbers used to treat liquid radioactive wastes.** Sebesta, F. (Czech Technical University in Prague (Czech Republic). Dept. of Nuclear Chemistry); John, J.; Motl, A.; Stamberg, K. Sandia National Labs., Albuquerque, NM (United States). Nov 1995. 50p. Sponsored by USDOE, Washington, DC (United States);Florida State Univ., Tallahassee, FL (United States). DOE Contract AC04-94AL85000. Order Number DE96004122. Source: OSTI; NTIS; INIS; GPO Dep.

The chemical and radiation stability of polyacrylonitrile (PAN) in the form of beads (B-PAN), similar to the beads of composite absorbers, and one selected composite absorber (ammonium molybdophosphate, the active component in PAN binder [AMP-PAN], a prospective candidate for the treatment of acidic wastes) were studied. Aqueous 1M HNO_3 + 1M $NaNO_3$, 1M NaOH + 1M $NaNO_3$, and 1M NaOH were chosen as simulants of DOE acidic and alkaline wastes. In addition,radiation stability was determined indistilled water. The chemical stability of B-PAN and AMP-PAN beads was tested for a period up to one month of contact with the solution at ambient temperature. The radiation stability of the beads was checked in a radiation dose range 10^3–10^6 Gy (10^5–10^8 rads). In acidic solutions the stability of PAN binder was proved not to be limited by either chemical or radiation decomposition. PAN binder may thus be used for preparing composite absorbers for treatment of acid wastes from DOE facilities. The same conclusion is valid for alkaline solutions with pH up to 13. In highly alkaline solutions (concentration of NAOH higher than I M) and in the presence of $NaNO_3$, the stability of the tested polyacrylonitrile polymer was sufficient for applications not extending over 10 days. Cross-linking of the polymer caused by ionizing radiation was found to have a positive influence on chemical stability. This effect enables a longer period of applicability of PAN-based composite absorbers. Because of the high sorption rate achievable with PAN-based absorbers, the stability achieved is sufficient for most applications in the DOE complex. The chemical stability of binding polymer may also be further improved by testing another, more suitable type of polymer from the broad family of polyacrylonitrile polymers.

2660 (SAND–96-0656C) **Ion exchange performance of commercial crystalline silicotitanates for cesium removal.** Braun, R. (and others); Dangieri, T.J.; Fennelly, D.J. Sandia National Labs., Albuquerque, NM (United States). 1996. 19p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC04-94AL85000. (CONF-960212–65: Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment, Tucson, AZ (United States), 25-29 Feb 1996). Order Number DE96006974. Source: OSTI; NTIS; INIS; GPO Dep.

A new class of inorganic ion exchangers called crystalline silicotitanates (CST), invented by researchers at Sandia National Laboratories and Texas A&M University, has been commercialized in a joint Sandia-UOP effort. The original developmental materials exhibited high selectivity for the ion exchange of cesium, strontium, and several other radionuclides from highly alkaline solutions containing molar concentrations of Na^+. The materials also showed excellent chemical and radiation stability. Together, the high selectivity and stability of the CSTs made them excellent candidates for treatment of solutions such as the Hanford tank supernates and other DOE radwastes. Sandia National Laboratories and UOP have teamed under a Cooperative Research and Development Agreement (CRADA) to develop CSTs in the powdered form and in an engineered form suitable for column ion exchange use. A continuous-flow, column ion exchange process is expected to be used to remove Cs and other radionuclides from the Hanford supernatant. The powder material invented by the Sandia and Texas A&M team consists of submicron-size particles. It is not designed for column ion exchange but may be used in other applications.

2661 (WHC-SD-CP-TC–033) **Test procedure for anion exchange testing with Argonne 10-L solutions.** Compton, J.A. Westinghouse Hanford Co., Richland, WA (United States). 17 May 1995. 15p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95013350. Source: OSTI; NTIS; INIS; GPO Dep.

Four anion exchange resins will be tested to confirm that they will sorb and release plutonium from/to the appropriate solutions in the presence of other cations. Certain cations need to be removed from the test solutions to minimize adverse behavior in other processing equipment. The ion exchange resins will be tested using old laboratory solutions from Argonne National Laboratory; results will be compared to results from other similar processes for application to all plutonium solutions stored in the Plutonium Finishing Plant.

2662 (WHC-SD-CP-TP–085) **Test plan for anion exchange testing with Argonne 10-L solutions.** Compton, J.A. Westinghouse Hanford Co., Richland, WA (United States). 10 May 1995. 10p. Sponsored by USDOE, Washington, DC (United States). DOE Contract AC06-87RL10930. Order Number DE95012579. Source: OSTI; NTIS; INIS; GPO Dep.

The purpose of this test plan is to determine the performance characteristics of four anion exchange resins. This information is required to scale up an ion exchange process for removing undesirable chemicals from calciner feed at PFP. The performance characteristics will be judged by comparing the total exchange capacity, the sorption and desorption of plutonium, the distribution coefficient, and other operating information in the presence of various complexing anions. The results will be compared to a similar process using organic extractants to determine the best way of removing the undesirable chemicals from the plutonium solutions.

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	96:2162	ORNL/ER–230/R1
	96:2163	ORNL/ER–249/R1
	96:2164	ORNL/ER–249/R2
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	96:2166	ORNL/ER–325
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	96:2176	ORNL/RASA–94/3
	96:2177	ORNL/RASA–95/1
	96:2179	ORNL/RASA–95/13
	96:2180	ORNL/RASA–95/14
	96:2181	ORNL/RASA–95/15
	96:2182	ORNL/RASA–95/16
	96:2185	ORNL/TM–13098
	96:2236	CONF-9410231–3
	96:2238	CONF-951006–32
	96:2239	CONF-951006–33
	96:2240	CONF-951006–36
	96:2241	CONF-951006–37
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	96:2243	CONF-951135–25
	96:2245	CONF-960448–14
	96:2260	DOE/OR/21400–T482
	96:2321	CONF-950209–8
	96:2322	CONF-950209–10
	96:2323	CONF-950209–11
	96:2324	CONF-9503121–2
	96:2325	CONF-9503121–3
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	96:2327	CONF-9509287–1
	96:2328	CONF-951057–7
	96:2330	CONF-951091–10
	96:2331	CONF-951091–11
	96:2332	CONF-9510125–1
	96:2333	CONF-9510319–2
	96:2334	CONF-951271–1
	96:2335	CONF-960212–80
	96:2336	CONF-960477–1
	96:2337	CONF-9606116–7
	96:2352	DOE/HWP–153
	96:2387	DOE/OR–01-1179-D2
	96:2390	DOE/OR–01-1326-D1/V2
	96:2391	DOE/OR–01-1326-D1/V3
	96:2392	DOE/OR–01-1326-D1/V4
	96:2393	DOE/OR–01-1326&D2/V1
	96:2394	DOE/OR–01-1326&D2/V2
	96:2395	DOE/OR–01-1326&D2/V3
	96:2396	DOE/OR–01-1326&D2/V4
	96:2397	DOE/OR–01-1337-D1
	96:2398	DOE/OR–01-1393V1&D1
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	96:2410	DOE/OR–01-1441/V1
	96:2411	DOE/OR–07-1414-D1
	96:2412	DOE/OR/21400–T483
	96:2418	DOE/ORO–2033
	96:2439	ES/ER/TM–162/R1
	96:2440	ES/ER/TM–170
	96:2441	ES/ER/TM–173
	96:2511	ORNL–6882
	96:2512	ORNL–6884
	96:2513	ORNL/ER–294
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	96:2517	ORNL/ER–329/V1
	96:2518	ORNL/ER–329/V2
	96:2519	ORNL/ER–335
	96:2520	ORNL/ER–340
	96:2521	ORNL/ER–360/R1
	96:2527	ORNL/ER/Sub–87-99053/75
	96:2528	ORNL/GWPO–013
	96:2530	ORNL/TM–12790
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	96:2629	CONF-9505101–6
	96:2630	CONF-9507119–9
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	96:2633	CONF-960314–3
	96:2646	ORNL/TM–12938
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	96:2235	Y/WM–224
	96:2389	DOE/OR–01-1273/V1&D2/A1
	96:2408	DOE/OR–01-1395&D1
	96:2409	DOE/OR–01-1396&D1

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	96:2625	Y/ER–237
	Department of Energy, Oak Ridge, TN (United States). Oak Ridge Operations Office	
	96:120	DOE/OR–01-1441/V2
	Oak Ridge National Lab., TN (United States). HAZWRAP Support Contractor Office	
	96:2090	DOE/HWP–171
	USDOE Oak Ridge Operations Office, TN (United States)	
	96:2388	DOE/OR–01-1192&D2
	H and R Technical Associates, Inc., Oak Ridge, TN (United States)	
	96:951	ORNL/ER–297
	96:953	ORNL/ER–304
	96:954	ORNL/ER–306
	Martin Marietta Energy Systems, Inc., Oak Ridge, TN (United States)	
	96:2026	CONF-950917–9
	Oak Ridge K-25 Site, TN (United States)	
	96:200	K/ER–47/R1
	96:524	K/ER–306
	96:2114	DOE/ORO–2032
	96:2147	K/TCD–1127
	96:2482	K/WM–96
	CDM Federal Programs Corp., Oak Ridge, TN (United States)	
	96:544	ORNL/ER–203/R1
	Oak Ridge Inst. for Science and Education, TN (United States)	
	96:1341	ORNL/ER/Sub–87-99053/74
	Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States)	
	96:153	ES/ER/TM–112/R2
	96:710	CONF-960212–74
	Oak Ridge Environmental Information System (OREIS) Program, TN (United States)	
	96:155	ES/ER/TM–145
	96:157	ES/ER/TM–189
AC05-84OS21400	**Oak Ridge National Lab., TN (United States)**	
	96:1150	Y/NA–1801
AC05-86OR21548	**Argonne National Lab., IL (United States)**	
	96:496	DOE/OR/21548–567
	MK-Ferguson Co., St. Charles, MO (United States)	
	96:823	DOE/OR/21548–584
	96:2113	DOE/OR/21548–592
AC05-93OR22000	**Oak Ridge National Lab., TN (United States)**	
	96:495	DOE/OR–2035
AC05-93OR22160	**IIT Research Inst., Chicago, IL (United States)**	
	96:2413	DOE/OR/22160–T17
	96:2414	DOE/OR/22160–T22-Vol.1
	96:2415	DOE/OR/22160–T22-Vol.2
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AC05-96OR22464	**Oak Ridge National Lab., TN (United States)**	
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	96:64	CONF-960477–7
	96:65	CONF-960648–1
	96:66	CONF-960648–3
	96:68	CONF-9607107–2
	96:69	CONF-960804–11
	96:70	CONF-960804–12
	96:406	CONF-960539–2
	96:407	CONF-960804–8
	96:493	DOE/OR–01-1393/V3&D2
	96:548	ORNL/ER—350
	96:550	ORNL/GWPO–0010
	96:554	ORNL/GWPO–023
	96:555	ORNL/GWPO–025
	96:561	ORNL/TM–13099
	96:699	CONF-9504255–1
	96:711	CONF-960271–5
	96:715	CONF-9606125–4
	96:716	CONF-960741–2
	96:717	CONF-960804–10
	96:850	ES/WM–80
	96:959	ORNL/ER–359
	96:960	ORNL/ER–372
	96:961	ORNL/ER–375
	96:962	ORNL/GWPO–0024
	96:970	ORNL/TM–13028
	96:974	ORNL/TM–13131
	96:976	ORNL/TM–13189
	96:978	ORNL/TM–13236
	96:1219	CONF-960421–35
	96:1340	ORNL/ER–365
	96:1342	ORNL/ER/Sub–87-99053/79
	96:2029	CONF-960804–13
	96:2170	ORNL/ER–343
	96:2172	ORNL/ER–347
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	96:2175	ORNL/ER–376
	96:2178	ORNL/RASA–95/2
	96:2183	ORNL/TM–12968
	96:2184	ORNL/TM–13026
	96:2186	ORNL/TM–13142
	96:2244	CONF-960448–13
	96:2338	CONF-960804–6
	96:2339	CONF-960804–7
	96:2400	DOE/OR–01-1393/V2&D2
	96:2401	DOE/OR–01-1393/V2&D3
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	96:2404	DOE/OR–01-1393/V4&D3
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	96:2529	ORNL/TM–12652
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	96:2648	ORNL/TM–13241
	Oak Ridge K-25 Site, TN (United States)	
	96:911	K/TSO–7A
	96:2438	ES/ER/TM–106/R1
	Lockheed Martin Energy Systems, Inc., Oak Ridge, TN (United States)	
	96:67	CONF-960706–9
	96:160	ES/WM–81
	96:2406	DOE/OR–01-1393/V5&D2
AC06-76RL01830	**Westinghouse Hanford Co., Richland, WA (United States)**	
	96:333	WHC-SP–0969-54
	96:1583	WHC-EP–0474-16
	96:1604	WHC-SA–2592
	EG and G Idaho, Inc., Idaho Falls, ID (United States)	
	96:2458	INEL–95/00263

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	Massachusetts Inst. of Tech., Cambridge, MA (United States). Plasma Fusion Center	
	96:1968	PFC/RR–95-11
	Pacific Northwest Lab., Richland, WA (United States)	
	96:226	PNL–10260-Rev.1
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	96:229	PNL–10601
	96:230	PNL–10608
	96:231	PNL–10714
	96:232	PNL-SA–23600
	96:233	PNL-SA–25593
	96:234	PNL-SA–25713
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	96:237	PNL-SA–26460
	96:238	PNNL–10969
	96:239	PNNL–10969-Rev.1
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	96:562	PNL–10522
	96:563	PNL–10605
	96:564	PNL–10698
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	96:568	PNL–10886
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	96:570	PNL-SA–25595
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	96:572	PNL-SA–25679
	96:573	PNL-SA–26258
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	96:990	PNL-SA–25207
	96:991	PNL-SA–25640
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	96:993	PNL-SA–25764
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	96:995	PNL-SA–26015
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	96:997	PNL-SA–26147
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	96:1349	PNL–10069
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	96:2189	PNL–10855
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	96:2267	PNL-SA–26161
	96:2540	PNL–6415-Rev.7
	96:2541	PNL–7722-Rev.2-Add.1
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	96:2543	PNL–10363
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	96:2652	PNL–10920
	96:2653	PNL-SA–25603
	96:2656	PNNL-SA–27105
USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development		
	96:503	DOE/RL–95-32
National Renewable Energy Lab., Golden, CO (United States)		
	96:1507	PNNL–11045
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	96:1000	PNNL–10913
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	Battelle Seattle Research Center, WA (United States)	
	96:575	PNNL–10912
AC06-87RL10930	**Douglas United Nuclear, Inc., Richland, WA (United States)**	
	96:1787	WHC-SD-WM-ER–459
	Westinghouse Hanford Co., Richland, WA (United States)	
	96:126	DOE/RL–93-69-Rev.2
	96:129	DOE/RL–94-96-Rev.1
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	96:283	WHC-EP–0857
	96:284	WHC-EP–0889
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	96:696	CONF-9501137–Summ.
	96:714	CONF-9605200–Summ.
AC07-94ID13266	**Science Applications International Corp., Idaho Falls, ID (United States)**	
	96:888	INEL–95/00321
AC08-91NV10833	**Raytheon Services Nevada, Las Vegas, NV (United States)**	
	96:2386	DOE/NV/10833–33
	Bechtel Nevada Corp., Las Vegas, NV (United States)	
	96:2112	DOE/NV/10833–34
AC09-89SR18035	**Clemson Univ., SC (United States). Dept. of Environmental Systems Engineering**	
	96:1957	DOE/SR/18035–T2
	Westinghouse Savannah River Co., Aiken, SC (United States)	
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	96:343	WSRC-TR–94-100-12
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	96:609	WSRC-RP–95-237
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	96:612	WSRC-TR–95-0144-1
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	96:1117	WSRC-MS–95-0064
	96:1118	WSRC-MS–95-0068
	96:1119	WSRC-MS–95-0080
	96:1120	WSRC-MS–95-0087
	96:1121	WSRC-MS–95-0153
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	96:1129	WSRC-TR–94-0239
	96:1130	WSRC-TR–94-0402
	96:1131	WSRC-TR–94-0608-Rev.2
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	96:1136	WSRC-TR–95-0034
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	96:2620	WSRC-MS–96-0022
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	96:2624	WSRC-TR–95-0232
AC21-90MC27346	**K and M Engineering and Consulting Corp., Washington, DC (United States)**	
	96:112	DOE/MC/27346–5098
	96:806	DOE/MC/27346–5099
AC21-92MC29101	**Arizona Univ., Tucson, AZ (United States). Lab. for Advanced Subsurface Imaging**	
	96:2358	DOE/MC/29101–96/CO564
AC21-92MC29103	**Babcock and Wilcox Co., Alliance, OH (United States). Research and Development Div.**	
	96:2359	DOE/MC–29103-95/C0459
	Babcock and Wilcox Co., Alliance, OH (United States)	
	96:2094	DOE/MC/29103–5100
	Babcock and Wilcox Co., Allison, OH (United States)	
	96:2093	DOE/MC/29103–96/CO565

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AC21-92MC29104	**Carnegie-Mellon Univ., Pittsburgh, PA (United States)**	
	96:2095	DOE/MC/29104–96/CO566
	Redzone Robotics, Inc., Pittsburgh, PA (United States)	
	96:2247	DOE/MC/29104–96/C0698
AC21-92MC29105	**Rust Federal Services, Inc., Anderson, SC (United States)**	
	96:808	DOE/MC/29105–96/CO563
	96:2636	DOE/MC/29105–5199
AC21-92MC29107	**Delphi Research, Inc., Albuquerque, NM (United States)**	
	96:809	DOE/MC/29107–96/CO567
	96:810	DOE/MC/29107–5046
AC21-92MC29108	**EIC Labs., Inc., Norwood, MA (United States)**	
	96:2360	DOE/MC/29108–95/C0417
	96:2361	DOE/MC/29108–96/CO568
AC21-92MC29109	**Engineering Computer Opteconomics, Inc., Annapolis, MD (United States)**	
	96:2362	DOE/MC/29109–96/CO569
	96:2363	DOE/MC/29109–5013
	Engineering Computer Optecnomics, Inc., Annapolis, MD (United States)	
	96:113	DOE/MC/29109–5173
	96:2364	DOE/MC/29109–5074
AC21-92MC29111	**INTERA, Inc., Austin, TX (United States)**	
	96:482	DOE/MC/29111–96/CO570
AC21-92MC29113	**Mechanical Technology, Inc., Latham, NY (United States)**	
	96:2096	DOE/MC/29113–96/CO571
	96:2248	DOE/MC/29113–4048
	96:2259	DOE/MC–92113-4016
AC21-92MC29114	**Halliburton NUS, Houston, TX (United States)**	
	96:483	DOE/MC/29114–5174
AC21-92MC29115	**South Carolina Universities Research, Clemson, SC (United States)**	
	96:2250	DOE/MC/29115–96/CO586
	South Carolina Universities Research and Education Foundation, Clemson, SC (United States). Strom Thurman Inst.	
	96:2249	DOE/MC/29115–96/CO562
AC21-92MC29117	**Stevens Inst. of Tech., Hoboken, NJ (United States). Center for Environmental Engineering**	
	96:484	DOE/MC/29117–5061
AC21-92MC29118	**Transducer Research, Inc., Naperville, IL (United States)**	
	96:2365	DOE/MC/29118–96/CO572
	Science Applications International Corp., Arlington, VA (United States). Center for Seismic Studies	
	96:2366	DOE/MC/29118–5014
AC21-92MC29120	**Vortec Corp., Collegeville, PA (United States)**	
	96:2367	DOE/MC/29120–96/CO573
AC21-92MC29121	**West Virginia Univ. Research Corp., Morgantown, WV (United States)**	
	96:485	DOE/MC/29121–5126
AC21-93MC30162	**Isotron Corp., New Orleans, LA (United States)**	
	96:2101	DOE/MC/30162–96/C0576
AC21-93MC30164	**Textron, Inc., Everett, MA (United States). Textron Defense Systems**	
	96:2102	DOE/MC/30164–96/CO577
AC21-93MC30165	**Oceaneering Technologies, Upper Marlboro, MD (United States)**	
	96:2251	DOE/MC–30165-3972
	Oceaneering International, Inc., Marlboro, MD (United States)	
	96:2103	DOE/MC/30165–96/CO578
AC21-93MC30168	**Babcock and Wilcox Co., Allison, OH (United States)**	
	96:2104	DOE/MC/30168–96/CO579
AC21-93MC30170	**Manufacturing Sciences Corp., Oak Ridge, TN (United States)**	
	96:2105	DOE/MC/30170–96/CO580
AC21-93MC30171	**Molten Metal Technology, Inc., Waltham, MA (United States)**	
	96:813	DOE/MC/30171–96/CO581
AC21-93MC30172	**Science and Engineering Associates, Inc., Albuquerque, NM (United States)**	
	96:2368	DOE/MC/30172—96/C0582
	96:2369	DOE/MC/30172–96/C0583
AC21-93MC30173	**Bio-Imaging Research, Inc., Lincolnshire, IL (United States)**	
	96:814	DOE/MC/30173–96/CO584
AC21-93MC30174	**General Electric Co., Schenectady, NY (United States). Corporate Research and Development Center**	
	96:2370	DOE/MC/30174–96/CO585
AC21-93MC30175	**Physical Sciences, Inc., Andover, MA (United States)**	
	96:2371	DOE/MC/30175–96/CO588
	96:2372	DOE/MC/30175–5033
AC21-93MC30176	**Coleman Research Corp., Springfield, VA (United States)**	
	96:2373	DOE/MC/30176–96/CO589
AC21-93MC30177	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center**	
	96:2374	DOE/MC/30177–5047
AC21-93MC30178	**Oceaneering Space Systems, Houston, TX (United States)**	
	96:2106	DOE/MC/30178–96/CO590
	96:2107	DOE/MC/30178–5181
AC21-93MC30179	**Membrane Technology and Research, Inc., Menlo Park, CA (United States)**	
	96:2108	DOE/MC/30179–96/CO591
AC21-94MC29249	**KAI Technologies, Inc., Woburn, MA (United States)**	
	96:812	DOE/MC/29249–4074
	KAI Technologies, Inc., Portsmouth, NH (United States)	
	96:811	DOE/MC/29249–96/CO574
AC22-88ID12735	**MSE, Inc., Butte, MT (United States)**	
	96:109	DOE/ID/12735–T35
	96:749	DOE/ID/12735–T36
	96:750	DOE/ID/12735–T37
	96:751	DOE/ID/12735–T38
	96:2354	DOE/ID/12735–1
	Parsons Engineering Science, Inc., Cleveland, OH (United States)	
	96:2355	DOE/ID/12735–2
AC24-81NE44139	**Oak Ridge National Lab., TN (United States)**	
	96:1207	CONF-950232–32
AC24-92OR21972	**Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States). Fernald Environmental Management Project**	
	96:164	FEMP–2516
	96:512	FEMP/SUB–095

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	96:853	FEMP/SUB–102
	96:2132	FEMP–2362B
	96:2133	FEMP/SUB–096
	Fernald Environmental Restoration Management Corp., Cincinnati, OH (United States)	
	96:162	FEMP–2425
	96:851	FEMP–2388
	96:852	FEMP–2445
	Fluor Daniel Environmental Restoration Management Corp., Fernald, OH (United States)	
	96:161	FEMP–2363B
	96:163	FEMP–2441
AD07-93ID10513	**USDOE Office of Environmental Restoration and Waste Management, Washington, DC (United States). Office of Technology Development**	
	96:2091	DOE/ID–10513
AI01-92EW50614	**Halliburton NUS Environmental Corp., Oak Ridge, TN (United States)**	
	96:737	DOE/EW/50614–T1
AI08-86NV10583	**Geological Survey, Denver, CO (United States)**	
	96:590	USGS-OFR–95-160
	96:591	USGS-OFR–95-284
AI08-91NV11040	**Geological Survey, Carson City, NV (United States)**	
	96:492	DOE/NV/11040–T1
AI34-93RF00467	**Army Engineer Waterways Experiment Station, Vicksburg, MS (United States)**	
	96:824	DOE/RF/00467–T1
	96:825	DOE/RF/00467–T3
	96:826	DOE/RF/00467–T5
	96:827	DOE/RF/00467–T9
AI34-93RF00646	**Research Triangle Inst., Research Triangle Park, NC (United States). Center for Environmental Technology**	
	96:2419	DOE/RF/00646–T1
AM07-92ID13167	**Jason Associates Corp., Idaho Falls, ID (United States)**	
	96:110	DOE/ID/13167–T22
AR21-93MC30357	**Mirage Systems, Sunnyvale, CA (United States)**	
	96:2375	DOE/MC/30357–96/C0592
AR21-93MC30358	**Geophex Ltd., Raleigh, NC (United States)**	
	96:2252	DOE/MC/30358–4067
	96:2376	DOE/MC/30358–96/CO593
AR21-93MC30361	**Aerojet-General Corp., Sacramento, CA (United States)**	
	96:815	DOE/MC/30361–95/C0498
	96:816	DOE/MC/30361–4087
AR21-93MC30362	**Carnegie-Mellon Univ., Pittsburgh, PA (United States)**	
	96:2253	DOE/MC/30362–96/CO620
	96:2255	DOE/MC/30362–5113
	Carnegie-Mellon Univ., Pittsburgh, PA (United States). Robotics Inst.	
	96:2254	DOE/MC/30362–4049
AR21-93MC30363	**Oceaneering Space Systems, Houston, TX (United States)**	
	96:2256	DOE/MC/30363–90/C0627
AR21-94MC30359	**F2 Associates, Albuquerque, NM (United States)**	
	96:2109	DOE/MC/30359–96/CO594
AR21-94MC30360	**Weiss Associates, Emeryville, CA (United States)**	
	96:486	DOE/MC/30360–96/CO614
AR21-94MC31177	**Aero Power Systems, Inc., Berkeley, CA (United States)**	
	96:487	DOE/MC/31177–96/C0623
AR21-94MC31178	**UTD, Inc., Newington, VA (United States)**	
	96:488	DOE/MC/31178–96/CO612
AR21-94MC31185	**Monsanto Co., St. Louis, MO (United States)**	
	96:489	DOE/MC/31185–96/CO619
AR21-94MC31189	**Mercury Recovery Services, New Brighton, PA (United States)**	
	96:818	DOE/MC/31189–5035
AR21-94MC31190	**Coleman Research Corp., Springfield, VA (United States)**	
	96:2237	CONF-9411197–2
	96:2257	DOE/MC–31190-96/CO630
	Coleman Research Corp., Houston, TX (United States)	
	96:2024	CONF-940815–115
AR21-95MC31186	**Applied Research Associates, Inc., South Royalton, VT (United States)**	
	96:2377	DOE/MC/31186–96/CO628
AR21-95MC31188	**Mirage Systems, Sunnyvale, CA (United States)**	
	96:817	DOE/MC/31188–96/CO629
AR21-95MC32087	**Westinghouse Electric Corp., Pittsburgh, PA (United States). Science and Technology Center**	
	96:2378	DOE/MC/32087–96/CO631
AR21-95MC32089	**Science and Engineering Associates, Inc., Albuquerque, NM (United States)**	
	96:2379	DOE/MC/32089–96/CO615
AR21-95MC32090	**NeuTek, Darnestown, MD (United States)**	
	96:2380	DOE/MC/32090–96/C0622
AR21-95MC32092	**Redzone Robotics, Inc., Pittsburgh, PA (United States)**	
	96:2258	DOE/MC/32092–96/CO621
AR21-95MC32108	**New Mexico Inst. of Mining and Technology, Socorro, NM (United States)**	
	96:490	DOE/MC/32108–96/CO616
AR21-95MC32109	**Science and Engineering Associates, Inc., Santa Fe, NM (United States)**	
	96:2381	DOE/MC/32109–96/CO613
AR21-95MC32110	**South Carolina Universities Research and Education Foundation, Clemson, SC (United States). Strom Thurman Inst.**	
	96:2382	DOE/MC/32110–96/C0626
AR21-95MC32111	**Physical Optics Corp., Torrance, CA (United States)**	
	96:2383	DOE/MC/32111–5193
AR21-95MC32112	**Wastren, Inc., Idaho Falls, ID (United States)**	
	96:116	DOE/MC/32112–96/CO632
AR21-95MC32113	**Rust Federal Services, Inc., Anderson, SC (United States)**	
	96:1265	DOE/MC/32113–96/CO633
AR21-95MC32114	**ARCTECH, Inc., Chantilly, VA (United States)**	
	96:491	DOE/MC/32114–96/CO625
AR21-95MC32116	**Environmental Research Inst. of Michigan, Ann Arbor, MI (United States)**	
	96:2384	DOE/MC/32116–96/CO617
	96:2385	DOE/MC/32116–5148
FC01-94EW54069	**National Academy of Sciences - National Research Council, Washington, DC (United States)**	
	96:105	DOE/EW/54069–T1

