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Implementation Plan for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee

June 1995

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Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

Implementation Plan for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory Under the Federal Facility Agreement, Oak Ridge, Tennessee

June 1995

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Prepared by
Waste Management and Remedial Action Division
Oak Ridge National Laboratory
Oak Ridge, Tennessee

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Oak Ridge National Laboratory
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ABBREVIATIONS

ADS	activity data sheet
BSR	Bulk Shielding Reactor
CAT	collection and transfer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CWCH	central waste collection header
DOE	U.S. Department of Energy
DOE-OR	DOE Oak Ridge Field Office
EPA	U.S. Environmental Protection Agency
ER	environmental restoration program
ES&H	environmental, safety, and health
FFA	Federal Facility Agreement
GAAT	gunite and associated tanks operable unit
GPP	general plant project
HEPA	high efficiency particulate air filter
HFIR	High Flux Isotopes Reactor
HRE	Homogeneous Reactor Experiment
HRLAL	High-Radiation-Level Analytical Laboratory
LIP	line-item project
LLLW	liquid low-level radioactive waste
MCS	monitoring and control station (LLLW)
MVST	Melton Valley Storage Tanks
NHF	New Hydrofracture Facility
OHF	Old Hydrofracture Facility
ORNL	Oak Ridge National Laboratory
ORR	Oak Ridge Research Reactor
OU	operable unit
PWTP	Process Waste Treatment Plant
R&D	research and development
RCRA	Resource Conservation and Recovery Act
REDC	Radiochemical Engineering Development Center
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPPP	Radiochemical Processing Pilot Plant
RQ	reportable quantities
SIA	structural integrity assessment
TBD	to be determined
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranic
TWRF	Transported Waste Receiving Facility
WAG	waste area grouping
WMRAD	Waste Management and Remedial Action Division
WOCC	Waste Operations Control Center

GLOSSARY

Category A. A new or replacement tank system with secondary containment.

Category B. A tank system with secondary containment that existed on the date the FFA became effective.

Category C. An existing tank system without secondary containment.

Category D. A tank system that has been removed from service.

Hot cell. An enclosure and its associated ancillary equipment that provides shielding, containment, and remote handling capabilities for work involving radioactive sources and materials. Ancillary equipment includes radioactive off-gas filtration and drains to the LLLW system.

LLLW tank. A stationary device, designed to contain an accumulation of LLLW. It is constructed primarily of nonearthen materials (e.g., concrete or steel) to provide structural support and containment. This tank will function as a waste storage or neutralization tank. This definition does not include tanks in which processing other than neutralization occurs or in which the entire tank contents may be recycled to a process.

Leaking. The measured passage of a hazardous liquid through the primary or secondary containment structure at a rate greater than or equal to the criteria established in the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System (ORNL/ER/Sub/92-SK263/1)*.

Raffinate. The part of a liquid remaining after its more soluble components have been extracted by a solvent.

Secondary containment tank system. For the purpose of the FFA, tank systems will be categorized as secondarily contained if the capability exists to contain regulated substances released from the primary tank system until such wastes are detected and removed. Some ORNL LLLW tank systems may require modification of ancillary equipment and the upgrade of secondary containment to meet FFA requirements.

Tank system. A waste storage or waste treatment tank and its associated ancillary equipment and containment system. In the ORNL LLLW system, ancillary equipment includes sumps, piping, and valves to the waste tank(s) and piping and valves from the waste tank(s).

EXECUTIVE SUMMARY

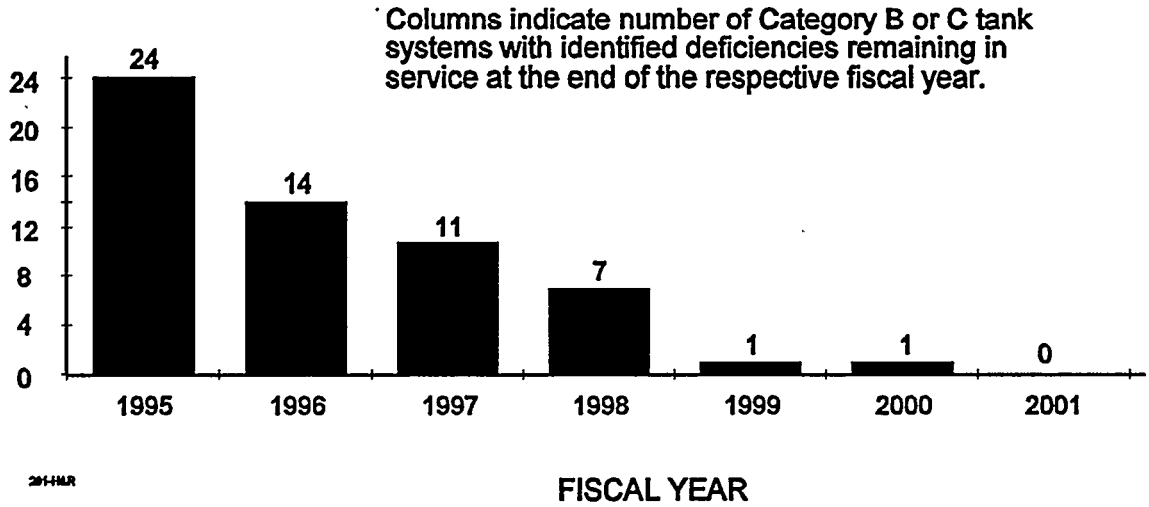
This document is an annual revision of the plans and schedules for implementing the Federal Facility Agreement (FFA) compliance program, originally submitted in ES/ER-17&D1, *Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste tanks Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*.

This document summarizes the progress that has been made to date in implementing the plans and schedules for meeting the FFA commitments for the Liquid Low-Level Waste (LLLW) System at Oak Ridge National Laboratory (ORNL). Information presented in this document provides a comprehensive summary to facilitate understanding of the FFA compliance program for LLLW tank systems and to present plans and schedules associated with remediation, through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process, of LLLW tank systems that have been removed from service.

ORNL has a comprehensive program underway to upgrade the LLLW system as necessary to meet the FFA requirements. The tank systems that are removed from service are being investigated and remediated through the CERCLA process. Waste and risk characterizations have been submitted. Additional data will be prepared and submitted to EPA/TDEC as tanks are taken out of service and as required by the remedial investigation/feasibility study (RI/FS) process.

Chapter 1 provides general background information and philosophies that lead to the plans and schedules that appear in Chaps. 2 through 5. The following figure illustrates the schedule for removing from service or upgrading LLLW tank systems that have identified deficiencies.

SCHEDULE FOR REMOVING FROM SERVICE OR UPGRADING LLLW TANK SYSTEMS



Prior to the FFA effective date, 52 singly contained tanks were removed from service. Implementation activities from 1992 through June 1995 are discussed in this document. Milestones achieved since the FFA became effective include submittal to EPA/TDEC of the following:

- a schedule for conducting secondary containment design demonstrations for doubly contained tank systems (ORO-91-331-001);
- a schedule for removing singly contained tanks from service (ORO-91-331-002);
- a schedule for periodic review and revision of the structural integrity assessments of singly contained tanks that temporarily remain in service (ORO-91-331-003);
- a schedule for evaluating the structural integrity assessments of singly contained tanks that temporarily remain in service (ORO-91-331-004);
- a schedule for providing waste characterization information for tank systems that are removed from service (ORO-91-331-005);
- a schedule for providing risk characterization information for tank systems that are removed from service (ORO-91-331-006);
- a plan for characterizing the risk for tank systems that are removed from service;
- the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System* (Active Tanks), ORNL/ER/Sub/92-SK263/1;
- the *Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1159&D1 (supersedes ES/ER-80);
- the *Risk Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1168&D1;
- the *Design Demonstrations Category-B Tank Systems*, DOE/OR/1047&D1;
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory*, LLLW Active Tanks DOE/OR/01-1129&D1;
- the *Design Demonstration for the Remaining 19 Category B Tank Systems*, DOE/OR/03-1150&D1;
- the *Remediation Schedule for Inactive Liquid Low-Level Waste Storage Tanks at ORNL*, DOE/OR/01-1138&D1;
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D1, September 1993;
- the *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory*, Oak Ridge, Tennessee, DOE/OR/03-1195&D1, February 1993;

- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory*, DOE/OR/03-1258&D1, Enserch Environmental Corp., May 1994;
- the *Annual Status Report on Federal Facility Agreement Compliance for the Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1291&D1, September 1994;
- the *Gunite and Associated Tanks Treatability Study Work Plan*, DOE/OR/02-1300&D1, September 1994;
- the *Remedial Investigation/Baseline Risk Assessment for the Gunite and Associated Tanks Operable Unit at WAG 1 at ORNL*, DOE/OR/02-1275&D1, June 1994;

Other submittals to EPA/TDEC include the following:

- the Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL, DOE/OR/03109D1, January 1994;
- the Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL, DOE/OR/031097D2, June 1994;
- the *Risk Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, DOE/OR/01-1168&D2,
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D2, August 1994;
- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D1, October 1994;
- the *Remedial Investigation/Baseline Risk Assessment for the Gunite and Associated Tanks Operable Unit at WAG 1 at ORNL*, DOE/OR/02-1275&D2, October 1994;
- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1258&D2, October 1994;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D1, October 1994;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D1, October 1994;
- the *Risk Evaluation of Embedded, Single-Walled Liquid Low-Level Waste Piping at ORNL*, DOE/OR/01-1314&D1, October 1994;

- the *Design Demonstrations Category-B Tank Systems at ORNL*, DOE/OR/1047&D2, November 1994;
- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D2, November 1994;
- the *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory, LLLW Active Tanks*, DOE/OR/01-1129&D2, December 1994;
- the *Design Demonstration for the Remaining 19 Category B Tank Systems*, DOE/OR/03-1150&D2, December 1994;
- the *Leak Testing Plan for the Oak Ridge National Laboratory Liquid Low-Level Waste System (Active Tanks)*, ORNL/ER/Sub/92-SK263/1 (Revision 2), December 1994;
- the *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1195&D2, January 1995;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D2, January 1995; and
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D2, January 1995.

