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HTI Retrieval Demonstration Project Execution Plan

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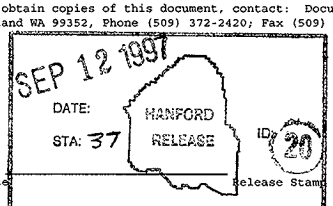
Abstract: This plan describes the process for demonstrating the retrieval of difficult Hanford tank waste forms utilizing commercial technologies and the private sector to conduct the operations. The demonstration is to be conducted in Tank 241-C-106.



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HTI RETRIEVAL DEMONSTRATION PROJECT EXECUTION PLAN

September 4, 1997

Prepared for
Lockheed Martin Hanford Corporation
by
Numatec Hanford Company and
Fluor Daniel Northwest

HTI RETRIEVAL DEMONSTRATION PROJECT EXECUTION PLAN

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FIGURES

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APPENDICES

List of Acronyms

A-E	= Architect-Engineer
ATP	= Acceptance Test Procedure
CAA	= Clean Air Act
CDR	= Conceptual Design Report
CM	= Construction Management
DOE-HQ	= U.S. Department of Energy-Headquarters
DST	= Double Shell Tank
EPA	= U.S. Environmental Protection Agency
ETF	= East Tank Farms (part of TWRS Operations)
FDC	= Functional Design Criteria
FDNW	= Fluor Daniel Northwest
F&R	= Functions and Requirements
HTI	= Hanford Tank Initiative
IMT	= Integration Management Team
LOI	= Letter of Instruction
NEPA	= National Environmental Policy Act of 1969
NRC	= Nuclear Regulatory Commission
OTP	= Operational Test Procedure
PHMC	= Project Hanford Management Contractor
PSWBS	= Project Summary Work Breakdown Structure
QA	= Quality Assurance
QAPP	= Quality Assurance Project Plan
RCRA	= Resource Conservation and Recovery Act of 1976
RL	= U.S. Department of Energy, Richland Operations Office
SST	= Single Shell Tank
TPA	= Tri-Party Agreement
TWP	= Tank Waste Projects
TWRS	= Tank Waste Remediation System
USQ	= Unreviewed Safety Question
WB	= Work breakdown structure
WDOE	= Washington Department of Ecology

HTI RETRIEVAL DEMONSTRATION PROJECT EXECUTION PLAN

1.0 INTRODUCTION

The HTI retrieval is a demonstration of private sector technology and operation in the accomplishment of DOE nuclear remediation including the regulatory interfaces and documentation needed to achieve the remediation. The subject of this plan is the retrieval of residual (hard heel) wastes from Hanford single shell tank (SST) 241-C-106, following bulk waste removal using past practice sluicing (separate project conducted under project W-320). The demonstration of residual waste retrieval from C-106 is a task within the larger Hanford Tanks Initiative (HTI), a five-year investigation and demonstration activity resulting from the technical and financial partnership of the U.S. Department of Energy Office of Waste Management (Environmental Management [EM]-30) and the Office of Science and Technology Development (EM-50). The HTI accelerates activities to gain key technical, cost performance, and regulatory perspectives on two high-activity waste tanks. One of these is the 241-C-106 Tank where hard heel retrieval will be demonstrated.

The Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement [TPA]) contains a major milestone (M-45-00) and two intermediate milestones (M-45-03-T02 and M-45-03-T01) directly related to the HTI retrieval task. Milestone M-45-00 requires the retrieval of as much waste as technically possible, with tank waste residues not to exceed 10.2 m^3 (360 ft^3) in 100 series tanks. Milestone M-45-03-T02 is to "Initiate Final Retrieval Demonstration of 241-C-106" due June 30, 2002. Milestone M-45-03-T01 is to "Complete SST Waste Retrieval Demonstration" due September 30, 2003. The DOE initiative to privatize the pretreatment and immobilization of Hanford tank wastes on a large scale adds the need for reliable "benchmark information" that can be turned over to the regulators and private sector to be used in future tank waste remediation operations. The three TPA milestones and the need for regulator/private sector benchmark information provide the driving direction and motivation for the HTI retrieval activities.

2.0 OBJECTIVES

The technical objectives of this project are to apply technologies and processes to remove the hard-heel and other waste that is expected to remain in tank 241-C-106 following waste retrieval by sluicing. The objective is to remove sufficient waste that the residue will be $\leq$ 10.2 m^3 (360 ft^3) or the limit of waste retrieval technology (Tri-Party Agreement Milestone M-45-00), and to establish what is technically and cost-effectively feasible for tank 241-C-106.

Tank 241-C-106, classified as a sound (nonleaking) tank, will be sluiced by equipment installed as part of Project W-320 to remove high-heat waste. Based on available waste characterization data and past tank sluicing experience, it is expected that the waste remaining after sluicing may exceed the $\leq$10.2 m^3 (360 ft^3) goal of the Tri-Party Agreement. Technologies and systems different from hydraulic sluicing are expected to be required to remove the residual hard-heel waste.

2.1 Purpose

The purpose of HTI retrieval demonstration is to:

- Retrieve the hard-heel waste from tank 241-C-106 to the extent that it is "technically and economically practical".
- Remove waste in a SST, using methods that mitigate potential for leakage and could be applied to leaking tanks.
- Document performance, cost, and the occupational risk incurred relative to the long-term risk reduction to the public and the environment in order to provide data for determining how much waste must be retrieved for closure of a SST.
- Establish retrieval performance criteria needed to refine the interim retrieval goal specified in Tri-Party Agreement Milestone M-45-00 criteria of residual waste for 100-Series tanks.

2.2 Technical Objectives

The technical objective to apply the best commercially- available technology for hard-heel waste removal without limiting the technology choice by preselection. The technology for removing residual hard-heel waste from tank 241-C-106 has not been predetermined, but will be based on results from competing commercially-available technologies that are obtainable by competitive bids from private industry. The major performance requirement is to remove sufficient waste to meet or exceed the Tri-Party Agreement requirement. A two-phased approach

to obtain the most cost-effective technical solution has been implemented.

1. **Evaluation of Commercial Retrieval Technology**. The Acquire Commercial Technology for Retrieval (ACTR) industry and other technology developers were solicited to propose alternate technologies for removing waste from SSTs. These technologies were evaluated and proof-of-principle tests of the best technologies have been performed. The results of these tests have been disseminated to prospective bidders to support design refinements for tank 241-C-106 waste heel removal.

2. **Tank 241-C-106 Waste Heel Removal**. After the results of the initial technology evaluations are disseminated, a performance-based competitive bid process will be used to select several vendors to provide preliminary system design plans for qualification testing and cost estimating for tank 241-C-106 hard heel retrieval. One vendor will be selected to test equipment in tank 241-C-106 and provide data on waste removal capability. As part of this hot test, the retrieval system will be used to complete retrieval of the hard-heel waste to comply with the requirement of either ≤ 10.2 m^3 (360 ft^3) residue or the limit of waste retrieval technology capability, whichever is less (Milestone M-45-00).

Results from the ACTR program indicate that adequate technology for waste retrieval components and integrated systems is available, but that this technology must be tested and tailored to the requirements of waste retrieval from the Hanford Site underground radioactive waste tanks.

2.3 Benchmark Objectives

The C-106 retrieval demonstration is, at least partly, a full scale prototype for future tank remediation activities. It is a prototype in the contracting and procurement of private sector designs and services for remediation of high-activity DOE nuclear waste; in the collection of information and data regarding retrieval of difficult waste forms; and in the demonstration of regulatory field application (from paper to compliant practice). The specific information benchmark objectives are:

- utilizing the risk management process where applicable in the decision process and documenting the results in a retrievable format
- obtain residual inventory characterization data to support regulatory closure decisions
- obtain information/data during waste retrieval operations to assist in base-lining future operations (retrieval rates, densities, flow rates, efficiencies, etc.)
- identify, obtain interpretations, and, as necessary, modify procedural areas needed to conduct the planned demonstration.

2.4 Cost and Schedule Objectives

The cost and schedule objectives support the accomplishment of TPA milestones M-45-03-T02, "Initiate Final Retrieval Demonstration of 241-C-106" by June 30, 2002. Appendix A contains a high level cost and schedule for the HTI retrieval demonstration. Additional detail can be found in the Technical Task Plan (Anderson, 1997). A staffing and resource profile is included below:

HTI RETRIEVAL STAFFING AND RESOURCE PROFILE					
		FY			
		1998	1999	2000	2001
HTI IMT	(FTE)	6.4	9.1	7.1	5.7
Operations	(FTE)	0.2	3.0	6.4	4.6
ES&H	(FTE)	2.7	1.3	0.4	0.4
QA/QC	(FTE)	0.5	4.7	4.2	0.7
FDNW	($K)	335	5,466	3,340	370
Vendor	($K)	2,609	3,490	1,600	1,010
SESC	($K)	180	442	604	360

3.0 DESCRIPTION AND JUSTIFICATION

3.1 Description

3.1.1 Background

Tank 241-C-106 is a 2,000-m^3 (530,000-gal) capacity SST located in the C tank farm in the 200 East Area of the Hanford Site. The tank has been used to store radioactive waste since 1947. Between mid-1963 and mid-1969, tank 241-C-106 received high-heat waste, including neutralized PUREX high-level waste (HLW) and strontium-bearing solids from the strontium and cesium recovery program. In 1971 temperatures in excess of 99 °C (210 °F) were observed in the tank. To prevent the sludge from drying out and the tank from overheating, ~23 m^3 (6,000 gal) of cooling water is added to the tank each month.