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FC04-82AL16257	**Jacobs Engineering Group, Inc., Albuquerque, NM (United States)**	
	96:2079	DOE/AL/62350–T7
FC04-87AL20532	**Texas State Government, Falls City, TX (United States)**	
	96:408	DOE/AL–050520.0000
FC07-90ID12915	**Modell Environmental Corp., Waltham, MA (United States)**	
	96:752	DOE/ID/12915–4
FC21-92MC28245	**Atomic Energy of Canada Ltd., Chalk River, ON (Canada)**	
	96:807	DOE/MC/28245–5043
	96:2357	DOE/MC/28245–4072
FC21-92MC29467	**West Virginia Univ., Morgantown, WV (United States)**	
	96:2099	DOE/MC/29467–5127
	96:2100	DOE/MC/29467–5177
	National Research Center for Coal and Energy, Morgantown, WV (United States)	
	96:1263	DOE/MC/29467–5042
	96:2097	DOE/MC/29467–4080
	West Virginia Univ. Research Corp., Morgantown, WV (United States)	
	96:2098	DOE/MC/29467–4091
FC21-94MC31179	**Global Environment and Technology Foundation, Annandale, VA (United States)**	
	96:114	DOE/MC/31179–96/CO618
FC21-94MC31388	**North Dakota Univ., Grand Forks, ND (United States). Energy and Environmental Research Center**	
	96:115	DOE/MC/31388–96/CO624
	96:819	DOE/MC/31388–5030
	96:1264	DOE/MC/31388–5141
FG01-92EW50625	**Medical Univ. of South Carolina, Charleston, SC (United States)**	
	96:91	DOE/EW/50625–T22
	96:92	DOE/EW/50625–T23
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	96:94	DOE/EW/50625–T25
	96:95	DOE/EW/50625–T27
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FG01-93EW53023	**Tulane Univ., New Orleans, LA (United States)**	
	96:100	DOE/EW/53023–T11
	96:101	DOE/EW/53023–T13
	96:478	DOE/EW/53023–T12
	96:738	DOE/EW/53023–T10
FG02-93CH10575	**Mississippi State Univ., MS (United States). Diagnostic Instrumentation and Analysis Lab.**	
	96:2341	DOE/CH/10575–T5
FG05-80ET53088	**Jacobs Engineering Group, Inc., Albuquerque, NM (United States)**	
	96:2080	DOE/AL/62350–T8
FG07-81ID12345	**EG and G Idaho, Inc., Idaho Falls, ID (United States)**	
	96:2639	INEL–95/00241
	96:2640	INEL–95/00243
FG07-91ID13042	**Idaho State Univ., Pocatello, ID (United States)**	
	96:480	DOE/ID/13042–50
	Idaho Univ., Moscow, ID (United States). Water Resources Research Inst.	
	96:479	DOE/ID/13042–49
FG07-93ER75912	**Pacific Northwest Lab., Richland, WA (United States)**	
	96:572	PNL-SA–25679
FG07-93ID13220	**Idaho Univ., Moscow, ID (United States). Dept. of Mechanical Engineering**	
	96:111	DOE/ID/13220–T5
FG09-91SR18233	**South Carolina Dept. of Health and Environmental Control, Columbia, SC (United States)**	
	96:147	DOE/SR/18233–4
	96:148	DOE/SR/18233–T1
FG21-93EW53023	**Tulane Univ., New Orleans, LA (United States)**	
	96:104	DOE/EW/53023–T16
	Tulane Univ., New Orleans, LA (United States). Center for Bioenvironmental Research	
	96:102	DOE/EW/53023–T14
	96:103	DOE/EW/53023–T15
FG34-91RF00117	**Oak Ridge National Lab., TN (United States)**	
	96:470	DOE/EM–0268-96003563
	Stone and Webster Environmental Technology and Services, Boston, MA (United States)	
	96:471	DOE/EM–0269
	96:473	DOE/EM–0271
	96:474	DOE/EM–0272
W-31-109-ENG-38	**Argonne National Lab., IL (United States)**	
	96:3	ANL/CMT-ACL/CP–85835
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	96:13	ANL/EA/CP–85661
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	96:617	ANL/CMT/CP–84846
	96:620	ANL/CMT/CP–86906
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	96:623	ANL/DIS/CP–87708
	96:624	ANL/DIS/CP–89084
	96:626	ANL/EA/CP–84317
	96:627	ANL/EA/CP–84357
	96:629	ANL/EA/CP–86212
	96:638	ANL/EAD/TM–29-Draft-Vol.2
	96:646	ANL/ET/CP–87963
	96:650	ANL/RE/CP–85598
	96:1160	ANL/CMT/CP–84718
	96:1163	ANL/CMT/CP–86023
	96:1165	ANL/CMT/CP–86907
	96:1166	ANL/CMT/CP–86953
	96:1176	ANL/CMT/VU–86003
	96:1177	ANL/EA/CP–89045
	96:1945	ANL/CMT/CP–84590
	96:1990	ANL/DIS/CP–87709
	96:1999	ANL/EWM/CP–82616
	96:2000	ANL/TD/CP–85768
	96:2002	ANL/TD/CP–88550
	96:2281	ANL/ACL–94/2
	96:2285	ANL/CMT-ACL/VU–84890
	96:2288	ANL/EA/CP–84904
	96:2292	ANL/ER/CP–84542
	96:2294	ANL/ER/CP–87350
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	96:2626	ANL–95/34
	Argonne National Lab., Washington, DC (United States)	
	96:346	ANL/EA/CP–84187

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W-31109-ENG-38	**Argonne National Lab., Idaho Falls, ID (United States)**	
	96:1168	ANL/CMT/CP–88456
	Argonne National Lab., IL (United States)	
	96:1	ANL–95/46
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85698	96:643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014096	MF-2020
86349	96:2291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013444	MF-2000
89921	96:644	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010800	MF-2020
90483	96:1995	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012757	MF-2050
90484	96:645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012758	MF-2000
ANL/ER/CP–					
84542	96:2292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013717	MF-402; MF-2070
85412	96:22	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012467	MF-2000
85995	96:2293	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002694	MF-2000
86429	96:353	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011792	MF-2070
87350	96:2294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006641	MF-2070
89080	96:2295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012689	MF-2000
ANL/ES/CP–					
85247	96:354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013690	MF-2010
86380	96:2296	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013445	MF-2000
86536	96:355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013719	MF-2010
ANL/ES/PP–					
80277	96:2297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012208	MF-2010
ANL/ES/RP–					
89091	96:1998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008777	MF-2010
ANL/ESH-HP–					
96/01	96:1996	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008722	MF-2050
96/02	96:1997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011918	MF-2050
ANL/ET/CP–					
83253	96:1181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012532	MF-2070
87963	96:646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006736	MF-2020
88272	96:647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009457	MF-2020
88344	96:648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009416	MF-2020
88412	96:649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009415	MF-2020
88519	96:23	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010812	MF-2000
ANL/EWM/CP–					
82616	96:1999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012940	MF-2010
ANL/RE/CP–					
79448	96:1182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014079	MF-2030
85598	96:650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014091	MF-2000
85929	96:1183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014221	MF-2030

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87833	96:1184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005263	MF-510; MF-2030
ANL/TD/CP–					
85768	96:2000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013787	MF-2050
86095	96:2001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005084	MF-2050
88550	96:2002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004296	MF-2050
89321	96:2003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007055	MF-2050
89380	96:2004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012690	MF-2050
ANL/TD/SUMM–					
85849	96:2005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013713	MF-2050
BCLDP–					
063095	96:2006	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017200	MF-2050
BHI–					
00010-Rev.1	96:651	OSTI; NTIS; GPO Dep.	E 1.99:	DE96005706	MF-2000
00022-Rev.2	96:1185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005707	MF-2000
00046-Rev.1	96:356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005866	MF-2010
00053	96:652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005868	MF-2000
00055-Rev.1	96:357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005867	MF-2010
00066-Rev.2	96:24	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005927	MF-2000
00079-Rev.	96:358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005929	MF-2070
00099	96:25	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005058	MF-2000
00099-Rev.1	96:26	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009064	MF-2010
00116-Rev.2	96:27	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012111	MF-2000
00117-Rev.2	96:653	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012110	MF-2000
00118-Rev.2	96:28	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012109	MF-2000
00119-Rev.2	96:29	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012112	MF-2000
00120-Rev.2	96:30	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012113	MF-2000
00121-Rev.2	96:31	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012114	MF-2000
00122-Rev.2	96:32	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012115	MF-2000
00123-Rev.2	96:33	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012116	MF-2000
00124	96:359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005708	MF-2010
00135-Rev.1	96:360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005051	MF-2010
00139-Rev.1	96:654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005936	MF-2020
00141	96:655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005060	MF-2000
00147-Rev.02	96:361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005056	MF-2010
00149	96:362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005059	MF-2010

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00158	96:363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005053	MF-2010
00159	96:364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005054	MF-2010
00161	96:365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005055	MF-2010
00162	96:2298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005052	MF-2070
00164-Rev.1	96:366	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005057	MF-2010
00167-Rev.	96:2007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006963	MF-2050
00174	96:1186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005836	MF-2000
00175	96:34	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005835	MF-2000
00176	96:1187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005834	MF-2000
00177	96:1188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005833	MF-2000
00178	96:1189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005048	MF-2000
00179	96:1190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005047	MF-2000
00180-Rev.	96:367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006964	MF-2010
00185-Rev.	96:368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005937	MF-2010
00187	96:369	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005050	MF-2010
00187-Rev.1	96:370	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012117	MF-2000
00187-Rev.2	96:371	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009914	MF-2010
00194	96:372	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005873	MF-2010
00196-Rev.1	96:2299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005875	MF-2000
00196-Rev.2	96:2300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005874	MF-2000
00217-Rev.1	96:35	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013576	MF-2000
00230	96:2301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012118	MF-2000
00232	96:2302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009917	MF-2010
00247-Rev.1	96:1191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008207	MF-2000
00288-Rev.1	96:36	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009919	MF-2000
00317	96:2303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008196	MF-2000
00345-Rev.1	96:373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005832	MF-2010
00352-Rev.2	96:656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005935	MF-2020
00395	96:657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012119	MF-2000
00402	96:374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008013	MF-2000
00409	96:375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008048	MF-2000
00410	96:376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008194	MF-2000
00412-Rev.1	96:37	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012140	MF-2000

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00416-Rev.2	96:377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005932	MF-2010
00432	96:378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004508	MF-2040
00446	96:379	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008046	MF-2000
00456	96:380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012120	MF-2000
00458	96:381	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009915	MF-2010
00463	96:382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008964	MF-2010
00464	96:383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012121	MF-2000
00465	96:384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008963	MF-2000
00466	96:2304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009918	MF-2070
00530	96:2008	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009902	MF-2000
00532	96:2305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005877	MF-2070
00536-Rev.	96:2009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005930	MF-2010
00541-Rev.	96:658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005933	MF-2020
00545	96:2306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008014	MF-2000
00552	96:385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005869	MF-2010
00553	96:386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008049	MF-2000
00554	96:387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008045	MF-2000
00555-Rev.	96:388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005934	MF-2020
00556	96:389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008208	MF-2000
00557	96:390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008028	MF-2000
00606	96:2010	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008015	MF-2000
00607	96:391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012139	MF-2000
00608	96:392	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012122	MF-2000
00616-Rev.	96:1192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005931	MF-2010
00618	96:2307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013572	MF-2070
00624	96:2308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013570	MF-2100
00626	96:2309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013571	MF-2000
00627	96:38	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005870	MF-2000
00628	96:39	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009903	MF-2000
00635	96:40	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013568	MF-2000
00639-Rev.1	96:659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005879	MF-2000
00645-Rev.1	96:41	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012138	MF-2000
00701	96:393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005878	MF-2010

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00713	96:2310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012137	MF-2000
00714-Rev.1	96:42	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009063	MF-2000
00715	96:2311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013562	MF-2000
00716	96:2312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005709	MF-2000
00717	96:2313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008043	MF-2000
00719	96:394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005872	MF-2010
00720	96:2314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008035	MF-2000
00722	96:2315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008961	MF-2010
00724	96:2316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012136	MF-2000
00731-Rev.	96:2317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005928	MF-2070
00735	96:660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008012	MF-2000
00736	96:661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009916	MF-2010
00739	96:2628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008044	MF-2000
00745	96:2011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009926	MF-2000
00747	96:662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008962	MF-2000
00748	96:2012	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012135	MF-2000
00752	96:663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009061	MF-2010
00753	96:395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008027	MF-2000
00758	96:2013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009925	MF-2000
00759	96:2014	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009920	MF-2010
00762	96:2015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012124	MF-2000
00764	96:396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012125	MF-2000
00768	96:664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012134	MF-2000
00770	96:397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012123	MF-2000
00774	96:665	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012126	MF-2000
00777	96:666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012127	MF-2000
00786	96:2318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013566	MF-2070
00789	96:667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012128	MF-2000
00792	96:43	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012129	MF-2000
00800	96:2016	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005871	MF-2000
00802	96:2017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008016	MF-2000
00803	96:2018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008195	MF-2000
00806	96:668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009927	MF-2010

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00808	96:2019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008209	MF-2000
00810	96:2319	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012130	MF-2000
00812	96:2020	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012131	MF-2000
00814-01	96:44	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012132	MF-2000
00816	96:45	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013573	MF-2000
00856	96:2021	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012133	MF-2000
BNL–					
52361(Rev.10/95)	96:1193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004058	MF-2030
52469	96:398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012459	PC-2010
52478	96:669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001638	MF-2020
52486	96:2022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004059	MF-2000
61458	96:399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014518	MF-403; MF-2000
61646	96:1194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011775	MF-2030
61647	96:1195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011776	MF-2030
61648	96:1196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010449	MF-2030
61651	96:1197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011403	MF-2030
61711	96:1198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011777	MF-2030
62294	96:1199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001917	MF-2030
62863	96:670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008725	MF-2010
62901	96:671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009939	MF-2010
63030	96:1200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010691	MF-2000
63201	96:46	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012423	MF-2000
BSRC–					
800/95/018	96:2565	*See* PNNL–10915			
800/95/019	96:576	*See* PNNL–10914			
800/95/020	96:1000	*See* PNNL–10913			
800/95/021	96:575	*See* PNNL–10912			
800/95/022	96:2564	*See* PNNL–10911			
CAO–					
94-1005-Rev.1	96:1235	*See* DOE/CAO–2056-Vol.3-Draft			
94-1005-Rev.1	96:1236	*See* DOE/CAO–2056-Vol.4-Draft			
94-1005-Rev.1-Vol.1	96:1201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009611	MF-2000
94-1005-Rev.1-Vol.2	96:1202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009612	MF-2000
94-1005-Rev.1-Vol.3	96:1203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009613	MF-2000
94-1010	96:1204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012993	MF-2070
CONF-9001183–		(Low level radioactive waste meeting; San Francisco, CA (United States); 24-26 Jan 1990)			
Exec.Summ.	96:672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013291	MF-2000

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CONF-9004379–		(Low level radioactive waste meeting; Austin, TX (United States); 25-27 Apr 1990)			
Exec.Summ.	96:673	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013290	MF-2000
CONF-9007264–		(Low level radioactive waste meeting; Minneapolis, MN (United States); 23-24 Jul 1990)			
Exec.Summ.	96:674	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013289	MF-2000
CONF-9010566–		(Low level radioactive waste meeting; Miami, FL (United States); 17-19 Oct 1990)			
Exec.Summ.	96:675	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013288	MF-2000
CONF-9104440–		(Low level radioactive waste meeting; New Orleans, LA (United States); 18-19 Apr 1991)			
Exec.Summ.	96:676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013286	MF-2000
CONF-9107286–		(Low level radioactive waste meeting; Seattle, WA (United States); 25-26 Jul 1991)			
Exec.Summ.	96:677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013285	MF-2000
CONF-9110558–		(Low level radioactive waste meeting; Las Vegas, NV (United States); 10-11 Oct 1991)			
Exec.Summ.	96:678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013284	MF-2000
CONF-9201182–		(Low level radioactive waste winter meeting; San Diego, CA (United States); 29-31 Jan 1992)			
Summ.	96:2320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013283	MF-2000
CONF-9204311–		(Low level radioactive waste spring meeting; Williamsburg, VA (United States); 27-29 Apr 1992)			
Summ.	96:679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013282	MF-2000
CONF-9207253–		(Low level radioactive waste summer meeting; Leystone, CO (United States); 23-24 Jul 1992)			
Summ.	96:680	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013281	MF-2000
CONF-9210513–		(Low level radioactive waste fall meeting; Savannah, GA (United States); 22-23 Oct 1992)			
Summ.	96:681	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013280	MF-2000
CONF-9301164–		(Low level radioactive waste winter meeting; San Diego, CA (United States); 27-29 Jan 1993)			
Summ.	96:682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013279	MF-2000
CONF-9304305–		(Low level radioactive waste spring meeting; Austin, TX (United States); 28-30 Apr 1993)			
Summ.	96:683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013278	MF-2000
CONF-9307231–		(Low level waste summer meeting; Santa Fe, NM (United States); 21-23 Jul 1993)			
Summ.	96:684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013277	MF-2000
CONF-9310462–		(Low level radioactive waste Fall meeting; Williamsburg, VA (United States); 20-22 Oct 1993)			
Summ.	96:685	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013276	MF-2000
CONF-9401133–		(Low level radioactive waste winter meeting; San Diego, CA (United States); 24-28 Jan 1994)			
Summ.	96:686	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013275	MF-2000
CONF-940401–		(International conference on methods and applications of radioanalytical chemistry; Kona, HI (United States); 10-16 Apr 1994)			
17	96:2558	*See* PNL-SA–23193			

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19	96:1205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010003	MF-2030
CONF-940406–		(International symposium on decontamination and decommissioning; Knoxville, TN (United States); 27-29 Apr 1994)			
17	96:2023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009994	MF-2070
CONF-9404126–		(Mixed waste thermal treatment symposium; Denver, CO (United States); 12-14 Apr 1994)			
6	96:687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009999	MF-2020
CONF-9404319–		(Low level radioactive waste spring meeting; New Orleans, LA (United States); 25-27 Apr 1994)			
Summ.	96:688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013274	MF-2000
CONF-9405155–		(18. actinide separations conference; Durango, CO (United States); 23-26 May 1994)			
3	96:1458	*See* PNL-SA–24044			
CONF-9407212–		(Low level radioactive waste summer meeting; Seattle, WA (United States); 20-22 Jul 1994)			
Summ.	96:690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013273	MF-2000
CONF-940729–		(International conference on mercury as a global pollutant; Whistler (Canada); 10-14 Jul 1994)			
1	96:689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009632	MF-2000
CONF-940815–		(SPECTRUM '94: international nuclear and hazardous waste management conference; Atlanta, GA (United States); 14-18 Aug 1994)			
113	96:1459	*See* PNL-SA–24720			
114	96:691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014030	MF-2020
115	96:2024	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008767	MF-2010
117	96:400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009620	MF-2010
118	96:692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009621	MF-2000
119	96:47	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010033	MF-2000
CONF-9409325–		(Workshop on climate change in the four corners and adjacent regions: implications for environmental restoration and land-use planning; Grand Junction, CO (United States); 12-14 Sep 1994)			
	96:48	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003275	MF-2000
CONF-9409423–		(Southeastern SAS User Group conference; Charleston, SC (United States); 18-20 Sep 1994)			
1	96:49	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009586	MF-2000
CONF-9410147–		(35. ORNL/DOE analytical chemistry in energy technology conference; Gatlinburg, TN (United States); 6-8 Oct 1994)			
5-Vugraphs	96:6	*See* ANL/CMT-ACL/VU–83596			
CONF-9410231–		(8. Deneb user group meeting; Detroit, MI (United States); 10-14 Oct 1994)			
3	96:2236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014254	MF-2060
CONF-9410466–		(Low level radioactive waste meeting; Williamsburg, VA (United States); 26-27 Oct 1994)			
Summ.	96:693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013272	MF-2000

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-941102–		(Winter meeting of the American Nuclear Society (ANS); Washington, DC (United States); 13-18 Nov 1994)			
45	96:11	*See* ANL/EA/CP–84766			
46	96:694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014032	MF-2000
CONF-9411149–		(Opportunity 95: environmental technology through small business; Morgantown, WV (United States); 16-17 Nov 1994)			
28	96:2360	*See* DOE/MC/29108–95/C0417			
CONF-9411197–		(SPIE: International Society for Optical Engineering meeting; Boston, MA (United States); 2-4 Nov 1994)			
2	96:2237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008768	MF-2060
CONF-941124–		(33. Hanford symposium on health and the environment: symposium on in-situ remediation–scientific basis for current and future technologies; Richland, WA (United States); 7-11 Nov 1994)			
23	96:2559	*See* PNL-SA–24280			
CONF-941192–		(Symposium on radioactive and mixed waste: risk as a basis for waste classification; Las Vegas, NV (United States); 9 Nov 1994)			
	96:950	*See* NCRP–95-22246			
CONF-941207–		(Spent nuclear fuel meeting: challenges and initiatives; Salt Lake City, UT (United States); 14-16 Dec 1994)			
37	96:1181	*See* ANL/ET/CP–83253			
CONF-9501100–		(Mixed waste focus area alternative technologies workshop; Salt Lake City, UT (United States); 24-27 Jan 1995)			
Summ	96:934	*See* LA-UR–95-1838			
CONF-9501119–		(Underwater intervention conference; New Orleans, LA (United States); 5-7 Jan 1995)			
1	96:2276	*See* WHC-SA–2924			
CONF-9501137–		(Low level radioactive waste meeting; San Diego, CA (United States); 31 Jan - 3 feb 1995)			
Summ.	96:696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013271	MF-2000
CONF-950159–		(Geostatistics for environmental and geotechnical applications; Phoenix, AZ (United States); 26-27 Jan 1995)			
2	96:347	*See* ANL/EA/CP–85472			
CONF-950163–		(3. international on-site analysis conference; Houston, TX (United States); 22-25 Jan 1995)			
5	96:2618	*See* WSRC-MS–95-0502			
CONF-950171–		(Efficient Separations and Processing Integrated Program (ESPIP) technical integration and exchange (TIE) meeting; Gaithersburg, MD (United States); 24-26 Jan 1995)			
	96:2653	*See* PNL-SA–25603			
2	96:1206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008643	MF-2000
3	96:695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008642	MF-2000
CONF-950209–		(4. international symposium on field screening methods for hazardous wastes and toxic chemicals; Las Vegas, NV (United States); 22-24 Feb 1995)			
8	96:2321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008969	MF-2070
9	96:22	*See* ANL/ER/CP–85412			
10	96:2322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013356	MF-2070

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11	96:2323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013353	MF-2070
12	96:2451	*See* INEL–95/00040			
13	96:2576	*See* UCRL-JC–119707			
CONF-9502113–		(1995 ACR conference on improving productivity in system development; Phoenix, AZ (United States); 6-10 Feb 1995)			
2	96:1299	*See* INEL–95/00124			
CONF-950216–		(Waste management '95; Tucson, AZ (United States); 26 Feb - 2 mar 1995)			
133	96:1118	*See* WSRC-MS–95-0068			
134	96:1117	*See* WSRC-MS–95-0064			
135	96:1116	*See* WSRC-MS–95-0038			
136	96:996	*See* PNL-SA–26066			
137	96:619	*See* ANL/CMT/CP–85710			
138	96:2193	*See* WHC-SA–2746			
140	96:625	*See* ANL/EA/CP–84132			
143	96:626	*See* ANL/EA/CP–84317			
144	96:13	*See* ANL/EA/CP–85661			
145	96:12	*See* ANL/EA/CP–85519			
146	96:627	*See* ANL/EA/CP–84357			
148	96:10	*See* ANL/EA/CP–84161			
151	96:1606	*See* WHC-SA–2623			
153	96:992	*See* PNL-SA–25753			
154	96:993	*See* PNL-SA–25764			
155	96:234	*See* PNL-SA–25713			
159	96:1316	*See* INEL–95/00460			
160	96:1962	*See* INEL–95/00459			
161	96:697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011209	MF-2070
CONF-950225–		(Geoenvironment 2000 meeting; Baton Rouge, LA (United States); 22-24 Feb 1995)			
2	96:1999	*See* ANL/EWM/CP–82616			
CONF-950232–		(6. American Nuclear Society meeting on robotics and remote systems; Monterey, CA (United States); 5-10 Feb 1995)			
32	96:1207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006620	MF-2000
CONF-9503110–		(TOUGH 95: transport of unsaturated ground water and heat workshop; Berkeley, CA (United States); 20-22 Mar 1995)			
1	96:213	*See* LBL–36928			
CONF-9503116–		(1995 TOUGH workshop; Berkeley, CA (United States); 20-22 Mar 1995)			
9	96:539	*See* LBL–37067			
11	96:1016	*See* SAND–95-1084C			
CONF-9503121–		(Geographic Information System (GIS); Vancouver (Canada); 27-30 Mar 1995)			
2	96:2324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004558	MF-2070
3	96:2325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004557	MF-2070
CONF-9503132–		(74. annual Gas Processors Association (GPA) meeting; San Antonio, TX (United States); 13-15 Mar 1995)			
3	96:2458	*See* INEL–95/00263			
CONF-950389–		(Pittsburgh conference and exhibition on analytical chemistry and applied spectroscopy: stimulating the minds of today's and tomorrow's scientists; New Orleans, LA (United States); 5-10 Mar 1995)			
2-Vugraphs	96:616	*See* ANL/CMT-ACL/VU–83809			
CONF-950401–		(97. annual meeting of the American Ceramic Society; Cincinnati, OH (United States); 30 Apr - 1 may 1995)			
6	96:1161	*See* ANL/CMT/CP–84719			
10	96:1159	*See* ANL/CMT/CP–84717			
11	96:851	*See* FEMP–2388			
13	96:1155	*See* ANL/CMT/CP–84524			

Report Number	*Abstract Number*	*Source of Availability*	*GPO Dep.*	*Order Number*	*Distribution Category*
16	96:1945	*See* ANL/CMT/CP–84590			
18	96:1463	*See* PNL-SA–26071			
20	96:1158	*See* ANL/CMT/CP–84591			
21	96:1465	*See* PNL-SA–26219			
23	96:1060	*See* WHC-SA–2857			
29	96:1121	*See* WSRC-MS–95-0153			
35	96:1615	*See* WHC-SA–2862			
CONF-950402–		(209. American Chemical Society (ACS) national meeting; Anaheim, CA (United States); 2-6 Apr 1995)			
15	96:1160	*See* ANL/CMT/CP–84718			
9-Vugraphs	96:2285	*See* ANL/CMT-ACL/VU–84890			
CONF-9504119–		(Air & Waste Management Association international speciality conference on thermal treatment and waste-to-energy technologies for solid waste management; Washington, DC (United States); 18-21 Apr 1995)			
1	96:997	*See* PNL-SA–26147			
CONF-9504123–		(Innovative concepts technology and business opportunities; Denver, CO (United States); 20-21 Apr 1995)			
2	96:402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014598	MF-2020
CONF-9504135–		(5. annual waste-management education and research consortium (WERC) technology development conference; Las Cruces, NM (United States); 18-20 Apr 1995)			
3	96:2645	*See* LA-UR–95-1868			
CONF-950414–		(57. annual American power conference; Chicago, IL (United States); 18-20 Apr 1995)			
4	96:1059	*See* WHC-SA–2611			
6	96:2000	*See* ANL/TD/CP–85768			
CONF-9504179–		(6. annual international conference on high level radioactive waste management; Las Vegas, NV (United States); 30 Apr - 5 may 1995)			
8	96:50	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009996	MF-2000
CONF-9504192–		(15. annual hydrology days conference; Ft. Collins, CO (United States); 3-7 Apr 1995)			
1	96:570	*See* PNL-SA–25595			
CONF-950420–		(International conference on mathematics and computations, reactor physics, and environmental analyses; Portland, OR (United States); 30 Apr - 4 may 1995)			
27	96:572	*See* PNL-SA–25679			
31	96:593	*See* WHC-SA–2665			
CONF-9504204–		(Advanced visual systems conference; Boston, MA (United States); 19-21 Apr 1995)			
1	96:2508	*See* LBL–36775			
CONF-9504207–		(Hazardous waste and materials conference; Pocatello, ID (United States); 17-19 Apr 1995)			
1	96:865	*See* INEL–95/00095			
3	96:171	*See* INEL–95/00193			
CONF-9504255–		(ESPIP task review meeting; Gaithersburg, MD (United States); 25 Apr 1995 - 26 apr 1996)			
1	96:699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010577	MF-2000
CONF-950430–		(5. ANS topical meeting on emergency preparedness and response; Savannah, GA (United States); 18-21 Apr 1995)			
8	96:2288	*See* ANL/EA/CP–84904			
9	96:9	*See* ANL/DIS/CP–84269			
CONF-950450–		(8. annual symposium on the application of geophysics to environmental and engineering problems; Orlando, FL (United States); 23-27 Apr 1995)			
8	96:353	*See* ANL/ER/CP–86429			
12	96:2563	*See* PNL-SA–25908			

