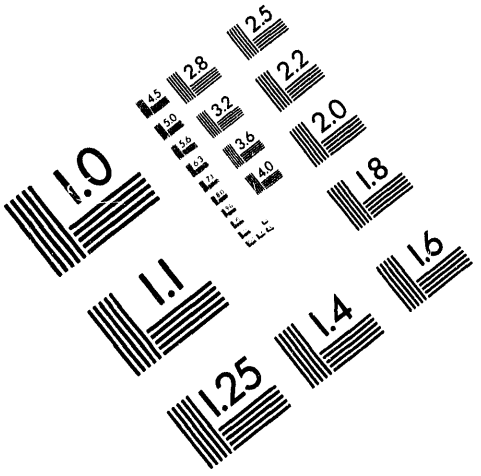

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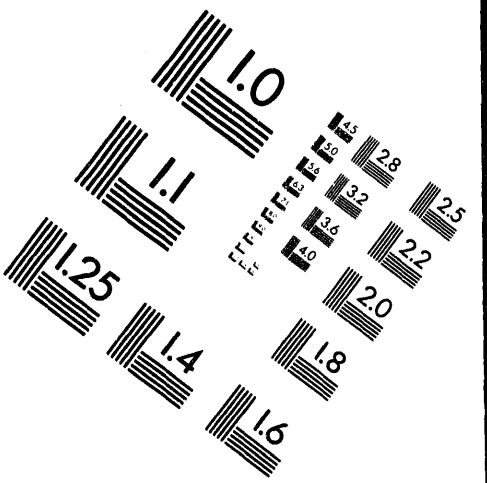

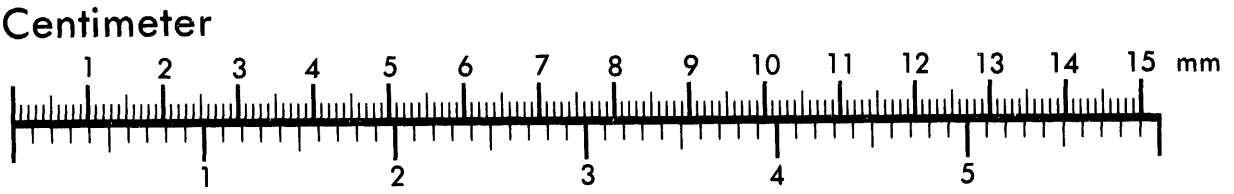

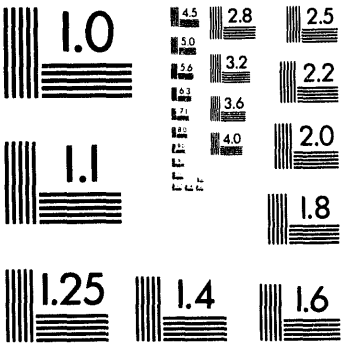

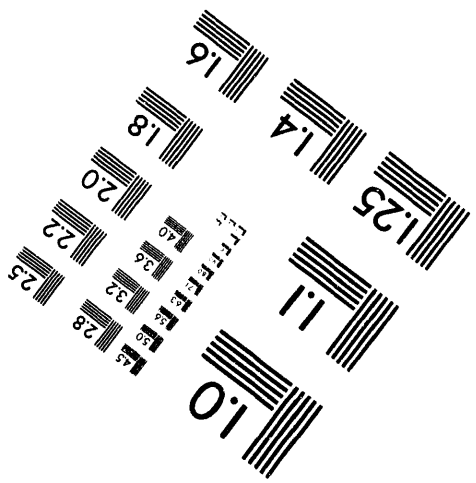

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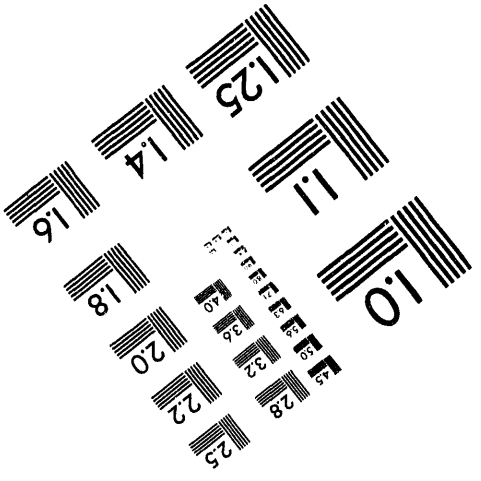

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DOE/OR/01-1276&D1
ORNL/ER-242&D1

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

H&R TECHNICAL ASSOCIATES, INC.