In addition to the submittal of these documents, the following actions have been accomplished:

- installed two new LLLW tanks serving Building 2026 and the transported waste receiving facility;
- reclassified tank LA-104 from Category B to Category D;
- initiated leak testing for all active, singly contained tanks and piping;
- eliminated two sources of nonprogrammatic inflow into tank WC-10;
- completed an ORNL-wide survey to identify inputs to the LLLW system that could be isolated or diverted to the process waste system;
- initiated projects to eliminate inputs to the LLLW system from the cell ventilation system and the hot off-gas system, specifically, isolated the drains from the cell ventilation ducts and fans at the 3039 central off-gas stack, and the off-gas condensate pots in the isotopes area;
- installed double wall pipe to bypass a leaking flange on the tank W-12 discharge line and submitted a request to use W-12 for decontamination of hot cells in Building 3525;

- repaired leaking discharge line on tank WC-10;
- installed double walled pipe to bypass leaking pump in WC-9 pump pit;
- enclosed filter pit at the Radiochemical Engineering Development Center (REDC);
- replaced 11 valves in Bldg. 2533, valve pit 3026, and tank systems WC-3, WC-7, WC-9, WC-19, W-16, and L-11 to support pipeline leak testing;
- repaired valves in valve boxes VB-1 and VB-2 and modified piping in valve pit 3026 to support pipeline leak testing;
- repaired steam supply valve in LA-104 pit;
- repaired steam ejector piping in WC-19 pit, and
- replaced S-223 discharge pipe valve to support pipeline leak testing.

The tank systems at ORNL to which the FFA applies are listed in Fig. 1.2 of this report and in Appendix F of the FFA. Periodic changes occur in tank categories as tank systems are tested, upgraded, or removed from service or for other reasons as agreed upon by the FFA signatories. Because of the time required to revise the FFA or this report, the lists in these documents may not reflect the latest approved status of some tanks. Any approved change in tank status that deviates from that shown in FFA Appendix F or this report will be supported by documentation on file in the Environmental Restoration Document Control Center and the Waste Management and Remedial Action Division Document Management Center. The FFA requirements applicable to each tank system are those for the latest approved category of that system.

1. BACKGROUND

1.1 INTRODUCTION

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 the Department of Energy Oak Ridge Operations Office (DOE-ORO), the U.S. Environmental Protection Agency (EPA)–Region IV, and the Tennessee Department of Environment and Conservation (TDEC). The effective date of the FFA was January 1, 1992. Section IX and Appendix F of the agreement impose design and operating requirements on the Oak Ridge National Laboratory (ORNL) liquid low-level radioactive waste (LLLW) tank systems and identify several plans, schedules, and assessments that must be submitted to EPA/TDEC for review or approval. The issue of ES/ER-17&D1, *Federal Facility Agreement Plans and Schedules for Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* in March 1992 transmitted to EPA/TDEC those plans and schedules that were required within 60 to 90 days of the FFA effective date. This document updates the plans, schedules, and strategy for achieving compliance with the FFA as presented in ES/ER-17&D1 and summarizes the progress that has been made to date. This document supersedes all updates of ES/ER-17&D1.

Chapter 1 describes the history and operation of the ORNL LLLW System and the objectives of the FFA. Chaps. 2 through 5 contain the updated plans and schedules for meeting FFA requirements. This document will continue to be periodically reassessed and refined to reflect newly developed information and progress.

1.2 LLLW SYSTEM BACKGROUND

ORNL is a multidisciplinary research facility that began operation in 1943 as part of the Manhattan Project. The original mission of the laboratory was to develop a prototype graphite reactor and reprocess the reactor fuel for plutonium recovery. Subsequent to World War II, the primary functions of ORNL were fuel reprocessing research; radioisotopes production and applications development; and development, testing, and operation of nuclear reactor concepts. More recently, the laboratory has increased its role in biological, environmental, energy, and materials research. As a consequence of these multidisciplinary research activities, heterogeneous wastes, including solid and liquid radioactive, hazardous, and mixed wastes, have been generated in varying amounts over time.

Since its establishment, ORNL has operated numerous facilities that generate LLLW. LLLW originates from radioactive liquid discarded into sinks and drains in research and development (R&D) laboratories and from facilities such as the Radiochemical Processing Pilot Plant (RPPP, Bldg. 3019), nuclear reactors, radioisotope production facilities, and the Process Waste Treatment Plant (PWTP).

The LLLW system is a complex system with multiple facilities, users, and operators. The system is used for collection, neutralization, transfer, and concentration of aqueous radioactive waste solutions from generator facilities, followed by storage of the LLLW concentrate. Figure 1.1 is a block flow diagram depicting the movement of waste through the system. Waste solutions are typically accumulated at source buildings, often in collection tanks located inside the buildings, and discharged to below-grade collection tanks that receive wastes from several different source buildings. However, in many instances, LLLW is transferred from laboratory and

hot-cell drains directly to underground collection tanks or to the central waste collection header (CWCH) through unvalved piping.

A network of below-grade piping interconnects the various system components. Because their initial pH may be low, LLLW solutions often must be neutralized with sodium hydroxide (NaOH). The solutions are periodically transferred via the CWCH to the LLLW evaporator service tanks. From there, the solutions are sent to the LLLW evaporator facility where they are concentrated by a factor of approximately 30:1. The evaporator concentrate is then transferred via pipeline to the Melton Valley Storage Tanks (MVST). LLLW collection tanks are equipped with liquid-level instrumentation with high-level and low-level alarms to alert the Waste Operations Control Center (WOCC) of unusual conditions. The tanks are vented to the atmosphere through a central off-gas collection and filtration system operating at a negative pressure or through an individual tank filter system.

Most of the LLLW system was installed more than 30 years ago. The initial system and its subsequent modifications were designed to minimize radiation exposure to LLLW system users and operators. The system includes features such as unvalved, gravity-drained transfer lines to prevent waste backup into generator areas; shielded lines and tanks; and provisions for remote operations to minimize personnel exposure. As-built drawings for some of the older tank systems do not exist. Over the years, tank systems were abandoned as their integrity was breached or as programs were terminated. Some of the tanks were abandoned in place with liquid wastes and sludge left in them. As new tank systems were installed during the past 10 to 15 years, secondary containment and improved leak detection features were provided. The LLLW system is a mix of singly and doubly contained tank systems. The portions of the system that have been removed from service consist almost exclusively of tanks without secondary containment.

1.3 FFA OBJECTIVES

The objectives of the FFA are to ensure (1) that active tank systems slated to remain in service comply with the design and containment requirements specified in FFA Appendix, Subsects. B and C; (2) that singly contained tank systems operated in the interim do not leak; and (3) that tank systems that are removed from service are evaluated and remediated through the CERCLA process. A breakdown of the LLLW tank systems by FFA category is provided in Fig. 1.2. Figures 1.3 and 1.4 are maps showing the relative locations of LLLW tanks under the FFA in Bethel Valley and Melton Valley, respectively.

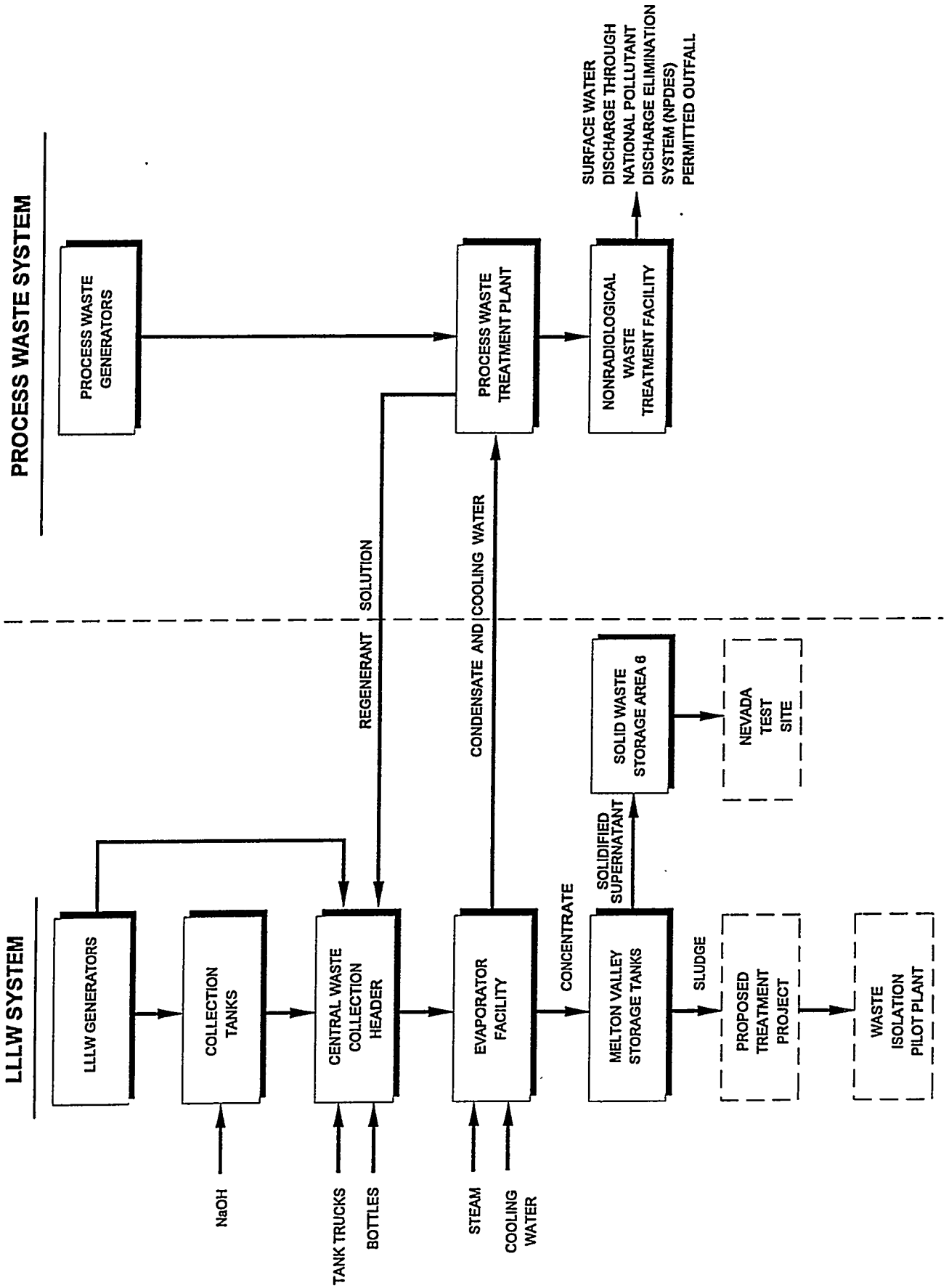


Fig. 1.1. Block flow diagram for the ORNL LLLW system.