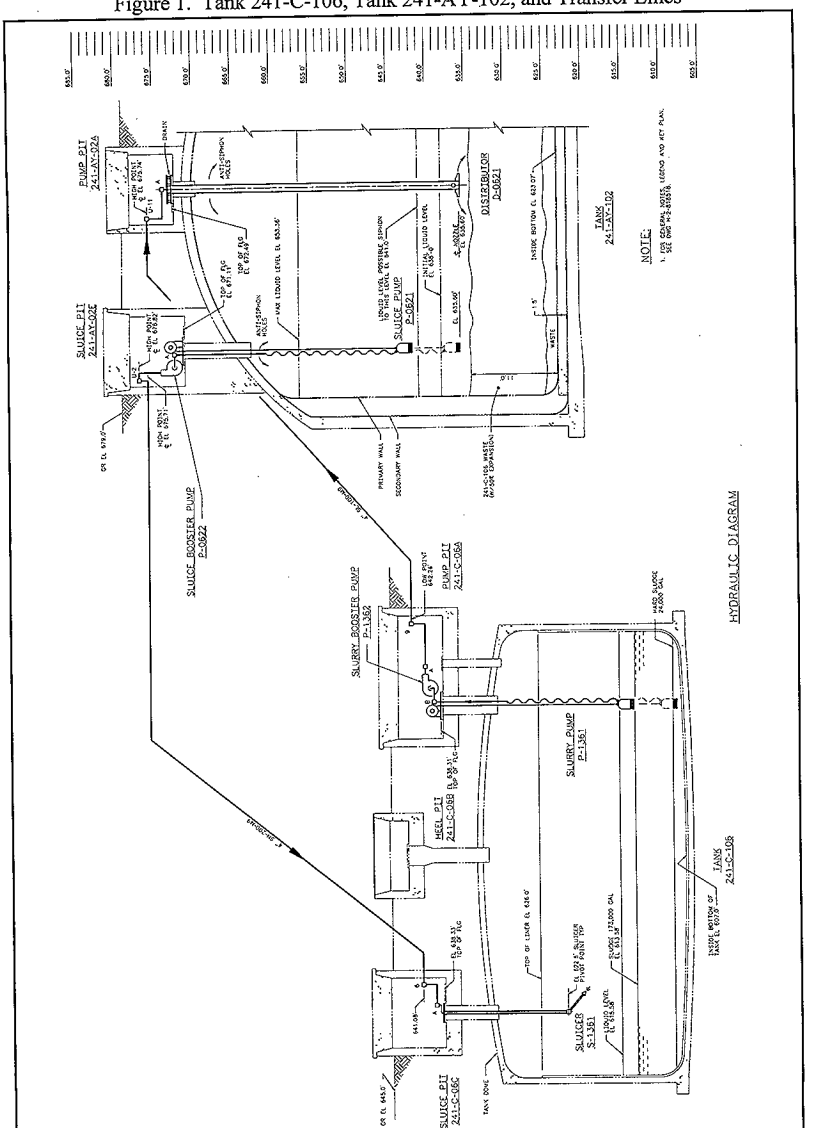
Tank 241-C-106 was withdrawn from active service in 1979 and is categorized as sound (i.e., not confirmed or suspected to be leaking). The heat generation rate of the waste in the tank is currently 110,000 Btu/h. The waste level in the tank is ~193 cm (76 in.) above the tank floor.

The high-heat waste of tank 241-C-106 has been identified as a priority-one safety issue and the planned resolution is to remove enough waste to reduce the tank heat load to <40,000 Btu/h. It is estimated that this can be achieved by removing 640 m^3 (170,000 gal) of soft sludge. The equipment installed by Project W-320 will be used to remove this sludge by utilizing past-practice hydraulic sluicing (Figure 1). However, this sluicing is not expected to dislodge and remove the 46 to 61 cm (18 to 24 in.) of hard-heel sludge in the bottom of the tank. Furthermore, past-practice sluicing may not be an acceptable method for removing waste from leaking tanks because of potential harm to the environment caused by washing waste into the soil through previous leak sites.

3.1.2 Hard Heel Retrieval

The Hanford Tank Initiative requires the design and retrieval operation of C-106 waste heel be conducted by the private sector as a demonstration of the commercial retrieval capabilities. The approach leading to achieving the actual hard-heel retrieval is to obtain commercial proposals, conduct cold tests of selected technologies, select the "best" technology for actual retrieval, conduct site upgrades and modifications to support the "best" technology, install selected retrieval equipment, conduct the retrieval demonstration transferring wastes to the 241-AY-102 double shell tank, and remove the equipment and place the tank in a stable configuration pending closure.

Figure 1. Tank 241-C-106, Tank 241-AY-102, and Transfer Lines



3.2 Justification

Tri-Party Agreement milestones associated with the final retrieval of waste from tank 241-C-106 include Milestone M-45-03-T02 "Initiate Final Retrieval Demonstration of 241-C-106" due June 2002, and Milestone M-45-03-T01 "Complete SST Waste Retrieval Demonstration" due September 2003.

Additional justification derives from the DOE initiative to privatize the treatment and immobilization of HLW and low-level waste (LLW). The provider(s) of these services will be paid when an acceptable product is produced. Phase I of privatization is intended to provide the private sector with sufficient confidence to bid on subsequent, large-scale pretreatment and immobilization work, and the ability to obtain the necessary financing. The current plan is to include tank retrieval operations as part of the TWRS Phase II privatization scope. However, unlike HLW immobilization and LLW pretreatment and immobilization, waste retrieval from SSTs is not part of Phase I privatization.

SST waste retrieval is one of the most technically challenging elements of the TWRS program. Consequently, an initiative analogous to the Phase I demonstration for pretreatment and immobilization is needed to provide confidence for this portion of the TWRS program as well. The waste retrieval requirement currently specified in the Tri-Party Agreement is an interim goal that is intended to be refined based on actual retrieval system performance and subsequent evaluation of cost, technical practicability, and risks. As such, retrieval system performance criteria that would apply to the Phase II privatization contractor cannot currently be specified.

Development and demonstration of the technology for SST waste retrieval, waste characterization, and tank closure have been identified by the Tanks Subgroup of the Site Technology Coordinating Group (STCG) as the highest priority technology need at the Hanford Site. The STCG consists of a cross section of Hanford Site stakeholders and is chartered to help determine priorities of technology development and acquisition for the Hanford Site.

As many as 131 SSTs may require hard-heel waste removal. The volume of these difficult-to-retrieve wastes is estimated at 21,000 m^3 (5.6 Mgal), and is not expected to be amenable to removal by past-practice sluicing. Therefore, the limits of technology for hard-heel waste retrieval need to be established to the extent that is "technically and economically practical." Removal of the hard-heel waste remaining in tank 241-C-106 specifically constitutes progress toward accomplishing two Tri-Party Agreement milestones:

- Retrieve as a minimum, an average of 99 vol. percent of the waste from all tanks (leaving 360 ft^3 maximum per tank), or determine the economic and technical limits of retrieval technology;

- Empty one of the 177 Hanford Site tanks.

4.0 ORGANIZATION

The original concept of a cohesive team with focused dedication to solving the many difficult issues surrounding the waste retrieval and tank closure issues was and continues to be the basis for the HTI organizational structure. The organizational team consists of the DOE EM-30 and EM-50 who co-sponsor the initiative, DOE-RL TWP division who provide program direction, Lockheed Martin Hanford Company who have operational responsibility, and the HTI performing team who have the day to day management responsibility.

Companies within the PHMC have general areas of primary responsibilities (e.g. Lockheed Martin Hanford Company has operational responsibility for TWRS). The HTI performing team was structured to capture the multiple talents necessary to complete the development portion of the demonstration i.e. a lateral cross-section of the PHMC and other Hanford contractors. The C-106 hard heel retrieval (HTI Retrieval) organization is a sub-set of the HTI team in that personnel needed to develop retrieval parameters and to obtain and evaluate designs are co-located and report to the HTI retrieval manager. Individuals with experience judged to be needed to compliment the retrieval team have been selected from various Hanford Site organizations regardless of the parent organization that the team member originated.The HTI retrieval organization is illustrated in figure 4. Major team organizations are discussed below.

4.1 U.S. Department of Energy

The Department of Energy EM-30 and EM-50 co-sponsor the Hanford Tank Initiative including the HTI Retrieval activity. The EM-30 focus is on the accomplishment and demonstration of tank heel retrieval i.e. waste management focus. The EM-50 focus is on the commercial and innovative technologies designed and demonstrated during the course of the HTI Retrieval demonstration. EM-30 and EM-50 share interest in the economies and DOE wide applications that will result from the investigations and demonstration of HTI retrieval.

4.2 Department of Energy - Richland Office

The Department of Energy - Richland Office (DOE-RL) Tank Waste Program (TWP) Division provides the management, administration, and performance direction for the HTI Retrieval activity through the overall HTI program. Specific management, administrative, and performance activities include, but are not limited to:

- Serve as the primary interface with other TPA regulatory agencies regarding HTI Retrieval performance and issue resolutions.
- Establish an organization and delegate appropriate authority for execution of the demonstration.
- Provide overall direction, administration, and performance evaluation of the HTI Retrieval activities.

- Coordinate management reviews, assessments, and audits and/or surveillance of the HTI Retrieval activities to ascertain compliance with applicable DOE safety, environmental, quality assurance, programmatic, and engineering requirements.

4.3 Performing Organization

The HTI Retrieval performing organization (figure 2) is a composite group from multiple PHMC companies and local consultants. The organizational alignment is according to the primary functional area of responsibility.

Table 1 provides a summary of the roles and responsibilities associated with currently identified tasks. An additional "vendor" role and responsibility has been added to the set of project assignments. A brief discussion of each of the project assignments and the relation to the organizational alignment is provided below.

4.3.1 Integration Management Team

The integration management team (IMT) role provides communication interface and guidance to the engineering, design/construction, and vendor functions. The IMT is also the primary liaison between the HTI Retrieval, HTI, TWRS Operations, and the DOE-RL owner/regulator. The IMT provides monitoring and performance reports on the progress of tasks and activities. Task managers/lead engineers for each of the functional areas identified in Figure 2 (organization) perform the IMT role for their assigned task. These individuals report to the HTI Retrieval manager who reports to the HTI project manager.