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CONF-950483–		(3. international in situ and on-site bioreclamation symposium; San Diego, CA (United States); 24-27 Apr 1995)			
3	96:991	*See* PNL-SA–25640			
4	96:573	*See* PNL-SA–26258			
5	96:571	*See* PNL-SA–25678			
6	96:535	*See* LA-UR–95-2467			
7	96:1040	*See* UCRL-JC–118024			
8	96:698	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003057	MF-2000
10	96:2326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005646	MF-2010
11	96:401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010666	MF-2010
CONF-950495–		(7. national technology information exchange workshop; Cincinnati, OH (United States); 18-20 Apr 1995)			
1	96:2560	*See* PNL-SA–25501			
2	96:3	*See* ANL/CMT-ACL/CP–85835			
CONF-950498–		(6. international environmental quality and waste management conference: managing for quality - meeting environmental challenges; Denver, CO (United States); 18-20 Apr 1995)			
1	96:2	*See* ANL/CMT-ACL/CP–84790			
CONF-9505101–		(Conference on challenges and innovations in the management of hazardous waste; Washington, DC (United States); 10-12 May 1995)			
1	96:1209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013204	MF-2030
2	96:621	*See* ANL/DIS/CP–85160			
3	96:2291	*See* ANL/EMO/CP–86349			
5	96:1210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013984	MF-2030
6	96:2629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014200	MF-2000
7	96:355	*See* ANL/ES/CP–86536			
8	96:2561	*See* PNL-SA–25532			
9	96:998	*See* PNL-SA–26246			
CONF-9505111–		(11. pollution prevention conference: shaping the future through pollution prevention involvement - commitment - progress; Knoxville, TN (United States); 16-18 May 1995)			
2	96:1611	*See* WHC-SA–2768			
3	96:2194	*See* WHC-SA–2761			
4	96:1139	*See* WSRC-TR–95-0199			
5	96:881	*See* INEL–95/00202			
6	96:2137	*See* INEL–95/00108			
CONF-9505164–		(Conference on challenges and innovations in the management of hazardous waste; Washington, DC (United States); 10-12 May 1995)			
1	96:2639	*See* INEL–95/00241			
2	96:2640	*See* INEL–95/00243			
CONF-9505193–		(1995 international conference on robotics and automation; Nagoya (Japan); 21-27 May 1995)			
5	96:2267	*See* PNL-SA–26161			
CONF-9505206–		(50. Purdue industrial waste conference; W. Lafayette, IN (United States); 8-10 May 1995)			
1	96:933	*See* LA-UR–95-1136			
CONF-9505208–		(Pacific basin conference on hazardous waste; Alberta (Canada); 7-12 May 1995)			
3	96:989	*See* PNL-SA–24939			
CONF-9505217–		(Air & Waste Management Association Policy meeting; Washington, DC (United States); 10-12 May 1995)			
3	96:354	*See* ANL/ES/CP–85247			

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CONF-9505236–		(Sybase Users Group conference; Dallas, TX (United States); 15-18 May 1995)			
1	96:1464	*See* PNL-SA–26111			
CONF-9505249–		(97. American Ceramic Society (ACS) annual meeting and exposition; Cincinnati, OH (United States); 1-4 May 1995)			
11	96:1115	*See* WSRC-MS–94-0640			
CONF-9505263–		(Sample and data management workshop; Richland, WA (United States); 23-24 May 1995)			
VUGRAPHS	96:7	*See* ANL/CMT-ACL/VU–86798			
CONF-9505278–		(Gensym users group meeting; Cambridge, MA (United States); 24 May 1995)			
1	96:207	*See* LA-UR–95-1703			
CONF-9505359–		(Low level radioactive waste meeting; Knoxville, TN (United States); 6-8 May 1995)			
Summ.	96:700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013270	MF-2000
CONF-950542–		(14. international symposium on thermal treatment technologies: incineration conference; Seattle, WA (United States); 8-12 May 1995)			
1	96:629	*See* ANL/EA/CP–86212			
2	96:8	*See* ANL/CMT/CP–85474			
3	96:2296	*See* ANL/ES/CP–86380			
4	96:990	*See* PNL-SA–25207			
5	96:2460	*See* INEL–95/00269			
CONF-950570–		(International high-level radioactive waste management conference: progress toward understanding; Las Vegas, NV (United States); 1-5 May 1995)			
26	96:1156	*See* ANL/CMT/CP–84525			
CONF-950596–		(Conference on measurement of toxic and related air pollutants; Durham, NC (United States); 2-5 May 1995)			
2	96:1208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016354	MF-2000
CONF-950601–		(Annual meeting of the American Nuclear Society (ANS); Philadelphia, PA (United States); 25-29 Jun 1995)			
12	96:2005	*See* ANL/TD/SUMM–85849			
17	96:994	*See* PNL-SA–25844			
24	96:1610	*See* WHC-SA–2758			
CONF-9506115–		(20. National Association of Environmental Professionals annual conference and exposition: environmental challenges - the next twenty years; Washington, DC (United States); 10-13 Jun 1995)			
9	96:51	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014275	MF-2000
CONF-9506150–		(2. annual Department of Energy defense programs packaging workshop; San Francisco, CA (United States); 12-15 Jun 1995)			
5	96:1612	*See* WHC-SA–2777			
7	96:1970	*See* WHC-SA–2781			
8	96:1604	*See* WHC-SA–2592			
CONF-9506183–		(Optics for environmental and public safety; Munich (Germany); 19-23 Jun 1995)			
1	96:2359	*See* DOE/MC–29103-95/C0459			
CONF-9506184–		(Society of Women Engineers national meeting; Boston, MA (United States); 27 Jun - 1 jul 1995)			
3	96:2263	*See* INEL–95/00196			
CONF-9506198–		(International Association of Hydro-Geologists Congress: solutions; Edmonton (Canada); 4-10 Jun 1995)			
1	96:606	*See* WSRC-MS–95-0187			

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CONF-9506199–		(Pollution prevention and waste minimization tools workshop; Salt Lake City, UT (United States); 20-21 Jun 1995)			
Summ.	96:52	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002402	MF-2000
CONF-9506222–		(MACPAC 95: Mid-America Chinese Professional annual convention; Itasca, IL (United States); 23-25 Jun 1995)			
2	96:2289	*See* ANL/EA/CP–86614			
CONF-9506234–		(1995 Bio-Rad users meeting; Boston, MA (United States); 20-22 Jun 1995)			
1	96:1616	*See* WHC-SA–2894			
CONF-9506237–		(International Congress on Hazardous Waste: impact on human and ecological health; Atlanta, GA (United States); 5-8 Jun 1995)			
1	96:208	*See* LA-UR–95-1880			
CONF-9506245–		(NATO meeting on nuclear submarine decommissioning and related problems; Moscow (Russian Federation); 19-22 Jun 1995)			
1	96:236	*See* PNL-SA–26402			
CONF-950646–		(Air and Waste Management Association meeting; San Antonio, TX (United States); 18-23 Jun 1995)			
21	96:403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013048	MF-2010
26	96:2292	*See* ANL/ER/CP–84542			
27	96:346	*See* ANL/EA/CP–84187			
30	96:233	*See* PNL-SA–25593			
CONF-950669–		(DOE records management conference: Camino Real to the year 2000; Albuquerque, NM (United States); 27-30 Jun 1995)			
1	96:162	*See* FEMP–2425			
CONF-9507119–		(Summer national meeting of the American Institute of Chemical Engineers; Boston, MA (United States); 30 Jul - 2 aug 1995)			
1	96:291	*See* WHC-SA–2885			
5	96:1936	*See* WSRC-TR–95-0265			
7	96:999	*See* PNL-SA–26455			
9	96:2630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003778	MF-2070
10	96:1211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010736	MF-2030
CONF-9507150–		(11. annual waste testing and quality assurance symposium; Washington, DC (United States); 23-28 Jul 1995)			
2	96:53	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016346	MF-2000
CONF-950718–		(Electric Power Research Institute low-level waste conference; Orlando, FL (United States); 10-12 Jul 1995)			
2	96:888	*See* INEL–95/00321			
CONF-9507185–		(Record of the Facility deactivation, decommissioning, and material disposition (D&D) workshop: a new focus for technology development, opportunities for industry/government collaboration; Morgantown, WV (United States); 11-12 Jul 1995)			
Summ.	96:2110	*See* DOE/METC–96/1022			
CONF-9507186–		(Meeting of the Korea Atomic Energy Research Institute; Taejon (Korea, Republic of); 16-22 Jul 1995)			
2	96:2278	*See* WSRC-MS-95-0271			
CONF-9507187–		(International Atomic Energy Agency Research Meeting; Idaho Falls, ID (United States); 24-28 Jul 1995)			
1	96:2467	*See* INEL–95/00356			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9507189–		(IABSE colloquium on reliable containment for the future; London (United Kingdom); 11-12 Jul 1995)			
1	96:1199	*See* BNL–62294			
CONF-9507191–		(Electric Power Research Institute radwaste workshop; Orlando, FL (United States); 14 Jul 1995)			
1	96:169	*See* INEL–95/00175			
CONF-950729–		(30. Intersociety energy conversion conference; Orlando, FL (United States); 30 Jul - 5 aug 1995)			
7	96:2287	*See* ANL/CMT/CP–86433			
CONF-950740–		(Joint American Society of Mechanical Engineers (ASME)/Japan Society of Mechanical Engineers (JSME) pressure vessels and piping conference; Honolulu, HI (United States); 23-27 Jul 1995)			
103	96:1607	*See* WHC-SA–2649			
34	96:1197	*See* BNL–61651			
38	96:1196	*See* BNL–61648			
40	96:1605	*See* WHC-SA–2616			
45	96:1198	*See* BNL–61711			
46	96:1195	*See* BNL–61647			
48	96:1194	*See* BNL–61646			
52	96:1608	*See* WHC-SA–2737			
63	96:1183	*See* ANL/RE/CP–85929			
69	96:399	*See* BNL–61458			
70	96:1182	*See* ANL/RE/CP–79448			
86	96:650	*See* ANL/RE/CP–85598			
99	96:1293	*See* INEL–94/00106			
CONF-950750–		(10. Institute of Electrical and Electronics Engineers (IEEE) pulsed power conference; Albuquerque, NM (United States); 10-13 Jul 1995)			
17	96:935	*See* LA-UR–95-2343			
CONF-950786–		(3. annual conference on the recycle and reuse of radioactive scrap metal; Knoxville, TN (United States); 31 Jul - 3 aug 1995)			
2	96:622	*See* ANL/DIS/CP–87032			
CONF-950787–		(36. annual meeting of the Institute for Nuclear Materials Management; Palm Desert, CA (United States); 9-12 Jul 1995)			
26	96:1972	*See* WHC-SA–2834			
27	96:1971	*See* WHC-SA–2833			
59	96:288	*See* WHC-SA–2831			
85	96:2577	*See* UCRL-JC–119959			
86	96:887	*See* INEL–95/00320			
87	96:166	*See* INEL–95/00057			
CONF-9508119–		(1. international symposium on assembly and task planning; Pittsburgh, PA (United States); 10-11 Aug 1995)			
1	96:2269	*See* SAND–95-0849C			
CONF-9508169–		(Energy Facilities Contractors Operating Group, Prioritization Working Group & Prioritization Methodology Users Group prioritization methodology workshop; Idaho Falls, ID (United States); 22-23 Aug 1995)			
3	96:2025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003756	MF-2010
CONF-9508172–		(1. symposium on the hydrogeology of Washington state; Olympia, WA (United States); 28-30 Aug 1995)			
1	96:2595	*See* WHC-SA–2925-FP			
CONF-9508178–		(Russia Federation/United States technical exchange on the non-reactor nuclear safety and waste management; Los Alamos, NM (United States); 14-17 Aug 1995)			
2	96:1311	*See* INEL–95/00390			

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CONF-9508189–		(6. DOE industry/university/lab forum on robotics for environmental restoration and waste management; Albuquerque, NM (United States); 16-17 Aug 1995)			
Summ.	96:2271	*See* SAND–95-2393			
CONF-9508190–		(PCB seminar; Boston, MA (United States); 29-31 Aug 1995)			
1	96:2293	*See* ANL/ER/CP–85995			
CONF-9508192–		(8. American water jet conference; Houston, TX (United States); 27-30 Aug 1995)			
1	96:1461	*See* PNL-SA–25132			
CONF-9508193–		(4. American Defense Preparedness Association Air Force pollution prevention conference; San Antonio, TX (United States); 14-17 Aug 1995)			
1	96:2562	*See* PNL-SA–25878			
CONF-9508197–		(NAS workshop on barriers for long term isolation; Denver, CO (United States); 13 Aug 1995)			
1	96:55	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003027	MF-2000
CONF-9508198–		(Mixed waste symposium; Baltimore, MD (United States); 7-11 Aug 1995)			
1	96:2443	*See* INEL–94/00066			
CONF-950828–		(1995 National heat transfer conference; Portland, OR (United States); 5-9 Aug 1995)			
3	96:1010	*See* SAND–94-2643C			
6	96:701	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007407	MF-2020
19	96:538	*See* LBL–36739			
21	96:2570	*See* SAND–95-2258C			
22	96:1562	*See* SAND–95-2244C			
25	96:702	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003049	MF-2000
CONF-950836–		(American Institute of Aeronautics and Astronautics guidance, navigation and control conference; Baltimore, MD (United States); 7-10 Aug 1995)			
2	96:1042	*See* UCRL-JC–120690			
CONF-950863–		(4. IEEE international symposium on high performance distributed computing; Pentagon City, VA (United States); 1-4 Aug 1995)			
23	96:880	*See* INEL–95/00184			
CONF-950865–		(29. annual meeting of the Microbeam Analysis Society; Breckenridge, CO (United States); 6-11 Aug 1995)			
4	96:1164	*See* ANL/CMT/CP–86025			
CONF-950868–		(ER '95: environmental remediation conference: committed to results; Denver, CO (United States); 13-18 Aug 1995)			
4	96:2153	*See* LA-UR–95-2277			
5	96:1015	*See* SAND–95-0789C			
6	96:4	*See* ANL/CMT-ACL/CP–86061			
7	96:5	*See* ANL/CMT-ACL/CP–86080			
8	96:209	*See* LA-UR–95-2267			
9	96:2154	*See* LA-UR–95-2435			
10	96:2155	*See* LA-UR–95-2465			
11	96:1066	*See* WHC-SA–2914			
12	96:630	*See* ANL/EA/CP–86245			
15	96:512	*See* FEMP/SUB–095			
16	96:2132	*See* FEMP–2362B			
17	96:2133	*See* FEMP/SUB–096			
20	96:2510	*See* LBL–37554			
22	96:172	*See* INEL–95/00228			
24	96:882	*See* INEL–95/00233			
26	96:173	*See* INEL–95/00234			
27	96:516	*See* INEL–95/00230			
28	96:883	*See* INEL–95/00256			
29	96:2140	*See* INEL–95/00229			

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30	96:2457	*See* INEL–95/00235			
31	96:1991	*See* ANL/EA/CP–87182			
33	96:404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003047	MF-2010
34	96:54	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003041	MF-2080
36	96:161	*See* FEMP–2363B			
37	96:2001	*See* ANL/TD/CP–86095			
38	96:349	*See* ANL/EA/CP–87306			
40	96:703	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005460	MF-2000
41	96:628	*See* ANL/EA/CP–86211			
42	96:2294	*See* ANL/ER/CP–87350			
43	96:348	*See* ANL/EA/CP–86379			
44	96:350	*See* ANL/EA/CP–87307			
CONF-950876–		(19. annual symposium of the Nuclear Information Records Management Association; Washington, DC (United States); 27-30 Aug 1995)			
2	96:293	*See* WHC-SA–2931-FP			
CONF-950877–		(3. American Society for Mechanical Engineers (ASME) biennial mixed waste symposium; Baltimore, MD (United States); 7-11 Aug 1995)			
1	96:932	*See* LA-UR–95-586			
5	96:1041	*See* UCRL-JC–120442			
7	96:2275	*See* UCRL-JC–118897			
9	96:1120	*See* WSRC-MS–95-0087			
14	96:617	*See* ANL/CMT/CP–84846			
16	96:643	*See* ANL/EMO/CP–85698			
18	96:1122	*See* WSRC-MS–95-0184			
20	96:1123	*See* WSRC-MS–95-0185			
21	96:1119	*See* WSRC-MS–95-0080			
22	96:235	*See* PNL-SA–26080			
23	96:2446	*See* INEL–94/00148			
24	96:854	*See* INEL–94/00063			
CONF-9509100–		(5. international conference on nuclear criticality safety; Albuquerque, NM (United States); 17-22 Sep 1995)			
11	96:2027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017432	MF-2000
131	96:179	*See* INEL–95/00303			
16	96:1609	*See* WHC-SA–2748			
CONF-9509111–		(Society of Photo-Optical Instrumentation Engineers (SPIE) meeting on environmental monitoring; San Francisco, CA (United States); 25-28 Sep 1995)			
1	96:2492	*See* LA-UR–95-3644			
CONF-9509139–		(7. ACS special symposium: emerging technologies in hazardous waste management; Atlanta, GA (United States); 17-20 Sep 1995)			
4	96:1946	*See* ANL/CMT/CP–86185			
6	96:1140	*See* WSRC-TR–95-0303			
8	96:1141	*See* WSRC-TR–95-0304			
9	96:1125	*See* WSRC-MS–95-0328			
CONF-950914–		(American Nuclear Society international topical conference on the safety of operating reactors; Seattle, WA (United States); 17-23 Sep 1995)			
2	96:292	*See* WHC-SA–2890			
CONF-950917–		(5. international conference on radioactive waste management and environmental remediation; Berlin (Germany); 3-9 Sep 1995)			
1	96:1012	*See* SAND–94-3188C			
2	96:931	*See* LA-UR–95-256			
3	96:930	*See* LA-UR–95-255			
4	96:929	*See* LA-UR–95-254			
5	96:928	*See* LA-UR–95-252			

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
9	96:2026	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010222	MF-2050
10	96:290	*See* WHC-SA–2855			
11	96:212	*See* LBL–36825			
14	96:876	*See* INEL–95/00137			
16	96:995	*See* PNL-SA–26015			
17	96:1460	*See* PNL-SA–25033			
18	96:1466	*See* PNL-SA–26441			
19	96:618	*See* ANL/CMT/CP–85434			
20	96:1157	*See* ANL/CMT/CP–84527			
CONF-9509175–		(8. international symposium on relations between homogeneous and heterogeneous catalysis; Balatonfuered (Hungary); 10-14 Sep 1995)			
1	96:1462	*See* PNL-SA–25954			
CONF-950923–		(5. international conference on facility-safeguards interface; Jackson Hole, WY (United States); 24-30 Sep 1995)			
15	96:2196	*See* WHC-SA–2807-FP			
19	96:289	*See* WHC-SA–2835			
CONF-9509253–		(18. international meeting on reduced enrichment for research and test reactors; Paris (France); 18-21 Sep 1995)			
7	96:1981	*See* WSRC-MS–95-0354			
CONF-9509266–		(Industrial and environmental chemistry special symposium; Atlanta, GA (United States); 17-20 Sep 1995)			
1	96:1915	*See* WSRC-MS–95-0294			
2-Ext.Abst.	96:181	*See* INEL–95/00347			
CONF-9509287–		(9. international conference on modern trends in activation analysis; Seoul (Korea, Republic of); 24-30 Sep 1995)			
1	96:2327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004929	MF-2010
CONF-9509349–		(Geographic technology in government; Reston, VA (United States); 6 Sep 1995)			
1	96:294	*See* WHC-SA–2935			
CONF-9509377–		(Low-level radioactive waste forum; Salt Lake City, UT (United States); 26-28 Sep 1995)			
Exc.	96:704	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013269	MF-2000
CONF-950946–		(5. international conference on the chemistry and migration behaviour of actinides and fission products in the geosphere; Saint-Malo (France); 10-15 Sep 1995)			
2	96:1556	*See* SAND–95-2009C			
4	96:1555	*See* SAND–95-2008C			
5	96:1554	*See* SAND–95-2007C			
6	96:1553	*See* SAND–95-2006C			
7	96:1552	*See* SAND–95-2005C			
CONF-951006–		(Winter meeting of the American Nuclear Society (ANS); San Francisco, CA (United States); 29 Oct - 1 nov 1995)			
10	96:405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014577	MF-2010
24	96:183	*See* INEL–95/00426			
29	96:1212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004599	MF-2070
32	96:2238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005542	MF-2060
33	96:2239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005647	MF-2030
36	96:2240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005393	MF-2070
37	96:2241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005987	MF-2060

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
CONF-9510108–		(Environmental technology development through industry partnership; Morgantown, WV (United States); 3-5 Oct 1995)			
	96:2375	*See* DOE/MC/30357–96/C0592			
2	96:2109	*See* DOE/MC/30359–96/CO594			
3	96:813	*See* DOE/MC/30171–96/CO581			
4	96:486	*See* DOE/MC/30360–96/CO614			
5	96:2361	*See* DOE/MC/29108–96/CO568			
6	96:2371	*See* DOE/MC/30175–96/CO588			
7	96:2365	*See* DOE/MC/29118–96/CO572			
8	96:2108	*See* DOE/MC/30179–96/CO591			
9	96:814	*See* DOE/MC/30173–96/CO584			
10	96:2379	*See* DOE/MC/32089–96/CO615			
11	96:809	*See* DOE/MC/29107–96/CO567			
12	96:808	*See* DOE/MC/29105–96/CO563			
13	96:2370	*See* DOE/MC/30174–96/CO585			
14	96:2102	*See* DOE/MC/30164–96/CO577			
15	96:811	*See* DOE/MC/29249–96/CO574			
16	96:490	*See* DOE/MC/32108–96/CO616			
17	96:2384	*See* DOE/MC/32116–96/CO617			
18	96:2105	*See* DOE/MC/30170–96/CO580			
19	96:2362	*See* DOE/MC/29109–96/CO569			
20	96:2373	*See* DOE/MC/30176–96/CO589			
21	96:2106	*See* DOE/MC/30178–96/CO590			
22	96:2104	*See* DOE/MC/30168–96/CO579			
23	96:2249	*See* DOE/MC/29115–96/CO562			
24	96:2103	*See* DOE/MC/30165–96/CO578			
25	96:2093	*See* DOE/MC/29103–96/CO565			
26	96:2095	*See* DOE/MC/29104–96/CO566			
27	96:2096	*See* DOE/MC/29113–96/CO571			
28	96:2367	*See* DOE/MC/29120–96/CO573			
29	96:115	*See* DOE/MC/31388–96/CO624			
30	96:1265	*See* DOE/MC/32113–96/CO633			
31	96:116	*See* DOE/MC/32112–96/CO632			
32	96:2253	*See* DOE/MC/30362–96/CO620			
33	96:2381	*See* DOE/MC/32109–96/CO613			
34	96:488	*See* DOE/MC/31178–96/CO612			
35	96:2358	*See* DOE/MC/29101–96/CO564			
36	96:114	*See* DOE/MC/31179–96/CO618			
37	96:489	*See* DOE/MC/31185–96/CO619			
38	96:482	*See* DOE/MC/29111–96/CO570			
39	96:2378	*See* DOE/MC/32087–96/CO631			
40	96:491	*See* DOE/MC/32114–96/CO625			
41	96:2377	*See* DOE/MC/31186–96/CO628			
42	96:2258	*See* DOE/MC/32092–96/CO621			
43	96:817	*See* DOE/MC/31188–96/CO629			
44	96:2376	*See* DOE/MC/30358–96/CO593			
45	96:2257	*See* DOE/MC–31190-96/CO630			
46	96:2256	*See* DOE/MC/30363–90/C0627			
47	96:487	*See* DOE/MC/31177–96/C0623			
48	96:2380	*See* DOE/MC/32090–96/C0622			
49	96:2368	*See* DOE/MC/30172—96/C0582			
50	96:2369	*See* DOE/MC/30172–96/C0583			
52	96:2382	*See* DOE/MC/32110–96/C0626			
53	96:2101	*See* DOE/MC/30162–96/C0576			
Vol.1	96:820	*See* DOE/METC–96/1021-Vol.1			
Vol.2	96:821	*See* DOE/METC–96/1021-Vol.2			
CONF-9510125–		(International symposium on environmental technologies: plasma systems and applications; Atlanta, GA (United States); 8-11 Oct 1995)			
1	96:2332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012896	MF-2070
2	96:890	*See* INEL–95/00393			
CONF-9510206–		(Deneb Robotics' user group conference and exhibition; Ypsilanti, MI (United States); 9-13 Oct 1995)			
3	96:2277	*See* WHC-SA–2974-FP			
CONF-9510219–		(46. international astronautical congress; Oslo (Norway); 2-6 Oct 1995)			
1	96:815	*See* DOE/MC/30361–95/C0498			

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CONF-9510307–		(6. topical meeting on robotics and remote systems; San Francisco, CA (United States); 29 Oct - 2 nov 1995)			
1	96:2242	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005986	MF-2060
CONF-9510319–		(11. annual model conference; Oak Ridge, TN (United States); 16-18 Oct 1995)			
1	96:705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005733	MF-2020
2	96:2333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010591	MF-2070
CONF-9510321–		(40. international ARMA annual conference; Nashville, TN (United States); 22-25 Oct 1995)			
1	96:56	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005493	MF-2000
CONF-951033–		(27. international technical conference of the Society for the Advancement of Material and Process Engineering (SAMPE): diversity into the next century; Albuquerque, NM (United States); 9-12 Oct 1995)			
14	96:2657	*See* SAND–95-1601C			
CONF-9510335–		(Minerals and Geotechnical Logging Society conference; Santa Fe, NM (United States); Oct 1995)			
1	96:2494	*See* LA-UR–96-34			
CONF-9510354–		(1. GAMM seminar on modelling and computation in environmental sciences; Stuttgart (Germany); 12-13 Oct 1995)			
1	96:216	*See* LBL–38151			
CONF-951057–		(9. symposium on separation science and technology for energy applications; Gatlinburg, TN (United States); 22-26 Oct 1995)			
1	96:2642	*See* INEL–95/00516			
5	96:1162	*See* ANL/CMT/CP–86022			
6	96:1176	*See* ANL/CMT/VU–86003			
7	96:2328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005751	MF-2000
8	96:1213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005398	MF-2000
9	96:1163	*See* ANL/CMT/CP–86023			
CONF-951073–		(IEEE nuclear science symposium and medical imaging conference; San Francisco, CA (United States); 23-28 Oct 1995)			
6	96:2594	*See* WHC-SA–2861			
CONF-951091–		(4. nondestructive assay and nondestructive examination waste characterization conference; Salt Lake City, UT (United States); 24-26 Oct 1995)			
	96:2329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002403	MF-2070
1	96:2491	*See* LA-UR–95-3382			
2	96:1622	*See* WHC-SA–2968-FP			
4	96:2464	*See* INEL–95/00311			
5	96:2474	*See* INEL–95/00503			
6	96:940	*See* LA-UR–95-3707			
7	96:2468	*See* INEL–95/00370			
10	96:2330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005981	MF-2070
11	96:2331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005980	MF-2070
12	96:2465	*See* INEL–95/00313			
13	96:2578	*See* UCRL-JC–121184			

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CONF-9511102–		(4. annual meeting of the Coucil on Ionising Radiation Measurements and Standards: advanced techniques in ionising radiation measurements; Gaithersburg, MD (United States); 28-30 Nov 1995)			
1-Vugraphs	96:2286	*See* ANL/CMT-ACL/VU–87803			
CONF-9511128–		(5. Department of Energy (DOE) natural phenomena hazards mitigation symposium; Denver, CO (United States); 13-17 Nov 1995)			
1	96:853	*See* FEMP/SUB–102			
9	96:185	*See* INEL–95/00480			
10	96:1618	*See* WHC-SA–2942			
14	96:295	*See* WHC-SA–2959			
17	96:1184	*See* ANL/RE/CP–87833			
22	96:1919	*See* WSRC-MS–95-0400			
25	96:1918	*See* WSRC-MS–95-0397			
CONF-9511133–		(41. annual conference on bioassay, analytical and environmental radiochemistry; Boston, MA (United States); 12-16 Nov 1995)			
3	96:2284	*See* ANL/CMT-ACL/CP–86742			
CONF-9511179–		(State and tribal forum on risk based decision making; St. Louis, MO (United States); 12-15 Nov 1995)			
1	96:270	*See* SAND–96-0203C			
CONF-9511189–		(Workshop on vitrification of low level waste: the process and potential; San Antonio, TX (United States); 5-6 Nov 1995)			
1	96:1214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005450	MF-2020
CONF-9511193–		(Annual American Institute of Chemical Engineers (AIChE) meeting; Gatlinburg, TN (United States); 12-17 Nov 1995)			
1	96:1916	*See* WSRC-MS–95-0370			
CONF-9511198–		(3. symposium on laser spectroscopy at the Korean Atomic Energy Research Institute; Taejon (Korea, Republic of); 9 Nov 1995)			
1	96:2481	*See* IS-M–840			
CONF-951135–		(1995 International mechanical engineering congress and exhibition; San Francisco, CA (United States); 12-17 Nov 1995)			
25	96:2243	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003031	MF-2060
26	96:237	*See* PNL-SA–26460			
CONF-951155–		(Fall meeting of the Materials Research Society (MRS); Boston, MA (United States); 27 Nov - 1 dec 1995)			
2	96:2658	*See* SAND–95-2379C			
4	96:938	*See* LA-UR–95-3690			
5	96:939	*See* LA-UR–95-3691			
112	96:1068	*See* WHC-SA–3015			
113	96:1069	*See* WHC-SA–3022			
19	96:1310	*See* INEL–95/00343			
31	96:1064	*See* WHC-SA–2906			
62	96:620	*See* ANL/CMT/CP–86906			
63	96:1166	*See* ANL/CMT/CP–86953			
67	96:1165	*See* ANL/CMT/CP–86907			
81	96:1169	*See* ANL/CMT/CP–88983			
82	96:1063	*See* WHC-SA–2905			
CONF-951171–		(23. Hanford symposium on health and the environment conference; Richland, WA (United States); 7-11 Nov 1995)			
1	96:569	*See* PNL-SA–23468			
CONF-951173–		(18. world energy engineering congress; Atlanta, GA (United States); 8-10 Nov 1995)			
2	96:300	*See* WHC-SA–2995-FP			