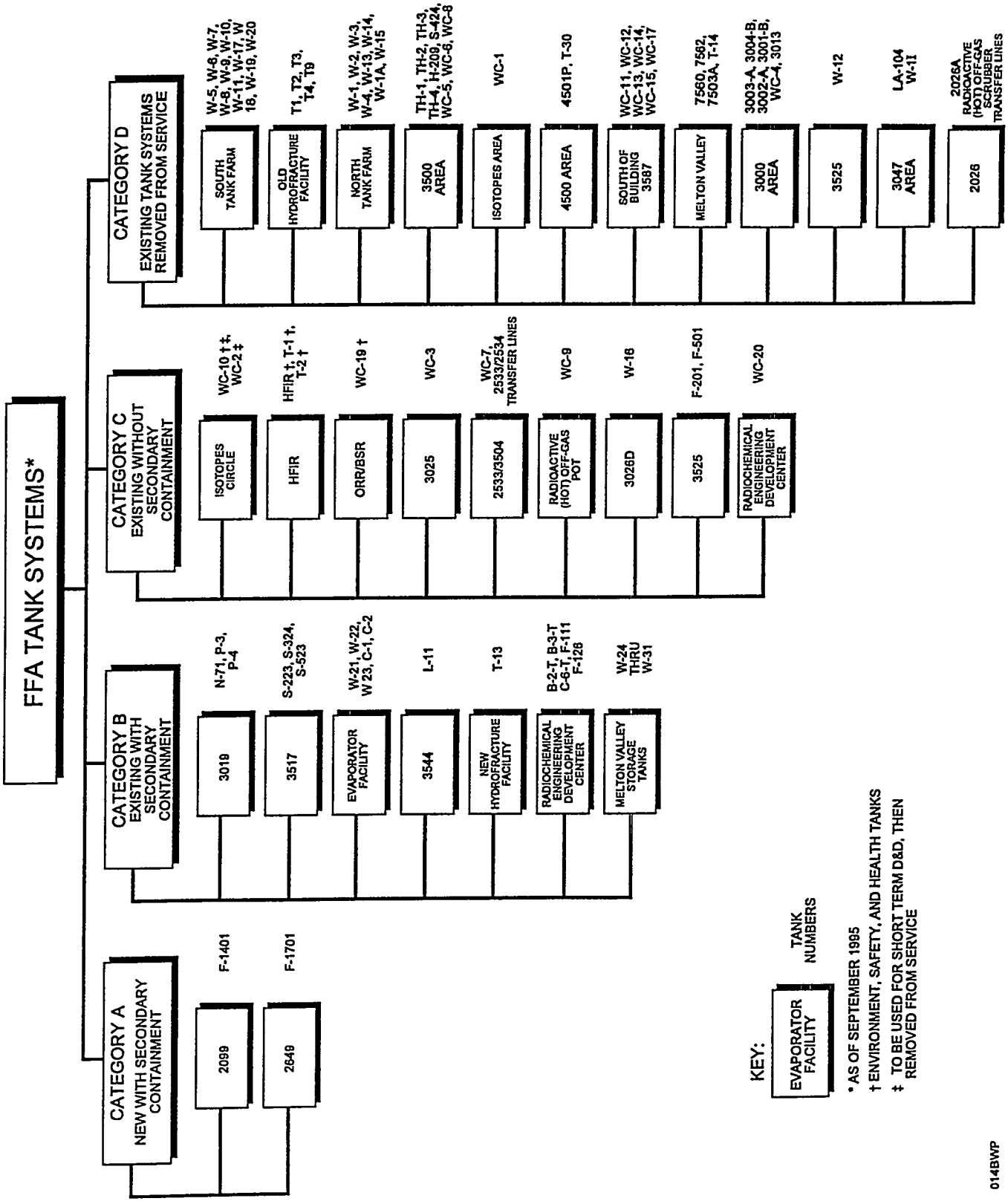


Fig. 1.2. ORNL LLLW tank systems by FFA category.

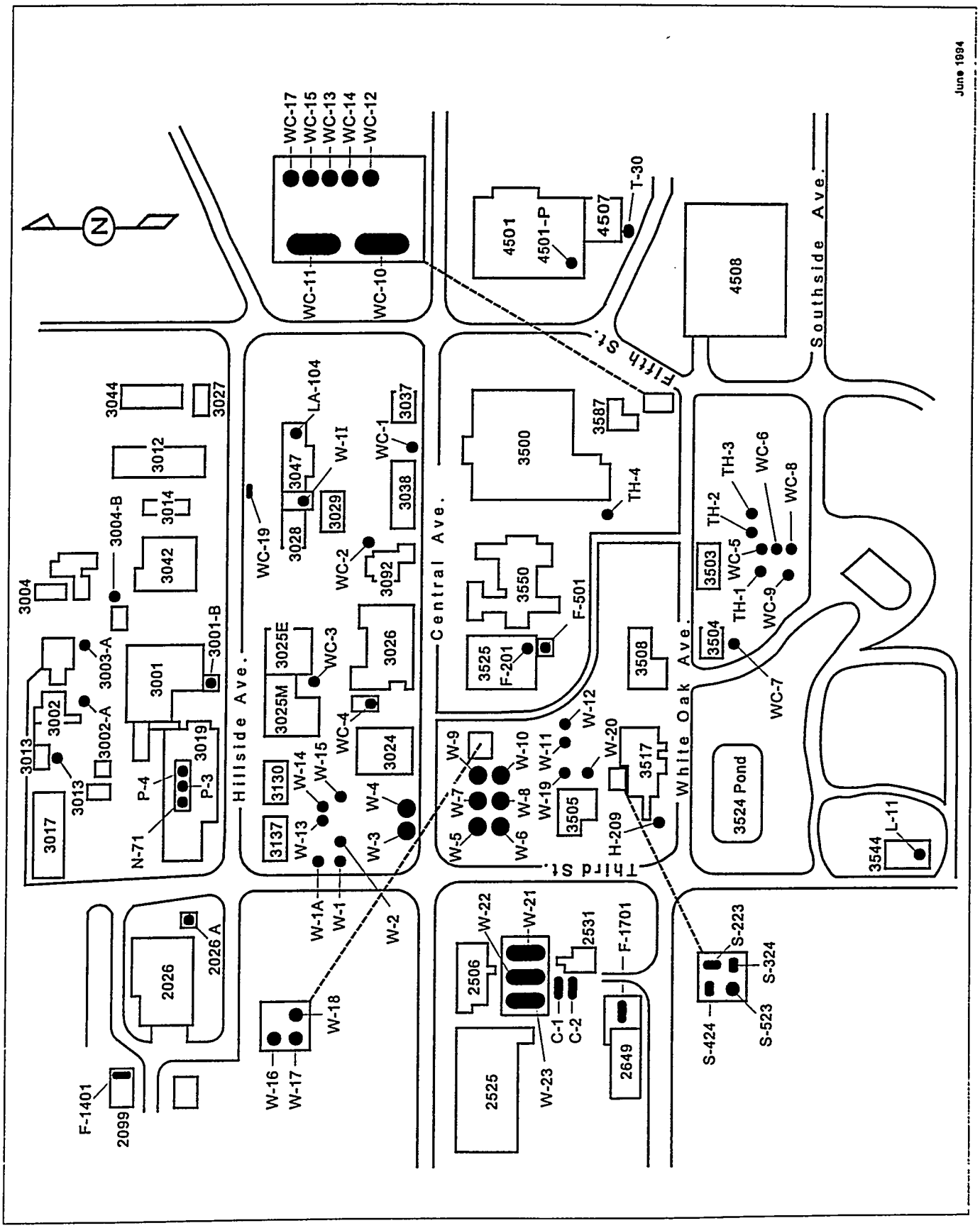


Fig. 1.3. Bethel Valley LLLW tank systems.

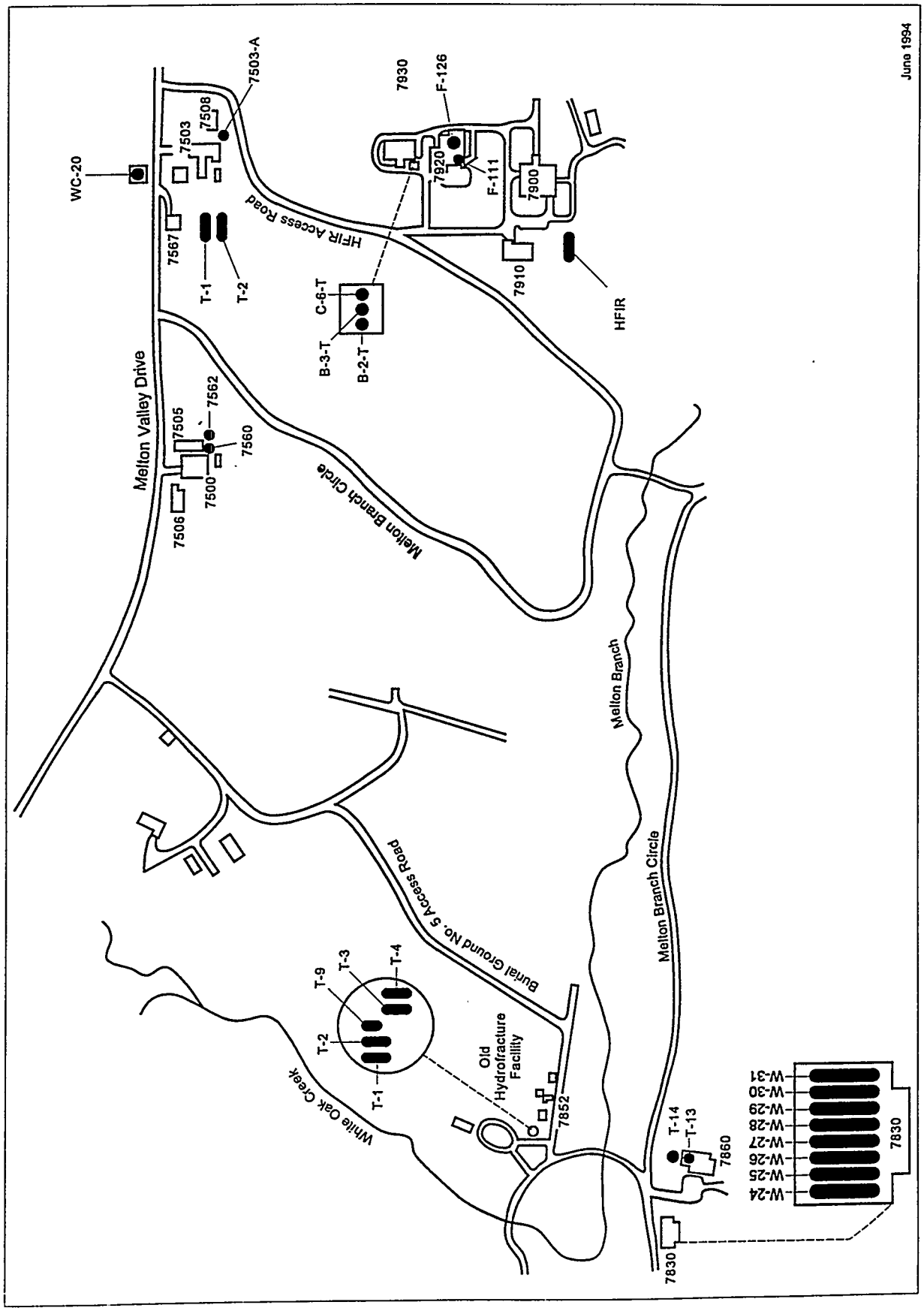


Fig. 1.4. Melton Valley LLLW tank systems.