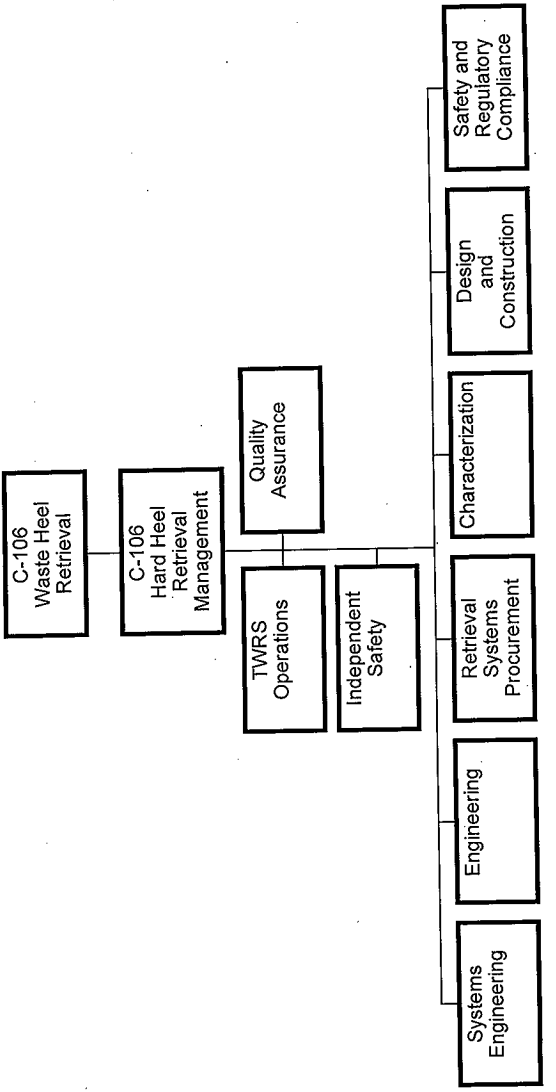
4.3.2 Engineering

As identified in Table 1, the engineering function is a composite of the Organizational (Figure 2) systems engineering, engineering, safety and regulatory compliance, and retrieval systems procurement. This function identifies, conceives, obtains, or, in some cases, develops interfaces in the hardware, software, and regulatory areas that allow the vendor to conduct the task of HTI retrieval. The function also evaluates vendor designs providing recommendations through the IMT for vendor design improvements.

4.3.3 Construction

Site upgrades and systems needed to provide interface with vendor designs will be provided by site forces either directly or by separate contracts. The vendor will provide their own equipment and make any necessary field modifications. The installation of equipment into the tank will be by the PHMC. The maintenance of vendor equipment will be by the vendor. All activities to maintain configuration and support equipment will be by the PHMC.

Figure 2. HTI Retrieval Organization and Relationship to HTI



(See McKinney 1997 for upper level Organization structure)

Table 1. HTI Retrieval Responsibility Assignment Matrix. (4 sheets)

Activity task product description	Design Engin.	Const.	HTI-IMT	TWRS ETF	Retrieval vendor	RL owner	Comments
Management and Integration							
Project Plan	C, R	C, R	P, A	C, R	--	C, R	Final approval obtained at the acquisition executive level in DOE-HQ.
PSWBS	--	--	P, A	--	--	R	Approved as a part of the project plan.
Class 1 change requests	P	C	P, R, RA	C	C	A	Class 1 changes are approved by RL. Changes affecting the TPA are submitted on TPA change request (considered Class 1 changes but on a special form).
Class 2 and 3 change requests	P	P	R, A	C	C	--	Class 2 changes are approved at the PHMC level; Class 3 changes are approved at the cost account / program / project level. Class 3 changes are low-level modifications and record changes.
Retrieval Vendor							
Project Support	--	--	--	--	P	--	Vendor to provide support for integrated project activities such as: ORR, Safety documents, Training, etc.
WRS Equipment and Submittals	C	--	R, A	R	P	--	HTI Retrieval's approval of submittals is authorization to proceed. Designs, per se, are not approved.
Conduct Tests	R	C, R	R, A	R	P	--	Vendor to conduct tests specified by contract.
Perform Retrieval	C	--	RA	RA	P	A	RL approval by concurrence of Operational Readiness.

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Activity task product description	Design Engin.	Const.	HTI-IMT	TWRS ETF	Retrieval vendor	RL owner	Comments
Business Management							
Contractor WBS	P	P	P, A	--	C	--	--
Schedules	C	C	P, A	R	----		Approved as a part of the project plan.
Cost reporting and analysis	P	C	P, R	--	C	--	--
Contractor work plans	R	P	A, S	R	P	--	Each contributing function to provide required documentation in accordance with plans, LOIs, task packages, and/or SOWs
Contractor staffing plans	C	P	A	C	--	--	--
Monthly/quarterly report to RL	C	C	P	C, P	--	R	ETF to provide necessary reports during operational phase
Monthly/quarterly report to DOE-HQ	--	--	C	C	--	P	--
Management reports, meetings, and reviews	C	C	P, C	C, P	P	P	ETF to take the lead during operational phase
Project Engineering (HTI)							
Prepare and maintain documents	C	--	P, A	C	C	R	Documents produced are those required by applicable requirements, contracts, and those needed to meet the retrieval demonstration needs
Review of design documents	R	R	C, A	C, R	--	S	CM reviews for constructibility. EFT reviews for configuration and authorization.
Testing during retrieval	--	--	P	C	C	--	Conduct data collection tests on retrieval parameters

Table 1. HTI Retrieval Responsibility Assignment Matrix. (4 sheets)

Activity task product description	Design Engin.	Const.	HTI-IMT	TWRS ETF	Retrieval vendor	RL owner	Comments
Design (Balance of Plant)							
Acceptance test plan	P, A	R	R	C, R	C	--	--
Operational test plan	C	--	P, R, A	C, R	--	S	--
Spare parts list	P	C	P, A, C	C, R	--	--	--
As-built drawings	P, A	C	R, P, A	R, C, A	C	--	--
Government acceptance inspections	P, RA	--	C, RA	--	--	A	HTI-IMT responsible for receiving inspections for procurement, not to be confused with government acceptance inspections. DOE-RL designates who performs government acceptance inspections.
Construction (Balance of Plants)							
Process Control packages	C	P, A	S, R	R, A	--	--	--
Construction permits, plans, and procedures	--	P, A	A	R, A	--	--	Welding permits, excavation permits, etc.
Construction support	C	P	S	C	C	--	--
Test plans	--	A	S	S	--	S	--
Acceptance/turnover	--	P	R, A	A	P	S	--
Pre-operational Readiness for Startup (ORR)							
Plans and procedures	C	C	P, A	R, RA	C	S	--

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Table 1. HTI Retrieval Responsibility Assignment Matrix. (4 sheets)

Activity task product description	Design Engin.	Const.	HTI-IMT	TWRS ETF	Retrieval vendor	RL owner	Comments
Retrieval Demonstration Operation							
Conduct Demo	--	--	C	P	C, P	S	--
Quality Assurance							
Develop project QA plan	--	--	P, A	P, A	--	R	Design and construction QA by HTI-IMT; operational QA by TWRS-ETF
Support	--	--	P	--	--	--	
Safety and Environmental							
Authorization Basis Documents	C, R	--	P, A	R, RA	--	A	USQs, Evaluations, Assessments, Analyses, etc. are approved by HTI-IMT at a minimum. RL approval is required on those documents that result in an actual change to the authorization basis or reduce the margin of safety.
Industrial safety	--	P, RA	C, S	R, A	P	S	OSHA, - worker safety documents
Safety equipment list	C, R	--	P, A	R, A	P	--	--
Environmental Permits and documents	C	C	P, A	R, RA	C	A	CAA, RCRA, NEPA, etc.

Table 1. HTI Retrieval Responsibility Assignment Matrix. (4 sheets)

Activity task product description	Design Engin.	Const.	HTI-IMT	TWRS ETF	Retrieval vendor	RL owner	Comments
A = Approval C = Contributes input P = Prepares/provides R = Reviews/comments RA = Recommends approval S = Selected technical surveillance							

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5.0 MANAGEMENT AND CONTROL

5.1 Baseline Definition

The approach to project management for the HTI Retrieval Demonstration will follow the applicable requirements contained in DOE Order 430.1, *Life Cycle Asset Management* (LCAM) and the Systems Engineering Management Plan (see section 6.2). Associated with the LCAM Order are 33 "Good Practice Guides" (GPGs) covering a wide variety of project management topics. Some of the GPG topics (e.g. Quality Assurance, Safety Analysis, Maintenance, etc.) are covered by requirements specific to the topic. The GPGs provide supplemental information on the topics from the perspective of project management. The GPGs do not replace or supersede the requirements contained in the contractual DOE requirement documents or PHMC Manuals. A implementation plan covering LCAM and the GPGs has been prepared for the HTI Retrieval Demonstration and is included as Appendix B.

A work breakdown structure (WBS) outlining the retrieval task scopes for HTI Retrieval has been developed for the HTI Program WBS (McKinney 1997). The WBS provides baseline information for individual activities conducted in direct support of the HTI Retrieval with reference to the controlling integrated HTI WBS.

The procedures for placing and accessing requirements are contained in the HTI configuration desk instruction (Root 1997). The technical baseline has been established in the RDD-100 database.

5.2 Performance Monitoring and Reporting

The HTI Retrieval status and performance is reported through the HTI program which has established processes to account for the co-sponsored demonstration nature of the Hanford Tank Initiative activities. Details of the process can be found in Boston and Root 1996, Appendix G.

5.3 Meetings

The developmental nature and private sector involvement expand the "meetings" to include not only the traditional design review but also regulatory interface, vendor design demonstration, and stakeholder involvement. Most of these meetings will be on the HTI level but will involve input from the HTI Retrieval IMT.

Formal HTI Retrieval - Vendor meetings are planned to occur during the qualification testing stage and the ATP/OTP operability testing stage of the demonstration process. Informal meetings to view progress and respond to requests for information will continue to occur through-out the demonstration.

Meetings with regulators are also an on-going process with meetings occurring at working and management levels. DOE-RL representatives attend weekly status meetings to exchange information on progress and issues.

Stakeholder meetings will occur at the HTI level but are also likely to involve issues related to the HTI Retrieval. The WBS presently contains a work planning item to determine if a Supplement to the existing Hanford Tank EIS would be required in order to conduct the retrieval activities. If needed, the NEPA process would require stakeholder meetings to keep the public informed and offer an opportunity for public involvement in the decision process. Even in the event a supplement is not required, communication networks established by EM-30 and EM-50 include provisions for information workshops as a means to help keep the public informed and solicit public input to aid in the development of retrieval performance criteria.