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CONF-951180–		(Annual meeting of the American Institute of Chemical Engineers; Miami Beach, FL (United States); 12-17 Nov 1995)			
3	96:2631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005464	MF-2000
CONF-951203–		(PATRAM '95: 11. international conference on packaging and transportation of radioactive materials; Las Vegas, NV (United States); 3-8 Dec 1995)			
1	96:1537	*See* SAND–94-2268C			
3	96:253	*See* SAND–95-0185C			
4	96:1543	*See* SAND–95-0186C			
5	96:264	*See* SAND–95-2696C			
6	96:1013	*See* SAND–95-0188C			
10	96:252	*See* SAND–95-0184C			
11	96:255	*See* SAND–95-0194C			
15	96:268	*See* SAND–95-3019C			
17	96:257	*See* SAND–95-0203C			
18	96:251	*See* SAND–95-0081C			
19	96:261	*See* SAND–95-0375C			
22	96:267	*See* SAND–95-3018C			
24	96:1014	*See* SAND–95-0208C			
25	96:266	*See* SAND–95-2842C			
29	96:269	*See* SAND–95-3020C			
30	96:57	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004940	MF-2000
31	96:58	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004939	MF-2000
32	96:59	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004938	MF-2000
36	96:287	*See* WHC-SA–2796			
37	96:286	*See* WHC-SA–2788			
38	96:302	*See* WHC-SA–3013			
39	96:1613	*See* WHC-SA–2794			
40	96:1614	*See* WHC-SA–2795			
41	96:2195	*See* WHC-SA–2786			
44	96:60	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005662	MF-2020
46	96:271	*See* SAND–96-0209C			
47	96:259	*See* SAND–95-0211C			
48	96:275	*See* SAND–96-0341C			
50	96:258	*See* SAND–95-0204C			
55	96:260	*See* SAND–95-0227C			
56	96:256	*See* SAND–95-0201C			
57	96:276	*See* SAND–96-0370C			
60	96:1569	*See* SAND–96-0342C			
61	96:254	*See* SAND–95-0193C			
62	96:272	*See* SAND–96-0258C			
63	96:273	*See* SAND–96-0282C			
72	96:61	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010730	MF-2000
CONF-951204–		(Fall meeting of the American Geophysical Union; San Francisco, CA (United States); 11-15 Dec 1995)			
28	96:265	*See* SAND–95-2736C			
CONF-951209–		(17. low-level radioactive waste management conference; Phoenix, AZ (United States); 12-14 Dec 1995)			
	96:706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005882	MF-2000
1	96:893	*See* INEL–95/00502			
3	96:937	*See* LA-UR–95-3523			
4	96:296	*See* WHC-SA–2964			
6	96:187	*See* INEL–95/00558			
7	96:189	*See* INEL–95/00602			
8	96:1024	*See* SAND–95-2934C			
9	96:707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005645	MF-2020

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10	96:708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005554	MF-2020
11	96:2142	*See* INEL–95/00403			
CONF-951258–		(4. national applied mechanisms and robotics conference; Cincinnati, OH (United States); 10-13 Dec 1995)			
1	96:2250	*See* DOE/MC/29115–96/CO586			
CONF-951259–		(Plutonium stabilization and immobilization workshop; Washington, DC (United States); 12-14 Dec 1995)			
	96:1948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011798	MF-2000
6	96:1973	*See* WHC-SA–3017-FP			
7	96:1982	*See* WSRC-TR–95-0468			
8	96:1941	*See* WSRC-TR–95-0470			
9	96:1983	*See* WSRC-TR–95-0472			
10	96:1148	*See* WSRC-TR–95-0471			
CONF-951271–		(On-site analysis: when is it the viable option?; Arlington, VA (United States); 11-12 Dec 1995)			
1	96:2334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005971	MF-2070
CONF-960109–		(STAIF 96: space technology and applications international forum; Albuquerque, NM (United States); 7-11 Jan 1996)			
6	96:2596	*See* WHC-SA–2971			
10	96:297	*See* WHC-SA–2975			
11	96:298	*See* WHC-SA–2979			
CONF-960110–		(29. midyear topical meeting of the Health Physics Society: naturally occuring and accelerator produced radioactive material - regulation and risk assessment; Scottsdale, AZ (United States); 7-10 Jan 1996)			
1	96:709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004924	MF-2040
2	96:191	*See* INEL–96/00005			
3	96:632	*See* ANL/EA/CP–88217			
CONF-960127–		(9. joint American Meteorological Society/Air and Waste Management Association conference on applications of air pollution meteorology; Atlanta, GA (United States); 28 Jan - 2 feb 1996)			
2	96:936	*See* LA-UR–95-3004			
CONF-960158–		(Efficient separations and processing crosscutting program 1996 technical meeting; Gaithersburg, MD (United States); 16-19 Jan 1996)			
	96:2656	*See* PNNL-SA–27105			
1	96:301	*See* WHC-SA–3006-FP			
2	96:1215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005667	MF-2030
3	96:1216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005368	MF-2030
4	96:2632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005660	MF-2020
5	96:1217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005659	MF-2030
CONF-960164–		(3. international conference/workshop on integrating GIS and environmental modeling; Santa Fe, NM (United States); 21-25 Jan 1996)			
2	96:2290	*See* ANL/EA/CP–88577			
CONF-960175–		(4. international on-site analysis meeting; Orlando, FL (United States); 21-24 Jan 1996)			
3	96:210	*See* LA-UR–96-170			

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CONF-960187–		(Nondestructive assay/nondestructive evaluation (NDA/NDE) program review; Pittsburgh, PA (United States); 23-26 Jan 1996)			
1	96:2579	*See* UCRL-JC–123342			
CONF-9602110–		(Low level radioactive waste meeting; San Diego, CA (United States); 13-16 Feb 1996)			
Summ.	96:712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013268	MF-2000
CONF-960212–		(Waste management '96: HLW, LLW, mixed wastes and environmental restoration - working towards a cleaner environment; Tucson, AZ (United States); 25-29 Feb 1996)			
2	96:1963	*See* INEL–95/00461			
3	96:1124	*See* WSRC-MS–95-0261			
4	96:2493	*See* LA-UR–95-4293			
5	96:2156	*See* LA-UR–95-4294			
8	96:942	*See* LA-UR–95-4245			
9	96:941	*See* LA-UR–95-4244			
11	96:1027	*See* SAND–96-0297C			
13	96:852	*See* FEMP–2445			
14	96:1317	*See* INEL–95/00466			
15	96:193	*See* INEL–96/00034			
16	96:1990	*See* ANL/DIS/CP–87709			
17	96:623	*See* ANL/DIS/CP–87708			
30	96:2472	*See* INEL–95/00462			
31	96:186	*See* INEL–95/00486			
32	96:624	*See* ANL/DIS/CP–89084			
33	96:646	*See* ANL/ET/CP–87963			
36	96:1917	*See* WSRC-MS–95-0371			
38	96:1177	*See* ANL/EA/CP–89045			
39	96:15	*See* ANL/EA/CP–88442			
40	96:631	*See* ANL/EA/CP–87799			
43	96:278	*See* SAND–96-0715C			
44	96:277	*See* SAND–96-0714C			
45	96:1022	*See* SAND–95-2216C			
46	96:1028	*See* SAND–96-0377C			
47	96:1029	*See* SAND–96-0378C			
49	96:1561	*See* SAND–95-2082C			
50	96:1920	*See* WSRC-MS–95-0421			
53	96:1617	*See* WHC-SA–2933-FP			
54	96:1630	*See* WHC-SA–3037-FP			
55	96:1628	*See* WHC-SA–3029-FP			
57	96:1026	*See* SAND–96-0294C			
58	96:1067	*See* WHC-SA–2960-FP			
59-Summ.	96:1551	*See* SAND–95-1998C			
60	96:1557	*See* SAND–95-2015C			
61	96:1620	*See* WHC-SA–2962-FP			
62	96:1629	*See* WHC-SA–3036-FP			
63	96:1621	*See* WHC-SA–2966-FP			
64	96:1627	*See* WHC-SA–3025-FP			
65	96:2660	*See* SAND–96-0656C			
66	96:2496	*See* LA-UR–96-369			
67	96:211	*See* LA-UR–96-378			
68	96:2158	*See* LA-UR–96-0421			
69	96:943	*See* LA-UR–96-368			
72	96:2498	*See* LA-UR–96-633			
74	96:710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008680	MF-2000
75	96:904	*See* INEL–96/00056			
76	96:1961	*See* INEL–95/00458			
77	96:903	*See* INEL–96/00055			
78	96:902	*See* INEL–96/00047			
80	96:2335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008803	MF-2070
81	96:1619	*See* WHC-SA–2952			
84	96:1147	*See* WSRC-TR–95-0454			
87	96:2619	*See* WSRC-MS–96-0005			
88	96:1126	*See* WSRC-MS–95-0423			
90	96:1218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010277	MF-2000

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94	96:2112	*See* DOE/NV/10833–34			
95	96:2386	*See* DOE/NV/10833–33			
96	96:1149	*See* WSRC-TR–96-0003			
97	96:1283	*See* DOE/WIPP–95-2132			
CONF-960246–		(Waste management '96 symposium and spectrum '96; Seattle, WA (United States); 25-29 Feb 1996)			
1	96:899	*See* INEL–95/00616			
CONF-960252–		(2. international symposium on environmental applications of advanced oxidation technologies; San Francisco, CA (United States); 28 Feb - 1 mar 1996)			
1	96:944	*See* LA-UR–96-0595			
2	96:2500	*See* LA-UR–96-1051			
CONF-960265–		(Environmental quality, innovative technologies and sustainable economic development: a NAFTA perspective; Mexico City (Mexico); 7-10 Feb 1996)			
1	96:62	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005439	MF-2010
CONF-960271–		(American Institute of Chemical Engineers (AIChE) spring meeting; New Orleans, LA (United States); 26-29 Feb 1996)			
2	96:2028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006708	MF-2000
5	96:711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006725	MF-2000
CONF-960272–		(8. annual Society of Hispanic Professional Engineers national technical and career conference; Seattle, WA (United States); 15-17 Feb 1996)			
1	96:1626	*See* WHC-SA–3023-FP			
CONF-960303–		(Annual meeting and exhibition of the Society for Mining, Metallurgy and Exploration; Phoenix, AZ (United States); 11-14 Mar 1996)			
2	96:1287	*See* DOE/WIPP–96-2087			
CONF-960306–		(ICONE 4: ASME/JSME international conference on nuclear engineering; New Orleans, LA (United States); 10-13 Mar 1996)			
8	96:2003	*See* ANL/TD/CP–89321			
CONF-9603129–		(1996 New Mexico conference on the environment; Albuquerque, NM (United States); 12-14 Mar 1996)			
1	96:1023	*See* SAND–95-2583C			
2	96:2497	*See* LA-UR–96-578			
5	96:2499	*See* LA-UR–96-732			
CONF-9603137–		(Western States section meeting; Tempe, AZ (United States); 11-12 Mar 1996)			
2	96:713	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008664	MF-2000
CONF-960314–		(International solvent extraction conference; Melbourne (Australia); 17-21 Mar 1996)			
3	96:2633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013989	MF-2000
4	96:1154	*See* ANL/CHM/CP–84143			
CONF-9603143–		(International symposium on robotics and manufacturing (ISRM); Montpellier (France); 27-30 Mar 1996)			
1	96:2274	*See* SAND–96-0881C			
CONF-9603148–		(Geographic Information System (GIS) enviromental management conference; Reno, NV (United States); 13 Mar 1996)			
1	96:63	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008802	MF-2000

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CONF-960389–		(CORROSION '96: National Association of Corrosion Engineers (NACE) conference; Denver, CO (United States); 24-29 Mar 1996)			
2	96:1625	*See* WHC-SA–3016			
3	96:1624	*See* WHC-SA–3010-FP			
6	96:1623	*See* WHC-SA–2990-FP			
10	96:1922	*See* WSRC-MS–95-0466			
CONF-9604104–		(20. compatibility, aging and stockpile stewardship conference; Kansas City, KS (United States); 30 Apr - 2 may 1996)			
7	96:1033	*See* SAND–96-0815C			
CONF-9604123–		(Conference on hazardous wastes and materials; Idaho Falls, ID (United States); 3-4 Apr 1996)			
1	96:901	*See* INEL–96/00041			
CONF-9604124–		(98. annual meeting of the American Ceramic Society; Indianapolis, IN (United States); 14-17 Apr 1996)			
5	96:648	*See* ANL/ET/CP–88344			
6	96:649	*See* ANL/ET/CP–88412			
7	96:647	*See* ANL/ET/CP–88272			
CONF-960415–		(American Nuclear Society (ANS) Radiation Protection and Shielding Division topical meeting on advancements and applications in radiation protection and shielding; Falmouth, MA (United States); 21-25 Apr 1996)			
38	96:303	*See* WHC-SA–3053			
CONF-960421–		(7. annual international high-level radioactive waste management conference; Las Vegas, NV (United States); 29 Apr - 3 may 1996)			
2	96:1566	*See* SAND–95-3056C			
8	96:1581	*See* UCRL-JC–122572			
26	96:1564	*See* SAND–95-2660C			
30	96:1167	*See* ANL/CMT/CP–88395			
31	96:345	*See* ANL/CMT/CP–88385			
35	96:1219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008810	MF-2030
46	96:2620	*See* WSRC-MS–96-0022			
CONF-960426–		(58. annual meeting of the American power conference; Chicago, IL (United States); 9-11 Apr 1996)			
10	96:1312	*See* INEL–95/00410			
CONF-960437–		(8. national technology information exchange workshop; Santa Fe, NM (United States); 16-18 Apr 1996)			
2	96:2623	*See* WSRC-TR–95-0206			
CONF-960443–		(American Nuclear Society (ANS) topical meeting on decontamination and decommissioning; Chicago, IL (United States); 14-17 Apr 1996)			
1	96:2002	*See* ANL/TD/CP–88550			
2	96:2157	*See* LA-UR–96-91			
5	96:1987	*See* ANL/CMT/CP–87865			
6	96:1986	*See* ANL/CMT/CP–87864			
7	96:1992	*See* ANL/EA/CP–88311			
8	96:2247	*See* DOE/MC/29104–96/C0698			
CONF-960448–		(IEEE international conference on robotics and automation; Minneapolis, MN (United States); 22-28 Apr 1996)			
4	96:2270	*See* SAND–95-2196C			
13	96:2244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008644	MF-2060
14	96:2245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008805	MF-2060

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CONF-960477--		(9. annual symposium on the application of geophysics to engineering and environmental problems; Denver, CO (United States); 15 Apr - 1 may 1996)			
1	96:2336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005483	MF-2070
2	96:536	*See* LA-UR--96-512			
3	96:2197	*See* WHC-SA--3035-FP			
4	96:1582	*See* UCRL-JC--122875			
5	96:589	*See* UCRL-JC--122874			
7	96:64	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010641	MF-2000
CONF-960482--		(Society of Computer Simulation (SCS) multiconference: high performance computing; New Orleans, LA (United States); 8-11 Apr 1996)			
9	96:608	*See* WSRC-MS--96-0042			
CONF-960487--		(ANS topical meeting on best of decontamination and decommissioning; Chicago, IL (United States); 14-17 Apr 1996)			
1	96:2111	*See* DOE/METC/C--96/7220			
CONF-9605103--		(2. international symposium on spatial accuracy assessment in natural resources and environmental sciences; St. Collins, CO (United States); 21-23 May 1996)			
1	96:1030	*See* SAND--96-0692C			
CONF-9605147--		(1996 prioritization methodology workshop; Oakland, CA (United States); 14-15 May 1996)			
1	96:279	*See* SAND--96-0850C			
CONF-9605148--		(Superfund Hazwaste West; Las Vegas, NV (United States); 21 May - 5 jun 1996)			
1	96:1034	*See* SAND--96-0899C			
CONF-9605162--		(National Academy of Sciences (NAS) on glass as a waste form and vitrification technology: an international workshop; Washington, DC (United States); 13 May 1996)			
1	96:1173	*See* ANL/CMT/CP--89865			
2	96:1174	*See* ANL/CMT/CP--89866			
3	96:1175	*See* ANL/CMT/CP--89924			
CONF-9605199--		(International symposium on the environmental issues and waste management technologies in ceramic and nuclear industry; Indianapolis, IN (United States); 31 May 1996)			
1	96:1127	*See* WSRC-MS--96-0256			
CONF-9605200--		(Low level radioactive waste forum meeting; Annapolis, MD (United States); 29-31 May 1996)			
Summ.	96:714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013267	MF-2000
CONF-960535--		(15. international conference on incineration and thermal treatment technologies; Savannah, GA (United States); 6-10 May 1996)			
1	96:945	*See* LA-UR--96-1102			
3	96:946	*See* LA-UR--96-1103			
CONF-960539--		(18. symposium on biotechnology for fuels and chemicals; Gatlinburg, TN (United States); 5-9 May 1996)			
2	96:406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012081	MF-2000
CONF-960601--		(11. world hydrogen energy conference: designing the energy link; Stuttgart (Germany); 23-27 Jun 1996)			
2	96:342	*See* WSRC-MS--95-0478			
CONF-9606114--		(6. annual Energy Facility Contractors Group (EFCOG) safety analysis workshop on doing the right thing; Knoxville, TN (United States); 5-7 Jun 1996)			
7	96:16	*See* ANL/EA/CP--88945			

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CONF-9606115–		(4. conference on the mechanical behavior of salt; Montreal (Canada); 17-18 Jun 1996)			
1	96:1546	*See* SAND–95-1148C			
2	96:1570	*See* SAND–96-0376C			
3	96:1572	*See* SAND–96-0791C			
4	96:1573	*See* SAND–96-0792C			
6	96:1574	*See* SAND–96-0838C			
CONF-9606116–		(Annual meeting of the American Nuclear Society (ANS); Reno, NV (United States); 16-20 Jun 1996)			
7	96:2337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008657	MF-2070
17	96:1314	*See* INEL–95/00438			
19	96:1947	*See* ANL/CMT/CP–88453			
26	96:633	*See* ANL/EA/CP–88903			
42	96:1319	*See* INEL–95/00505			
44	96:1313	*See* INEL–95/00437			
49	96:1923	*See* WSRC-MS–96-0119			
CONF-9606123–		(Robotics for challenging environments; Albuquerque, NM (United States); 1-6 Jun 1996)			
1	96:2272	*See* SAND–96-0485C			
CONF-9606125–		(Air and Waste Management (AWM) annual meeting; Nashville, TN (United States); 23-28 Jun 1996)			
2	96:2495	*See* LA-UR–96-100			
4	96:715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008619	MF-2020
10	96:164	*See* FEMP–2516			
CONF-9606155–		(2. international conference on improvements geosystems; Tokyo (Japan); 1 Jun 1996)			
1	96:1065	*See* WHC-SA–2908-FP			
CONF-9606172–		(4. international alumina quality workshop; Darwin (Australia); 2-7 Jun 1996)			
1	96:23	*See* ANL/ET/CP–88519			
CONF-960619–		(2. North American rock mechanics symposium: tools and techniques in rock mechanics; Montreal (Canada); 19-21 Jun 1996)			
2	96:1568	*See* SAND–96-0195C			
3	96:1549	*See* SAND–95-1704C			
7	96:1565	*See* SAND–95-2983C			
CONF-9606219–		(3. international conference on precision agriculture; St. Paul, MN (United States); 23-26 Jun 1996)			
1	96:2503	*See* LA-UR–96-1322			
CONF-960631–		(Engineering Foundation conference on emerging separation technologies; Kona, HI (United States); 16-21 Jun 1996)			
2	96:2627	*See* ANL/CMT/CP–85955			
CONF-960648–		(21. annual conference of the National Association of Environmental Professionals: practical environmental directions - a changing agenda; Houston, TX (United States); 2-6 Jun 1996)			
1	96:65	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009890	MF-2000
3	96:66	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009635	MF-2000
5	96:14	*See* ANL/EA/CP–88164			
6	96:644	*See* ANL/EMO/CP–89921			
CONF-960706–		(American Society of Mechanical Engineers (ASME) pressure vessels and piping conference; Montreal (Canada); 21-26 Jul 1996)			
8	96:1631	*See* WHC-SA–3075			
9	96:67	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009102	MF-2000
12	96:299	*See* WHC-SA–2980			
19	96:1924	*See* WSRC-MS–96-0142			
20	96:1200	*See* BNL–63030			
29	96:280	*See* SAND–96-1922C			

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30	96:1578	*See* SAND–96-1921C			
CONF-9607107–		(18. international Society for Photogrammetry and Remote Sensing's congress; Vienna (Austria); 9-19 Jul 1996)			
1	96:2501	*See* LA-UR–96-1172			
2	96:68	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012146	MF-2000
CONF-9607134–		(10. American Glovebox Society annual conference; San Diego, CA (United States); 22-25 Jul 1996)			
3	96:1967	*See* LA-UR–96-2301			
CONF-960741–		(Pollution prevention conference; Chicago, IL (United States); 9-11 Jul 1996)			
2	96:716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011932	MF-2000
5	96:2295	*See* ANL/ER/CP–89080			
6	96:2004	*See* ANL/TD/CP–89380			
11	96:1995	*See* ANL/EMO/CP–90483			
12	96:645	*See* ANL/EMO/CP–90484			
15	96:2159	*See* LA-UR–96-2051			
CONF-960767–		(37. annual meeting of the Institute of Nuclear Materials Management; Naples, FL (United States); 28-31 Jul 1996)			
22	96:1579	*See* SAND–96-2011C			
30	96:1332	*See* INEL–96/00251			
CONF-960770–		(18. international laser radar conference; Berlin (Germany); 22-26 Jul 1996)			
2	96:2506	*See* LA-UR–96-1566			
CONF-960804–		(SPECTRUM '96: international conference on nuclear and hazardous waste management; Seattle, WA (United States); 18-23 Aug 1996)			
1	96:263	*See* SAND–95-2639C			
2	96:274	*See* SAND–96-0323C			
4	96:1031	*See* SAND–96-0749C			
6	96:2338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009625	MF-2050
7	96:2339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009634	MF-2070
8	96:407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009633	MF-2010
10	96:717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009396	MF-2020
11	96:69	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009395	MF-2000
12	96:70	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009394	MF-2000; MF-820
13	96:2029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009408	MF-2050
14	96:2502	*See* LA-UR–96-1272			
17	96:947	*See* LA-UR–96-1287			
23	96:1320	*See* INEL–95/00507			
25	96:588	*See* UCRL-JC–122299			
26	96:1322	*See* INEL–95/00603			
27	96:897	*See* INEL–95/00549			
28	96:2145	*See* INEL–95/00559			
29	96:1327	*See* INEL–96/00134			
33	96:2505	*See* LA-UR–96-1428			
34	96:1567	*See* SAND–96-0178C			
35	96:1577	*See* SAND–96-1100C			
40	96:1168	*See* ANL/CMT/CP–88456			
42	96:2507	*See* LA-UR–96-1970			
43	96:634	*See* ANL/EA/CP–89877			
47	96:1037	*See* SAND–96-1651C			
51	96:1038	*See* SAND–96-1652C			
52	96:907	*See* INEL–96/00151			
54	96:909	*See* INEL–96/00188			

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CONF-9608108–		(30. annual meeting of Microbeam Analysis Society; Minneapolis, MN (United States); 11-15 Aug 1996)			
1	96:1172	*See* ANL/CMT/CP–89579			
2	96:1171	*See* ANL/CMT/CP–89578			
3	96:1170	*See* ANL/CMT/CP–89567			
CONF-960815–		(31. national heat transfer conference; Houston, TX (United States); 3-6 Aug 1996)			
4	96:1921	*See* WSRC-MS–95-0436			
CONF-960911–		(Canadian Nuclear Society (CNS) international conference on deep geological disposal of radioactive waste; Winnipeg (Canada); 15-18 Sep 1996)			
1	96:2437	*See* DOE/WIPP–95-2129			
2	96:1285	*See* DOE/WIPP–95-2140			
CONF-9609131–		(5. international geostatistics congress; Wollongong (Australia); 22-27 Sep 1996)			
1	96:2191	*See* SAND–94-3100C			
CONF-9609156–		(NRC-4/nuclear and radiochemistry meeting; St. Malo (France); Sep 1996)			
1	96:537	*See* LA-UR–96-1723			
DOE-EM-STD–					
5505-96	96:90	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009462	MF-600; MF-2000
DOE/AL–					
050520.0000	96:408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013586	MF-2020
DOE/AL/58309–					
59	96:1220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003859	MF-2000
60	96:1221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004879	MF-2070
61	96:1222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006160	MF-2000
DOE/AL/62350–					
050510-GRNO-Rev.2-Ver.5	96:462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000661	MF-2010
116-Rev.1	96:420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002053	MF-2010
117S	96:421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000658	MF-2010
118S	96:422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000655	MF-2010
12	96:2030	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016207	MF-2000
121-Rev.1	96:423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000448	MF-2010
122S	96:424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000654	MF-2010
125S	96:425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000659	MF-2010
132-Rev.2	96:426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000653	MF-2010
133-Rev.1-Ver.6	96:427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000691	MF-2010
134-Rev.1	96:428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000238	MF-2070
145-Rev.1	96:429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004146	MF-2070; MF-2050
145-Rev.2	96:430	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008307	MF-2010
146S	96:431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000660	MF-2010
147-Rev.1	96:432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000662	MF-2010

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149-Rev.1	96:2041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005292	MF-2070
151	96:2042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009832	MF-2000
155-Rev.1	96:2043	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003970	MF-2010
156-Rev.	96:2044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015442	MF-2010
157-Rev.	96:433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015575	MF-2070
158-Rev.	96:434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016288	MF-2010
159S	96:435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004148	MF-2070; MF-2050
159S(2/96)	96:436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007544	MF-2070
171	96:2045	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016204	MF-2010
175-Rev.1	96:437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000237	MF-2070
177	96:438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011234	MF-2010
179	96:439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013503	MF-2010
179-Rev.1	96:440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000236	MF-2070
179-Rev.2	96:441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008003	MF-2010
182	96:2046	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008304	MF-2070
183	96:2047	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011231	MF-2010
184	96:2048	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003200	MF-2010
185	96:2049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016206	MF-2010
187	96:2050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013796	MF-2050
187-Rev.1	96:2051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016202	MF-2010
188	96:2052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013502	MF-2010
189	96:2053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006188	MF-2000
190	96:442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011233	MF-2010
191	96:443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013501	MF-2010
192	96:444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011232	MF-2010
193	96:445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016205	MF-2010
194	96:446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000657	MF-2010
195	96:447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000440	MF-2010
195-Rev.1	96:448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003077	MF-2010
196	96:449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000450	MF-2010
197	96:2054	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000652	MF-2010
197-Rev.2	96:2055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011536	MF-2000

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198	96:2056	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002054	MF-2070
200-Rev.1	96:2057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003087	MF-2010
201	96:450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002052	MF-2010
201(3/96)	96:451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009934	MF-2010
203	96:2058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002056	MF-2070
204	96:2059	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000216	MF-2070
205	96:2060	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002055	MF-2010
207	96:2061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004141	MF-2070; MF-2050
207-Rev.1	96:2062	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008002	MF-2000
208	96:2063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000233	MF-2000
209	96:452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000449	MF-2010
209-Rev.1	96:453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006185	MF-2010
210	96:2064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003076	MF-2070
211	96:2065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004149	MF-2070; MF-2050
212	96:2066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004147	MF-2020; MF-2050
212-Rev.1	96:2067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004144	MF-2020; MF-2050
213-Rev.2	96:454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004143	MF-2070; MF-2050
214	96:455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007515	MF-2070
215	96:456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004142	MF-2070; MF-2050
215(3/96)	96:457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006187	MF-2010; MF-2070
217	96:2068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007514	MF-2010
219	96:458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007516	MF-2010
21F-Rev.1	96:2031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000224	MF-2010
21F-Rev.1-Attach.	96:2032	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000228	MF-2010
21F-Rev.1-Attach.3-App.A	96:409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000225	MF-2010
21F-Rev.1-Attach.3-App.B	96:2033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000226	MF-2010
21F-Rev.1-Attach.3-App.C	96:2034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000227	MF-2010