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2. CATEGORY A TANK SYSTEMS

2.1 FFA DELIVERABLE

The FFA requires DOE to prepare design assessments demonstrating that new or replacement tank systems meet the standards for design, containment, and release detection specified in FFA Appendix F, Sects. B and C. This chapter contains the schedules by which these assessments are being conducted and indicates the dates for submittal of information to EPA/TDEC. Design assessments will be submitted to EPA and TDEC for approval at least 90 days prior to start of construction. An installation assessment will be performed at the end of the project to document changes to the system, and the installation assessment will be kept on file.

2.2 STATUS

Design assessments are being prepared for projects that install, upgrade, and/or replace deficient LLLW systems at ORNL. The following design assessments have been submitted to and approved by EPA/TDEC:

- the *Design Assessment for FFA Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at ORNL*, DOE/OR/03-1097&D2, June 1994;
- the *Design Assessment for Melton Valley Liquid Low-Level Waste Collection and Transfer System at Oak Ridge National Laboratory*, DOE/OR/03-1258&D2, October 1994;
- the *Design/Installation and Structural Integrity Assessment Under the Federal Facility Agreement for Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2026 (High Radiation Level Analytical Laboratory) and Building 2099 (Monitoring and Control Station) at Oak Ridge National Laboratory*, DOE/OR/01-1311&D2, November 1994;
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 2649 (Transported Waste Receiving Facility) at ORNL*, DOE/OR/01-1312&D2, January 1995; and
- the *Design/Installation and Structural Integrity Assessment of Bethel Valley Low-Level Waste Collection and Transfer System Upgrade for Building 3092 (Central Off-Gas Scrubber Facility) at ORNL*, DOE/OR/01-1313&D2, January 1995.

Future design assessments will be submitted at least 90 days prior to the start of project construction. The schedule for installing category A systems is shown in Table 2.1.

Table 2.1. Projects that will install Category A tank systems

Year of funding (FY)	Projected completion date (FY)	Project title	Project scope	Tank system	Type of funding
1992	1996	Melton Valley LLLW-CAT System Upgrade	Deletes, replaces or upgrades tank systems for REDC and HFIR	Installs MCS with local collection tank	line-item project
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1988	1997	Bethel Valley LLW-CAT System Upgrade Phase II	Deletes, replaces or upgrades LLW-CAT systems for Bldgs. 3092, and 3525	Installs replacement transfer piping	line-item project
1994	1998	Bethel Valley FFA Upgrades	Deletes, replaces or upgrades tank systems for Bldg. 3503, 3025 and 2533.	Installs replacement transfer piping	line-item project
1994	1998	Melton Valley Storage Tank Capacity Increase	Provides additional storage capacity for LLLW concentrates	Installs additional concentrate storage tanks	line-item project

Note: Based on FY [illegible] Activity Data Sheets (ADS), target funding levels.

3. CATEGORY B TANK SYSTEMS

3.1 FFA DELIVERABLE

The FFA requires DOE to demonstrate that the secondary containments for Category B tank systems meet the design and operating conditions specified in FFA Appendix F, Sect. C.

3.2 STATUS

Design demonstrations have been submitted for all Category B tanks[1,2] and pipelines.[3] The objective of each assessment is to demonstrate that the design of the secondary containment system meets the requirements of the FFA, Appendix F, Sect. C. Fourteen tank systems (C-1, C-2, T-13, W-21, W-22, W-23, W-24, W-25, W-26, W-27, W-28, W-29, W-30, and W-31) meet the requirements of the FFA. Twelve Tank Systems (N-71, P-3, P-4, L-11, B-2-T, B-3-T, C-6-T, F-111, F-126, S-223, S-324, and S-523) have minor deficiencies in the tank secondary containment design for which there are one or more mitigating design features. Some of the piping associated these tank systems is singly contained, notably, buried transfer piping connecting the tanks to the central waste collection system. Projects planned or initiated to correct these noted deficiencies are summarized in Table 3.1; the schedule for these upgrades is shown in Table 3.2. Until the projects correcting these pipeline deficiencies are completed, the pipelines will be periodically leak tested.[4]

Additionally, four tank systems originally considered as Category B (WC-20, F-201, F-501, and LA-104) do not fully meet the secondary containment requirements and will not be upgraded. Three of these systems (WC-20, F-201, and F-501) have been transferred to Category C and will be subject to the FFA requirements for Category C tank systems until they are removed from service. Tank system LA-104 has been transferred to Category D.

Table 3.1. Projects for upgrading/replacing Category B LLLW tank systems

Year of funding (FY)	Projected completion date (FY)	Project title	Project scope	Tank system	Type of funding
1994	1997	NHF Cell Plugs Enclosures	Eliminates nonprogrammatic waste generation at 7830 and 7860	T-13	GPP
1994	1995	Incinerator Drive/OHF Valve Box Upgrade	Upgrades valve boxes to meet FFA requirements	Melton Valley Facilities	GPP
1992	1995	FFA Compliance Work, Bldg. 3019A	Doubly contains discharge piping for 3019	N-71, P-3, P-4	GPP
1995	1996	W-6 Valve Box Upgrade	Upgrades valve box to meet FFA requirements		GPP
1995	1996	East Evaporator Valve Pit Upgrade	Upgrades valve pit to meet FFA requirements		GPP
1996	2000	ORNL Process Waste Treatment Facility	Eliminates generation of LLLW by process waste treatment operations	L-11	line-item project
1992	1996	Melton Valley LLLW-CAT System Upgrade	Deletes, replaces or upgrades tank systems for REDC and HFIR	B-2-T, B-3-T, C-6-T F-111, F-126, WC-20[a] HFIR[a] T-1[a] T-2[a]	line-item project
1995	1995	Bldg. 3517 LLLW Upgrade	Installs valve inside bldg. to allow leak testing of discharge line	S-223 S-523 S-324	Expense

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding levels.
[a]Category C tanks that are included in the line-item project. These tanks will be removed from service within 1 year after project completion.

Table 3.2. Schedule for upgrade or removal from service of Category B tank systems

Fiscal year	Tank systems upgraded	Tank systems removed from service
1995	P-3, P-4, N-71	
1996	B-2-T, B-3-T, C-6-T, F-111, F-126	
1999		S-223, S-523, S-324
2001		L-11

REFERENCES FOR CHAPTER 3

1. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-1047&D2, Foster Wheeler, Oak Ridge, Tennessee, November 1994.

2. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1150&D2, Foster Wheeler, Oak Ridge, Tennessee, December 1994.

3. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1195&D2, Foster Wheeler, Oak Ridge, Tennessee, January 1995.

4. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D2, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, August 1994.

4. CATEGORY C TANK SYSTEMS

4.1 BACKGROUND

The FFA allows tank systems that do not meet secondary containment standards to remain in service until the system can be upgraded or replaced, as long as the tank systems are not leaking and no adverse change occurs in the tank systems' baseline structural integrity data. If a tank system leaks, all programmatic inputs will be stopped, provided that complete shutdown of the tank system would not pose unacceptable environmental, safety, or health risk (e.g., reactor cooling-water treatment systems). Such systems will be repaired or replaced as soon as practicable.

4.2 FFA DELIVERABLE

4.2.1 Removal from Service

The FFA requires DOE to remove from service any tanks that do not meet the secondary containment standards in FFA Appendix F, Subsect. C. The plan and schedule for removing Category C tank systems from service is shown in Table 4.1.

4.2.1.1 Status

General plant projects (GPPs) and line-item projects are being planned and implemented to upgrade or replace the LLLW tank systems that do not meet secondary containment and leak detection standards (Category C). Ongoing treatment projects associated with singly contained LLLW tank systems are listed in Table 4.2. The schedule for capital projects for FFA early actions for singly contained LLLW tank systems is shown in Table 4.3.

The schedules presented in this section will continue to be subject to annual renegotiation to adjust for updated information based on duration of activities or for changes in priorities and funding.

4.2.2 Structural Integrity Assessment

The FFA requires DOE to provide information concerning the structural integrity of tank systems not meeting the secondary containment standards (Category C).

4.2.2.1 Status

The information to be submitted will follow the requirements of FFA Appendix F, Subsect. A., titled "Standards for Integrity Assessment for Tank System(s)." The structural integrity assessments (SIAs) will include tank system design data, generic descriptions of the hazardous or radioactive contents, a description of the system's corrosion protection measures, the age of the tank system, and the results of leak tests on the tank system.