5.4 Configuration Management

Hardware configuration will be controlled by the processes defined in the TWRS SEMP (Peck 1996). Specific information on the hardware configurations and/or modifications will be developed after a retrieval system has been selected. The HTI has developed a document configuration management desk instruction to control the documentation defining its form, retrievability, and traceability (Root 1997). The desk instruction defines the process for adding information, modifying information, and accessing information using designated "gate keepers" and definition points.

5.5 Surveillance, Evaluations, and Assessments

All Project Hanford Management Contract (PHMC) performing work for Hanford Tanks Initiative (HTI) Systems Engineering, Safety, Closure, Characterization, and Retrieval shall be in accordance with the requirements set forth in the Flour Daniel Hanford, Inc. (FDH) Quality Assurance Program Description (QAPD), HNF-MP-599, Revision 0.

The QAPD implements the requirements of Title 10, Code of Federal Regulations, Part 830.120 "QUALITY ASSURANCE" requirements.

A graded approach will be used for assigning applicable quality requirements to all PHMC Subcontractors as defined in the QAPD.

6.0 PLANNING

The HTI Retrieval demonstration receives input and contributions from all the major aspects of the larger HTI effort except for actual closure of the tank. There is systems engineering, out-of-tank equipment and cold testing (commercial system acquisition), in-tank equipment and heel retrieval demonstration, waste characterization, regulatory compliance, and auxiliary components (waste transfer and receiving tank waste compatibility). Each of these aspects is described in separate documents, test plans, or trade studies.

6.1 Approach

Part of the demonstration is the involvement of the private sector in the conception of designs, proof-of-principal, detailed design, cold testing, and remedial operations. This involvement changes the role of the DOE contractor from the "performing" organization to an aid, guide, evaluator, and mentor assisting the winning vendor in the performance of high-level radioactivity remediation work on a DOE nuclear reservation. The Project Hanford Management Contractor (PHMC) maintains the performing role in the continued safe maintenance and waste storage in adjacent tanks, overall configuration management, and site operations. The specific interfaces, roles, and responsibilities between the PHMC and the vendor will be addressed in requests for proposals (scope of work section) and statements of work for the phase of work to be provided.

The general approach to the successful achievement of the demonstration is provided in the below sections.

6.2 System Engineering

The HTI SEMP (LMHC 1997) describes the products and processes utilized by HTI to further define the project mission into an executable technical baseline to ensure successful completion of that baseline. The HTI SEMP provides a grading matrix that allows the level of detail in system engineering products to be tailored based on risk/complexity factors. The HTI SEMP also provides a plan and specification flow chart to further add definition to the system engineering process used in each of the HTI activities.

6.3 Commercial Technologies

The technology for removing residual hard-heel waste from Tank 241-C-106 has not been predetermined, but will be based on results from competing commercially-available technologies that are obtainable by competitive bids from private industry. The two major performance requirements will be to remove sufficient waste to meet or exceed the Tri-Party Agreement requirement and to develop a system which could be used in a leaking tank while minimizing added environmental insult. A task within HTI Retrieval (Retrieval Systems Procurement) is implementing a three-part approach to obtain the best, cost-

effective technical solution for retrieval of difficult waste forms and for retrieval of wastes from potentially leaking tanks. Additional details on the process used to acquire commercial technologies can be found in Ramsower 1996.

The selection of a vendor will be based on the results of competitive design selection. The best design will be fabricated and tested by conducting cold tests on simulated waste forms designed to represent material forms at least as challenging as the material in the C-106 tank. Data will also be collected during the cold test on those factors that would have a bearing on the potential releases to the environment from retrieval activities.

6.4 In-Tank Equipment and Hot Retrieval Demonstration

The early state of present development (the final design has not been selected) allows only the general description of this phase to be discussed. Safety and performance requirements that the final design must be able to demonstrate and achieve are being developed in specification documents to be provided with the request for proposals (RFP). The test simulant formula and procedures for mixing the formula have been developed and will also be included in the RFP.

The current plan is for the HTI Retrieval team to guide the vendor to the point of equipment acceptance testing (ATP/OTP) then turn overview and coordination (mentoring) of the activity over to TWRS East Tank Farms (ETF) Operations for the vendor to conduct the actual retrieval. On completion of retrieval the HTI Retrieval team will remove equipment from the tank, conduct necessary characterization, and prepare the tank for final closure actions. Closure actions for tank C-106 are expected to follow the process developed for AX-104 but are beyond the scope of the HTI Retrieval demonstration.

6.5 Characterization

Collecting data specific to difficult waste forms will help future tank remediations to minimize the programmatic risks and help regulators determine the feasibility of the retrieval actions. Current plans call for characterization of the C-106 hard heel prior to HTI Retrieval and following HTI Retrieval. Information to be collected includes data on radionuclide inventories, waste densities, distributions (before and after retrieval) and residual volumes (after retrieval). Additional data may be collected during the retrieval to assist Engineering in the determining retrieval efficiencies, transfer efficiencies or waste compatibilities in the receiving tank. It is presently unknown if these Engineering efficiency determinations will be included as part of the formal characterization process or will be part of the engineering package.

6.6 Safety and Regulatory Compliance

The responsibility for planning the safety and regulatory compliance strategies has been assigned to one point of contact within HTI. This assignment is to assure maximum coordination of the "regulatory" aspects of the project and to simplify reporting and communications. A detailed regulatory compliance plan (Bloom, 1997) was developed to detail the permitting requirements and strategies needed to successfully conduct the retrieval of the C-106 hard heel following the soft sludge removal by Project W-320. The safety documentation will be generated in accordance with the approved TWRS Safety Management System (SMS) procedures found in WHC-IP-0842, *TWRS Administration.*

6.7 Quality Assurance

In compliance with 10 CFR 830.120, "Quality Assurance Requirements", work being performed for HTI will be in accordance with the requirements set forth in the "PROJECT HANFORD QUALITY ASSURANCE PROGRAM DESCRIPTION" (QAPD) HNF-MP-599, Rev. 0 for nuclear facilities.

7.0 REFERENCES

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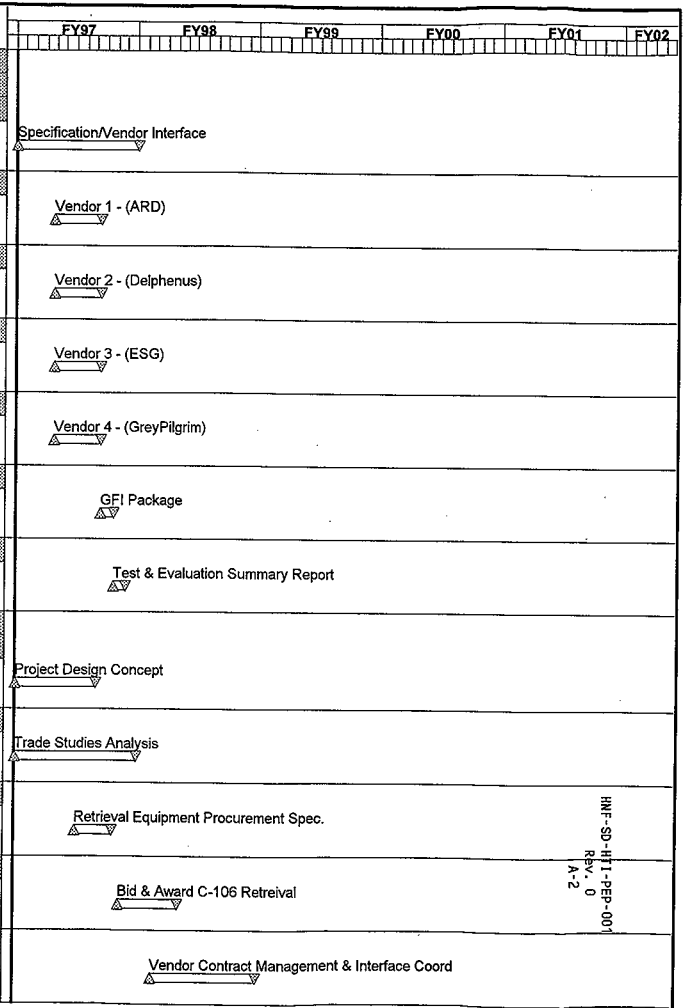
Anderson, T. L. 1997, Ltr 9756062, "Submittal of 1998 HTI Technical Task Plan RLO-7-WT-61" Fluor Daniel Hanford Company