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21F-Rev.1-Vol.1	96:2035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000229	MF-2010
21F-Rev.1-Vol.2	96:2036	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000230	MF-2010
21F-Rev.1-Vol.3	96:2037	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000231	MF-2010
21F-Rev.1-Vol.4	96:2038	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000232	MF-2010
220	96:459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006184	MF-2010
221-Rev.1	96:2069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010980	MF-2000
221-Rev.2	96:2070	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013528	MF-2000
222	96:2071	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008305	MF-2020
222(5/96)	96:2072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013506	MF-2000
222-Rev.	96:2073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011650	MF-2000
222-Rev.1	96:2074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013527	MF-2020
225	96:2075	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008306	MF-2020
227	96:460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006186	MF-2010
228	96:2076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011513	MF-2000
229	96:461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008001	MF-2070
231	96:2077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011835	MF-2070
233	96:2078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013530	MF-2000
43-Rev.2	96:410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011537	MF-2070
57-Rev.2	96:411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013531	MF-2100
65-Rev.1	96:412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000235	MF-2070
70-Rev.1	96:413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000234	MF-2070
72-Rev.2	96:414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003086	MF-2010
76-Rev.7	96:2039	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007512	MF-2010
77-Rev.1	96:2040	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003199	MF-2070; MF-2010
87-Rev.1	96:415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000239	MF-2070; MF-2010
90S	96:416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000240	MF-2010; MF-2070
95-Rev.1	96:417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000656	MF-2010
97-Rev.1	96:418	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000447	MF-2010
99-Rev.1	96:419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015576	MF-2070
T10	96:2082	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013585	MF-2100

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T7	96:2079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015507	MF-2010
T8	96:2080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005572	MF-2000
T9	96:2081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012683	MF-2000
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2056-Vol.1-Draft	96:1233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012433	MF-2000
2056-Vol.2-Draft	96:1234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012436	MF-2000
2056-Vol.3-Draft	96:1235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012437	MF-2000
2056-Vol.4-Draft	96:1236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012754	MF-2000
2056-Vol.5-Draft	96:1237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012434	MF-2000
2056-Vol.6-Draft	96:1238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012435	MF-2000
2056-Vol.7-Draft	96:1239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012752	MF-2000
2056-Vol.8-Draft	96:1240	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012753	MF-2000
2056-Vol.9-Draft	96:1241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012755	MF-2000
95-1076	96:2340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003981	MF-2070
95-1077	96:1223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003980	MF-2070
95-1095	96:1224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003973	MF-2000
95-1121-Rev.3	96:1225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012535	MF-2000
95-2043-Draft	96:1226	OSTI		TI95014143	ND-2000
95-2043-Vol.2-Draft	96:1227	OSTI		TI95014144	ND-2000
95-2043-Vol.3-Draft	96:1228	OSTI		TI95014145	ND-2000
95-2043-Vol.4-Draft	96:1229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014146	MF-2000
95-2043-Vol.5-Draft	96:1230	OSTI		TI95014147	ND-2000
95-2043-Vol.6-Draft	96:1231	OSTI		TI95014148	ND-2000
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T5	96:2341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003939	MF-2070
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0988	96:2083	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016112	MF-2050
1030	96:2342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012247	MF-2070; MF-630
1059	96:1949	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004641	MF-630
1149-Draft	96:2084	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010275	MF-600; MF-2000
1155	96:463	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008308	MF-2020
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0198	96:464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011264	MF-2010
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0198-Vol.1(4/96)	96:466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013507	MF-2100
0198-Vol.2	96:467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005294	MF-2010
0198-Vol.2(4/96)	96:468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013508	MF-2100
0200-D-Summ.	96:718	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017564	MF-2000
0200-D-Vol.1	96:719	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017608	MF-2000
0200-D-Vol.2	96:720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017609	MF-2000
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0239	96:81	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014141	MF-2000
0240	96:82	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014140	MF-2000
0245	96:83	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014895	MF-2000
0248	96:469	OSTI; NTIS; INIS; GPO Dep.	E, 1.99:	DE95016125	MF-2010
0249	96:2634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016004	MF-2000
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0265	96:2087	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003569	MF-2000
0266	96:88	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009985	MF-2000
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0269	96:471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003564	MF-2010
0270	96:472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003565	MF-2010
0271	96:473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003566	MF-902
0272	96:474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003567	MF-902
0273	96:475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003568	MF-2010
0274	96:89	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003786	MF-2000
0276	96:2346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009319	MF-2070
0277	96:728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008370	MF-2000
0278	96:476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007145	MF-2010; MF-2020
0279	96:1950	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008374	MF-2000
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0293	96:736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013523	MF-2020
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0295	96:1255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013518	MF-2030
0296	96:477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013524	MF-2020
0297	96:1951	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013519	MF-2020
0298	96:2350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013520	MF-2070
0300	96:2088	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013521	MF-2050
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T1	96:737	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001698	MF-2000
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T22	96:91	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012199	MF-2010
T23	96:92	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016210	MF-2010
T24	96:93	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016211	MF-2010
T25	96:94	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016555	MF-2000
T27	96:95	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001996	MF-2000
T29	96:96	OSTI; NTIS; GPO Dep.	E 1.99:	DE96006068	MF-2000
T30	96:97	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010198	MF-2000
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T32	96:99	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013627	MF-2000
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T10	96:738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011930	MF-2010
T11	96:100	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016068	MF-2070
T12	96:478	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002884	MF-2010; MF-2070

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T13	96:101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005713	MF-2000
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T15	96:103	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010294	MF-2000
T16	96:104	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013670	MF-2000
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T1	96:105	National Academy Press, 2101 Constitution Avenue, N.W., Box 285, Washington, D.C. 20055			ND-2000
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140-96-005	96:2089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011247	MF-2010
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153	96:2352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014025	MF-2070
171	96:2090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016376	MF-2010
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10057(94)	96:739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002209	MF-2000
10474-Rev.2	96:106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002356	MF-2010
10511	96:107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001332	MF-2000
10512	96:740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002208	MF-2020
10513	96:2091	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001578	MF-2010
10515	96:1258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001155	MF-2000
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22128	96:481	OSTI; NTIS; INIS; US Geological Survey, Earth Science Information Center, Open-File Reports Section, Box 25286, MS 517, Denver Federal Center, Denver, CO 80225 (United States); GPO Dep.	E 1.99:	DE96014158	MF-2100
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132	96:746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003843	MF-2020
230	96:108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004909	MF-2010
239	96:747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005952	MF-2020
252	96:1259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013696	MF-2030
263	96:748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013700	MF-2000
266	96:1260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013697	MF-2070
271	96:2092	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013690	MF-2000
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1	96:2354	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012447	MF-2000
2	96:2355	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012448	MF-2000
T35	96:109	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013077	MF-2010
T36	96:749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016479	MF-2010
T37	96:750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004110	MF-2010
T38	96:751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004568	MF-2010
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4	96:752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013300	MF-2000
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49	96:479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011926	MF-2000
50	96:480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011925	MF-2070
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T22	96:110	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001019	MF-2000
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T5	96:111	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002992	MF-2000
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11026-94-1	96:796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007406	MF-2000
114A-1	96:753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002383	MF-2020
114A-2	96:754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002384	MF-2020
114A-3	96:755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002385	MF-2020
114D-3	96:756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002386	MF-2020
114E-1	96:757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002387	MF-2020
114E-2	96:758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002388	MF-2020
114E-3	96:759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002389	MF-2020
114E-4	96:760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002390	MF-2020
114E-5	96:761	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002391	MF-2020
114F	96:762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002307	MF-2020
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114H	96:764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002381	MF-2020
114I	96:765	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002382	MF-2020
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128	96:767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017655	MF-2010
129-Vol.13	96:768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001323	MF-2000
130	96:769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002366	MF-2000
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160-Rev.1	96:773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001157	MF-2000
179	96:774	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008980	MF-2020
185	96:775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002302	MF-2020
186	96:776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017654	MF-2010
187	96:777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001326	MF-2000
189	96:778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001576	MF-2000
192	96:779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017651	MF-2020
199	96:780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001577	MF-2000
208	96:781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017656	MF-2020
210	96:782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009673	MF-2000
213	96:783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002367	MF-2000
218	96:784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002288	MF-2020
219	96:2356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014020	MF-2020
220	96:785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002369	MF-2000
221	96:786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017657	MF-2000
222	96:787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009663	MF-2020
223	96:1261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002301	MF-2030
224	96:788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002357	MF-2000
225	96:789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007520	MF-2000
226	96:1262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002204	MF-2030
227	96:790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002364	MF-2070
228	96:791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002189	MF-2000
233	96:792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004071	MF-2020
235	96:793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008981	MF-2020
236	96:794	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013299	MF-2000
8843-91-1	96:795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005884	MF-2000
96007139	96:797	OSTI; NTIS; INIS		DE96007139	MF-2020
96007140	96:798	OSTI; NTIS; INIS		DE96007140	MF-2020
96007141	96:799	OSTI; NTIS; INIS		DE96007141	MF-2020
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96007143	96:801	OSTI; NTIS; INIS		DE96007143	MF-2020

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96007144	96:802	OSTI; NTIS; INIS		DE96007144	MF-2020
96013498	96:803	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE96013498	MF-2000
96013499	96:804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013499	MF-2000
96013500	96:805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013500	MF-2000
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29103-95/C0459	96:2359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012313	MF-2070
30165-3972	96:2251	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000056	PC-2060
31190-96/CO630	96:2257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003774	MF-2070
92113-4016	96:2259	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000086	PC-2060
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5098	96:112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000631	MF-2000
5099	96:806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000630	MF-2000
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4072	96:2357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009718	MF-2010
5043	96:807	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000574	MF-2020
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96/CO564	96:2358	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003687	MF-2070
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5100	96:2094	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000629	MF-2000
96/CO565	96:2093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003434	MF-2050
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96/C0698	96:2247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010171	MF-2060
96/CO566	96:2095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003433	MF-2060; MF-2050
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5199	96:2636	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004480	
96/CO563	96:808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003462	MF-2020
DOE/MC/29107–					
5046	96:810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000587	MF-2020
96/CO567	96:809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003459	MF-2020
DOE/MC/29108–					
95/C0417	96:2360	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007969	MF-2000; MF-2010
96/CO568	96:2361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003447	MF-2070
DOE/MC/29109–					
5013	96:2363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000585	MF-2010; MF-107
5074	96:2364	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000605	MF-2070
5173	96:113	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004435	MF-2000

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96/CO569	96:2362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003441	MF-2050; MF-2010
DOE/MC/29111–					
96/CO570	96:482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003695	MF-2010
DOE/MC/29113–					
4048	96:2248	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011301	MF-2060
96/CO571	96:2096	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003432	MF-2060; MF-2050
DOE/MC/29114–					
5174	96:483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004443	MF-2010
DOE/MC/29115–					
96/CO562	96:2249	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003435	MF-2060
96/CO586	96:2250	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003445	MF-2060
DOE/MC/29117–					
5061	96:484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000601	MF-2010
DOE/MC/29118–					
5014	96:2366	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000584	MF-2000
96/CO572	96:2365	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003450	MF-2000
DOE/MC/29120–					
96/CO573	96:2367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003431	MF-2020
DOE/MC/29121–					
5126	96:485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000646	MF-2010
DOE/MC/29249–					
4074	96:812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009720	MF-2020
96/CO574	96:811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003464	MF-2020
DOE/MC/29467–					
4080	96:2097	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009726	MF-2000
4091	96:2098	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000580	MF-2000
5042	96:1263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000573	MF-2000
5127	96:2099	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000647	MF-2010
5177	96:2100	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004454	MF-2000
DOE/MC/30162–					
96/C0576	96:2101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007381	MF-2050
DOE/MC/30164–					
96/CO577	96:2102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003465	MF-2050
DOE/MC/30165–					
96/CO578	96:2103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003436	MF-2050; MF-2060
DOE/MC/30168–					
96/CO579	96:2104	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003437	MF-2050

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DOE/MC/30170–					
96/CO580	96:2105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003443	MF-2050
DOE/MC/30171–					
96/CO581	96:813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003452	MF-2000
DOE/MC/30172–					
-96/C0582	96:2368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004622	MF-2050
96/C0583	96:2369	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004621	MF-2050
DOE/MC/30173–					
96/CO584	96:814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003455	MF-2020
DOE/MC/30174–					
96/CO585	96:2370	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003463	MF-2000
DOE/MC/30175–					
5033	96:2372	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000569	MF-2000; MF-107
96/CO588	96:2371	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003456	MF-2000
DOE/MC/30176–					
96/CO589	96:2373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003439	MF-2050
DOE/MC/30177–					
5047	96:2374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000588	MF-2070
DOE/MC/30178–					
5181	96:2107	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004458	MF-2000
96/CO590	96:2106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003438	MF-2050
DOE/MC/30179–					
96/CO591	96:2108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003449	MF-2050
DOE/MC/30357–					
96/C0592	96:2375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004620	MF-2070
DOE/MC/30358–					
4067	96:2252	OSTI; NTIS; GPO Dep.	E 1.99:	DE95009713	MF-2000
96/CO593	96:2376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003738	MF-2070
DOE/MC/30359–					
96/CO594	96:2109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003446	MF-2000
DOE/MC/30360–					
96/CO614	96:486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003453	MF-2010
DOE/MC/30361–					
4087	96:816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009734	MF-2020
95/C0498	96:815	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017866	MF-2000
DOE/MC/30362–					
4049	96:2254	OSTI; NTIS; GPO Dep.	E 1.99:	DE95000095	MF-2060
5113	96:2255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004341	MF-2000
96/CO620	96:2253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003686	MF-2060
DOE/MC/30363–					
90/C0627	96:2256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004625	MF-2060

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DOE/MC/31177– 96/C0623	96:487	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004624	MF-2000
DOE/MC/31178– 96/CO612	96:488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003684	MF-2010
DOE/MC/31179– 96/CO618	96:114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003668	MF-2080
DOE/MC/31185– 96/CO619	96:489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003638	MF-2010
DOE/MC/31186– 96/CO628	96:2377	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003690	MF-2010
DOE/MC/31188– 96/CO629	96:817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003735	MF-2020
DOE/MC/31189– 5035	96:818	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000557	MF-2020
DOE/MC/31388– 5030	96:819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000567	MF-2000
5141	96:1264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004364	MF-2000
96/CO624	96:115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003683	MF-2080
DOE/MC/32087– 96/CO631	96:2378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003740	MF-2000
DOE/MC/32089– 96/CO615	96:2379	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003454	MF-2000
DOE/MC/32090– 96/C0622	96:2380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004623	MF-2070
DOE/MC/32092– 96/CO621	96:2258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003691	MF-2060
DOE/MC/32108– 96/CO616	96:490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003466	MF-2010
DOE/MC/32109– 96/CO613	96:2381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003685	MF-2010
DOE/MC/32110– 96/C0626	96:2382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005242	MF-2000
DOE/MC/32111– 5193	96:2383	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004474	MF-2000
DOE/MC/32112– 96/CO632	96:116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003688	MF-2000
DOE/MC/32113– 96/CO633	96:1265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003689	MF-2030
DOE/MC/32114– 96/CO625	96:491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003741	MF-2010
DOE/MC/32116– 5148	96:2385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004368	MF-2000
96/CO617	96:2384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003467	MF-2070

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DOE/METC–					
96/1021-Vol.1	96:820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000551	MF-2080
96/1021-Vol.2	96:821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000552	MF-2080
96/1022	96:2110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000553	MF-2050
DOE/METC/C–					
96/7220	96:2111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005197	MF-2000
DOE/MWIP–					
26	96:822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015684	MF-2020
DOE/NV/10833–					
33	96:2386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012337	MF-2070
34	96:2112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012182	MF-2000
DOE/NV/11040–					
T1	96:492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012361	MF-2000
DOE/OR–					
01-1179-D2	96:2387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016109	MF-2070
01-1192&D2	96:2388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006228	MF-2000
01-1273/V1&D2/A1	96:2389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003471	MF-2000
01-1326&D2/V1	96:2393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004371	MF-2010
01-1326&D2/V2	96:2394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004372	MF-2010
01-1326&D2/V3	96:2395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004373	MF-2010
01-1326&D2/V4	96:2396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004374	MF-2010
01-1326-D1/V2	96:2390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012490	MF-2010
01-1326-D1/V3	96:2391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012492	MF-2010
01-1326-D1/V4	96:2392	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012540	MF-2070
01-1337-D1	96:2397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007106	MF-2010
01-1347/V4	96:117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001774	MF-2010
01-1393/V2&D1	96:2399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010202	MF-2070
01-1393/V2&D2	96:2400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013718	MF-2100
01-1393/V2&D3	96:2401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014012	MF-2100
01-1393/V3&D1	96:118	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010203	MF-2070
01-1393/V3&D2	96:493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013719	MF-2100
01-1393/V4&D1	96:2402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010204	MF-2070
01-1393/V4&D2	96:2403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013720	MF-2100
01-1393/V4&D3	96:2404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014007	MF-2100
01-1393/V5&D1	96:2405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010205	MF-2070
01-1393/V5&D2	96:2406	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013721	MF-2100

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01-1393/V5&D3	96:2407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014009	MF-2100
01-1393V1&D1	96:2398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010201	MF-2070; MF-2010
01-1395&D1	96:2408	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003971	MF-2010
01-1396&D1	96:2409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003469	MF-2070
01-1407-D1	96:119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017552	MF-2000
01-1441/V1	96:2410	OSTI; NTIS; GPO Dep.	E 1.99:	DE96006081	MF-2010
01-1441/V2	96:120	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009976	MF-2000
01-1445-D1	96:121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008331	MF-2000
07-1414-D1	96:2411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006670	MF-2010
2006	96:494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016400	MF-2010
2035	96:495	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016634	MF-2010
DOE/OR/21400–					
T482	96:2260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000762	MF-2060
T483	96:2412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000664	MF-2070; MF-2010
DOE/OR/21548–					
567	96:496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017588	MF-602; MF-2010
584	96:823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014288	MF-2000
592	96:2113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012446	MF-2010
DOE/OR/22160–					
T17	96:2413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007851	MF-2000
T22-Vol.1	96:2414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006051	MF-2020
T22-Vol.2	96:2415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005711	MF-2020
T23-Vol.1	96:2416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009599	MF-2000
T23-Vol.2	96:2417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009600	MF-2000
DOE/ORO–					
2032	96:2114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001201	MF-2000
2033	96:2418	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006086	MF-2070
2034	96:2115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003221	MF-2050
DOE/OSTI–					
3411/1	96:122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001666	MF-902
DOE/RF/00467–					
T1	96:824	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013635	MF-2000
T3	96:825	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013637	MF-2000
T5	96:826	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013639	MF-2000
T9	96:827	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013643	MF-2000

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DOE/RF/00646– T1	96:2419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010070	MF-2000
DOE/RL– 107	96:146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006852	MF-2000
364162-1-Vol.1	96:838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010983	MF-2000
364162-1-Vol.3	96:839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010980	MF-2000
364162-1-Vol.4	96:840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010981	MF-2000
364162-1-Vol.5	96:841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010982	MF-2000
89-16-Rev.A	96:1266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001202	MF-2030
90-11-Rev.1	96:2116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010174	MF-2050
91-45-Rev.3	96:123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017531	MF-2000
93-33	96:124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013560	MF-2000
93-46-Rev.2	96:2420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012048	MF-2000
93-54	96:2117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017536	MF-2010
93-64-Rev.2	96:828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012047	MF-2000
93-64-Rev.3	96:2118	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017352	MF-2010
93-66	96:125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014919	MF-2000; MF-630
93-69-Rev.2	96:126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005134	MF-2000
93-82	96:2119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000282	MF-2010
94-100	96:2424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017540	MF-2010
94-101	96:2425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017539	MF-2010
94-101-Rev.1	96:2426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017541	MF-2010
94-102	96:498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017545	MF-2010
94-102-Rev.1	96:499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017501	MF-2010
94-104	96:2427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000284	MF-2070
94-104-Rev.1	96:2428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004132	MF-2070
94-113-Rev.1	96:2429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017496	MF-2050
94-119	96:2125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017512	MF-2010
94-119-Rev.1	96:2126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000283	MF-2010
94-140	96:130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013574	MF-2000
94-20	96:2120	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017535	MF-2010
94-30	96:2121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017534	MF-2010
94-36-4	96:497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012821	MF-2070
94-48	96:2122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017528	MF-2010

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94-53	96:2421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017533	MF-2070
94-61-Vol.1	96:127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014150	MF-2000
94-61-Vol.2	96:2422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017537	MF-2070
94-67	96:2123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017530	MF-2010
94-69	96:128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006358	MF-2000
94-85	96:2124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017542	MF-2010
94-96-Rev.1	96:129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001068	MF-2000
94-99	96:2423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017538	MF-2010
95-02	96:500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017532	MF-2010
95-101	96:508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005876	MF-2070
95-103	96:142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005133	MF-2000
95-15	96:829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011574	MF-2020
95-17-VOL.2	96:830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012348	MF-2000
95-17-Vol.1-Pt.1	96:131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012346	MF-2000
95-17-Vol.1-Pt.2	96:132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012347	MF-2000
95-17-Vol.3	96:831	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012350	MF-2000
95-17-Vol.3-Pt.1	96:832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012349	MF-2000
95-17-Vol.4	96:833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012451	MF-2000
95-24-Rev.1	96:133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008047	MF-2000
95-26	96:501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017529	MF-2010
95-30	96:502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017544	MF-2010
95-32	96:503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011333	MF-2010
95-34	96:2430	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017515	MF-2050
95-38	96:834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017514	MF-2010
95-43	96:134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000683	MF-2000
95-44	96:2127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017513	MF-2010
95-46	96:835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000281	MF-2010
95-49	96:135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016483	MF-2070
95-52	96:2431	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017500	MF-2070
95-53	96:136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017511	MF-2070
95-55	96:2432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017498	MF-2070
95-56	96:2128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017543	MF-2010
95-56-Rev.2	96:137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017499	MF-2000

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95-60	96:2129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017497	MF-2010
95-69-2	96:504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005130	MF-2070
95-69-3	96:505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006860	MF-2070
95-75	96:138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001822	MF-2000
95-82	96:139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001634	MF-2000
95-84	96:140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001813	MF-2000
95-89	96:506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008183	MF-2000
95-94	96:141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001633	MF-2000
95-99	96:507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013564	MF-2070
96-01	96:509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009932	MF-2010
96-09	96:2130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008985	MF-2010
96-09-Rev.1	96:143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013567	MF-2000
96-16-c-Vol.1	96:144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012244	MF-2000
96-16-c-Vol.2	96:145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012239	MF-2000
96-18	96:836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009667	MF-2000
96-19	96:837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013563	MF-2000
96-59	96:510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013575	MF-2100
DOE/S–					
0118	96:842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011033	MF-2000
DOE/SF/20948–					
T1	96:1952	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009306	MF-2000
T2	96:1953	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009307	MF-2000
T4	96:1954	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012349	MF-2000
T5	96:1955	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012348	MF-2000
T6	96:1956	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012347	MF-2000
DOE/SNF/REP–					
002-Rev.3	96:1267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003485	MF-2000
DOE/SR/18035–					
T2	96:1957	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011434	MF-2000
T3	96:1268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011535	MF-2000
DOE/SR/18233–					
4	96:147	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009662	MF-2000
T1	96:148	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016156	MF-2000
DOE/WIPP–					
069-Rev.5	96:1269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010619	MF-2000
91-005-Pt.B-Vol.2	96:1270	OSTI		TI95013007	ND-2000

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91-005-Rev.-Pt.B-Vol.1	96:1279	OSTI		TI95013008	ND-2000
91-005-Rev.5-Pt.B-Vol.3	96:1271	OSTI		TI95013006	ND-2000
91-005-Rev.5-Pt.B-Vol.4	96:1272	OSTI		TI95011885	ND-2000
91-005-Rev.5-Pt.B-Vol.5	96:1273	OSTI		TI95013010	ND-2000
91-005-Rev.5-Pt.B-Vol.6	96:1274	OSTI		TI95013011	ND-2000
91-005-Rev.5-Pt.B-Vol.7	96:1275	OSTI		TI95013051	ND-2000
91-005-Rev.5-Pt.B-Vol.8	96:1276	OSTI		TI95013009	ND-2000
91-005-Rev.5-Pt.B-Vol.10	96:1278	OSTI		TI95013013	ND-2000
91-005-Rev.5.Pt.B-Vol.9	96:1277	OSTI		TI95013012	ND-2000
91-043-Rev.	96:2433	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004514	MF-2070
91-043-Rev.1	96:2434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013556	MF-2070
95-1149	96:1280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005827	MF-2000
95-2060	96:1281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010278	MF-2000
95-2072	96:1237	*See* DOE/CAO–2056-Vol.5-Draft			
95-2094	96:2435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003975	MF-2070
95-2100	96:2436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003982	MF-2070
95-2120	96:1282	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010279	MF-2020
95-2129	96:2437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014294	MF-2070
95-2132	96:1283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014293	MF-2000
95-2135	96:1284	OSTI		TI96004221	ND-2000
95-2140	96:1285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014289	MF-2000
95-2154	96:1286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010604	MF-2070
96-2087	96:1287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010276	MF-2000
96-2175	96:1288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010280	MF-2000
96010611	96:1289	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010611	MF-2000
EEG–					
60	96:1221	*See* DOE/AL/58309–60			
61	96:1222	*See* DOE/AL/58309–61			
EFR-TDD–					
950060	96:2131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060012	MF-2050
EGG-LLW–					
10135-92-1	96:845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007407	MF-2000
10135-92-2	96:846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007408	MF-2000
10135-92-3	96:847	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007409	MF-2000
8843-91-2	96:843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007404	MF-2000
8843-91-3	96:844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007405	MF-2000

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EGG-TMI–					
7385-Rev.1	96:1290	OSTI; NTIS; GPO Dep.	E 1.99:	DE96014149	MF-2000
EGG-WM–					
11118	96:848	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003832	MF-2000
EML–					
567	96:511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014966	MF-2000
581	96:149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012328	MF-2070
582	96:150	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012329	MF-2070
ES/ER/TM–					
106	96:152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013998	MF-2070
106/R1	96:2438	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96010693	MF-2010
112/R2	96:153	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015374	MF-2000
137	96:154	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013299	MF-2000
145	96:155	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014026	MF-2000
152	96:156	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012979	MF-2070
155-D1	96:2411	*See* DOE/OR–07-1414-D1			
162/R1	96:2439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013229	MF-2010
170	96:2440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006095	MF-2000
173	96:2441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012841	MF-2070
189	96:157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011655	MF-2000
33/R2	96:151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007746	MF-2070
ES/WM–					
30	96:158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012970	MF-2000
47	96:849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017170	MF-2020
49	96:159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015372	MF-2020
80	96:850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011783	MF-2000
81	96:160	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011533	MF-2000
FEMP–					
2362B	96:2132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000318	MF-2010
2363B	96:161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004701	MF-2000
2388	96:851	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013793	MF-2020
2425	96:162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013795	MF-2000
2441	96:163	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004201	MF-2000
2445	96:852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007278	MF-2020
2516	96:164	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012142	MF-2000
FEMP/SUB–					
095	96:512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000317	MF-2010

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096	96:2133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000319	MF-2010
102	96:853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000320	MF-2000
GA–					
C22131(1-96)	96:2442	OSTI; NTIS; GPO Dep.	E 1.99:	DE96006532	MF-2070
GJPO–					
114	96:746	*See* DOE/ID/12584–132			
120	96:108	*See* DOE/ID/12584–230			
GJPO-ES–					
17	96:748	*See* DOE/ID/12584–263			
GJPO-HAN–					
2	96:1259	*See* DOE/ID/12584–252			
3	96:1260	*See* DOE/ID/12584–266			
GJPO-MRAP–					
27	96:2092	*See* DOE/ID/12584–271			
GJPO-MWTP–					
05	96:747	*See* DOE/ID/12584–239			
GJPO-WMP–					
96	96:513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013678	MF-2100
HWVP–					
89-IVR0010101C	96:1511	*See* PNNL–11067			
INEL–					
94/00063	96:854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003507	MF-2020
94/00066	96:2443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003512	MF-2020
94/00106	96:1293	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001616	MF-2000
94/0012-Rev.3	96:514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009711	MF-2010
94/00148	96:2446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003506	MF-2020
94/0028	96:2637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002943	MF-2000
94/0040	96:2638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002849	MF-2030
94/0054	96:1291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002937	MF-2000
94/0067	96:1292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002950	MF-2000
94/0080	96:2444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001179	MF-2070
94/0095	96:855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001325	MF-2020
94/0098	96:2445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002942	MF-2070
94/0115-Rev.2	96:165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009568	MF-1000
94/0119	96:1294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001338	MF-2000
94/0134	96:2134	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96002940	MF-2050
94/0162	96:2447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001194	MF-2000
94/0165-Rev.1	96:2135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002861	MF-2050
94/0211-Rev.2	96:856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009906	MF-2000
94/0237	96:857	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS		TI96001552	MF-2000
94/0251	96:2448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002933	MF-2070
94/0252-Rev.1	96:858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001190	MF-2020