Table 4.1. Projects for removing Category C tank systems from service

Tank location	Tank system	Project title	Project scope	Funding (FY and type)	Projected completion date (FY)	Removal from service date (FY)
Isotopes Circle Facilities	WC-10	Isotope Facility Deactivation	Removes WC-10 from service	Expense	1998	1998
	WC-2	Isotope Facility Deactivation	Removes WC-2 from service	Expense	1998	1996
HFIR	HFIR T-1 T-2 WC-20	Melton Valley LLLW-CAT System Upgrade	Provides an ion exchange treatment system to convert LLLW to solid waste and installs an MCS to eliminate the need for the tanks	FY 92-LIP	1996	1997
BSR/ORR	WC-19	BSR/ORR LLLW Upgrade	Diverts waste from LLLW system to process waste.	FY 92-GPP	1995	1996
3025	WC-3	Bethel Valley FFA Upgrades	Replaces WC-3	FY 94-LIP	1998	1999
	WC-7	Bethel Valley FFA Upgrades	Doubly contains LLLW piping for 2533/2534 transfer line	FY94-LIP	1998 (piping)	1999
Radioactive (hot) Off-gas	WC-9	Bethel Valley FFA Upgrades	Replaces need for WC-9 Tank System	FY 94-LIP	1998	1999
2026	2026A	Bethel Valley LLLW-CAT System Upgrades	Upgrades High Rad Level Analytical Lab (Bldg. 2026) LLW-CAT system	FY 88-LIP	1995	1995
3026D	W-16	Isotope Facilities Shutdown	Removes W-16 from service	Expense	1998	1998
3525	F-201 F-501	Bethel Valley LLLW-Cat System Upgrades	Upgrades High Rad Level Examination Lab (Bldg. 3525) LLW-CAT system	FY 88-LIP	1997	1998

Table 4.2. Treatment projects for newly generated LLLW

Funding year	Title	Scope	Locations of interim upgrades[a]
1990	4501 Source Treatment	Installs source treatment to reduce radioactivity of LLLW to meet bottling requirements	4501
1990-94	HFIR Source Treatment	Installs source treatment to reduce volume and radioactivity of LLLW	HFIR
1990-94	REDC Source Treatment	Installs source treatment to reduce volume of LLLW; installs temporary trucking station	REDC
1992-93	3517 Source Treatment	Upgrades filter pit sump to reduce nonprogrammatic waste inputs	3517
1993-94	3025 Source Treatment	Installs source treatment to remove ^{60}Co to allow trucking	3025
1994	Pretreatment REDC LLLW-GPP	Provides capability to remove TRU constituents from process materials before discharge to LLLW system	REDC

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding level.
[a]See Fig. 1.2 for LLLW tank systems associated with a given facility.

Table 4.3. Capital projects for FFA early actions for singly contained LLLW tank systems

Funding year	Completion year	Title	Scope	Tank locations[a]
1992	1995	BSR/ORR LLLW Upgrade	Diverts waste from LLLW system to process waste	ORR/BSR
1993	1995	3108 Filter Pit Enclosure	Encloses filter pit 3108 that serves Building 3019	3019
1996	1998	1 GPP to be defined	Eliminates nonprogrammatic waste generation or upgrades appropriate collection/transport system	
1997	1999	1 GPP to be defined	Eliminates nonprogrammatic waste generation or upgrades appropriate collection/transport system	
1998	2001	1 GPP to be defined	Eliminates nonprogrammatic waste generation or upgrades appropriate collection/transport system	

Note: Based on FY 1997 Activity Data Sheets (ADS), target funding levels.
[a]See Fig. 1.2 for LLLW tanks associated with a given facility.

The structural integrity assessments for the tank systems not meeting secondary containment standards will be submitted to EPA/TDEC by the end of Fiscal Year 1995. The results of periodic reviews of the SIAs will be submitted to EPA/TDEC. They will consist of the results of leak tests and notice of any change in the baseline design data provided in the SIA.

The schedules presented in this section will be subject to annual renegotiation to adjust for updated information based on duration of activities or for changes in priorities and funding.

4.2.3 Leak Detection Tests

The FFA requires DOE to provide the schedule for periodic review and revision of the SIAs and to provide leak detection test results for Category C tank systems. Leak detection tests are being performed in support of the SIAs.

4.2.3.1 Status

All Category C tank systems except WC-20 and F-201 are being leak tested. Leak testing of the WC-20 tank system will be initiated by the end of Fiscal Year 1995. Tank System F-201 is not in use and will therefore not be leak tested. The Category B tanks that demonstrated secondary containment in accordance with FFA requirements have been removed from the Leak Testing Program. The pipelines for several Category B Tank Systems were included in the Leak Testing Program on the basis of results from the Secondary Containment Design Demonstration documents.[3,4,5] The test schedule for tanks is contained in the detailed leak detection test plan and schedule for active tanks.[1] The test schedule for pipelines is contained in the detailed leak detection test plan and schedule for active pipelines.[2]

REFERENCES FOR CHAPTER 4

1. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Tanks*, DOE/OR/01-1129&D1 ORNL/ER/Sub/92-SK263/2&D1 (revision 2), Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, December 1994.

2. *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D2, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, August 1994.

3. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR-1047&D2, Foster Wheeler, Oak Ridge, Tennessee, November 1994.

4. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1150&D2, Foster Wheeler, Oak Ridge, Tennessee, December 1994.

5. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1195&D2, Foster Wheeler, Oak Ridge, Tennessee, January 1995.

5. CATEGORY D TANK SYSTEMS

(Entire chapter has been revised)

In this chapter, the FFA deliverable for Category D tank systems is described and the status of the deliverable is noted. In addition, a brief overview of the Inactive Tank Remediation Program is provided.

5.1 FFA DELIVERABLE

The FFA requires DOE to provide to EPA and TDEC a plan and schedule for conducting a characterization of tank contents and a schedule for characterization of the risk associated with the tank system within 90 days of the date the tank is declared inactive.

5.2 STATUS

Waste and risk characterization data have been submitted to EPA and TDEC for all Category D tank systems except LA-104, which was removed from service in November 1994. The schedule for submittal of waste and risk characterization for tank system LA-104 has been submitted to EPA and TDEC.

5.3 INACTIVE TANK REMEDIATION PROGRAM

5.3.1 Objectives

The objectives of the Inactive Tank Remediation Program were selected to complement the objectives for a comprehensive environmental restoration of the Oak Ridge Reservation in keeping with the mission of the Environmental Restoration Program.

ENVIRONMENTAL RESTORATION MISSION

> Our mission is to remediate contaminated sites and contaminant releases to reduce current and future risk to human health and the environment. Early actions focused on reducing current or potential off-site risk are conducted in parallel with efforts to select, implement, and verify final remedies for contaminated sites. Remedial efforts are prioritized and innovative approaches are developed to support cost-effective risk reduction. All efforts are conducted with an emphasis on worker health and safety and with the goals of meeting regulatory requirements and the expectations of the public.

The overall objective of the Inactive Tank Remediation Program is to remediate all LLLW tanks that have been removed from service to the extent practicable in accordance with CERCLA requirements. In addition to risk and risk reduction, applicable or relevant and appropriate requirements 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.

Environmental restoration requires decision making with available data containing uncertainties and traditional approaches can sometimes be very time consuming, expensive, and inefficient. Therefore, to meet the goals of the ER inactive LLLW tank program, the environmental restoration process for LLLW tanks that have been removed from service will consider (1) employing innovative and technically sound approaches to tank remedial actions; (2) balancing short-term needs to protect health and environment with long-term future use objectives for the Oak Ridge reservation; (3) remediating the inactive tank systems in a logical order that is integrated with other remedial actions; (4) attaining cost-effective risk reduction; (5) meeting environmental regulations; and (6) addressing the expectations and requirements of all stakeholders.

5.3.2 Remediation Strategy

The management strategy for timely and efficient remediation of all sites at ORNL is to divide the waste units into waste area groupings (WAGs), which are areas that are either geographically contiguous or hydrologically confined units. Within each WAG, one or more operable units (OUs) have been defined. These OUs are smaller, more manageable units chosen on the basis of contaminant pathways analysis, application of similar remediation technology, geographical consideration, assessment of early or time-phased action, and remediation efficiency or simplicity considerations. The designation of all OUs for the Oak Ridge Reservation is shown in FFA Appendix C. Of interest to this report are those OUs that contain LLLW tanks.

As of December 1994, FFA Appendix F identified a total of 55 tanks that had been removed from service. The FFA designates tanks that have been removed from service as Category D. Of these 55 Category D tanks, FFA Appendix C shows that 46 are located in WAG 1, 6 are located in WAG 5, 1 is located in WAG 8, and 2 are located in WAG 9. FFA Appendix C also shows that within WAG 1 are two OUs that address tank remediation: WAG 1 OU 1, Gunite and Associated Tanks (GAAT), contains 18 tanks and WAG 1 OU 10, Steel Tank Systems, contains 28 tanks.

5.3.3 Remediation Plan

Of the 55 Category D tanks presently designated, 18 tanks in WAG 1 OU 1, GAAT, are being remediated under a separate project owing to the size of the tanks and complexity of their cleanup. A treatability study is currently being prepared for evalation of GAAT remediation alternatives. The tanks assigned to WAG 1 OU 1, GAAT, are as follows: W-1, W-2, W-3, W-4, W-13, W-14, W-15, W-1A, W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-17, W-18, and TH-4.

The remediation plan described in the following paragraphs applies to the remaining Category D tanks.

The 37 Category D tanks were preliminarily screened according to risk, remediation technology required, interferences with other piping and equipment, location, available sludge removal techniques, and storage requirements. On the basis of this preliminary screening, the tanks were assigned to one of 5 "batches" for consideration of remedial action alternatives and these batches were tentatively scheduled for remedial actions.

It is recognized that other tanks are scheduled to be removed from service as projects are completed to bring the active LLLW system into full FFA compliance. In anticipation of their transfer, the Waste Management and Remedial Action Division (WMRAD) active tanks have been tentatively assigned to "batches". The same preliminary screening factors that were used for the initial batch assignment of the ER tanks were applied to these currently active LLLW tanks. The tanks that will be transferred from WMRAD to ER will be emptied prior to transfer and will meet acceptance criteria that are mutually acceptable to ER and WMRAD.

A team has been assembled to address remediation of the inactive tanks. The team is a core group of technical representatives from Energy Systems WMRAD, ORNL ER Program, Engineering Division, Risk Analysis Section of the Health Sciences Research Division, and Chemical Technology Division; Jacobs Engineering Group, Inc.; and other subcontractors as appropriate. The team meets regularly to coordinate and plan remedial action activities for the tanks that have been removed from service. The team provides a mechanism for integrated responses on remedial action issues to DOE, EPA, and TDEC.