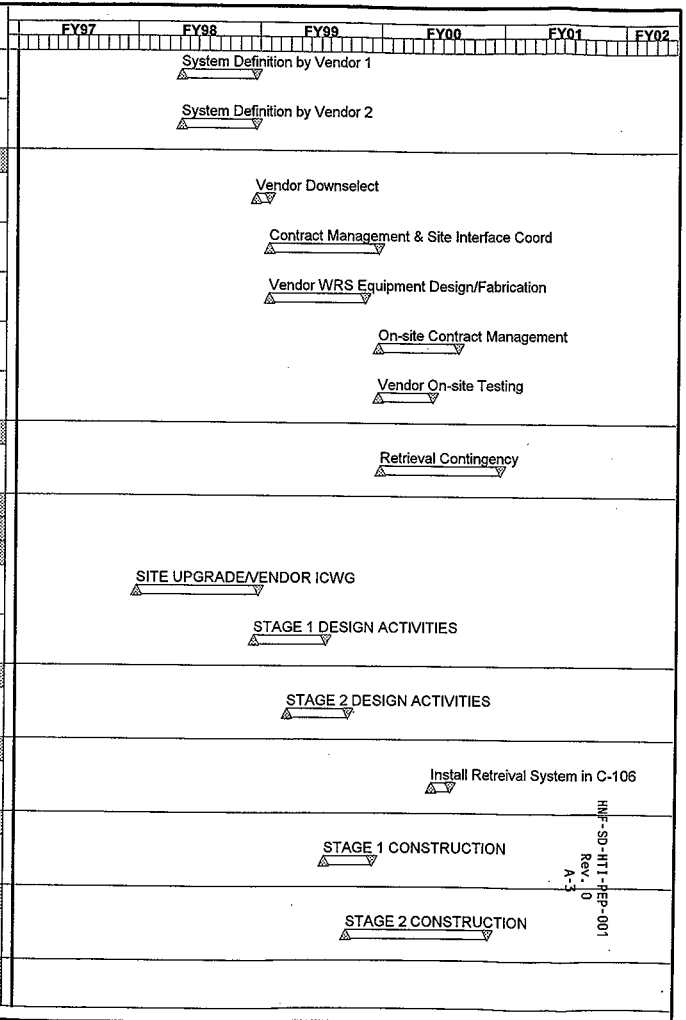
APPENDIX A

HTI Retrieval Cost and Schedule Objectives

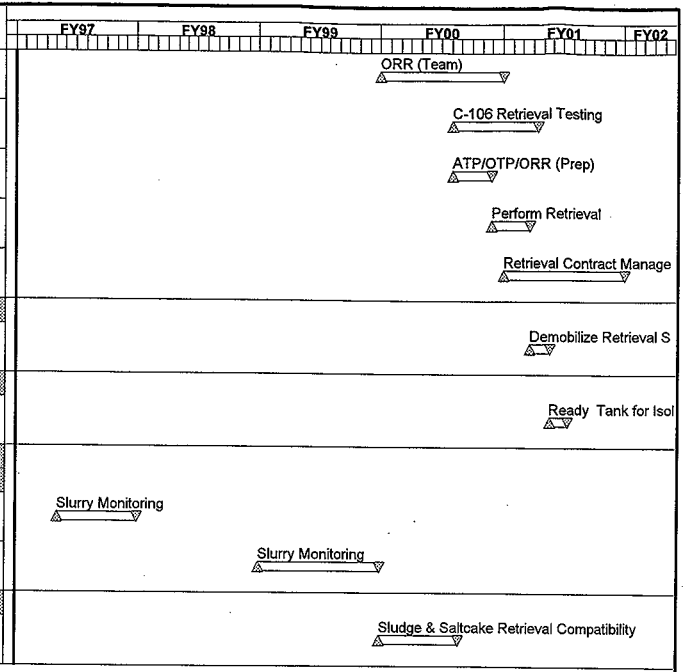
Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	HELP	Budgeted Cost
1.5 Retrieval						
1.5.1 Technology Acquisition						
1.5.1.1 Specification / Vendor Interface						
R255ON0105	Specification/Vendor Interface	251	01OCT96*	30SEP97		658,841.11
1.5.1.2 ARD						
R255ON0205	Vendor 1 - (ARD)	98	21JAN97*	09JUN97		552,982.95
1.5.1.3 Delphenus						
R255ON0305	Vendor 2 - (Delphenus)	98	21JAN97*	09JUN97		552,982.95
1.5.1.4 ESG						
R255ON0405	Vendor 3 - (ESG)	98	21JAN97*	09JUN97		552,982.95
1.5.1.5 Grey Pilgrrim						
R255ON0505	Vendor 4 - (GreyPilgrim)	98	21JAN97*	09JUN97		552,982.95
1.5.1.6 GFI Package						
R255ON0605	GFI Package	28	10JUN97*	21JUL97		37,806.15
1.5.1.7 Test Summary Report						
R255ON0705	Test & Evaluation Summary Report	26	22JUL97*	26AUG97		37,806.15
1.5.2 Retrieval System Supply						
1.5.2.1 Project Design Concept						
R255OX0105	Project Design Concept	167	01OCT96*	30MAY97		512,052.90
1.5.2.2 Trade Studies Analysis						
R255OX0205	Trade Studies Analysis	251	01OCT96*	30SEP97		392,009.40
1.5.2.3 Retrieval Equipment Specification						
R255OX0305	Retrieval Equipment Procurement Spec.	77	01APR97*	21JUL97		316,837.78
1.5.2.4 Bid & Award C-106 Retrieval						
R255OX0405	Bid & Award C-106 Retreival	122	11AUG97*	04FEB98		129,119.13
1.5.2.5 Vendor 1 & 2						
R255OX0505	Vendor Contract Management & Interface Coord	218	17NOV97*	30SEP98		617,016.65



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	HELP	Budgeted Cost
R255OX0510	System Definition by Vendor 1	155	05FEB98*	16SEP98		1,262,600.00
R255OX0515	System Definition by Vendor 2	155	05FEB98*	16SEP98		1,262,600.00
1.5.2.6 Vendor Design/ Fab/ Test						
R255OX0605	Vendor Downselect	30	17SEP98*	28OCT98		86,110.83
R255OX0610	Contract Management & Site Interface Coord	225*	29OCT98	22SEP99		641,100.97
R255OX0620	Vendor WRS Equipment Design/Fabrication	195	29OCT98*	10AUG99		3,195,020.00
R255OX0630	On-site Contract Management	166	23SEP99*	19MAY00		284,150.90
R255OX0635	Vendor On-site Testing	111*	23SEP99	03MAR00		906,949.87
1.5.2.7 Vendor 3						
R255OX0705	Retrieval Contingency	245	01OCT99*	21SEP00		5,888,085.00
1.5.3 Site Upgrades						
1.5.3.1 Design						
1.5.3.1.1 Stage 1 Design						
R255OS0105	SITE UPGRADE/VENDOR ICWG	251*	01OCT97*	30SEP98		603,041.30
R255OS0110	STAGE 1 DESIGN ACTIVITIES	150*	17SEP98	22APR99		1,107,293.44
1.5.3.1.2 Stage 2 Design						
R255OS0205	STAGE 2 DESIGN ACTIVITIES	130*	28DEC98	30JUN99		1,349,554.14
1.5.3.2 Construction						
R255OS0301	Install Retreival System in C-106	42	06MAR00	02MAY00		888,786.95
1.5.3.2.1 Stage 1 Construction						
R255OS0305	STAGE 1 CONSTRUCTION	98*	23APR99	13SEP99		3,357,896.20
1.5.3.2.2 Stage 2 Construction						
R255OS0403	STAGE 2 CONSTRUCTION	290*	30JUN99	24AUG00		4,800,691.26
1.5.4 Retrieval Operations & Services (In-Tank)						
1.5.4.1 Perform Retrieval						



Activity ID	Activity Description	Rem Dur	Early Start	Early Finish	HELP	Budgeted Cost
R255OH0105	ORR (Team)	251	01OCT99*	29SEP00		114,592.80
R255OH0110	C-106 Retrieval Testing	173*	03MAY00	11JAN01		314,736.33
R255OH0120	ATP/OTP/ORR (Prep)	79	03MAY00*	24AUG00		851,393.40
R255OH0145	Perform Retrieval	80	25AUG00*	19DEC00		1,510,521.17
R255OH0150	Retrieval Contract Management	250	02OCT00*	28SEP01		354,269.58
1.5.4.2 Demobilize						
R255OH0205	Demobilize Retrieval System	40	20DEC00*	16FEB01		662,305.97
1.5.4.3 Ready Tank for Closure						
R255OH0305	Ready Tank for Isolation	38	20FEB01*	12APR01		274,901.18
1.5.5 C-106 Heel Process Analytics & Slurry Monitoring						
1.5.5.1 Slurry Monitoring						
R255OM0105	Slurry Monitoring	167	03FEB97*	30SEP97		126,118.38
R255OM0115	Slurry Monitoring	251	01OCT98*	30SEP99		448,945.20
1.5.5.2 Sludge & Saltcake Retrieval Compatibility						
R255OM0205	Sludge & Saltcake Retrieval Compatibility	161	01OCT99*	22MAY00		588,611.11



Hanford Tanks Initiative (HTI)
Waste Retrieval Demonstration
Life Cycle Asset Management (LCAM)
Implementation Plan

May 22, 1997

Table of Contents

Acronym List

GPG	Good Practice Guide
HFE	Human Factors Engineering
HTI	Hanford Tanks Initiative
LCAM	Life Cycle Asset Management
LCC	Life Cycle Cost
LMHC	Lockheed Martin Hanford Company
PDC	Project Design Concept
PEAEMP	Project Execution And Engineering Management Planning
QA	Quality Assurance
RMA	Reliability, Maintainability, Availability

Hanford Tanks Initiative (HTI)
Waste Retrieval Demonstration
Life Cycle Asset Management (LCAM)
Implementation Plan

1 Introduction This implementation plan describes the Hanford Tanks Initiative (HTI) Waste Retrieval Demonstration project's implementation of the U.S. Department of Energy (DOE) Life Cycle Asset Management (LCAM) policy (DOE Order 430.1). Specifically, this plan identifies the application and tailoring of individual aspects of DOE Order 430.1 to the work required to successfully accomplish the retrieval of hard heel waste from a single shell tank at the Hanford, WA. nuclear facility.

1.1 Summary LCAM is the approach selected by the Lockheed Martin Hanford Company (LMHC) to implement project management on the Tank Waste Remediation System project and related subprojects. To help clarify the LCAM policy, the DOE has prepared 33 separate "Good Practices Guides" (GPG) beginning with an introductory guide which serves as an overview of the remaining GPGs.

Project management provides a framework for a systematic approach to assimilate, correlate, and distill available information, in a timely manner, so that the responsible staff, including program and project management, can integrate information to make effective decisions. The need for a systematic approach comes from:

- projects becoming more complex;
- pressure to find solutions that tend toward optimum, and not only do the job, but comply with large numbers of constraints;
- the need to address the full life-cycle of a project from initiation to closeout; and
- the multi-disciplinary and multidimensional nature of complex projects, which makes it difficult to track critical aspects without detailed and integrated project planning and execution documentation.

This LCAM implementation plan has been prepared to define how the GPGs will be applied to help manage the HTI Waste Retrieval Demonstration project and to assist personnel involved to better understand their application.

1.2 Implementation The LCAM policy recognizes the need for a graded approach to project management and suggests various factors (i.e. cost, complexity, visibility, and risk) which should be used as the "basis for determining the degree to which the elements" of the policy apply. Accordingly, this implementation plan will identify the applicability and implementation of each guide. Table 1 lists these guides and their applicability to the Retrieval Demonstration.

1.3 Key Participants The project is being funded as a joint venture by the U.S. Department of Energy Office of Waste Management - Environmental Management (EM-30) and the Office of Science and Technology Development (EM-50). The project is being planned and managed by DOE (Richland Office) and LMHC. The Waste Retrieval Demonstration will be performed by the winner of a contract awarded by LMHC.