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94/0395	96:1295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002193	MF-2000
95/00040	96:2451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001628	MF-2070
95/00057	96:166	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001618	MF-2000
95/00095	96:865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001623	MF-2000
95/00108	96:2137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001924	MF-2000
95/00124	96:1299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003517	MF-2030
95/0013	96:859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001353	MF-2000
95/00137	96:876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001615	MF-2000
95/0014-Rev.1	96:860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001352	MF-2020
95/0015-Rev.1	96:2449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001371	MF-2020
95/0016-Rev.1	96:861	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001351	MF-2000
95/00175	96:169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002050	MF-2000
95/00184	96:880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001926	MF-2020
95/00193	96:171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004001	MF-2000
95/00196	96:2263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001610	MF-2060
95/0020-Rev.1	96:862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001555	MF-2020
95/00202	96:881	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001710	MF-2000
95/0022	96:2136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002941	MF-2050
95/00228	96:172	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001925	MF-2010
95/00229	96:2140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004005	MF-2010
95/00230	96:516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004003	MF-2010
95/00233	96:882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001931	MF-2020
95/00234	96:173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001933	MF-2000
95/00235	96:2457	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96004006	MF-2070
95/00241	96:2639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002524	MF-2020
95/00243	96:2640	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002523	MF-2020
95/00256	96:883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004004	MF-2020
95/00263	96:2458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002525	MF-2020
95/00269	96:2460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001927	MF-2020
95/00290	96:1309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004672	MF-2000
95/00303	96:179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002522	MF-2000
95/00311	96:2464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002513	MF-2070
95/00313	96:2465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007704	MF-2000

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95/00320	96:887	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001612	MF-2000
95/00321	96:888	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002044	MF-2020
95/00343	96:1310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003502	MF-2000
95/00347	96:181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003503	MF-2000
95/00356	96:2467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001851	MF-2010
95/0036	96:2450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001183	MF-2000
95/00370	96:2468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002776	MF-2070
95/0038	96:1958	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003537	MF-2030
95/00390	96:1311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001627	MF-2000
95/00393	96:890	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001551	MF-2020
95/00403	96:2142	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009023	MF-2040
95/0041	96:1296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002932	MF-2000
95/00410	96:1312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010447	MF-2000
95/00426	96:183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002533	MF-2000
95/00437	96:1313	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010440	MF-2000
95/00438	96:1314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009020	MF-2000
95/00458	96:1961	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009059	MF-2020
95/00459	96:1962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003509	MF-2020
95/00460	96:1316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003508	MF-2000
95/00461	96:1963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003511	MF-2020
95/00462	96:2472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007281	MF-2010
95/00466	96:1317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007276	MF-2030
95/00480	96:185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002510	MF-2020
95/00486	96:186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007282	MF-2010
95/00502	96:893	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002775	MF-2020
95/00503	96:2474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002500	MF-2000
95/00505	96:1319	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009017	MF-2000
95/00507	96:1320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009060	MF-2000
95/0051	96:2452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002354	MF-2070
95/00516	96:2642	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002512	MF-2020
95/0054	96:863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001189	MF-2020
95/00549	96:897	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010442	MF-2000
95/0055	96:864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001140	MF-2000

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95/00558	96:187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003115	MF-2000
95/00559	96:2145	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010446	MF-2000
95/00602	96:189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003510	MF-2000
95/00603	96:1322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010437	MF-2000
95/00616	96:899	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004553	MF-2020
95/0063	96:1297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002938	MF-2070
95/0076	96:2453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001348	MF-2040
95/0089	96:2454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001195	MF-2010
95/0090	96:2261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002372	MF-2070; MF-2060
95/0091	96:2262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002373	MF-2060; MF-2070
95/0095-Rev.1	96:866	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002303	MF-2020
95/0097	96:1298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002944	MF-2000
95/0098	96:867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004069	MF-2020
95/0109-Rev.1	96:868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001196	MF-2000
95/0112	96:869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001178	MF-2020
95/0114	96:870	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001356	MF-2000
95/0123	96:2138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004068	MF-2050
95/0127-Draft	96:1300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002191	MF-2000
95/0129	96:871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000981	MF-2020
95/0129-Rev.1	96:872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008968	MF-2020
95/0130	96:1301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002860	MF-2030
95/0131	96:1302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002841	MF-2070
95/0135-Vol.1	96:873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001162	MF-2000
95/0135-Vol.2	96:874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001163	MF-2000
95/0135-Vol.3	96:875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001164	MF-2000
95/0145	96:1303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001579	MF-2000
95/0146	96:877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001554	MF-2020
95/0161	96:1304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001181	MF-2000
95/0164	96:878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001180	MF-2000
95/0166	96:167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014147	MF-2000
95/0167	96:168	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017516	MF-2000

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95/0169-Rev.1	96:515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002196	MF-2010
95/0171	96:2455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003550	MF-2000
95/0182	96:879	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017629	MF-2000
95/0184	96:1305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001549	MF-2000
95/0185	96:170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001340	MF-2000
95/0194	96:1306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001339	MF-2000
95/0214	96:1959	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001553	MF-2020
95/0218	96:2139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001370	MF-2050
95/0224	96:1307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001188	MF-2070
95/0225	96:1308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001184	MF-2000
95/0231	96:2264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001560	MF-2070
95/0233	96:2456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001561	MF-2020; MF-2030; MF-2070
95/0248	96:2641	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001350	MF-2090
95/0255(94)	96:174	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003484	MF-2000
95/0258	96:884	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003556	MF-2000
95/0266	96:2265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003547	MF-2060
95/0269	96:2459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003483	MF-2040
95/0272	96:885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001336	MF-2000
95/0273	96:175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001354	MF-2000
95/0274(1stQTR)	96:176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001580	MF-2000
95/0274(3rdQTR)	96:177	OSTI; NTIS; GPO Dep.	E 1.99:	DE96004528	MF-2000
95/0281	96:2461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001548	MF-2070
95/0287	96:2141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002300	MF-2030
95/0291	96:2462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001558	MF-2020
95/0300-Rev.1	96:178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002295	MF-2000
95/0302	96:2463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001337	MF-2000
95/0312	96:180	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001550	MF-2070
95/0315	96:886	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009937	MF-2020
95/0321	96:2466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001335	MF-2000
95/0381	96:889	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001177	MF-2020
95/0384	96:1960	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001187	MF-2000

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95/0411	96:2469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002363	MF-2000
95/0419	96:2143	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002206	MF-2050
95/0422	96:182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001367	MF-2000
95/0442	96:1315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001334	MF-2030
95/0445	96:2470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002194	MF-2020
95/0453	96:2144	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002230	MF-2050
95/0454	96:2471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002188	MF-2070; MF-505
95/0455	96:184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002186	MF-2000
95/0460	96:891	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002190	MF-2020
95/0475	96:2473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002355	MF-2070
95/0477	96:1318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002185	MF-2000
95/0502	96:892	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014153	MF-2100
95/0511	96:1964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003534	MF-2030
95/0513	96:2475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002218	MF-2000
95/0517	96:894	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004070	MF-2000
95/0519	96:895	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002205	MF-2070
95/0534	96:1321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003535	MF-2030
95/0537	96:896	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003834	MF-2000
95/0546	96:517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004072	MF-2000
95/0555	96:898	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003831	MF-2020
95/0576	96:188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004135	MF-2000
95/0583	96:518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009938	MF-2010
95/0596	96:519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003993	MF-2000
95/0619	96:190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003994	MF-2000
95/0633	96:520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007527	MF-2020
95/0637	96:521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006028	MF-2000
95/0642	96:1323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003835	MF-2000
95/0647	96:900	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007529	MF-2020
96/00005	96:191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007275	MF-2000
96/00034	96:193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007274	MF-2000
96/00041	96:901	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009117	MF-2020
96/00047	96:902	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009016	MF-2020
96/00055	96:903	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009014	MF-2020

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96/00056	96:904	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009013	MF-2020
96/0012	96:192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007523	MF-2000
96/00134	96:1327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010448	MF-2000
96/0014	96:2476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010361	MF-2070
96/00151	96:907	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014121	MF-2000
96/0017	96:2146	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007524	MF-2000
96/00188	96:909	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014106	MF-2000
96/0021	96:2643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007525	MF-2070
96/00251	96:1332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014123	MF-2000
96/0036	96:1324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007521	MF-2000
96/0053	96:194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010359	MF-2000
96/0054	96:195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013303	MF-2010
96/0060	96:905	OSTI; NTIS; GPO Dep.	E 1.99:	DE96013292	MF-2000
96/0067	96:1325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009670	MF-2000
96/0068	96:2477	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009904	MF-2000
96/0073	96:906	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010319	MF-2020
96/0076	96:2478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013294	MF-2000
96/0094	96:1326	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010356	MF-2000
96/0101	96:196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010362	MF-2000
96/0113	96:2479	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010354	MF-2000
96/0140	96:1328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014176	MF-2000
96/0148	96:197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014177	MF-2000
96/0151	96:2480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010360	MF-2010
96/0155	96:908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010270	MF-2020
96/0176	96:522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013315	MF-2000
96/0186	96:198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013307	MF-2070
96/0187	96:1329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013296	MF-2000
96/0189	96:1330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012819	MF-2000
96/0229	96:2644	OSTI; NTIS; GPO Dep.	E 1.99:	DE96014095	MF-2000
96/0246	96:1331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014180	MF-2000
96/0249	96:910	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014151	MF-2020
IS–					
5117	96:523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000214	MF-2070

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IS-M–					
840	96:2481	OSTI; NTIS; GPO Dep.	E 1.99:	DE96006840	MF-2000
K/ER–					
306	96:524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010210	MF-2070
47/R1	96:200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003111	MF-2000
K/TCD–					
1127	96:2147	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012978	MF-2050
K/TSO–					
7A	96:911	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011091	MF-2020
K/WM–					
96	96:2482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000422	MF-2010
KCP–					
613-5649	96:2657	*See* SAND–95-1601C			
613-5735	96:199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006087	MF-2080
LA–					
12912-MS	96:525	OSTI; NTIS; GPO Dep.	E 1.99:	DE95015015	MF-2070
12913-MS	96:526	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010649	MF-2000
12943	96:1333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013479	PC-2030
12967-MS	96:912	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015053	MF-2000
12968-MS	96:527	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000894	MF-2070
12978-MS	96:528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016709	MF-2010
12986	96:2483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016707	MF-2070
13000	96:1334	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000291	PC-2030
13011	96:1965	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001443	MF-707; MF-2000; MF-607
13028-MS	96:201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000053	MF-2070
13041-MS	96:913	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000887	MF-2020
13042-MS	96:914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003988	MF-2000
13058-MS	96:1966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007461	MF-2070
13060-MS	96:2148	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007456	MF-2070
13061-MS	96:2149	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007455	MF-2070
13062-MS	96:2150	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007454	MF-2070
13063-MS	96:2151	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006237	MF-2070
13089-MS	96:915	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012968	MF-2070
13108-MS	96:529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009346	MF-2000
13114-MS	96:916	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007457	MF-2000
13133-SR	96:202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010651	MF-2000

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13148-MS	96:203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010042	MF-2000; MF-721
13175	96:917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013912	MF-2020
LA-SUB–					
95-141-Prelim.	96:2485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003542	MF-2000
95-166	96:918	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003108	MF-2000
95-191	96:1335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006856	MF-2030; MF-2070
95-196-Vol.1	96:919	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003373	MF-2000
95-196-Vol.2	96:920	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003374	MF-2000
95-196-Vol.3	96:921	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003375	MF-2000
95-196-Vol.4	96:922	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003376	MF-2000
95-196-Vol.5	96:923	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003377	MF-2000
95-208	96:924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006790	MF-2010; MF-721
95-223	96:925	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006842	MF-2000
95-27-1	96:530	OSTI; NTIS; GPO Dep.	E 1.99:	DE95007639	MF-2000
95-27-2	96:531	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013053	MF-2000
95-27-3	96:532	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013054	MF-2000
95-99	96:2152	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017359	MF-2050
95/141	96:2484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003258	MF-2000
96-2	96:2486	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009520	MF-2070
96-10	96:2487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008998	MF-2070
96-108	96:2490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013684	MF-2070
96-36	96:1336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009555	MF-2000
96-48	96:204	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012106	MF-2070
96-64	96:2488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009556	MF-2020
96-77-Vol.1	96:533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011888	MF-2010
96-77-Vol.2	96:534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011887	MF-2010
96-97	96:205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013704	MF-2070
96-99-Pt.1	96:926	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013264	MF-2000
96-99-Pt.2	96:2489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013265	MF-2100
96-99-Pt.3	96:927	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013367	MF-2000
LA-UR–					
94-4234	96:1337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016876	MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
95-1136	96:933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010884	MF-2000
95-1703	96:207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015327	MF-2000
95-1838	96:934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015256	MF-2020
95-1868	96:2645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016429	MF-2020
95-1880	96:208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015197	MF-2050
95-2267	96:209	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016915	MF-2070
95-2277	96:2153	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016792	MF-2050
95-2343	96:935	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016780	MF-2000
95-2435	96:2154	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016323	MF-2050
95-2465	96:2155	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016910	MF-2050
95-2467	96:535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016900	MF-2070
95-252	96:928	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006270	MF-2000
95-254	96:929	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006269	MF-2020
95-255	96:930	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006267	MF-2020
95-256	96:931	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006268	MF-2020
95-3004	96:936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000027	MF-2000
95-3382	96:2491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001383	MF-2020
95-3523	96:937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002597	MF-2000
95-3644	96:2492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002589	MF-2000
95-3690	96:938	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002586	MF-2020; MF-2070
95-3691	96:939	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002585	MF-2020
95-3707	96:940	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002583	MF-2020
95-4244	96:941	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005607	MF-2000
95-4245	96:942	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005606	MF-2020
95-4293	96:2493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005598	MF-2070
95-4294	96:2156	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005597	MF-2050
95-586	96:932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007887	MF-2020
95-692	96:206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007853	MF-2000
96-0421	96:2158	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008123	MF-2050
96-0595	96:944	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006969	MF-2000
96-100	96:2495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007170	MF-2070
96-1051	96:2500	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009771	MF-2000

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
96-1102	96:945	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009034	MF-2020
96-1103	96:946	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009035	MF-2020
96-1172	96:2501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009028	MF-2070
96-1272	96:2502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009226	MF-2070; MF-721
96-1287	96:947	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009230	MF-2020
96-1322	96:2503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010480	MF-2010
96-1328	96:2504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010943	MF-2070
96-1428	96:2505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010492	MF-2000
96-1566	96:2506	OSTI; NTIS; GPO Dep.	E 1.99:	DE96011257	MF-700; MF-2000
96-170	96:210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007169	MF-2050
96-1723	96:537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011294	MF-2000
96-1970	96:2507	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012749	MF-2070
96-2051	96:2159	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012638	MF-2000
96-2301	96:1967	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012827	MF-2010
96-34	96:2494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007187	MF-2070
96-368	96:943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008122	MF-2000
96-369	96:2496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008161	MF-2070
96-378	96:211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008124	MF-2000
96-512	96:536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008703	MF-2010
96-578	96:2497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006966	MF-2070
96-633	96:2498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008509	MF-2070
96-732	96:2499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009785	MF-902
96-91	96:2157	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007177	MF-2050
962050	96:948	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012850	MF-2000
LBL–					
36739	96:538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000134	MF-2010
36775	96:2508	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000131	MF-2070
36825	96:212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012351	MF-2070
36928	96:213	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014777	MF-2000
37067	96:539	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012373	MF-2010
37333	96:214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015138	MF-2010
37337	96:215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015137	MF-2010
37339	96:2509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016527	MF-2010

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
37380	96:540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016529	MF-2010
37554	96:2510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001123	MF-2010
38095	96:541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008559	MF-2000
38151	96:216	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008394	MF-402; MF-2000
38262	96:542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009141	MF-2010
LBNL–					
38825-Pt.1-2	96:543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013125	MF-2000
MMSC-EM–					
95011	96:2160	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014021	MF-2000
MSE–					
14	96:749	*See* DOE/ID/12735–T36			
NBL–					
332	96:949	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011952	MF-2000
NCRP–					
95-22246	96:950	OSTI; NTIS; INIS; NCRP Publications, 7910 Woodmont Avenue, Suite 800, Bethesda, MD 20814-3095; GPO Dep.	E 1.99:	DE95016101	MF-2000
ORNL–					
6854	96:1338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000899	MF-2030
6882	96:2511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006586	MF-2010
6884	96:2512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006583	MF-2070
ORNL/ER–					
-350	96:548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008143	MF-2070
158&D2	96:2388	*See* DOE/OR–01-1192&D2			
183/A1	96:217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017188	MF-2070
200/R1	96:218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006788	MF-2000
203/R1	96:544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006582	MF-2070
206/V1	96:219	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012537	MF-2070
206/V2	96:220	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012538	MF-2070
230	96:2161	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008963	MF-2050
230/R1	96:2162	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016168	MF-2050
249/R1	96:2163	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014995	MF-2070
249/R2	96:2164	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016574	MF-2050
257	96:1339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006603	MF-2030
284&D2/V1	96:2393	*See* DOE/OR–01-1326&D2/V1			
284&D2/V2	96:2394	*See* DOE/OR–01-1326&D2/V2			
284&D2/V3	96:2395	*See* DOE/OR–01-1326&D2/V3			
284&D2/V4	96:2396	*See* DOE/OR–01-1326&D2/V4			
284-D1/V2	96:2390	*See* DOE/OR–01-1326-D1/V2			
284-D1/V3	96:2391	*See* DOE/OR–01-1326-D1/V3			
284-D1/V4	96:2392	*See* DOE/OR–01-1326-D1/V4			
292	96:2397	*See* DOE/OR–01-1337-D1			
294	96:2513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014002	MF-2010

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
297	96:951	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017059	MF-2030
298	96:952	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014996	MF-2000
299	96:2514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012486	MF-2070
300	96:545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006537	MF-2070
304	96:953	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016172	MF-2020
306	96:954	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017049	MF-2030
307	96:221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017047	MF-2070
311	96:2165	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017406	MF-2000
312	96:955	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016167	MF-2020
313	96:546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006585	MF-2070
314	96:2515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016173	MF-2000
315/V1&D1	96:2398	*See* DOE/OR–01-1393V1&D1			
315/V2&D1	96:2399	*See* DOE/OR–01-1393/V2&D1			
315/V2&D2	96:2400	*See* DOE/OR–01-1393/V2&D2			
315/V2&D3	96:2401	*See* DOE/OR–01-1393/V2&D3			
315/V3&D1	96:118	*See* DOE/OR–01-1393/V3&D1			
315/V3&D2	96:493	*See* DOE/OR–01-1393/V3&D2			
315/V4&D1	96:2402	*See* DOE/OR–01-1393/V4&D1			
315/V4&D2	96:2403	*See* DOE/OR–01-1393/V4&D2			
315/V4&D3	96:2404	*See* DOE/OR–01-1393/V4&D3			
315/V5&D1	96:2405	*See* DOE/OR–01-1393/V5&D1			
315/V5&D2	96:2406	*See* DOE/OR–01-1393/V5&D2			
315/V5&D3	96:2407	*See* DOE/OR–01-1393/V5&D3			
318	96:956	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016169	MF-2020
319	96:957	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016170	MF-2020
325	96:2166	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017060	MF-2050
326	96:2167	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009986	MF-2010
327	96:2516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007655	MF-2000
329/V1	96:2517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017189	MF-2070
329/V2	96:2518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017190	MF-2070
334	96:2168	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007657	MF-2000
335	96:2519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007393	MF-2000
336	96:2169	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006664	MF-2010
337	96:547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011793	MF-2010
340	96:2520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006673	MF-2000
343	96:2170	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011792	MF-2010
345	96:2171	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006669	MF-2000
347	96:2172	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96009987	MF-2050
349	96:958	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006685	MF-2030
355	96:2173	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006674	MF-2000

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359	96:959	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013408	MF-2000
360/R1	96:2521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012610	MF-2000
361	96:2522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009355	MF-2010
363	96:2523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009975	MF-2010
365	96:1340	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96009365	MF-2070
366	96:549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011794	MF-2000
367	96:2524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012631	MF-2100
370/R1	96:2174	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013409	MF-2050
372	96:960	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014280	MF-2000
374	96:2525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012828	MF-2100
375	96:961	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012158	MF-2000
376	96:2175	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012622	MF-2050
377	96:2526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012820	MF-2100
ORNL/ER/Sub–					
87-99053/2/R1	96:222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002148	MF-2010
87-99053/74	96:1341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016128	MF-2000
87-99053/75	96:2527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013228	MF-2070
87-99053/76/D2/V1	96:2393	*See* DOE/OR–01-1326&D2/V1			
87-99053/76/D2/V2	96:2394	*See* DOE/OR–01-1326&D2/V2			
87-99053/76/D2/V3	96:2395	*See* DOE/OR–01-1326&D2/V3			
87-99053/76/D2/V4	96:2396	*See* DOE/OR–01-1326&D2/V4			
87-99053/76/V2	96:2390	*See* DOE/OR–01-1326-D1/V2			
87-99053/76/V3	96:2391	*See* DOE/OR–01-1326-D1/V3			
87-99053/76/V4	96:2392	*See* DOE/OR–01-1326-D1/V4			
87-99053/79	96:1342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012206	MF-2070
ORNL/GWPO–					
0010	96:550	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010092	MF-2000
0017	96:552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006190	MF-2010
0024	96:962	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013673	MF-2020
013	96:2528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002199	MF-2070
015	96:551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017048	MF-2010
019	96:553	OSTI; NTIS; GPO Dep.	E 1.99:	DE96006034	MF-2000
023	96:554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009666	MF-2000
025	96:555	OSTI; NTIS; GPO Dep.	E 1.99:	DE96014595	MF-2100
ORNL/M–					
4087	96:223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008966	MF-2000
4090	96:158	*See* ES/WM–30			
4592	96:551	*See* ORNL/GWPO–015			
4614	96:849	*See* ES/WM–47			
4616	96:159	*See* ES/WM–49			
4913	96:224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006821	MF-2000

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4922	96:2418	*See* DOE/ORO–2033			
4987	96:554	*See* ORNL/GWPO–023			
4988	96:550	*See* ORNL/GWPO–0010			
ORNL/RASA–					
94/3	96:2176	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012542	MF-2070
95/1	96:2177	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000836	MF-2070
95/13	96:2179	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016566	MF-2000
95/14	96:2180	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003584	MF-2070
95/15	96:2181	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006026	MF-2070
95/16	96:2182	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011220	MF-2000
95/2	96:2178	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010626	MF-2000
ORNL/TM–					
12105	96:963	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011626	MF-2020
12299	96:964	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000849	MF-2020
12380	96:225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003110	MF-2000
12652	96:2529	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012445	MF-2000
12784	96:1343	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011630	MF-2030
12790	96:2530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003220	MF-2010
12851	96:556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000848	MF-2010
12884	96:2531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014271	MF-2070
12887	96:965	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017139	MF-2020
12903	96:557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011627	MF-2020; MF-2010
12912	96:558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015798	MF-2070
12913	96:966	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014460	MF-2020
12926	96:2532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008962	MF-2000
12935	96:1344	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012546	MF-2000
12938	96:2646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013798	MF-2030
12939	96:967	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002293	MF-2020
12960	96:2533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002360	MF-2010
12968	96:2183	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010625	MF-2000
12974	96:968	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015662	MF-2000
12985	96:2534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012541	MF-2070
13003	96:559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000846	MF-2010
13004	96:2535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016126	MF-2010; MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
13012	96:969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014488	MF-2000
13017	96:1345	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006191	MF-2070
13026	96:2184	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011585	MF-2000
13028	96:970	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011591	MF-2000
13029	96:2536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010347	MF-2070
13033	96:2537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017194	MF-2070
13034	96:1346	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008645	MF-2000
13036	96:971	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003185	MF-2020
13045	96:1347	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011586	MF-2000
13055	96:560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000315	MF-2000
13078	96:972	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000834	MF-2030
13098	96:2185	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006024	MF-2050
13099	96:561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009669	MF-2010
13101	96:973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006025	MF-2020
13113	96:2538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006671	MF-2010
13131	96:974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010623	MF-2000
13142	96:2186	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008017	MF-2000
13156	96:2539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006023	MF-2010
13164	96:975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009374	MF-2020
13189	96:976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012271	MF-2000
13192	96:977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008763	MF-2000
13201	96:2647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014273	MF-2030
13236	96:978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014278	MF-2000
13241	96:2648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012272	MF-2030
PFC/RR–					
95-11	96:1968	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011009	MF-2000
PHTD–					
C93-03-02L	96:1503	*See* PNNL–11039			
C93-03-08A	96:1506	*See* PNNL–11043			
K0959	96:1482	*See* PNNL–10981			
K967	96:1493	*See* PNNL–11010			
PNL–					
10068	96:979	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008343	MF-2020
10069	96:1349	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008034	MF-2030
10100	96:1350	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95001311	MF-2070
10175-Suppl.1	96:1351	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002223	MF-2070
10213	96:1352	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017064	MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
10248	96:1353	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001197	MF-2030
10255	96:1354	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010687	MF-2030
10256	96:1355	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012229	MF-2030
10257	96:1356	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015808	MF-2030
10260-Rev.†	96:226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014168	MF-2000
10282	96:1357	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012230	MF-2030
10284	96:1358	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011682	MF-2030
10288	96:1359	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015814	MF-2070
10351	96:1360	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96001902	MF-2070; MF-2030
10360	96:1361	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014506	MF-2030
10361	96:1362	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001811	MF-2030
10363	96:2543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000715	MF-2000
10366	96:1363	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001901	MF-2070; MF-2030
10367	96:1364	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001900	MF-2070; MF-2030
10369	96:1365	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010774	MF-2030
10388	96:1366	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015771	MF-2070
10389	96:1367	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015404	MF-2070
10393	96:2544	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000810	MF-2000
10397	96:2545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010422	MF-2000
10412	96:1368	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010424	MF-2000
10412-Rev.1	96:1369	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017017	MF-2030
10418	96:1370	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015406	MF-2070
10450	96:2546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002670	MF-2000
10460	96:2649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011683	MF-2030
10464	96:1371	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011404	MF-2000
10466	96:1372	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015405	MF-2070
10468	96:1373	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002222	MF-2070; MF-2030
10473	96:1374	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016041	MF-2030; MF-2070

Report Number	*Abstract Number*	*Source of Availability*	*GPO Dep.*	*Order Number*	*Distribution Category*
10491	96:1375	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002229	MF-2070
10495	96:1376	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001899	MF-2070; MF-2030
10498	96:1377	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015772	MF-2070
10499	96:1378	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001898	MF-2070; MF-2030
10505	96:1379	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015445	MF-2070
10510	96:1380	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000871	MF-2000
10511	96:1381	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012764	MF-2030
10514	96:1382	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010425	MF-2030
10517	96:1383	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008005	MF-2000
10522	96:562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011869	MF-2010
10524	96:980	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012395	MF-2000
10534	96:2547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012232	MF-2010
10550	96:2548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012478	MF-2000
10564	96:1384	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016774	MF-2030
10570	96:1385	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004518	MF-2000
10574	96:227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001346	MF-2000
10575	96:228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001151	MF-2000
10582	96:1386	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016773	MF-2030
10584	96:1387	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002065	MF-2070; MF-2030
10587	96:1388	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001138	MF-2030
10588	96:1389	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016042	MF-2030; MF-2070
10589	96:1390	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015134	MF-2030
10593	96:1391	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016043	MF-2030
10594	96:1392	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016040	MF-2030; MF-2070
10595	96:1393	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016039	MF-2030; MF-2070
10597	96:1394	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015813	MF-2070
10599	96:1395	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015750	MF-2070
10601	96:229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000877	MF-2000