For each batch of tanks required to be remediated under CERCLA, documentation will be prepared that incorporates all the requirements of the CERCLA remediation process leading to an expedited record of decision (ROD). The specific remediation alternative will be chosen on the basis of risk as described in EPA guidance manuals. This "streamlined" approach will combine the CERCLA Site Investigation, Remedial Investigation, Feasibility Study, and Proposed Plan requirements into a single Interim Proposed Plan document. The tank system components, both piping and containment (tank, vault, etc.) that will be included in the interim remedial action will be clearly defined in the Interim Proposed Plan. The means taken to safely secure the components not immediately remediated will also be described in the proposed plan and the OUs to which these components will be assigned will be clearly indicated. Following the selection of a preferred remedial action alternative and its documentation in the ROD, remedial design and remedial actions will proceed. The goal will be to arrive at final remediation for each tank system, although in some cases interim actions may be indicated.

The approach to remediation of each tank or batch of tanks can and should be viewed as a dynamic, flexible, customized process that must be adapted in response to the specific circumstances of individual tanks and sites. Thus, the approach will be tailored to accommodate feedback on lessons learned from previous remediation actions and will not be a rigid step-by-step approach that must be conducted identically for every tank system.

Appendix A

DATA SUMMARIES FOR CATEGORY A, B, AND C TANK SYSTEMS

Exhibit A.1. Data summary for the MCS at Bldg. 2026.

A. Facility: 2026 [High Radiation Level Analytical Laboratory (HRLAL)]

B. Tank Location: ORNL Bethel Valley Area, West of Bldg. 2026

C. Tank User Divisions: Analytical Chemistry, Waste Management and Remedial Action Division (WMRAD)

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1401	1993	IGV	1900	SS	A

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

E. Original or Past Tank Usage:

The 2026 facility generates LLLW from analysis of samples at ORNL. The primary activities conducted within the facility include analysis of LLLW waste tank contents, reactor fuel analysis, and work for others. The facility is key to environmental characterization of materials considered by the FFA and other environmental compliance programs.

F. Current or Future Tank Usage:

This tank was installed in 1993 as part of the Bethel Valley LLW-CAT line-item project and will be put into service following completion of the DOE Operational Readiness Review.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~900 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.2. Data summary for the TWRF storage tank.

A. Facility: 2649 [Transported Waste Receiving Facility (TWRF)]

B. Tank Location: ORNL Bethel Valley, in Bldg. 2649

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1701	1993	AGV	1900	SS	A

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

F-1701 is the central receiving point for all transported LLLW at ORNL.

F. Current or Future Tank Usage:

This tank is part of the newly constructed central station for receipt of bottled or trucked LLLW. Initial operation of the facility is planned for FY 1995.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 900 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.3. Data summary for the LLLW tank systems at Bldg. 3019.

A. Facility: 3019 [Radiochemical Processing Pilot Plant (RPPP)]

B. Tank Location: Bethel Valley, Cells 6 and 7 of Bldg. 3019

C. Tank User Divisions: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
N-71	Unknown	AGV	240	304SS	B
P-3	Unknown	AGV	197	347SS	B
P-4	Unknown	AGV	197	347SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

E. Original or Past Tank Usage:

These tanks were used for collection of a variety of production waste process streams such as raffinates from extraction processes, overheads from evaporation processes, and others. In addition, laboratory wastes, such as liquids left after analyses and bench scale experimental processes were collected in the tanks. Also, any spills that might occur in the cells are jetted to these tanks.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~700 ft
Percent Doubly Contained Buried Pipe: 60%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.4. Data summary for the LLLW tank systems at Bldg. 3517.

A. Facility: 3517 [Fission Products Development Laboratory (FPDL)]

B. Tank Location: Bethel Valley, Cells 23 and 24 of Bldg. 3517

C. Tank User Division: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
S-223	1955	IGV	2500	304L-SS	B
S-324	1955	IGV	1000	304L-SS	B
S-523	1955	IGV	1000	304L-SS	B

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

These tanks were used to collect production process wastes from a variety of operations. Wastes included supernate from cesium and strontium precipitation operations, raffinate from a cerium-144 extraction process, and general decontamination solutions that contained ^{60}Co, ^{90}Sr, ^{192}Ir, ^{147}Pm, and $^{137}Cs/^{134}Cs$.

F. Current or Future Tank Usage:

These tanks are scheduled to be removed from service in 1999.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 360 ft
Percent Doubly Contained Buried Pipe: 98%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.5. Data summary for the Evaporator Facility LLLW tank systems.

A. Facility: 2531 (Evaporator Facility)

B. Tank Location: C-1,C-2, W-21, W-22, and W-23 are located in Bethel Valley, north of Bldg. 2531.

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
C-1	1964	IGV	50,000	SS	B
C-2	1964	IGV	50,000	SS	B
W-21	1979	IGV	50,000	SS	B
W-22	1979	IGV	50,000	SS	B
W-23	1979	IGV	50,000	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

E. Original or Past Tank Usage:

Tanks C-1, C-2, and W-21 through W-23 are used as feed or concentrate storage tanks for the LLLW evaporator located in Bldg. 2531.

F. Current or Future Tank Usage:

Current and future use remains unchanged for the tanks in the evaporator complex.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: ~400 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: All doubly contained piping has cathodic protection.
System Operation at Negative Pressure: Yes

Exhibit A.6. Data summary for the LLLW tank systems at Bldg. 3544.

A. Facility: 3544 [Process Waste Treatment Plant (PWTP)]

B. Tank Location: Bethel Valley, in Bldg. 3544

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
L-11	1975	IF	400	SS	B

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite
IF—inside facility

E. Original or Past Tank Usage:

L-11 is used as a collection tank for the evaporator bottoms from the Process Waste Treatment Plant.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 900 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.7. Data summary for the New Hydrofracture Facility LLLW tank system.

A. Facility: NHF (New Hydrofracture Facility)

B. Tank Location: Melton Valley NHF area

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
T-13	1979	IGV	4000	SS	B

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

Served as a waste tank for the New Hydrofracture Facility, which was used to solidify concentrated LLLW for disposal.

F. Current or Future Tank Usage:

Potential uses include pilot plant operations to develop new LLLW treatment processes and decontamination activities.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 0 ft
Percent Doubly Contained Buried Pipe: NA
Cathodic Protection for Buried Pipe: NA
System Operation at Negative Pressure: Yes

Exhibit A.8. Data summary for the Radiochemical Engineering Development Center LLLW tank systems.

A. Facility: REDC (Radiochemical Engineering Development Center)

B. Tank Location: ORNL Melton Valley, HFIR Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-111	1962	IGV	125	SS	B
F-126	1962	IGV	1200	SS	B
C-6-T	1965	IGV	700	SS	B
B-2-T	1965	IGV	1870	SS	B
B-3-T	1965	IGV	1870	SS	B

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

LLLW was produced from radiochemical operations designed to recover isotopes produced from irradiated HFIR targets and other sources. LLLW at REDC was primarily generated from disposal of spent off-gas scrubber solutions. Other sources included routine and nonroutine washdown of hot cells and other contaminated equipment. REDC is the major contributor of transuranic radionuclides in the LLLW system.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 55%
Length of Buried Piping: 4300 ft
Percent Doubly Contained Buried Pipe: 11%
Cathodic Protection for Buried Pipe: All underground lines cathodically protected except three LLLW lines from Bldg. 7930 to the 7930 tank vault. The transfer line from Melton Valley to Bethel Valley is also protected. Approximately 90% of the system is protected.
System Operation at Negative Pressure: Yes

Exhibit A.9. Data summary for the Melton Valley Storage Tank systems.

A. Facility: Melton Valley Storage Tanks

B. Tank Location: Melton Valley, Hydrofracture area

C. Tank User Division: WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-24	1980	IGV	50,000	SS	B
W-25	1980	IGV	50,000	SS	B
W-26	1980	IGV	50,000	SS	B
W-27	1980	IGV	50,000	SS	B
W-28	1980	IGV	50,000	SS	B
W-29	1980	IGV	50,000	SS	B
W-30	1980	IGV	50,000	SS	B
W-31	1980	IGV	50,000	SS	B

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

E. Tank Usage:

The evaporator bottoms from the LLLW evaporators in Bethel Valley are stored in these tanks. This material, which includes transuranic waste, must be stored at ORNL until a DOE facility that can accept it becomes operational.

F. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 6,300 ft
Percent Doubly Contained Buried Pipe: 100%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Exhibit A.10. Data summary for the LLLW tank systems at Bldg. 3525.

A. Facility: 3525 (High Radiation Level Examination Laboratory)

B. Tank Location: ORNL Bethel Valley, South of Bldg. 3525

C. Tank User Division: Chemical Technology, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-201	1962	IGV	40	SS	C
F-501	1962	IGV	200	SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

Bldg. 3525 provides for the postirradiation mechanical disassembly of reactor components so that physical and metallurgical examinations can be conducted. LLLW is produced from the decontamination and cleanup of the hot cells used in the disassembly and examination process.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 50%
Length of Buried Piping: 290 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: None
System Operation at Negative Pressure: Yes

Exhibit A.11. Data summary for the Isotopes Circle Facilities LLLW tank systems.

A. Facility: Isotopes Circle

B. Tank Location: ORNL Bethel Valley, Isotopes Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-10	1951	BT	2000	SS	C
WC-2	1951	BT	1000	SS	C

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

E. Original or Past Tank Usage:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities served by the LLLW system. A wide range of radionuclides were produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, isotopes, and other contaminated liquids. The waste from the Hot Off-Gas Scrubber treatment facility is transferred via a pipe that intersects the WC-2 tank discharge line.

F. Current or Future Tank Usage:

Significant isotopes production in the facilities served by the LLLW system was terminated in FY 1990. However, the LLLW system continues to collect waste from routine cleanup and washdown of hot cells and other components. The LLLW system will be used during formal cleanup and shutdown stabilization of the facility through FY 1998. Research and medical production activities will continue in a limited portion of these facilities for the foreseeable future. The Hot Off-Gas Scrubber waste will continue to be collected.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3900 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.12. Data summary for the HFIR LLLW tank systems.