2 HTI Retrieval Demonstration Technical Baseline The HTI Waste Retrieval Demonstration is a development test activity to provide data and resolve the uncertainties and risks in removing "hard heel" waste from single shell tanks.

3 LCAM Process LCAM is a process of implementing project management which considers all aspects of the life-cycle of a product at the beginning of the project. It can be a powerful tool that is particularly useful in terms of the management of the many interfaces within a project. By systematically addressing the needs at different periods of the life-cycle (i.e. development, acceptance, operation, decommission, disposal, etc) at the beginning of the project, decisions and tradeoffs can be made to optimize the cost-effectiveness of the project over the life of the system. Project management is a tool which, when properly used under appropriate circumstances, can aid an organization in the achievement of its major goals.

3.1 Project Management Overview Project management is a means to effectively and efficiently organize, plan, execute, control, and review projects. The use of a systematic approach to project management provides a consistent structure for managing projects from the earliest idea for a project through final closeout.

The project management overview GPG (GPG-FM-001) provides a description of the different phases of a project, describes how to apply the principles of project management, and identifies appropriate tasks to be performed in each phase. These GPGs are written specifically for capital funded programs. However, life-cycle asset management is applicable to all projects and is a cost-effective approach to project management.

The processes outlined in 3.2 and 3.3 of this GPG will be used to identify the tasks that need to be performed during the planning and execution phases of the HTI Waste Retrieval Demonstration project.

3.2 Critical Decision Criteria Critical decision points are established as milestones in a project to ensure that specific pre-defined project completion criteria are met before the project can move forward. This philosophy is based upon a building-block approach where one phase of the work builds upon another. Milestones are established at logical break points in the project. Requiring completion of one phase before advancing to the next ensures that progress toward an end goal is being incrementally achieved, alerts the project manager when progress is not forthcoming, and

allows termination of unsuccessful projects prior to exhaustion of the entire budget on "get-well" efforts that lead to little or no progress.

The critical decision criteria guide (GPG-FM-002) is written to address the needs of a capital funded program. It defines the four critical high-level decision points (mission need approval, baseline approval, production, and acceptance). It identifies criteria that may be applicable for determining whether to advance from one decision point to the next project phase. Finally, it outlines actions that can be taken to ensure that the criteria have been met.

Although this GPG addresses many high level issues that do not apply to the HTI Waste Retrieval Demonstration project, the strategy of introducing strategic milestones as checkpoints is being incorporated. The critical decision points for the project will be at a much lower level (i.e. system definition, cold testing, and on-site demo), but sections 2.3 through 2.5 and section 8 of the GPG will be used for guidance to help ensure successful completion of one phase before moving forward to the next.

3.3 Engineering Tradeoff Studies Engineering tradeoff studies are performed to select from two or more options at any time during a project's life cycle. Tradeoff studies can range from complex to simple with three general categories of tradeoff study identified: formal, informal, and mental. A formal tradeoff study follows a structured and systematic approach for comparison of options/alternatives via formal analysis. An informal tradeoff study follows the methodology of a formal tradeoff study but is not formally documented. A mental tradeoff study is a simple process of selection among options where one option is clearly better based on sound engineering judgment; a mental tradeoff study requires no formal analysis.

This GPG (GPG-FM-003) describes the purpose of each type of tradeoff study, explains the process, provides techniques to remove bias, and provides guidance for when and how to apply the process. Because evaluation of alternative architectures is a complex use of tradeoff studies, the guide focuses on this example to present the approach.

Tradeoff studies have already been used to make various HTI project decisions. One such example, the Project Design Concept (PDC) study, was used to assess viable approaches to the design of waste retrieval equipment. The results of the PDC study will be useful in the evaluation of proposals for this contract. The initial phase of the HTI Waste Retrieval Demonstration project will be awarded to multiple contractors with follow-on work being awarded to a single contractor. The results of further tradeoff studies will be a key input in determining the winner of the final phase. Such studies will continue to be an essential part of this project. Tradeoff studies will be conducted in accordance with this GPG to ensure necessary information is available to enable proper project decisions.

3.4 Reliability, Maintainability, Availability Planning The control of life-cycle cost is a primary concern in any project. Though overhaul, maintenance, and repair are major contributors to operations costs, concern about achieving the performance objectives often dominates the development process. However, the extent of overhaul, maintenance, and repair required during operation is largely determined by the design of an item. Thus, equal attention should be paid to both performance and Reliability, Maintainability, Availability (RMA) issues during the design process to control life-cycle cost. Analysis used to control the cost of overhaul, maintenance, and repair is called RMA.

The RMA Planning GPG (GPG-FM-004) identifies the steps to be taken in each phase of a project to minimize the life-cycle costs of equipment. It is intended to provide a basis for tailoring an RMA program for the design and production of project end products.

Because the HTI Waste Retrieval Demonstration is a services contract, the contractor will be required to maintain the waste retrieval system. The ability of the contractor to successfully complete the pre-demonstration activities within the constraints of schedule and budget will be directly affected by the reliability of his equipment. Performance in pre-demonstration activities will affect his ability to compete for the down selection. As a result, equipment specific RMA issues will be of major concern to the contractor.. The customer's interest will be focused more on how these issues apply to the general approach of waste retrieval and how they will affect follow-on projects. Specific RMA planning requirements will, therefore, not be levied on this project.

3.5 Test and Evaluation Testing and Evaluation (T&E) includes the complete set of activities that verify that the end product meets the customer's requirements. The principles and practices of T&E should be used by the project manager to ensure that selected verification methods are complete, compatible, non-redundant, and that they add value. T&E is a project-specific extension of Quality Assurance (QA).

This GPG (GPG-FM-005) describes various test methods, T&E documentation, and acceptance criteria principles to ensure that requirements are verifiable. It identifies how and when in the project to apply these practices.

GPG-FM-005 will be used to facilitate planning and conduct of T&E efforts on the HTI Waste Retrieval Demonstration project to verify the contractor's equipment meets the Hanford site safety and facility requirements (customer's need) prior to its introduction into the tank.

3.6 Performance Analysis and Reporting Performance evaluation and reporting tools are used to measure contract and project performance. These include schedule, cost, and technical performance. Reporting requirements exist at all project, and contractor levels to show different combinations of data and degrees of detail. Reporting becomes cost effective when requirements

meet, but do not exceed, the needs of each user, and when the level of report detail is consistent with the level of management and management responsibility.

This GPG (GPG-FM-006) provides suggested reporting formats to help project offices establish reporting requirements and package information on project status. Format ideas and instructions are presented for project baselines, work scope, technical requirements, schedule, cost, funds, and the integration of these data elements. The sample formats are suited for different size projects. The "application" section of each format addresses the size of project for which it is best suited.

Using the information provided in this GPG, along with established Hanford reporting processes, the HTI Waste Retrieval Demonstration project data requirements will be identified and tailored to ensure that the information needed to effectively and efficiently manage the project is obtained. This data will also become part of the functional requirements baseline for tank waste remediation and will be used as a point of departure from which follow-on waste retrieval efforts will be developed.

3.7 Risk Analysis and Reporting Risk analysis should be used throughout a project to identify significant risk factors and to formulate management and mitigation plans. It should not be conducted separately from, or in addition to, other risk-based analyses traditionally employed during project development, such as those used to determine pure technical risk or to establish cost and schedule contingencies. Instead, project risk analysis should be considered an ongoing, integrated process that addresses the risk associated with each element of the project. The time and money spent analyzing risks and determining risk management and mitigation strategies should be considered from a cost-to-benefit perspective. Managing or mitigating a risk should cost far less than the consequences of the risk itself.

The risk analysis and reporting GPG (GPG-FM-007) discusses the need for risk analysis at various points in a project, identifies methods for risk evaluation, explains the need for good record keeping, and provides suggested risk mitigation strategies. It provides flowcharts for risk analysis and identifies methods for ranking and classifying identified risks.

The HTI Waste Retrieval Demonstration project will use this GPG for development of risk determination and mitigation planning. The results of risk management efforts will be factored in to cost and schedule projections.

3.8 Work Scope Planning For every project, technical objectives should be established early. As the project progresses and becomes more completely planned, technical objectives are translated into tasks and task sequences. This process is the development and definition of the work scope. Technical objectives define what the project will accomplish, and work scope describes how the technical objectives will be accomplished. Because the project cost and schedule are driven by

the work scope, and changes in work scope result in changes in the project schedule and the time-phased budget, proper definition of the work scope is critical to the project's success. During early project phases, such as conceptual design, the work scope is necessarily less well defined than it is later; however, work scope must be defined in as much detail as possible during each phase.

This GPG (GPG-FM-008) provides information about defining work scope, developing structures for managing and controlling work scope and documenting work scope. This data can be used for developing the work scope to ensure cost-effective and efficient management of the project.

The HTI Waste Retrieval Demonstration project is consistent with the intent of this guide through task identification in the SOW and requirements for a Work Breakdown Structure. This GPG will be used on the project for guidance in further evaluating and managing work scope planning and reporting efforts. However, because the purpose of this project is to pioneer technologies for the retrieval of hard-heel waste, many of the tasks cannot be scoped beyond the identified objective without severely restricting the contractor and will therefore, remain at a high level of definition. The contractor will be required as part of his bid to determine the scope of the work to be performed.

3.9 Baseline Change Control Baselines are considered the controlled elements for each project and are labeled as scope, schedule, or cost baselines. Change is a project occurrence that is directly related to the risks and uncertainties associated with baseline control. The objective of a change control process is to understand project changes to allow for better mitigation and management, but not absolute prevention. To effectively manage a project, change must be managed through a dedicated process. The goals of a baseline change control process are to: 1) recognize and predict change, 2) control consequences of those changes, and 3) prevent unauthorized or unintended deviations from approved baselines. Baseline changes should be managed as are other project risks, by establishing a control process for identifying change and responding appropriately.

This GPG (GPG-FM-009) defines different types of changes and describes the process for managing and controlling them. Although this guide is written to address capital funded projects, the processes described therein are applicable to all projects.

The importance of properly managing and controlling changes and baselines is well recognized at Hanford. As a result a comprehensive set of procedures is already in place. Among these are change control boards and document management systems. The methods described in this GPG will be used where applicable to supplement existing processes in controlling the baselines in the HTI Waste Retrieval Demonstration project.