Report Number	*Abstract Number*	*Source of Availability*	*GPO Dep.*	*Order Number*	*Distribution Category*
10605	96:563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016683	MF-2010
10608	96:230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015593	MF-2000
10615	96:2187	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017599	MF-2050; MF-510
10620	96:2549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015815	MF-2000
10623	96:981	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016115	MF-2020
10625	96:1396	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001136	MF-2030
10633	96:2550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015839	MF-2020
10635	96:2551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000199	MF-2000
10637	96:1397	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015443	MF-2030
10642	96:1398	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001134	MF-2030
10643	96:1399	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001137	MF-2030
10644	96:1400	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001135	MF-2030
10645	96:1401	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001198	MF-2030
10646	96:1402	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001417	MF-2030
10647	96:1403	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002032	MF-2030
10648	96:1404	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001150	MF-2030
10650	96:1405	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016637	MF-2030
10651	96:2188	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001420	MF-2010
10655	96:1406	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012315	MF-2030
10661	96:1407	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016635	MF-2030
10666	96:982	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017598	MF-2020; MF-510
10681	96:1408	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002822	MF-2030
10683	96:1409	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016038	MF-2030
10688	96:2552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017601	MF-2010; MF-602
10692	96:2553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017596	MF-2010; MF-510
10694	96:1410	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017600	MF-2070
10697	96:1411	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000750	MF-2030
10698	96:564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001345	MF-2070
10702	96:1412	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002030	MF-2030
10703	96:1413	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001810	MF-2030
10704	96:1414	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001905	MF-2030

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
10706	96:1415	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002063	MF-2070; MF-2030
10712	96:1416	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017592	MF-2030
10713	96:1417	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001342	MF-2030
10714	96:231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003370	MF-2000
10723	96:1418	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001362	MF-2030
10725	96:1419	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001200	MF-2030
10729	96:1420	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002027	MF-2030
10730	96:1421	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002028	MF-2030
10732	96:1422	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001906	MF-2030
10733	96:1423	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002031	MF-2030
10736	96:1424	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002066	MF-2070; MF-2030
10737	96:1425	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002029	MF-2030
10740	96:1426	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017707	MF-2030
10743	96:983	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000203	MF-2020
10746	96:984	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000197	MF-2000
10749	96:1427	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001887	MF-2030; MF-2070
10750	96:2650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000807	MF-2030
10754	96:2554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000748	MF-2030
10755	96:1428	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000727	MF-2030
10757	96:2266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001341	MF-2060
10761	96:1429	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000745	MF-2030
10762	96:1430	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000732	MF-2030
10763	96:1431	OSTI; NTIS; GPO Dep.	E 1.99:	DE96000728	MF-2030
10765	96:2555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000729	MF-2030
10766	96:1432	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000714	MF-2030
10767	96:2651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002212	MF-2030
10772	96:1433	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96000819	MF-2030
10773	96:1434	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004127	MF-2030
10777	96:1435	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000731	MF-2030
10778	96:1436	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003600	MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
10779	96:985	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003602	MF-2020
10781	96:1437	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000747	MF-2030
10785	96:1438	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000713	MF-2030
10786	96:565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000746	MF-2010
10787	96:1969	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000749	MF-2000
10788	96:986	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000814	MF-2000
10794	96:1439	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003371	MF-2030
10797	96:1440	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001146	MF-2030
10800	96:2556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001888	MF-2070
10801	96:2557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001804	MF-2070
10803	96:1441	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002935	MF-2070
10808	96:1442	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003222	MF-2030
10809	96:1443	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003173	MF-2030; MF-2070
10811	96:1444	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003224	MF-2030
10812	96:1445	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003225	MF-2030
10813	96:1446	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002064	MF-2070; MF-2030
10814	96:1447	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002057	MF-2070; MF-2030
10815	96:1448	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000813	MF-2030
10817	96:566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001153	MF-2070
10821	96:1449	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001141	MF-2030
10822	96:1450	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001199	MF-2030
10830	96:987	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001363	MF-2020
10835	96:567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002033	MF-2070
10837	96:1451	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001812	MF-2030
10840	96:1452	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002679	MF-2070
10855	96:2189	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002887	MF-2010
10865	96:1453	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003562	MF-2030
10870	96:1454	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003081	MF-2030
10872	96:988	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003908	MF-2000
10873	96:1455	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003223	MF-2030

Report Number	*Abstract Number*	*Source of Availability*	*GPO Dep.*	*Order Number*	*Distribution Category*
10886	96:568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003996	MF-2010
10890	96:1456	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006078	MF-2030
10893	96:1457	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004519	MF-2030
10920	96:2652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005840	MF-2030
6415-Rev.7	96:2540	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017595	MF-2000
7722-Rev.2-Add.1	96:2541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014291	MF-2070
8557-Rev.1	96:1348	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002322	MF-2030
9224	96:2542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010721	MF-2010
PNL-SA–					
23193	96:2558	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011411	MF-2070
23468	96:569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011412	MF-2010
23600	96:232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015802	MF-2000
24044	96:1458	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014176	MF-2030
24280	96:2559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014625	MF-2010
24720	96:1459	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014639	MF-2000
24939	96:989	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014179	MF-2020
25033	96:1460	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002632	MF-2000
25132	96:1461	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002631	MF-2030
25207	96:990	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014175	MF-2050
25501	96:2560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010724	MF-2010
25532	96:2561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014184	MF-2000
25593	96:233	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014183	MF-2000
25595	96:570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014182	MF-2010
25603	96:2653	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007261	MF-2030; MF-2010; MF-2020
25640	96:991	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014168	MF-2080
25678	96:571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014194	MF-2010
25679	96:572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014195	MF-2010
25713	96:234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014191	MF-2000
25753	96:992	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014171	MF-2020
25764	96:993	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014190	MF-2020
25844	96:994	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014188	MF-2010; MF-402

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25878	96:2562	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002493	MF-2000
25908	96:2563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014618	MF-2070
25954	96:1462	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002718	MF-2000
26015	96:995	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002717	MF-2020
26066	96:996	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011492	MF-2080
26071	96:1463	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014169	MF-2030
26080	96:235	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002716	MF-2070
26111	96:1464	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014198	MF-2030
26147	96:997	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014635	MF-2000
26161	96:2267	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014614	MF-2060
26219	96:1465	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014178	MF-2070
26246	96:998	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015826	MF-2020
26258	96:573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014637	MF-2010
26402	96:236	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016818	MF-2080
26441	96:1466	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002608	MF-2030
26455	96:999	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002615	MF-2000
26460	96:237	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004382	MF-2000
PNNL–					
10748	96:1467	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009209	MF-2030
10883	96:1468	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014004	MF-2070
10907	96:574	OSTI (requests by U.S. Government Agencies and Their Contractors). Other requestors should be directed to Pacific Northwest National Laboratory		TI96012430	ND-2010
10911	96:2564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006113	MF-2010
10912	96:575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005841	MF-2010
10913	96:1000	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005842	MF-2000
10914	96:576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006114	MF-2010
10915	96:2565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005843	MF-2010
10927	96:1469	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004513	MF-2030
10937	96:1470	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011471	MF-2030
10944	96:2566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010452	MF-2070
10945	96:1471	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009900	MF-2030
10946	96:1472	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006405	MF-2030
10947	96:1001	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006587	MF-2000
10950	96:577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007517	MF-2070

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10969	96:238	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008336	MF-2000
10969-Rev.1	96:239	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008174	MF-2000
10969-Rev.2	96:240	OSTI; NTIS; GPO Dep.	E 1.99:	DE96011470	MF-2000
10970	96:1473	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006404	MF-2030
10970-Rev.1	96:1474	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010266	MF-2030
10971	96:1475	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008765	MF-2070
10971-Vol.1	96:1476	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008928	MF-2070
10971-Vol.2	96:1477	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96008929	MF-2070
10974	96:1478	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008849	MF-2070; MF-2030
10976	96:1479	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007092	MF-2030
10977	96:578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008811	MF-2010
10978	96:1480	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009073	MF-2030
10979	96:2567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008026	MF-2000
10980	96:1481	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008426	MF-2000
10981	96:1482	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008427	MF-2000
10982	96:1483	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008857	MF-2000
10984	96:1484	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008177	MF-2000
10986	96:1485	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008339	MF-2000
10987	96:1486	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008204	MF-2000
10988	96:1487	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008007	MF-2030
10989	96:1488	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008726	MF-2000
10991	96:1489	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008199	MF-2000
10992	96:1490	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008179	MF-2000
10996	96:1491	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008249	MF-2000
11007	96:1492	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008350	MF-2030
11010	96:1493	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008349	MF-2030
11013	96:1494	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008235	MF-2000
11015	96:1495	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008259	MF-2000
11016	96:1496	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008348	MF-2030
11018	96:1497	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008351	MF-2030
11021	96:1498	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010133	MF-2030
11029	96:1499	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008181	MF-2000

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11030	96:241	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008180	MF-2000
11033	96:1500	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008203	MF-2000
11036	96:1501	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008335	MF-2000
11037	96:1502	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008205	MF-2000
11039	96:1503	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008423	MF-2000
11040	96:1504	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008182	MF-2000
11042	96:1505	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008033	MF-2000
11043	96:1506	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008425	MF-2000
11045	96:1507	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008201	MF-2000
11050	96:1508	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008856	MF-2000
11051	96:1509	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008859	MF-2000
11052	96:1002	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008860	MF-2000
11053	96:1003	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008814	MF-2000
11054	96:1510	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008858	MF-2070
11055	96:1004	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008429	MF-2000
11056	96:1005	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008184	MF-2000
11057	96:1006	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008338	MF-2000
11067	96:1511	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008428	MF-2000
11068	96:1512	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010454	MF-2030
11080	96:242	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE96008330	MF-2010
11080-Rev.	96:243	OSTI; NTIS (documentation only); ESTSC (complete software package), P.O. Box 1020, Oak Ridge, TN 37831-1020 (United States); INIS; GPO Dep.	E 1.99:	DE96010944	MF-2010
11089	96:1513	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009074	MF-2030
11091	96:1514	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008987	MF-2030
11098	96:1515	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008029	MF-2030
11106	96:244	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010136	MF-2000
11116	96:1007	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011464	MF-2000
11120	96:1516	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011468	MF-2030
11121	96:2654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011241	MF-2000
11122	96:1517	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011239	MF-2030
11124	96:2655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011240	MF-2000
11127	96:1518	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011467	MF-2000

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11133	96:1519	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010453	MF-2030
11146	96:1520	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010132	MF-2030
11169	96:1521	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011223	MF-2000
11186	96:1522	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011527	MF-2000
11208-Vol.1	96:144	*See* DOE/RL–96-16-c-Vol.1			
11208-Vol.2	96:145	*See* DOE/RL–96-16-c-Vol.2			
11211	96:1523	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013208	MF-2030
11212	96:1524	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012242	MF-2030
11222	96:1525	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013198	MF-2030
11233	96:1526	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013204	MF-2030
11237	96:1527	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013494	MF-2030
11247	96:1528	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014096	MF-2030
PNNL-SA–					
27105	96:2656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005494	MF-2000
PVTD–					
C94-03-02R	96:1483	*See* PNNL–10982			
C94-04-20B	96:1497	*See* PNNL–11018			
C94-22-02D	96:1004	*See* PNNL–11055			
C95-02-01AD	96:1509	*See* PNNL–11051			
C95-02-01B	96:1003	*See* PNNL–11053			
C95-02-01GG	96:1488	*See* PNNL–10989			
C95-02-01V	96:1485	*See* PNNL–10986			
C95-02-03D	96:1510	*See* PNNL–11054			
C95-02-03G	96:1002	*See* PNNL–11052			
C95-02-04A	96:1501	*See* PNNL–11036			
C95-03-01C1-Pt.A	96:1495	*See* PNNL–11015			
C95-03-01C4	96:1496	*See* PNNL–11016			
K101-C94-04-14E	96:1492	*See* PNNL–11007			
T3B-95-206	96:1494	*See* PNNL–11013			
T3B-95-212	96:1006	*See* PNNL–11057			
T3C-95-111	96:1481	*See* PNNL–10980			
T3C-95-125	96:1491	*See* PNNL–10996			
T3C-95-126	96:1508	*See* PNNL–11050			
RAC–					
12	96:212	*See* LBL–36825			
RAE–					
9304/1-1	96:778	*See* DOE/LLW–189			
SAND–					
78-1596-Vol.1	96:1238	*See* DOE/CAO–2056-Vol.6-Draft			
78-1596-Vol.2	96:1239	*See* DOE/CAO–2056-Vol.7-Draft			
78-1596-Vol.5	96:1273	*See* DOE/WIPP–91-005-Rev.5-Pt.B-Vol.5			
78-1596-Vol.6	96:1274	*See* DOE/WIPP–91-005-Rev.5-Pt.B-Vol.6			
88-0157-Vol.3	96:1271	*See* DOE/WIPP–91-005-Rev.5-Pt.B-Vol.3			
93-0350	96:245	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014529	MF-2000
93-1000	96:1529	OSTI; NTIS; INIS; GPO; GPO Dep.	E 1.99:	DE96010871	MF-2030
93-1378	96:1530	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004113	MF-2000
93-1986	96:1531	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004541	MF-2000
93-7038	96:579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010868	MF-2070
94-0251	96:1532	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004115	MF-2000
94-0686	96:2190	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011839	MF-2010

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94-0890	96:1533	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016749	MF-2010
94-0932	96:246	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006448	MF-2020
94-0991	96:1534	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004946	MF-2070
94-1311	96:247	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006196	MF-2020
94-1376	96:1535	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016954	MF-2010
94-1495	96:1536	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016731	MF-2010
94-1639	96:1008	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013676	MF-2100
94-1945	96:248	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015057	MF-2000
94-1946	96:249	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015058	MF-2000
94-1949	96:250	OSTI; NTIS; GPO Dep.	E 1.99:	DE95016459	MF-2000
94-2094	96:580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010512	MF-2010
94-2268C	96:1537	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006817	MF-2000
94-2274	96:1538	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016768	MF-2010
94-2340	96:1009	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011835	MF-2020
94-2563/2	96:1539	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011840	MF-2000
94-2571	96:1540	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016460	MF-2030
94-2611	96:2568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015010	MF-2000
94-2643C	96:1010	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006315	MF-2050
94-2728	96:1011	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008800	MF-2020
94-3069	96:1541	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010892	MF-2000
94-3100C	96:2191	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010863	MF-2010
94-3173	96:1542	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010896	MF-2070
94-3188C	96:1012	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006308	MF-2020
94-3267	96:2268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013912	PC-2030
95-0081C	96:251	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003643	MF-2000
95-0184C	96:252	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003645	MF-2030
95-0185C	96:253	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003070	MF-2020
95-0186C	96:1543	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003069	MF-2020
95-0188C	96:1013	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003097	MF-2020
95-0193C	96:254	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007665	MF-2000
95-0194C	96:255	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003655	MF-2000
95-0201C	96:256	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007686	MF-2000
95-0203C	96:257	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003642	MF-2000

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95-0204C	96:258	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007683	MF-2000
95-0208C	96:1014	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003658	MF-2020
95-0211C	96:259	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007422	MF-2030
95-0227C	96:260	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007685	MF-2000
95-0329	96:1544	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001864	MF-2000
95-0375C	96:261	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003644	MF-2000
95-0789C	96:1015	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015853	MF-2000
95-0849C	96:2269	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011888	MF-2060
95-1084C	96:1016	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013027	MF-2000
95-1120	96:1545	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004950	MF-2000
95-1148C	96:1546	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007339	MF-2000
95-1236	96:1547	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014532	MF-2000
95-1240	96:1548	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010907	MF-2000
95-1356	96:1017	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008036	MF-2010
95-1601C	96:2657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015431	MF-2020
95-1609	96:1018	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010900	MF-2020
95-1611	96:1019	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009071	MF-2020
95-1637	96:1020	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008037	MF-2020
95-1689	96:2192	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001761	MF-2010
95-1704C	96:1549	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007344	MF-2000
95-1758	96:262	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017835	MF-2000
95-1941	96:1550	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005043	MF-2000
95-1998C	96:1551	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008256	MF-2000
95-2005C	96:1552	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017641	MF-811; MF-2030
95-2006C	96:1553	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017642	MF-811; MF-2030
95-2007C	96:1554	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017643	MF-811; MF-2030
95-2008C	96:1555	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017644	MF-811; MF-2030
95-2009C	96:1556	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017646	MF-811; MF-2030
95-2015C	96:1557	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008255	MF-2000
95-2017/1	96:1558	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011056	MF-2000
95-2017/2	96:1559	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011199	MF-2000

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95-2017/3	96:1560	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011013	MF-2000
95-2060	96:1021	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001760	MF-2020
95-2082C	96:1561	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006478	MF-2000
95-2087	96:2569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004551	MF-2070
95-2187	96:581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005044	MF-2010
95-2196C	96:2270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001725	MF-2060
95-2216C	96:1022	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006398	MF-2020
95-2244C	96:1562	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000704	MF-2000
95-2258C	96:2570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000780	MF-2020
95-2379C	96:2658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002120	MF-2030
95-2393	96:2271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002342	PC-2060
95-2571	96:1563	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010905	MF-2020
95-2583C	96:1023	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007059	MF-2070
95-2639C	96:263	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002780	MF-2010
95-2660C	96:1564	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008254	MF-2000
95-2696C	96:264	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003099	MF-2000
95-2729	96:2659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004122	MF-2000
95-2736C	96:265	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003663	MF-2000
95-2842C	96:266	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003660	MF-2030
95-2934C	96:1024	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004302	MF-2020
95-2983C	96:1565	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010857	MF-2000
95-3018C	96:267	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003639	MF-2000
95-3019C	96:268	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003640	MF-2000
95-3020C	96:269	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003768	MF-2000
95-3024	96:2571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004549	MF-2070
95-3056C	96:1566	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004301	MF-2000
95-3062	96:2572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004896	MF-2000
96-0113	96:1025	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006197	MF-2020
96-0163	96:582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010967	MF-2000
96-0164	96:583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010910	MF-2070
96-0165	96:584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010869	MF-2070
96-0178C	96:1567	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010548	MF-2020
96-0195C	96:1568	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007340	MF-2000

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96-0203C	96:270	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007682	MF-2000
96-0209C	96:271	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007663	MF-2000
96-0258C	96:272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007667	MF-2000
96-0262	96:2573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006440	MF-2070
96-0282C	96:273	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007668	MF-2000
96-0294C	96:1026	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007341	MF-2000
96-0297C	96:1027	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007428	MF-2020
96-0323C	96:274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005900	MF-2000
96-0341C	96:275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007423	MF-2000
96-0342C	96:1569	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007424	MF-2030
96-0370C	96:276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96007427	MF-2080
96-0376C	96:1570	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006991	MF-2000
96-0377C	96:1028	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006479	MF-2020
96-0378C	96:1029	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006474	MF-2020
96-0435	96:1571	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010653	MF-2000
96-0485C	96:2272	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006399	MF-2060
96-0521	96:2273	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008356	MF-2030
96-0582	96:2574	OSTI; NTIS; GPO Dep.	E 1.99:	DE96008728	MF-403; MF-405; MF-2000
96-0656C	96:2660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006974	MF-2000
96-0692C	96:1030	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006981	MF-2070
96-0714C	96:277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006980	MF-2000
96-0715C	96:278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006979	MF-2000
96-0721/1	96:741	*See* DOE/ID–10521/1			
96-0721/2	96:742	*See* DOE/ID–10521/2			
96-0721/3	96:743	*See* DOE/ID–10521/3			
96-0749C	96:1031	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008252	MF-2000
96-0791C	96:1572	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009175	MF-2000
96-0792C	96:1573	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010849	MF-2000
96-0813	96:1032	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010914	MF-2020
96-0815C	96:1033	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008165	MF-2020
96-0838C	96:1574	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011715	MF-2000
96-0850C	96:279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008867	MF-2000
96-0866	96:1575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010373	MF-2000
96-0881C	96:2274	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008906	MF-2060

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96-0886	96:1576	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011876	MF-2000
96-0899C	96:1034	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96008862	MF-2000
96-0972	96:1035	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010381	MF-2020
96-1031	96:585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010899	MF-2010
96-1088	96:1036	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010906	MF-2020
96-1100C	96:1577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011691	MF-2000
96-1459	96:586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012418	MF-2010
96-1651C	96:1037	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012953	MF-2000
96-1652C	96:1038	OSTI; NTIS; GPO Dep.	E 1.99:	DE96012951	MF-2100
96-1921C	96:1578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013237	MF-2000
96-1922C	96:280	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013238	MF-2000
96-2011C	96:1579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013830	MF-2000
96-2090	96:1039	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96014311	MF-2020
96-8213	96:2575	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009912	MF-2000
UCRL-ID–					
118561	96:1580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015026	MF-2070; MF-2030
120416	96:587	OSTI; NTIS; GPO Dep.	E 1.99:	DE95011415	MF-2010
UCRL-JC–					
118024	96:1040	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96000360	MF-2000
118897	96:2275	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011842	MF-2060
119707	96:2576	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001728	MF-2070
119959	96:2577	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001322	MF-2070; MF-702
120442	96:1041	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95009875	MF-2020
120690	96:1042	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012484	MF-2020
121184	96:2578	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010712	MF-2070
122299	96:588	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010702	MF-2010
122572	96:1581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006314	MF-2000
122874	96:589	OSTI; NTIS; GPO; GPO Dep.	E 1.99:	DE96010245	MF-2010
122875	96:1582	OSTI; NTIS; GPO Dep.	E 1.99:	DE96010700	MF-2030
123342	96:2579	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009253	MF-2070
USGS-OFR–					
95-160	96:590	OSTI; NTIS; INIS; U.S. Geological Survey, Information Services, Box 25286, MS 517, Denver Federal Center, Denver, CO (United States) 80225-0046; GPO Dep.	E 1.99:	DE96000244	MF-2070

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95-284	96:591	OSTI; NTIS; INIS; U.S. Geological Survey, Information Services, Box 25286, MS 517, Denver Federal Center, Denver, CO (United States) 80225-0046; GPO Dep.	E 1.99:	DE96000243	MF-2070
WHC-EP–					
0125-7	96:2580	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017145	MF-2070; MF-600
0394-10	96:592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017147	MF-2010; MF-603
0466-2	96:2581	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008793	MF-2070
0474-16	96:1583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012969	MF-2030
0474-17	96:1584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017142	MF-2030
0474-18	96:1585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003339	MF-2030
0474-19	96:1586	OSTI; NTIS; GPO Dep.	E 1.99:	DE96009668	MF-2030
0479-1	96:1587	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015658	MF-2030
0497-Rev.1	96:2582	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001604	MF-2070
0527-4	96:2583	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017146	MF-2070; MF-603
0528-Rev.2	96:2584	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005138	MF-2000
0536-2	96:2585	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010579	MF-2010
0536-3	96:2586	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005139	MF-2070
0538-2	96:2587	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017143	MF-2070
0573-3	96:2588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001069	MF-2010
0600-Rev.1	96:1588	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012985	MF-2030
0645	96:1043	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017141	MF-2020; MF-510
0685	96:1589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006825	MF-2070
0817	96:1590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015769	MF-2000
0818	96:1591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013515	MF-2030
0826-Rev.1	96:1044	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016325	MF-2020
0827-Rev.1	96:1045	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010576	MF-2020
0828	96:1046	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012840	MF-2020
0828-Rev.1	96:1047	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012791	MF-2020
0835-1	96:2589	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006833	MF-2070
0846	96:1048	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010938	MF-2020
0850-1	96:281	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006831	MF-2000
0853-Rev.1-Vol.1	96:1592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003261	MF-2000
0853-Rev.1-Vol.2	96:1593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003929	MF-2000

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0853-Vol.1	96:1594	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017151	MF-2050
0853-Vol.2	96:282	OSTI; NTIS; GPO Dep.	E 1.99:	DE95017152	MF-2050
0856	96:1595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013573	MF-2030
0857	96:283	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012822	MF-2070
0859	96:1049	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015548	MF-2020
0861	96:1596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003336	MF-2030
0862	96:1597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011568	MF-2030
0863	96:1050	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013580	MF-2000
0865	96:1051	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015657	MF-2070
0870	96:1598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002791	MF-2030
0871	96:1052	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017153	MF-2020
0872	96:1053	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001605	MF-2070
0873	96:1599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006826	MF-2030
0876	96:1600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001606	MF-2030
0882	96:1601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001564	MF-2030
0883	96:2590	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004634	MF-2070
0885	96:1054	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003337	MF-2020
0888	96:1055	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004827	MF-2070
0889	96:284	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006823	MF-2080
0890	96:285	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006824	MF-2080
0891	96:1056	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004832	MF-2020
0892	96:1057	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003256	MF-2020
0893	96:1602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005124	MF-2000
0894	96:2591	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006834	MF-2000
WHC-MR–					
0496	96:2592	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003329	MF-2000
0505	96:2593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015810	MF-2070
0506	96:1603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015783	MF-2000
0507	96:1058	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016484	MF-2020
WHC-SA–					
2592	96:1604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017149	MF-2070: MF-510
2611	96:1059	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013575	MF-2000
2616	96:1605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008787	MF-2030
2623	96:1606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013487	MF-2030

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2649	96:1607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009110	MF-2030
2665	96:593	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015741	MF-2010
2737	96:1608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012565	MF-2020
2746	96:2193	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008788	MF-2050
2748	96:1609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013721	MF-2030
2758	96:1610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014315	MF-2030
2761	96:2194	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012573	MF-2050
2768	96:1611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013574	MF-2020
2777	96:1612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012839	MF-2000
2781	96:1970	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016337	MF-2000
2786	96:2195	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005194	MF-2000
2788	96:286	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005196	MF-2000
2794	96:1613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005191	MF-2000
2795	96:1614	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005193	MF-2070
2796	96:287	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005195	MF-2000
2807-FP	96:2196	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001599	MF-2000
2831	96:288	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015737	MF-2000
2833	96:1971	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015740	MF-2070
2834	96:1972	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015738	MF-2070
2835	96:289	OSTI; NTIS; GPO Dep.	E 1.99:	DE96002796	MF-2000
2855	96:290	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011570	MF-2030
2857	96:1060	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95013720	MF-2020
2861	96:2594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011635	MF-2070
2862	96:1615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009909	MF-2030
2865	96:1061	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013576	MF-2020
2885	96:291	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016338	MF-2070
2887	96:1062	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016340	MF-2020
2890	96:292	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015811	MF-2000
2894	96:1616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015739	MF-2070
2905	96:1063	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005229	MF-2020
2906	96:1064	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005199	MF-2020
2908-FP	96:1065	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009887	MF-2000
2914	96:1066	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017150	MF-2020

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2924	96:2276	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005188	MF-2060
2925-FP	96:2595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001102	MF-2070
2931-FP	96:293	OSTI; NTIS; GPO Dep.	E 1.99:	DE96001103	MF-2000
2933-FP	96:1617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006882	MF-2030; MF-2070
2935	96:294	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009103	MF-2000
2942	96:1618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002795	MF-2030
2952	96:1619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009104	MF-2070
2959	96:295	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005192	MF-2070
2960-FP	96:1067	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006377	MF-2050
2962-FP	96:1620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006378	MF-2030
2964	96:296	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002797	MF-2070
2966-FP	96:1621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006887	MF-2030
2968-FP	96:1622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001856	MF-2030
2971	96:2596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002798	MF-2070
2974-FP	96:2277	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004830	MF-2010
2975	96:297	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003113	MF-2000
2979	96:298	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003112	MF-2000
2980	96:299	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009891	MF-2000
2990-FP	96:1623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005228	MF-2030
2995-FP	96:300	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003498	MF-2000
3006-FP	96:301	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004831	MF-2030
3010-FP	96:1624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005517	MF-2030
3013	96:302	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005190	MF-2000
3015	96:1068	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009106	MF-2020
3016	96:1625	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005200	MF-2030
3017-FP	96:1973	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009107	MF-2000
3022	96:1069	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009105	MF-2020
3023-FP	96:1626	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005516	MF-2030
3025-FP	96:1627	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006888	MF-2030
3029-FP	96:1628	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006881	MF-2070; MF-2030
3035-FP	96:2197	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009908	MF-2050

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3036-FP	96:1629	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006889	MF-2000
3037-FP	96:1630	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006879	MF-2000
3053	96:303	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009910	MF-2000
3075	96:1631	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009892	MF-2000
WHC-SD-534-CSWD–					
005-Rev.2	96:1632	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013342	MF-2020
WHC-SD-610-ATR–					
002	96:2597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015651	MF-2050
WHC-SD-C018H-ATP–					
004	96:2198	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014433	MF-2050
WHC-SD-C018H-ATR–					
002	96:2199	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014425	MF-2050
WHC-SD-C018H-FDC–					
001-Rev.3	96:2200	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015749	MF-2050
WHC-SD-CP-CR–					
036	96:2201	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014309	MF-2000
WHC-SD-CP-DRD–					
002	96:304	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050000	MF-2020
003	96:1974	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050001	MF-2000
WHC-SD-CP-LB–					
036	96:305	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050002	MF-2020
WHC-SD-CP-MAR–					
002	96:2202	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013878	MF-2050
WHC-SD-CP-OCD–					
040-Rev.1	96:2203	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010701	MF-2050
WHC-SD-CP-OTP–					
153	96:2598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011654	MF-2030
WHC-SD-CP-OTR–					
152	96:2204	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012580	MF-2050
153	96:2205	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012578	MF-2050
WHC-SD-CP-QAPP–					
016-Rev.1	96:306	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001067	MF-2020
017	96:307	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008870	MF-2070
WHC-SD-CP-SA–					
026-Rev.1	96:1975	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012487	MF-2070
WHC-SD-CP-SDD–					
004-Rev.2	96:2206	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015547	MF-2000
WHC-SD-CP-TC–					
033	96:2661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013350	MF-2000
WHC-SD-CP-TI–					
171	96:308	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011573	MF-2050
195	96:1976	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015549	MF-2050