A. Facility: HFIR (High Flux Isotopes Reactor)

B. Tank Location: ORNL Melton Valley Area, HFIR Area

C. Tank User Division: Research Reactors, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
HFIR	1961	BT	13,000	SS	C
T-1	1963	BT	15,000	SS	C
T-2	1963	BT	15,000	SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

These LLLW systems serve a major research reactor facility. LLLW from the HFIR primarily results from (1) regeneration and backwashing of primary and pool demineralizer systems, (2) sampling operations, (3) gaseous waste filter pit inleakage and condensation, and (4) stack drainage. Other waste is generated by routine maintenance and decontamination of contaminated equipment. When in operation, the HFIR is the primary source of ^{60}Co in the LLLW system.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3000 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Transfer piping from T-1 and T-2 only.
System Operation at Negative Pressure: Yes

Exhibit A.13. Data summary for the ORR/BSR LLLW tank system.

A. Facility: Oak Ridge Research Reactor/Bulk Shielding Reactor (ORR/BSR)

B. Tank Location: Bethel Valley, North of Bldg. 3047

C. Tank User Division: Research Reactors, Surplus Facilities

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-19	1955	BT	2250	SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

LLLW was produced from the regeneration of reactor pool and canal demineralizers at Bldgs. 3019, 3001, 3042, 3004, and 3010. Also, the tanks received condensate from off-gas High Efficiency Particulate Air (HEPA) filter pits associated with these reactors.

F. Current or Future Tank Usage:

Although the reactors are not currently being operated, LLLW is produced from a condensate blowdown trap in Bldg. 3042 and from the semiannual regeneration of the demineralizer serving the 3001 canal. Tank WC-19, which is an ES&H tank, will continue to be used to process waste from these sources.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 1200 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.14. Data summary for the LLLW tank system at Bldg. 3025.

A. Facility: 3025 (Irradiated Materials Examination and Testing Facility)

B. Tank Location: Bethel Valley, South of Bldg. 3025

C. Tank User Divisions: WMRAD, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-3	1951	BT	1000	347SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

WC-3 was used primarily to collect residuals from metallurgical sampling and analysis. The waste solutions came from etching, dissolution, and decontamination of particulate residue from physical property analysis (such as tensile and shear testing) of irradiated metals.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 250 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.15. Data summary for the LLLW tank system at Bldg. 2533/3504.

A. Facility: 2533/3504 (Cell Ventilation Filter Pit & Geosciences Laboratory)

B. Tank Location: ORNL Bethel Valley, West of Bldg. 3504

C. Tank User Divisions: Environmental Science, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-7	1951	BT	1100	SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

Waste solutions from health physics research of contaminated animals were stored in the LLLW tank. Original tank waste included fission products and other contaminated waste generated during animal contamination studies. LLLW from the Evaporator Complex Bldg. 2533 sump is transferred to the central LLLW system via the WC-7 discharge line.

F. Current or Future Tank Usage:

Current waste in Bldg. 3504 is generated from disposal of contaminated soil samples and from decontamination of equipment used in collecting soil samples. The tank discharge line will continue to receive condensate from the Evaporator Complex Bldg. 2533 sump.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 1100 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: No

Exhibit A.16. Data summary for the Radioactive (Hot) Off-Gas LLLW tank system.

A. Facility: Radioactive (Hot) Off-Gas also referred to as HOG (Hot Off-Gas Collection)

B. Tank Location: Bethel Valley, South of Bldg. 3503

C. Tank User Division: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-9	1952	BT	2150	SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

Tank WC-9 received LLLW from Bldg. 3503. Building 3503 originally was a high-level radiation engineering laboratory. LLLW was generated by pilot plant studies. The tank also received waste from the Hot Off-Gas System, which collects condensate from the hot off-gas and cell ventilation gaseous waste collection systems.

F. Current or Future Tank Usage:

WC-9 currently receives condensate from the Hot Off-Gas Pot.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 0%
Length of Buried Piping: 125 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: None
System Operation at Negative Pressure: No

Exhibit A.17. Data summary for the LLLW tank system at Bldg. 3026D.

A. Facility: 3026D (Segmenting Hot Cell Facility)

B. Tank Location: Melton Valley South Tank Farm

C. Tank User Divisions: WMRAD, Metals and Ceramics

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-16	1951	BT	1000	347SS	C

Legend:
AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

Tank W-16 serves Bldg. 3026D in the Isotopes Complex. Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities served by the LLLW system. A wide range of radionuclides was produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of routine and nonroutine hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, trace quantities of isotopes, and other contaminated liquids.

F. Current or Future Tank Usage:

Potential use for decontamination of Bldg. 3026D.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 550 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: No
System Operation at Negative Pressure: Yes

Exhibit A.18. Data summary for the WC-20 tank system.

A. Facility: REDC (Radiochemical Engineering Development Center)

B. Tank Location: ORNL Melton Valley, High Flux Isotope Reactor (HFIR) Area

C. Tank User Division: Chemical Technology, WMRAD

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-20	1976	IGV	10000	SS	C

Legend:

AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable

SS—stainless steel
CS—carbon steel
G—gunite

E. Original or Past Tank Usage:

LLLW resulted from radiochemical operations designed to recover isotopes produced from irradiation of HFIR targets and other sources. LLLW produced at REDC was primarily generated from disposal of spent off-gas scrubber solutions. Other sources included routine and nonroutine washdown of hot cells and other contaminated equipment.

F. Current or Future Tank Usage:

Same as above (E).

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 100%
Length of Buried Piping: 3521 ft
Percent Doubly Contained Buried Pipe: 0%
Cathodic Protection for Buried Pipe: Yes
System Operation at Negative Pressure: Yes

Appendix B

DATA SUMMARIES FOR CATEGORY D TANK SYSTEMS

Exhibit B.1. Data summary for South Tank Farm Category D LLLW tank systems.

A. Tanks Located at: Bethel Valley, South Tank Farm (W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-17, and W-18); south of the South Tank Farm (W-19, and W-20).

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
W-5	1943	BT	170,000	G	no	NA
W-6	1943	BT	170,000	G	no	NA
W-7	1943	BT	170,000	G	no	NA
W-8	1943	BT	170,000	G	no	NA
W-9	1943	BT	170,000	G	no	NA
W-10	1943	BT	170,000	G	no	NA
W-11	1943	BT	1,500	G	no	NA
W-17	1951	BT	1,000	SS	no	no
W-18	1951	BT	1,000	SS	no	no
W-19	1955	BT	2,250	SS	no	no
W-20	1955	BT	2,250	SS	no	no

Legend: **AGV**—above-ground vault **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable

D. Original or Past Tank Usage:

Tanks W-5 through W-10 were constructed in 1943 for long-term storage of LLLW. Because of the expanding needs of the Laboratory, the capacity of the tanks proved inadequate. The waste was directed to an evaporator between 1949 and 1954 and from 1959 until the tanks were taken out of service in 1980. Between 1953 and 1959 the waste was sent to open waste pits.

Tank W-11 was constructed in 1943 to serve as a waste collection and monitoring tank for research laboratories in Bldg. 3550. The tank was removed from service in 1948 because of leaks.

Tanks W-17 and W-18 served as waste tanks for isotope production in Bldg. 3026.

Tanks W-19 and W-20 were used to collect waste produced from recovery and reprocessing of uranium and other nuclear material from the Metal Recovery Facility in Bldg. 3505. The tanks were removed from service in 1960.

E. Waste Characterization:

The results of a previous sampling campaign revealed that Tanks W-5 through W-10 contain sludge with transuranics and toxic metals. In addition, most of these tanks contain organics. Tank W-11 contains primarily low-level waste in aqueous form.

The results of a previous sampling campaign revealed that tanks W-19 and W-20 are empty.

The results of the 1992-1993 sampling campaign showed that contaminant levels in tanks W-17 and W-18 are very low.

Exhibit B.2. Data summary for Old Hydrofracture Facility Category D LLLW tank systems.

A. Tanks Located at: Melton Valley Hydrofracture Area

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
T1	1963	BT	15,000	CS	no	yes *
T2	1963	BT	15,000	CS	no	yes *
T3	1963	BT	25,000	CS/RL	no	yes *
T4	1963	BT	25,000	CS/RL	no	yes *
T9	1963	BT	13,000	CS	no	yes *

Legend: **AGV**—above ground vault **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable **RL**—rubber lining

* The cathodic protection system is not operational.

D. Original or Past Tank Usage:

Tanks T1 through T4 and T9 were used during the Old Hydrofracture Facility operation to store liquid waste until it was ready to be blended with grout, before waste injection by hydrofracture. The Old Hydrofracture Facility operations were discontinued in 1980.

E. Waste Characterization:

The results of a previous sampling campaign indicate that the Old Hydrofracture Facility tanks (T-1 through T-4 and T-9) contain soft sludge containing high concentrations of transuranics and toxic metals.

Exhibit B.3. Data summary for the North Tank Farm Category D LLLW tank systems.

A. Tanks Located at: Bethel Valley, North Tank Farm Area

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
W-1	1943	BT	4,800	G	no	NA
W-2	1943	BT	4,800	G	no	NA
W-3	1943	BT	42,500	G	no	NA
W-4	1943	BT	42,500	G	no	NA
W-13	1945	BT	2,000	SS	no	no
W-14	1945	BT	2,000	SS	no	no
W-1A	1951	BT	4,000	SS	no	no
W-15	1945	BT	2,000	SS	no	no

Legend: **AGV**—above-ground vault **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable

D. Original or Past Tank Usage:

Tanks W-1 through W-4 and W-1A received waste from Bldg. 3019, a radiochemical processing facility. The principal radionuclides in the waste were cesium, strontium, and transuranics. Tanks W-1 through W-4 were taken out of service in the early 1960s, and tank W-1A was taken out of service in 1986 because of leaks. The tanks were emptied when removed from service.

Tanks W-13, W-14, and W-15 were connected to the metal waste drains from the Radiochemical Processing Facility, Bldg. 3019, but also collected chemical waste from recovery of fission products. The tanks were taken out of service in 1958.

E. Waste Characterization:

The results of a previous sampling campaign revealed that the North Tank Farm varies from tanks with only liquids (W-1, W-1A, W-2, W-13, W-14, and W-15) to tanks that contain a liquid phase and a sludge with transuranic and toxic metals (W-3 and W-4).

Exhibit B.4. Data summary for the 3500 Area Category D LLLW tank systems.