3.10 Project Execution and Engineering Management Planning Project execution and engineering management planning, when properly applied, ensures that all the aspects and phases of a project, over its entire life-cycle, are considered when decisions are made and work is planned. Key to this planning is the understanding that the project manager is responsible for the project from "birth to death" even when a transition of responsibility is planned prior to project closeout.

The Project Execution and Engineering Management Planning (PEAEMP) guide (GPG-FM-010) was developed to provide guidance to a project manager for successful completion of a project. This guidance is in the form of recommended documents, management systems, and other products of project planning and execution activities. It is based on technical and management products rather than processes. The products are grouped into five categories: Planning, Management, Engineering, Specialty Engineering Integration, and Reviews. These products all have a common thread necessitating that work be planned, scheduled, performed, and verified. Each product completed represents a measure of accomplishment leading to successful completion of the project.

The HTI Waste Retrieval Demonstration project is using many of these products to help ensure project success. The information in this guide will be used as guidance during the project to ensure that the products being obtained are properly developed and used.

3.11 Value Engineering Value engineering is an organized effort to obtain optimum value by providing the necessary functions at the lowest life cycle cost. Although value engineering must be performed throughout the life of the project, to be of maximum effectiveness, it must be performed as an integral part of the design process. Value engineering is closely tied to RMA planning and life-cycle estimating.

The value engineering guide (GPG-FM-011) is currently unavailable.

Because the HTI Waste Retrieval Demonstration project is a services contract and no equipment is being purchased, value engineering will largely be the responsibility of the contractor. But to the degree that value engineering is applicable on the part of the buyer, the local value engineering personnel at Hanford will be consulted for guidance.

3.12 Configuration and Data Management Successful accomplishment of a project requires all participants be have access to accurate information on the project and its end product(s) at any point in the project life cycle. The task of managing this information is a major challenge and essential to project success. This is usually accomplished by controlling revision and distribution of the documentation containing the requirements. As the project matures, the increased volume of information, number of documents, number of participants, and requests for changes all contribute to the increasing complexity of this task. The key processes to manage this

information are identification, document control, change control, and data management. The integration of these elements among all participants is referred to as configuration management.

The configuration and data management guide (GPG-FM-012) distinguishes between baseline management and configuration management and describes the processes to control configuration of hardware, software, and data. It also identifies organizational structures that can be used to facilitate configuration control. As with the baseline control guide (GPG-FM-009) this guide is written for capital funded projects.

Although HTI Waste Retrieval Demonstration project is a services contract, the need to control configuration is applicable. Once the safety studies are completed and the design is approved for use on site, it is essential to know that the equipment being deployed is built to the approved design. Additionally, data configuration control will be essential to ensuring that everyone is working to the latest data. The principles described in this GPG along with existing processes documented in the HTI configuration management desk instruction are being levied on the contractor through the SOW.

3.13 Interface Management The purpose of an interface management program is to develop and maintain a system of interface controls that will assure functional and physical compatibility between interfacing equipment. Interface management programs can be applied to both internal (within an organization) and external (across organizations) interfaces.

This GPG (GPG-FM-013) is unavailable at the present time.

The HTI Waste Retrieval Demonstration project requires the contractor to interface with existing and buyer-fabricated equipment, as a result, interface control is vital to the success of the project. Because the guide is unavailable, the HTI project has prepared an interface control plan which will be used to manage the necessary interfaces on the HTI Waste Retrieval Demonstration project.

3.14 Program/Project Relationships When responsibility for a project is assigned to a project manager, it is essential that the corresponding authority also be delegated. This is especially important when transitioning responsibility. Development of the agreements and planning necessary to protect the interests of both the party transitioning and the party receiving the responsibility are fundamental to project success. A clear understanding of these relationships by all parties involved will greatly minimize problems in both the short and the long run.

This guide (GPG-FM-014) discusses the need to delegate responsibility and authority to those performing the work. It identifies responsibilities of various project functions and describes methods to clarify the roles of the individuals involved.

The HTI Waste Retrieval Demonstration project is a small project for which the responsibility and authority has been delegated to the project manager and his project team. The relationships between the project manager and his team are well understood. No formal documentation describing these relationships has been developed, but the principles discussed in this guide have either already been incorporated or are not applicable.

3.15 Project Reviews A structured review process provides knowledge to make necessary decisions, and demonstrate and confirm a project's accomplishments at various stages in its life-cycle and its ultimate success through achievement of the required objectives. Many variables such as size, scope, and regulatory pressures exist that cause individual projects to vary significantly. However, many universally applied basic functions and processes must be performed effectively to achieve successful project completion.

Guide GPG-FM-015 identifies various reviews that can be imposed upon a project and lists the requirements for completion of each. Among these are technical reviews and decision point reviews.

The HTI Waste Retrieval Demonstration project has imposed a 30% design completion and a 90% design completion review as well as an operational readiness review on the contractor and will use the information provided in the guide to verify that the reviews has been successfully completed before approving and closing each review.

3.16 Baseline Development A project baseline describes a desired end-product and associated schedules and costs. Although project baselines should be established during the conceptual project phase, baseline development should continue throughout each phase of the project, with more detail added at each step. Project baselines should be reaffirmed at each major decision point and at "critical decisions" for strategic systems. A project baseline contains three elements: (1) the technical baseline, (2) the cost baseline, and (3) the schedule baseline. The technical baseline is developed first and describes the desired configuration, performance, and characteristics of the end-product. The scope of work necessary to provide the end-product is determined using the technical baseline. The scope of work is divided into elements that become the work breakdown structure (WBS) and are the basis for the schedule and cost baselines.

The baseline development guide (GPG-FM-016) describes the three elements of a project baseline and how to develop each. It also defines how to develop work plans once the baseline has been established.

Baseline development and control are key elements to the overall success of the HTI Waste Retrieval Demonstration project. Accordingly, this guide, along with GPG-FM-009 and GPG-FM-012, will be used for guidance and direction in developing and managing project baselines.

3.17 Quality Assurance The goals of quality assurance (QA) are to provide confidence that: project development occurs in a controlled manner; components, systems and processes are designed, developed, constructed, tested, operated, and maintained according to engineering standards and technical specifications; and resulting technical data are valid and retrievable. QA begins during pre-conceptual activities and continues through project design, construction, commissioning, and closeout.

The LCAM QA guide (GPG-FM-107) provides supplemental guidance for a QA program in each phase of a project and provides tools for deciding how to implement the program. It also points out that a key to a successful QA program is the recognition and capture of lessons learned and the incorporation of those lessons into existing processes.

The impacts of poor quality in a radioactive waste environment can be especially catastrophic. Thus, the existing QA policies and procedures at Hanford are well developed and robust. They comply with CFR 830.120. These processes are being vigorously applied to the HTI Waste Retrieval Demonstration project. The LCAM QA guide will be used along with GPG-FM-005 to supplement the existing process in determining the quality requirements for the HTI Waste Retrieval Demonstration Program.

3.18 Reserved

3.19 Project Budget Process An understanding of the budget development process will help ensure the timely acquisition of capital assets. Effective project budgeting is necessary to ensure that a constant flow of funds is available for the project manager to complete the project within the allocated budget and schedule. A project manager's performance is measured to a great extent on how effectively he is able to accomplish this task.

This guide (GPG-FM-019) describes the process for providing inputs to the DOE budget request and obtaining federal budget funds for a capital funded program and briefly discusses the requirements for reporting on the progress and status of the project .

The federal budgeting requirements for the HTI project are determined at a higher level than the project. As a result, the budgeting information provided in this guide does not apply. However, management of budget and reporting of status are key responsibilities of the project manager. These tasks will be performed according to internal management policies and procedures.

3.20 Performance Measurement Performance measurement is the key to judging progress and objectively determining status of a project. Performance measures are those methods used to verify that performance objectives have been met when judged against performance criteria. Objectives are determined early in the project. By establishing criteria and measures at the same

time, all parties involved understand the measure for success. This not only eliminates surprises, it ensures fairness and objectivity in the evaluation process.

The performance measurement guide (GPG-FM-020) provides definitions of critical terms, and explains how to develop performance measures emphasizing fairness and "measurability". It discusses strengths and weaknesses of various methods and stresses the importance of measuring the "critical few vs. the insignificant many" objectives.

These issues are being addressed in the SOW and specification for the HTI Waste Retrieval Demonstration. This guide will be used to guide and temper this process.

3.21 Environmental Issues Environmental requirements, as is the case with all other critical mission requirements, need to be managed in a systemic way to ensure compliance throughout the life-cycle of the project. The project manager must be aware that the possibility of both organizational and individual liability, at both civil and criminal levels, exists for every aspect of project management and its interfaces with all regulatory compliance. It is essential that project managers maintain compliance with environmental regulations, using best management practices. Environmental compliance is required throughout the various phases of the project life cycle.

This guide (GPG-FM-021) stresses the need for the project manager to ensure that environmental management systems and engineering controls are established within his program organizational structure to address environmental issues. The intent of this guide is not to make an instant environmental expert of the project manager, but to emphasize that environmental compliance is critical to the successful completion of his project.

Many of the environmental requirements for the HTI Waste Retrieval Demonstration project are being handled at the HTI project level. However, the Waste Retrieval Demonstration project has considered the environmental issues involved and is incorporating requirements into the SOW and specification to address these issues. This guide will be used as a reference to ensure that all applicable issues are properly addressed and that the project complies with current policies and public law.

3.22 Public Participation The goal of a public participation plan is to align project interests with public interests so that project decisions reflect community concerns. To ensure the proper level of public participation, planning should begin early, during the project's conceptual phase, so that public participation can be integrated with the decision-making process throughout the project.

This guide (GPG-FM-022) explains how public participation works within a project. It includes an overview of the elements that should be part of a successful Public Participation Program, but it assumes the project manager will work closely with the public affairs staff. It also

explains how and why public involvement is important to the success of a project and describes different public participation tools the project manager, working with Public Affairs, may use.