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197	96:309	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050003	MF-2000
WHC-SD-CP-TP–					
085	96:2662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012579	MF-2050
087	96:1070	OSTI; NTIS; GPO Dep.	E 1.99:	DE95015583	MF-2000
087-REV1	96:1071	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050007	MF-2000
WHC-SD-CP-TRP–					
063	96:1072	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050008	MF-2050
WHC-SD-EN-AP–					
165-Rev.1	96:594	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015656	MF-2010
174	96:595	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050009	MF-2000
180	96:596	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050004	MF-2070
185	96:597	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013880	MF-2010
186	96:2207	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015654	MF-2000
WHC-SD-EN-CSUD–					
002	96:310	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011652	MF-2000
WHC-SD-EN-TI–					
300	96:2208	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015653	MF-2000
WHC-SD-EN-WP–					
012-Rev.1	96:598	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014429	MF-2070
WHC-SD-ER5480-ER–					
001-Rev.1	96:599	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012799	MF-2000
WHC-SD-FF-CSER–					
004	96:2209	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012576	MF-2050
WHC-SD-FF-CSWD–					
055-Rev.1	96:311	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014314	MF-2000
056-Rev.1	96:312	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014313	MF-2000
WHC-SD-FF-HC–					
002-Rev.1	96:2210	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016341	MF-2050
WHC-SD-FF-MAR–					
001	96:2211	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013564	MF-2050
WHC-SD-FF-MP–					
01-Rev1	96:1073	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050012	MF-2000
WHC-SD-FF-QAPP–					
005-Rev.1	96:1074	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014312	MF-2020
WHC-SD-FF-TRP–					
019	96:2212	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050016	MF-2050
WHC-SD-FL-MAR–					
001	96:2213	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013900	MF-2050
002	96:2214	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013882	MF-2050
WHC-SD-GN-TI–					
20004	96:1075	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010677	MF-2010

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WHC-SD-L045H-PLN–					
004-Rev.1	96:1076	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050017	MF-2020
WHC-SD-LEF-PLN–					
002-Rev.1	96:600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016342	MF-2070
WHC-SD-LEF-RPT–					
001	96:601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011677	MF-2070
WHC-SD-LL-ATP–					
023	96:313	OSTI; NTIS; GPO Dep.	E 1.99:	DE95010739	MF-2000
WHC-SD-MP-SWD–					
30001-Rev.7	96:314	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011546	MF-2000
WHC-SD-NR-ISB–					
001	96:2215	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013349	MF-2050
WHC-SD-NR-TSR–					
001	96:315	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013341	MF-2000
WHC-SD-PRP-HA–					
002-Rev.2	96:1977	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050018	MF-2020
007-Rev.1	96:1077	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050019	MF-2020
012-Rev.1	96:316	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050020	MF-2020
WHC-SD-SNF-ATP–					
010	96:317	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015652	MF-2000
WHC-SD-SNF-ATR–					
004	96:602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013345	MF-2070
005	96:2599	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015655	MF-2070
WHC-SD-SNF-CM–					
001	96:2216	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015582	MF-2050
WHC-SD-SNF-DGS–					
001	96:2600	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015820	MF-2030
WHC-SD-SNF-DP–					
001	96:1633	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013329	MF-2000
WHC-SD-SNF-DQO–					
004	96:2217	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014310	MF-2050
WHC-SD-SNF-DTP–					
001	96:2601	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012569	MF-2070
WHC-SD-SNF-DTR–					
001	96:1078	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050021	MF-2020
WHC-SD-SNF-ER–					
006-Rev.1	96:603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015599	MF-2070
WHC-SD-SNF-PLN–					
007	96:2602	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015586	MF-2070
008	96:318	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016345	MF-2010
WHC-SD-SNF-SD–					
003-Vol.2	96:2218	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010600	MF-2050
WHC-SD-SNF-SP–					
001	96:1634	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012570	MF-2070

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WHC-SD-SNF-TA–					
007	96:1978	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014311	MF-2070
WHC-SD-SNF-TC–					
004	96:2219	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015584	MF-2000
WHC-SD-SNF-TRP–					
006	96:604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014431	MF-2020
007	96:2603	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013343	MF-2070
WHC-SD-SP-MAR–					
001	96:2220	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013884	MF-2050
WHC-SD-SQA-CSA–					
20395	96:1635	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011651	MF-2000
20397	96:1979	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015550	MF-2020
20398	96:319	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013344	MF-2000
WHC-SD-TP-CSWD–					
002-Vol.2	96:320	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050093	MF-2000
WHC-SD-TP-RPT–					
015-Rev.1	96:321	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013330	MF-2050
WHC-SD-TP-SEP–					
034	96:322	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012577	MF-2050
035-Rev.1	96:1079	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050094	MF-2000
040	96:1080	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050095	MF-2000
WHC-SD-W007H-OTR–					
001	96:2604	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010810	MF-2050
WHC-SD-W026-PLN–					
007	96:1081	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012952	MF-2020
WHC-SD-W030-ATP–					
001	96:1636	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011680	MF-2030
002	96:1637	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011681	MF-2030
003	96:1638	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011634	MF-2030
WHC-SD-W058-TA–					
001	96:1639	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012951	MF-2030
WHC-SD-W059-DR–					
001	96:2221	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011545	MF-2050
WHC-SD-W079-ES–					
001-Rev.3	96:1640	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013883	MF-2030
WHC-SD-W105-SWD–					
1-Rev.1	96:1082	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013905	MF-2000
WHC-SD-W105-TM–					
001-Rev.3	96:1083	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013336	MF-2020
WHC-SD-W113-FDR–					
001-Vol.1	96:1084	OSTI		TI96000769	MF-2000
001-Vol.3	96:1085	OSTI; NTIS; INIS; OSTI		DE96000772	MF-2000

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WHC-SD-W164-ATP–					
001	96:1641	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010941	MF-2000
WHC-SD-W211-FDC–					
001-Rev.1	96:1642	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95007197	MF-2030
WHC-SD-W236A-ER–					
013	96:1643	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008864	MF-2030
018-Rev.1	96:1644	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010939	MF-2030
021-Rev.1	96:1645	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011544	MF-2030
021-Rev.2	96:2222	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014308	MF-2050
022	96:1646	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012792	MF-2020
WHC-SD-W236A-ES–					
012	96:1647	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011639	MF-2020
013	96:1648	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011675	MF-2030
014	96:1649	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012566	MF-2020
015	96:1650	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011676	MF-2020
WHC-SD-W236A-PHA–					
001-Rev.1	96:1651	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013335	MF-2030
WHC-SD-W236A-QAPP–					
001-Rev.2	96:1652	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014424	MF-2030
WHC-SD-W236A-RPT–					
010	96:1653	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015787	MF-2030
WHC-SD-W236A-TI–					
020	96:1654	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013338	MF-2030
07	96:2223	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015747	MF-2050
WHC-SD-W236A-TS–					
001	96:1655	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95006597	MF-2030
WHC-SD-W252-FHA–					
001	96:1656	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013889	MF-2000
WHC-SD-W259-ACDR–					
001	96:2224	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013337	MF-2050
WHC-SD-W320-DA–					
007	96:1086	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010573	MF-2020
WHC-SD-W320-FHA–					
001	96:1657	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050097	MF-2000
WHC-SD-W320-SUP–					
002	96:1658	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014421	MF-2030
WHC-SD-W378-DRD–					
001	96:1087	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010676	MF-2020
WHC-SD-W379-QAPP–					
001	96:1659	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050092	MF-2070
WHC-SD-W430-FDC–					
001	96:1660	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012794	MF-2030

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WHC-SD-WM-ANAL–					
020-Rev.2	96:1661	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011662	MF-2070
WHC-SD-WM-AP–					
036	96:1662	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050098	MF-2030
037	96:2225	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015794	MF-2050
WHC-SD-WM-ATP–					
125	96:1663	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010574	MF-2030
128	96:1664	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013362	MF-2030
128-Rev.1	96:1665	OSTI; NTIS; GPO Dep.	E 1.99:	DE95014423	MF-2030
129	96:2605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013325	MF-2070
132	96:1666	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016327	MF-2070
134	96:1667	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014318	MF-2030
WHC-SD-WM-ATR–					
090	96:1668	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013364	MF-2030
096	96:1669	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013332	MF-2030
120	96:2606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050100	MF-2070
127	96:1670	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015777	MF-2030
129	96:1671	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013328	MF-2070
130	96:1672	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013327	MF-2070
135	96:1673	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050101	MF-2030
WHC-SD-WM-CSCM–					
028	96:1674	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011688	MF-2030
032	96:1675	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050102	MF-2070
WHC-SD-WM-CSRS–					
023-Rev.1	96:1676	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011667	MF-2030
025	96:1677	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011687	MF-2030
026	96:1678	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012798	MF-2000
WHC-SD-WM-DA–					
148	96:1679	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015790	MF-2030
189	96:1680	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050105	MF-2030
194	96:1088	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050106	MF-2020
196	96:1681	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014422	MF-2030
200	96:2607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050107	MF-2070
206	96:1089	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050108	MF-2020
WHC-SD-WM-DP–					
081-Rev.1	96:1682	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013333	MF-2070
103	96:1683	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011632	MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
104	96:1684	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011448	MF-2070
105	96:1685	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011653	MF-2070
106	96:1686	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012800	MF-2070
107	96:1687	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012568	MF-2070
108	96:1688	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012834	MF-2070
109	96:1689	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012837	MF-2070
110	96:1690	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012833	MF-2070
111	96:1691	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012586	MF-2070
112	96:1692	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013365	MF-2070
113	96:1693	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013346	MF-2070
114	96:1694	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014307	MF-2070
115	96:1695	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016330	MF-2070
116	96:1696	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015782	MF-2070
130	96:1697	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010945	MF-2000
132	96:1698	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016329	MF-2070
133	96:1699	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015779	MF-2070
WHC-SD-WM-DQO–					
001-Rev.1	96:1700	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010927	MF-2030
002-Rev.1	96:1701	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012797	MF-2030
004-Rev.1	96:1702	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011674	MF-2030
006-Rev.1	96:1703	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011633	MF-2030
007-Rev.1	96:1704	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012787	MF-2070
018	96:1705	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012827	MF-2070
WHC-SD-WM-DR–					
013	96:1706	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016333	MF-2030
WHC-SD-WM-DRD–					
002	96:2608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050110	MF-2070
WHC-SD-WM-DRR–					
049	96:2226	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015788	MF-2050
WHC-SD-WM-DSD–					
002	96:1521	*See* PNNL–11169			
WHC-SD-WM-DTR–					
040	96:1707	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050111	MF-2030
WHC-SD-WM-ER–					
029-Rev.21	96:1708	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050112	MF-2030
314	96:1709	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050006	MF-2070
315	96:1710	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050005	MF-2070

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
316	96:1711	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050113	MF-2070
317	96:1712	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050114	MF-2070
318	96:1713	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050115	MF-2070
319	96:1714	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050216	MF-2070
350	96:1715	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015546	MF-2070
366	96:1716	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014306	MF-2070
400-Vol.1	96:1717	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012488	MF-2030
400-Vol.2	96:1718	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012489	MF-2030
418	96:1719	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012592	MF-2070
418-Rev.1	96:1720	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013567	MF-2070
418-Rev.2	96:1721	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050116	MF-2070
419	96:1722	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012591	MF-2070
419-Rev.1	96:1723	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013566	MF-2070
419-Rev.2	96:1724	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050117	MF-2070
420	96:1725	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012571	MF-2070
420-Rev.1	96:1726	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013595	MF-2070
420-Rev.2	96:1727	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050118	MF-2070
421	96:1728	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012831	MF-2070
421-Rev.1	96:1729	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013594	MF-2070
421-Rev.2	96:1730	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050217	MF-2070
422	96:1731	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012585	MF-2070
422-Rev.1	96:1732	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014304	MF-2070
422-Rev.2	96:1980	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050119	MF-2070
423	96:1733	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012832	MF-2070
423-Rev.1	96:1734	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013569	MF-2070
423-Rev.2	96:1735	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050120	MF-2070
424	96:1736	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012830	MF-2070
424-Rev.1	96:1737	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013561	MF-2030
424-Rev.2	96:1738	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050121	MF-2070
425	96:1739	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012593	MF-2070
425-Rev.1	96:1740	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013559	MF-2030
425-Rev.2	96:1741	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050122	MF-2070
426	96:1742	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012594	MF-2070

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426-Rev.1	96:1743	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013565	MF-2070
426-Rev.2	96:1744	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050218	MF-2070
427	96:1745	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014316	MF-2030
428	96:1746	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012824	MF-2070
428-Rev.2	96:1747	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050123	MF-2000
429	96:1748	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012595	MF-2070
429-Rev.1	96:1749	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013907	MF-2070
429-Rev.2	96:1750	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050124	MF-2070
430	96:1751	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012823	MF-2070
432	96:1752	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012789	MF-2030
434	96:1090	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013324	MF-2020
436	96:1753	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016334	MF-2030
437	96:1754	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015785	MF-2030
438	96:1755	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013896	MF-2070
438-Rev.1	96:1756	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050125	MF-2070
439	96:1757	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013897	MF-2070
439-Rev.1	96:1758	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050126	MF-2070
440	96:1759	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013572	MF-2070
440-Rev.1	96:1760	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050127	MF-2070
441	96:1761	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013571	MF-2070
441-Rev.1	96:1762	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050135	MF-2070
442	96:1763	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013597	MF-2070
442-Rev.1	96:1764	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050137	MF-2070
443	96:1765	OSTI; INIS; NTIS; GPO Dep.	E 1.99:	DE95012136	MF-2030
443-Rev.1	96:1766	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050140	MF-2070
444	96:1767	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013230	MF-2030
444-Rev.1	96:1768	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050141	MF-2070
445	96:1769	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015155	MF-2030
445-Rev.1	96:1770	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050143	MF-2070
446	96:1771	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013596	MF-2070
446-Rev.1	96:1772	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050145	MF-2070
447	96:1773	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013895	MF-2070
447-REV1	96:1774	OSTI; NTIS; GPO Dep.	E 1.99:	DE96050149	MF-2070

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448	96:1775	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013568	MF-2070
448-REV1	96:1776	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050151	MF-2070
449	96:1777	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013570	MF-2070
449-Rev.1	96:1778	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050153	MF-2070
450	96:1779	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013911	MF-2070
450-REV1	96:1780	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050155	MF-2070
451	96:1781	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013578	MF-2070
451-Rev.1	96:1782	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050158	MF-2070
452	96:1783	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013577	MF-2070
452-Rev.1	96:1784	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050160	MF-2070
458	96:1785	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013881	MF-2070
458-Rev.1	96:1786	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050162	MF-2070
459	96:1787	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013562	MF-2030
459-Rev.1	96:1788	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050164	MF-2070
460	96:1789	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013903	MF-2070
460-Rev.1	96:1790	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050166	MF-2070
461	96:1791	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013902	MF-2070
461-Rev.1	96:1792	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050168	MF-2070
462	96:1793	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013898	MF-2070
462-Rev.1	96:1794	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050172	MF-2070
463	96:1795	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013560	MF-2030
463-Rev.1	96:1796	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050174	MF-2070
464	96:1797	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013894	MF-2070
464-Rev.1	96:1798	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050176	MF-2070
495	96:1799	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050179	MF-2020
502	96:1091	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050182	MF-2000
503	96:1800	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050184	MF-2070
505	96:1801	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050186	MF-2070
506	96:1802	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050189	MF-2070
507	96:1803	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050192	MF-2070
508	96:1804	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050197	MF-2070
509	96:1805	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050198	MF-2070
511	96:1806	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050200	MF-2070

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512	96:1807	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050201	MF-2070
513	96:1808	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050202	MF-2070
514	96:1809	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050128	MF-2070
519	96:1810	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050203	MF-2030
WHC-SD-WM-ES–					
283-Vol.1	96:2227	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010930	MF-2050
283-Vol.2	96:2228	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010931	MF-2050
283-Vol.3	96:2229	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010932	MF-2050
315	96:2230	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010942	MF-2070
317	96:1811	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015786	MF-2000
321	96:1812	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011673	MF-2030
325	96:1813	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015784	MF-2000
331	96:1814	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012567	MF-2030
337	96:1815	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013837	MF-2030
343	96:1816	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012588	MF-2030
345	96:1817	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015819	MF-2030
346	96:1818	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050204	MF-2030
348	96:1819	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050205	MF-2000
WHC-SD-WM-ETP–					
109	96:1820	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010594	MF-2030
152	96:1821	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013363	MF-2070
153	96:1822	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015776	MF-2030
159	96:2609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050206	MF-2070
WHC-SD-WM-EV–					
060-Rev.5	96:1092	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011503	MF-2050
110	96:1823	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050208	MF-2000
WHC-SD-WM-FHA–					
009	96:1093	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015789	MF-2010
010	96:1094	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011509	MF-2020
012	96:1824	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010925	MF-2030
015	96:1095	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050210	MF-2000
WHC-SD-WM-FRD–					
018	96:1825	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011449	MF-2070; MF-2030
021	96:1826	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011506	MF-2030
024	96:2610	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050211	MF-2030

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WHC-SD-WM-ISB–					
007	96:1096	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013331	MF-2000
WHC-SD-WM-LL–					
007	96:1097	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015793	MF-2020
WHC-SD-WM-MAR–					
006	96:2231	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013901	MF-2050
007	96:323	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013879	MF-2050
WHC-SD-WM-OCD–					
015-Rev.1	96:1827	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011504	MF-2030
WHC-SD-WM-OTP–					
174	96:1828	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011664	MF-2070
175	96:1829	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011666	MF-2070
176	96:1830	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013563	MF-2070
177	96:1831	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011661	MF-2070
181	96:1832	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050212	MF-2030
182	96:1833	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050129	MF-2030
183	96:1834	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050130	MF-2030
189	96:1835	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050131	MF-2030
WHC-SD-WM-OTR–					
158	96:1836	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015778	MF-2030
171	96:605	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010595	MF-2050
WHC-SD-WM-PAP–					
062	96:1098	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011508	MF-2020
062-Rev.1	96:1099	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015748	MF-2020
WHC-SD-WM-PCP–					
010	96:1100	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013334	MF-2020
WHC-SD-WM-PLN–					
100	96:1837	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012836	MF-2030
104	96:1101	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015781	MF-2000
WHC-SD-WM-QAPP–					
009-Rev.2	96:1838	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012575	MF-2050
WHC-SD-WM-RPT–					
099-Rev.2	96:1102	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012587	MF-2020
110	96:1839	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050132	MF-2070
111	96:1840	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050133	MF-2070
112	96:1841	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050134	MF-2070
113	96:1842	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050136	MF-2070
114	96:1843	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050138	MF-2070
115	96:1844	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050139	MF-2070

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116	96:2611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010566	MF-2070
119	96:1845	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050142	MF-2070
120	96:1846	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050144	MF-2070
121	96:1847	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050146	MF-2070
122	96:1848	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050147	MF-2070
123	96:1849	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050148	MF-2070
124	96:1850	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050150	MF-2070
125	96:1851	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050152	MF-2070
130	96:1852	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050154	MF-2070
131	96:1853	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050156	MF-2070
133	96:1854	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050157	MF-2070
142	96:1855	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050159	MF-2070
143	96:1856	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050161	MF-2070
144	96:1857	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050163	MF-2000
145	96:1858	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050165	MF-2000
146	96:1859	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050167	MF-2000
147	96:1860	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050169	MF-2070
152	96:1861	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050175	MF-2070
153	96:1862	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050177	MF-2070
159	96:1103	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013360	MF-2020
190	96:1863	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050180	MF-2030
191	96:1864	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050181	MF-2000
WHC-SD-WM-SARR–					
031-Rev.1	96:1865	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015587	MF-2070; MF-2030
032	96:1866	OSTI		TI95010658	MF-2030
WHC-SD-WM-SD–					
020	96:1867	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008786	MF-2030
WHC-SD-WM-SDP–					
010	96:1868	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012796	MF-2030
WHC-SD-WM-SDS–					
005	96:1869	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050183	MF-2070
WHC-SD-WM-SP–					
004-Rev.1	96:1870	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011669	MF-2070
006-Rev.1	96:1871	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012829	MF-2030
009	96:1872	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015818	MF-2070

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WHC-SD-WM-TA–					
162	96:1873	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050185	MF-2000
WHC-SD-WM-TI–					
640	96:1874	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014319	MF-2070
684	96:1875	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013347	MF-2070
690	96:1876	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012790	MF-2030
691	96:1877	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011507	MF-2030
696	96:1878	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011665	MF-2050
700	96:2612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012825	MF-2050
702	96:1879	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015585	MF-2000
705	96:1880	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014305	MF-2030
706	96:1881	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014317	MF-2000
711	96:1882	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050188	MF-2000
713	96:1883	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050214	MF-2030
719	96:1884	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050215	MF-2000
WHC-SD-WM-TP–					
169	96:2613	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014427	MF-2070
325	96:1885	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012835	MF-2070
328	96:1886	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015742	MF-2030; MF-2070
336	96:1104	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013326	MF-2020
339	96:1887	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011505	MF-2070; MF-2030
348	96:1888	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95008950	MF-2070
350	96:1889	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011668	MF-2070
353	96:1890	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015780	MF-2070
354	96:1891	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013366	MF-2070
357	96:1892	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011510	MF-2070
358	96:1893	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013368	MF-2070
WHC-SD-WM-TRP–					
224	96:1894	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016332	MF-2030
237	96:2614	OSTI; NTIS; GPO Dep.	E 1.99:	DE95012589	MF-2070
243	96:1105	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050213	MF-2000
245	96:1106	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050191	MF-2000
WHC-SD-WM-TSAP–					
002	96:1895	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015792	MF-2070

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003	96:1896	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013361	MF-2070
004	96:1897	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013367	MF-2070
007	96:1898	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050193	MF-2070
037-Rev.1	96:1899	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050194	MF-2070
040	96:1900	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050195	MF-2070
WHC-SD-WM-UM–					
030	96:324	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95012788	MF-2000
WHC-SD-WM-VI–					
020	96:1107	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016331	MF-2020
021	96:1108	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014303	MF-2020
024	96:1109	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050196	MF-2000
WHC-SD-WM-WP–					
299	96:1901	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010926	MF-2030
299-Rev.1	96:1902	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016328	MF-2030
303	96:1903	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014406	MF-2030; MF-2070
311	96:1904	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96050199	MF-2000
WHC-SP–					
0098-6	96:325	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95015812	MF-2000
0564-37	96:326	OSTI; NTIS; GPO Dep.	E 1.99:	DE95013514	MF-2000
0564-39	96:327	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005129	MF-2000
0665-16	96:2615	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95011571	MF-2070
0665-17	96:328	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001070	MF-2030
0665-18	96:2616	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003335	MF-2070
0665-19	96:2617	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006851	MF-2070
0856-Rev.2	96:329	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013579	MF-2000
0858-Rev.4	96:1905	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006830	MF-2000
0969-48	96:330	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013581	MF-2000
0969-52	96:331	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001818	MF-2000
0969-53	96:332	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003260	MF-2010
0969-54	96:333	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004643	MF-2000
1004	96:1906	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001784	MF-902
1101-Rev.1-App.A	96:1907	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002804	MF-2030
1101-Rev.1-Vol.1	96:1908	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002803	MF-2030
1103-Rev.1	96:334	OSTI; NTIS; GPO Dep.	E 1.99:	DE96003351	MF-2000
1104-Rev.1	96:1909	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001636	MF-2000

WHC-SP–

Report Number	Abstract Number	Source of Availability	GPO Dep.	Order Number	Distribution Category
1114-Rev.1	96:1110	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001637	MF-2000
1132	96:335	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005137	MF-2000
1138-Rev.1	96:336	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001631	MF-2000
1142-Rev.1	96:1910	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002800	MF-2000
1155	96:1911	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95016344	MF-2050
1156	96:1912	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95013513	MF-2070
1159	96:1111	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001814	MF-2000
1166	96:337	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002793	MF-2080
1167	96:2232	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003350	MF-2000
1168	96:338	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001632	MF-2000
1169	96:339	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005135	MF-2000
1177	96:1913	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006822	MF-2000
1179	96:1914	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006836	MF-2030
WINCO–					
1196	96:1112	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003548	MF-2000
1197	96:340	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003482	MF-2000
1198	96:1113	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003532	MF-2020; MF-2030
WSRC-IM–					
91-53-Vol.X	96:1114	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017473	MF-2020
WSRC-MS–					
94-0255	96:341	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060138	MF-2010
94-0640	96:1115	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017491	MF-2000
95-0038	96:1116	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010967	MF-2020
95-0064	96:1117	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010960	MF-2020
95-0068	96:1118	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95010966	MF-2020
95-0080	96:1119	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001859	MF-2020
95-0087	96:1120	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060113	MF-2020
95-0153	96:1121	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001849	MF-2020
95-0184	96:1122	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060001	MF-2020
95-0185	96:1123	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001858	MF-2020
95-0187	96:606	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060146	MF-2010
95-0261	96:1124	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96005347	MF-2070
95-0271	96:2278	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001847	MF-2020; MF-2060

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95-0294	96:1915	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003084	MF-2000
95-0299	96:2279	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009338	MF-2060
95-0303	96:607	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002956	MF-2010
95-0328	96:1125	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002926	MF-2020
95-0354	96:1981	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003361	MF-2020
95-0370	96:1916	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006499	MF-2030
95-0371	96:1917	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060036	MF-2030
95-0397	96:1918	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009653	MF-2030
95-0400	96:1919	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006493	MF-2030
95-0421	96:1920	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96006491	MF-2000
95-0423	96:1126	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009649	MF-2020
95-0436	96:1921	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009639	MF-2000
95-0466	96:1922	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009617	MF-2030
95-0478	96:342	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009651	MF-2080
95-0502	96:2618	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017486	MF-2070
96-0005	96:2619	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96009644	MF-2070
96-0022	96:2620	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012425	MF-2020
96-0042	96:608	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012429	MF-2070
96-0119	96:1923	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011040	MF-2000
96-0142	96:1924	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96011039	MF-2000
96-0256	96:1127	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060060	MF-2020
WSRC-RP–					
94-1300	96:1925	OSTI; NTIS; GPO Dep.	E 1.99:	DE95060112	MF-2080
94-927	96:1128	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060136	MF-2000
95-237	96:609	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002957	MF-2010
96-76	96:1926	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060048	MF-2030
WSRC-TR–					
0400-Rev.1	96:1943	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014726	MF-2030
94-0239	96:1129	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014720	MF-2000
94-0344	96:2621	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017470	MF-2070
94-0402	96:1130	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060133	MF-2020
94-0608-Rev.2	96:1131	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001688	MF-2020
94-0608-Rev.3	96:1132	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002955	MF-2020
94-0608-Rev.4	96:1133	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96012433	MF-2000

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94-0608-Vol.1-2	96:1134	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060111	MF-2020
94-0616	96:610	OSTI; NTIS; GPO Dep.	E 1.99:	DE95060134	MF-2070
94-100-12	96:343	OSTI; NTIS; GPO Dep.	E 1.99:	DE95060145	ND-2000
95-0016	96:1135	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017492	MF-2070
95-0019	96:1927	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96004065	MF-2030
95-0034	96:1136	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95014719	MF-2020
95-0085	96:1137	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017502	MF-2020
95-0122	96:1928	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002906	MF-2030
95-0139-1	96:611	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001684	MF-2070
95-0144-1	96:612	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001687	MF-2070
95-0157	96:2233	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060139	MF-2060
95-0170	96:1930	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060018	MF-2030
95-0176	96:1138	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060149	MF-2000
95-0178	96:1931	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95060142	MF-2030
95-0183	96:2622	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001693	MF-2010
95-0195	96:1932	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96003011	MF-2070
95-0199	96:1139	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE95017490	MF-2020
95-0206	96:2623	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96060038	MF-2020
95-0213	96:1933	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001692	MF-2030
95-0231	96:2234	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002952	MF-2040
95-0232	96:2624	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002954	MF-2070
95-0242	96:1934	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001661	MF-2030
95-0257	96:1935	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96013312	MF-2030
95-0265	96:1936	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96001845	MF-2050
95-0288	96:1937	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96010050	MF-2030
95-0303	96:1140	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002922	MF-2020
95-0304	96:1141	OSTI; NTIS; INIS; GPO Dep.	E 1.99:	DE96002923	MF-2000
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