A. Tank Group Location: Bethel Valley, 3500 Area

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
TH-1	1948	BT	2,500	SS	no	no
TH-2	1952	BT	2,400	SS	no	no
TH-3	1952	BT	3,300	SS	no	no
TH-4	1952	BT	14,000	G	no	NA
S-424	1955	IGV	500	SS/GL	yes	no
H-209	1961	BT	2,500*	SS	no	no
WC-5	1952	BT	1,000	SS	no	no
WC-6	1952	BT	500	SS	no	no
WC-8	1952	BT	1,000	SS	no	no

Legend: AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite
*—estimated

D. Original or Past Tank Usage:

Tanks TH-1, TH-2, and TH-3, received waste from the irradiated thorium and uranium pilot development plant development projects in Bldg. 3503. TH-4 received waste from thorium and uranium projects in Bldg. 3550. The tanks were taken out of service in 1970.

Tank H-209 collected condensate and floor drain waste from Bldg. 3517.

S-424 was used to collect highly corrosive chloride-bearing supernate from a precipitation operation.

Tanks WC-5, WC-6, and WC-8 received waste from development projects in Bldgs. 3508, 3541, and 3592.

E. Waste Characterization:

Tanks TH-1, TH-2, and TH-3 contain little or no sludge. The liquid phase contains low levels of radioactivity.

Tank TH-4 contains large quantities of sludge but is not known to leak.

Tanks S-424, H-209, WC-5, WC-6, and WC-8 were sampled in FY 92 and early FY 93. Tank S-424 contains no liquids and will be further characterized as part of the RI/FS process. Tank H-209 contains no sludge, and its liquid has low levels of chemical and radiological contaminants. Tanks WC-5, WC-6, and WC-8 contain no sludge, and their liquids have very low levels of chemical and radiological contaminants.

Exhibit B.5. Data summary for the Isotopes Circle Category D LLLW tank systems.

A. Tank Location Bethel Valley, Isotopes Circle.

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
WC-1	1950	BT	2150	SS	no	no

Legend: **AGV**—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS—stainless steel
CS—carbon steel
G—gunite

D. Original or Past Tank Usage:

WC-1 was used to collect and monitor process liquid waste from isotopes production and development laboratories in Bldgs. 3038, 3028, 3029, 3030, 3031, 3032, 3033, 3047, the filter in Bldg. 3110, the 3039 stack, and the scrubber in 3092. The tank was taken out of service in 1968 because of a leaking discharge line.

E. Waste Characterization:

Tank WC-1 contains approximately 3 inches of sludge at the sample point. The liquid contents have been removed. Tank W-1I has no liquids, and its sludge contains high levels of alpha contamination.

Exhibit B.6. Data summary for the 4500 Area Category D LLLW tank systems.

A. Tanks Located at: Bethel Valley, 4500 Area

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
4501-P	unknown	IGV	100	SS	yes	NA
T-30	1961	IGV	825	SS	yes	NA

Legend: AGV—above-ground vault
IGV—in-ground vault
BT—buried tank
NA—not applicable
SS-stainless steel
CS—carbon steel
G—gunite

D. Original or Past Tank Usage:

Tank 4501-P was used to store waste from the plutonium recovery loop experiment and other waste from experiments in Bldg. 4501. The tank was flushed and drained in 1990.

Tank T-30 was used to store radioactive materials for the Curium Recovery Facility, Bldg. 4507, which later became the High Radiation Level Chemical Recovery Facility.

E. Waste Characterization:

The liquid contents were removed from Tank T-30 in September 1993. Tank 4501-P is empty.

Exhibit B.7. Data summary for the 3587 Area Category D LLLW tank systems.

A. Tank Located at: South of Bldg. 3587

B. Responsible Divisions: Environmental Restoration, WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
WC-11	1951	BT	4000	SS	no	no
WC-12	1947	BT	700	SS	no	no
WC-13	1951	BT	1000	SS	no	no
WC-14	1951	BT	1000	SS	no	no
WC-15	1951	BT	1000	SS	no	no
WC-17	1951	BT	1000	SS	no	no

Legend: **AGV**—above ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **G**—gunite; **GL**—glass lined

D. Original or Past Tank Usage:

Tanks WC-11, WC-12, WC-13 and WC-14 were used as waste tanks for the 4500 complex.

Tanks WC-15 and WC-17 were used to collect LLLW from research laboratories in Bldg. 4500. Tanks WC-15 and WC-17 were taken out of service in the 1960s because of leaks.

E. Waste Characterization:

Tanks WC-11, WC-13, and WC-14 were sampled in FY 92 and early FY 93. Tanks WC-11 and WC-13 contain a thin, floating organic layer. The liquid is radioactive. Tank WC-14 contains liquid contaminated primarily with ^{137}Cs.

Tanks WC-15, and WC-17 contain little or no sludge. The liquid phase contains low levels of radioactivity with an organic layer within the liquid phase.

Exhibit B.8. Data summary for Melton Valley Area Category D LLLW tank systems.

A. Tanks Located at: Melton Valley Area

B. Responsible Division: Environmental Restoration

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
T-14	1979	BT	48500	C	no	no
7503-A	1962	IGV	11000	SS	yes	NA
7560	1957	BT	1000	SS	no	no
7562	1957	BT	12000	SS	no	no

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **C**—concrete; **RL**—rubber lining

D. Original or Past Tank Usage:

Tank T-14 was used as an overflow emergency waste tank for the new Hydrofracture Facility.

Tank 7503-A was a waste holding tank for the Molten Salt Reactor Experiment.

Tank 7560 was originally used as a waste tank for the Homogenous Reactor Experiment (HRE) and later used as the clean vapor condensate tank for HRE-2. Tank 7562 was used as a waste tank for the HRE. The tanks were removed from active service in 1961.

E. Waste Characterization:

The results of a previous sampling campaign revealed that tank 7562 contains an aqueous phase with little or no sludge and tank 7560 is empty.

Tank 7503-A was sampled in FY 93 and was found to be empty except for a very thin layer of dry sludge. Tank T-14 contains low levels of chemicals and radiological contaminants.

Exhibit B.9. Data summary for the 3000 Area Category D LLLW tank systems.

A. Tank Location: Bethel Valley, 3000 Area

B. Responsible Divisions: Environmental Restoration, WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
3001-B	1943	BT	300	SS	no	no
3003-A	1943	BT	16000	G	no	NA
3004-B	1956	IGV	30	SS	yes	NA
3013	1949	BT	400	SS	no	no
3002-A	1943	IGV	1600	SS	no	no
WC-4	1944	BT	1700	SS	no	no

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **G**—gunite; **GL**—glass lined

D. Original or Past Tank Usage:

Tank 3001-B is thought to have been a hold-up tank for hot lab drains in Bldg. 3001. The tank was taken out of service in 1965.

Tank 3003-A received LLLW from three cells and a stack in Bldg. 3003. Building 3003 was the air-handling building for the graphite reactor (Bldg. 3001). Because it was in contact with the air handling system, condensate from this equipment is expected to be contaminated with low levels of fission products. The tank was taken out of service in 1965.

Tank 3004-B was a waste-holding tank for the Low Intensity Test Reactor. The tank was taken out of service in 1968.

Tank 3013 is believed to be connected to the drains in Bldg. 3013. Building 3013 was originally an environmental processing laboratory that dealt with low-level contaminated environmental samples.

Tank 3002-A was used to collect liquid condensate from Bldg. 3002. Building 3002 was the filter house for the Old Graphite Reactor.

Tank WC-4 was used as a waste tank for Bldg. 3026. Wastes were generated primarily from the Roll Up Process, which involved dissolving uranium targets and extracting isotopes. The tank was taken out of service in the 1950s.

E. Waste Characterization:

Tank 3001-B contains <1 in. of liquid containing low levels of chemical and radiological contaminants. Tank 3003-A contains liquid and sludge with chemical and radiological contaminants. Tank 3004-B is a very small tank containing liquid with low levels of chemical and radiological contaminants. Tank 3013 contains liquid with very low chemical and radiological contamination. Tank 3002-A contains liquid and a thin sludge layer with very low levels of chemical and radiological contaminants. Tank WC-4 contains liquids with low levels of radiological and chemical contaminants.

Exhibit B.10. Data summary for the 3525 Area Category D LLLW tank systems.

A. Tank Location: Bethel Valley, Southwest of Bldg. 3525

B. Responsible Division: WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
W-12	1947	BT	700	SS	no	no

Legend: **AGV**—above-ground vault; **IGV**—in-ground vault; **BT**—buried tank; **NA**—not applicable; **SS**—stainless steel; **CS**—carbon steel; **G**—gunite; **GL**—glass lined

D. Original or Past Tank Usage:

Tank W-12 is designed to receive waste from the examination of reactor components in Bldg. 3525 from tanks F-501 and F-201. The tank system has been repaired and was returned to service in June 1994. Tank W-12 will operate under a waiver until October 1995.

Exhibit B.11. Data summary for the Bldg. 3047 Area LLLW tank systems.

A. Tank Location: ORNL Bethel Valley, Isotopes Area, Bldg. 3047.

B. Responsible Division: Environmental Restoration

C Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
LA-104	1960	IGV	296	SS	Yes	NA
W-1I	1959	BT	500	SS	No	No

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

D. Original or Past Tank Usage:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities served by the LLLW system. A wide range of radionuclides were produced. Isotopes were produced for use in medical, research, and industrial applications. Most waste was generated as a result of hot-cell and equipment decontamination. Waste includes residual solutions used for isotope separation, isotopes, and other contaminated liquids.

Tank LA-104 was a surge tank for the vacuum system serving Bldg. 3047. No LLLW was intentionally transferred to the tank.

Tank W1I was used to collect waste liquids from isotope recovery operations in Bldg. 3028. Although the actual data is uncertain, the tank was removed from service by 1987.

E. Waste Characterization:

Exhibit B.12. Data summary for the LLLW tank system at Bldg. 2026.

A. Tank Location: ORNL Bethel Valley Area, East of Bldg. 2026

B. Responsible Tank User Divisions: Analytical Chemistry, WMRAD

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment.	Cathodic Prot.
2026A	1962	IGV	500	SS	No	No

Legend: AGV—above-ground vault; IGV—in-ground vault; BT—buried tank; NA—not applicable; SS—stainless steel; CS—carbon steel; G—gunite

D. Original or Past Tank Usage:

The 2026 facility provided analytical sample analysis for various programs at ORNL. LLLW was generated upon disposal of various samples once analysis was completed and from routine washdown and decontamination of hot cells and other contaminated equipment.

Tank 2026A was removed from service in 1995.

E. Waste Characterization:

Tank 2026A is scheduled for removal from service by the end of September 1995. The schedule for submittal of waste characterization data will be submitted to EPA and TDEC within 90 days of this date.

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