Public participation efforts for the HTI Waste Retrieval Demonstration project are being handling at a higher project level. This requires that the HTI Waste Retrieval Demonstration project manager provide support and occasional briefings. To the degree applicable, this guide will be used to provide guidance in ensuring that the public is aware, has been informed, and is participating in discussions regarding the work associated with this project.

3.23 Safety Analysis Safety analyses are important to the prevention of safety problems which may occur later in a project. Safety analyses must consider not only the equipment, but the environment it will be used in. They should address not only normal operating conditions but also probable failure and off normal conditions. The results of a safety analysis must be incorporated into the project either by design or procedure. By addressing possible unsafe practices and conditions and correcting them before they are implemented, accidents can be avoided and lives can be saved.

To date, the safety analysis GPG (GPG-FM-023) has not been released.

As with any project, safety is of ultimate importance in the HTI Waste Retrieval Demonstration project. This includes worker health as well as public safety. The project has strongly grasped the need for safety and is requiring support from the contractor in the development of safety analyses and associated documentation. The existing safety processes and procedures at Hanford comply with DOE Order 5480.23. They are very thorough and well defined. The safety considerations of this project are being coordinated through the Hanford safety personnel to ensure all safety aspects of the project are identified and addressed.

3.24 Site Selection The site-selection process is conducted to identify possible sites for a proposed project and to compare their relative merits based on environmental protection, technical, safety and health protection, and life-cycle cost requirements. The outcome of the process is the documentation necessary to compare site alternatives, confirm site suitability, make recommendations, and ensure that the site selected meets requirements. Site-selection processes range from formal, processes for major projects like the Superconducting Super Collider, to semi-formal processes at smaller support facilities.

This Guide (GPG-FM-024) is based on experience in selecting sites for major tasks and reflects some of the difficulties and successes encountered during those efforts. The processes discussed in this Guide represent model and rationalized procedures from which good practices can be derived for lesser efforts.

The HTI Waste Retrieval Demonstration project has gone through the process of selecting a site for the project. The site selected is Tank 241-C-106. Because of possible delays in another project that is required to prepare the tank for the waste retrieval demonstration, this site may not be acceptable for the project. If this becomes an issue, the selection of another site will be required. The selection process will use this GPG for guidance in this process.

3.25 Pollution Prevention The goals of pollution prevention are to minimize raw material consumption, energy consumption, waste generation, health and safety risks, and ecological degradation over the entire life of a project. Although, traditionally, only the environmental impacts of facility operations have been evaluated and regulated, the aim is to identify and minimize environmental impacts on all aspects of the project.

This guide (GPG-FM-025) employs a combination of pollution prevention opportunity assessment methods and design for environment methods and philosophies. The process was primarily developed for existing products, processes, and facilities. Design-specific circumstances prohibit direct application to items that have not yet materialized, existing only on drawings, specifications, and design reports.

Although the guide is written to address facility construction projects, the HTI Waste Retrieval Demonstration project will use it (in conjunction with GPG-FM-021 and GPG-FM-023) for guidance in assuring that pollution prevention measures are incorporated into project planning and contract requirements. Of particular concern to this project is the minimization of waste material from the tank. To this end, the amount of water being added to mobilize the waste will be monitored for planning of future retrieval efforts.

3.26 Project Closeout Project closeout has traditionally been ignored during the planning and operating phases of a project. Only when it was time to perform the closeout was this phase ever addressed. With the increased emphasis on life-cycle management, planning for the closeout phase has become a more important consideration during the earlier phases of a project. In many cases, planning for closeout during concept and design development can drastically reduce the costs associated with closeout with little impact on the overall design costs.

This guide (GPG-FM-026) provides information about the project closeout phase, which includes project transition, physical closeout, and financial closeout. It also provides information about closeout as a result of project termination. Use of this guide can help the project manager ensure that these processes progress smoothly and that the project meets asset management and financial closure goals.

Although the HTI Waste Retrieval Demonstration project is a services contract, closeout issues such as decontamination, transportation, and disposal of the contractor's equipment are

being addressed. The guide will be used to help identify other closeout issues that may need to be included in the overall project.

3.27 Human Factors Engineering Human factors engineering (HFE) is the application of the knowledge of human capabilities and characteristics to the development of engineered equipment, facilities, and systems. By applying this knowledge, human performance, and therefore system performance, can be improved dramatically. Man/machine systems designed with the human as a key element are inherently safer and more reliable than those that are not. Over the years, more than a few accidents have been attributed to "human or operator error." What is typically not emphasized is that in many instances, causes of human error result from poorly designed human/equipment interfaces. It is the goal of HFE to ensure that the potential for this "design-induced" human error is minimized.

Accordingly, this guide (GPG-FM-027) describes a methodology for applying the principles and practices of HFE. This is necessary to ensure that equipment and facility designs support safe and effective human performance.

The HTI Waste Retrieval Demonstration project is addressing HFE issues and has incorporated them into the specification for the equipment. In conjunction with GPG-FM-023, this guide will be used to ensure that HFE requirements are identified and will meet the needs of the project.

3.28 Productivity Tools: Automated Models and Simulations In an environment of decreasing budgets and shortened schedules, productivity enhancement is essential. Advances in technologies affect many aspects of a project such as communications, engineering design, financial management, etc.

This LCAM Guide (GPG-FM-028) identifies and recommends productivity enhancement tools that can be used by technical and management project managers and organizations to improve the outcome of their performance throughout the life-cycle of a fixed asset. Such tools, take advantage of the compound leveraging effort provided by technology on abilities and resource savings. The objective is to provide systems oriented tools that result in cost effective, efficient, high value ways to acquire, operate and manage fixed assets.

The advantages of productivity tools are applicable even on a services contract. Communications methods such as video teleconferencing and electronic data transmission are two examples. This guide will be used as reference to identify other methods that may be employed on the HTI Waste Retrieval Demonstration project.

3.29 Disposal Analysis and Assessment Disposal analysis and assessment addresses procedures for determining appropriate methods for disposal of waste and obsolete products or facilities. The goal of this process is to minimize impacts to personnel and the environment.

Guide GPG-FM-029, Disposal Analysis and Assessment has not yet been published.

One of the purposes of the HTI Waste Retrieval Demonstration project is to provide additional information for waste retrieval activities. This information will be used as an input to the overall long term waste disposal strategies being developed for the Hanford facility.

3.30 Prioritization Prioritization of projects has become a very critical and valuable tool for project managers in allocating resources in a preferred order that is credible, consistent, auditable, and technically sound.

This guide (GPG-FM-030) provides information for consistently applying prioritization methodologies that allocate budget resources to the most important activities. It provides an overview of four widely used risk-based prioritization processes for determining the preferred order for allocating limited resources to solve problems. This prioritization process is written to address line items and major expense elements of the federal budget.

Because the HTI Waste Retrieval Demonstration is being funded out of expense funds, the tools discussed in this guide are not applicable. The prioritization of this project has been determined via an agreement between EM-30 and EM-50. Should there be a need to reassess this prioritization, it will be made using internal processes. This guide is will not be used for this project.

3.31 Maintenance Maintenance and repair of equipment and facilities is a major cost in their overall life-cycle. By designing to facilitate maintenance and to increase reliability thus minimizing the need for maintenance, this cost can be substantially reduced.

GPG-FM-031 describes maintenance approaches and strategies.

For a services contract such as the HTI Waste Retrieval Demonstration project, maintenance is not directly applicable. However, since the contractor's equipment will be deployed at the Hanford Site, maintenance methods and procedures will be reviewed and approved prior to installation at the site. The principles identified in this guide will be used as a guide in conjunction with GPG-FM-004 to evaluate the proposed maintenance concept.

3.32 Life-Cycle Cost Life-cycle cost (LCC) equals acquisition costs plus ownership costs (ownership includes operating, maintenance, and support of an asset throughout its life and

through disposition), less revenues. LCC estimates should be included in the cost and funding information presented for a proposed project. These estimates are used to justify the project.

This guide (GPG-FM-032) is intended to clarify and supplement the standard methods used to estimate LCCs. It is intended to assist in accomplishing the goals and requirements of DOE O 430.1, Life-Cycle Asset Management.

LCC is not applicable to a services contract such as the HTI Waste Retrieval Demonstration project.

3.33 Comprehensive Land Use Planning The comprehensive land use planning process came about in response to concerns raised by senior management concerning the short and long-term uses and management of DOE land and facilities.

This guide (GPG-FM-033) is intended to assist in implementing a comprehensive land-use planning process. After briefly describing the policy, history, and importance of effective land use planning in sections 2- 3, the Guide delineates the major steps that should be taken as part of the comprehensive planning process in section 4. This section also discusses some of the major processes and issues that should be considered to develop a planning approach suited to individual site needs. In section 5, the Guide describes DOE headquarters' expectations for the comprehensive land use planning process.

The HTI Waste Retrieval Demonstration project does not affect the use of land. Therefore, this process and the associated guide (GPG-FM-033) do not apply.

Table 1

No.	Title	Applicability
1	Project Management Overview	Para. 3.2, 3.3
2	Critical Decision Criteria	Para. 2.3, 2.4, 2.5, 8
3	Engineering Tradeoff Studies	All
4	Reliability, Maintainability, Availability Planning	N/A
5	Test and Evaluation	All
6	Performance Analysis and Reporting	Guidance
7	Risk Analysis and Management	All
8	Work Scope Planning	Guidance
9	Baseline Change Control	Guidance
10	Project Execution and Engineering Management Planning	All
11	Value Engineering	Not available
12	Configuration and Data Management	Guidance
13	Interface Management	Not available
14	Program/Project Relationships	N/A
15	Project Reviews	Guidance
16	Baseline Development	Guidance
17	Quality Assurance	Guidance
18	Reserved	Not available
19	Project Budget Process	N/A
20	Performance Measurement	All
21	Environmental Interfaces	All
22	Public Participation	Guidance
23	Safety Analysis	Not available
24	Site Selection	Guidance
25	Pollution Prevention	Guidance
26	Project Closeout	Guidance
27	Human Factors Engineering	All
28	Productivity Tools: Automated Models and Simulations	Guidance
29	Disposal Analysis and Assessment	Not available
30	Prioritization	N/A
31	Maintenance	Guidance

32	Life-Cycle Cost	N/A
33	Comprehensive Land Use Planning	N/A

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