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

DOE/OR/01-1276&D1
ORNL/ER-242&D1

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

Date Issued—June 1994

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

Prepared for
U.S. Department of Energy
Office of Environmental Restoration and Waste Management
under budget and reporting codes EX 20, EW 20, and EW-31

MARTIN MARIETTA ENERGY SYSTEMS, INC.
managing the

Oak Ridge K-25 Site
Oak Ridge Y-12 Plant
Oak Ridge National Laboratory
under contract DE-AC05-84OR21400
for the
U.S. DEPARTMENT OF ENERGY

DOE/OR Revision Control Index

Part	Page(s)	Rev. No.	Date

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ABBREVIATIONS

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
ES&H	environmental, safety, and health
FFA	Federal Facility Agreement
GAAT	gunite and associated tanks (OU)
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
RPPP	Radiochemical Processing Pilot Plant
RQ	reportable quantities
SIA	structural integrity assessment
TDEC	Tennessee Department of Environment and Conservation
TRU	transuranics
TWRF	Transferred Waste Receiving Facility
WAG	waste area grouping
WM	Waste Management
WOCC	Waste Operations Control Center

GLOSSARY

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

Category B. An existing tank system with secondary containment.

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 liquid low-level waste, It is constructed primarily of nonearthen materials (e.g., concrete or steel) to provide structural support and containment. Such tanks may be used for waste storage or neutralization. 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 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 Federal Facility Agreement, tank systems will be categorized as secondarily contained if they are capable of containing regulated substances released from the primary tank system until such wastes are detected and removed. Some Oak Ridge National Laboratory liquid low-level waste tank systems may require modification of ancillary equipment and the upgrade of secondary containment to meet Federal Facility Agreement requirements.

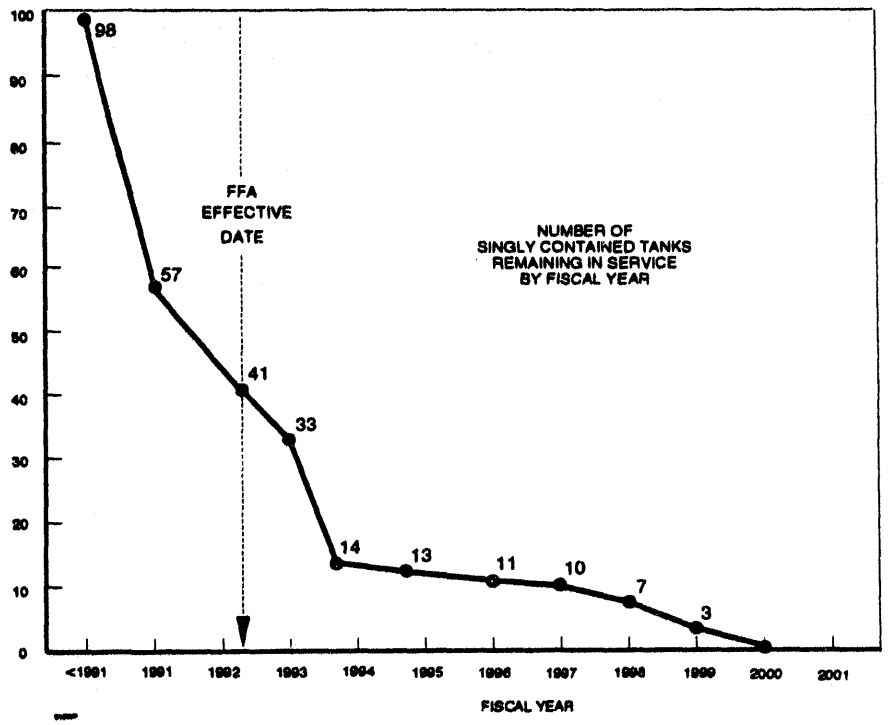
Tank system. A waste storage or waste treatment tank and its associated ancillary equipment and containment system. In the ORNL LLLW system, ancillary equipment includes sumps, piping, and valves to the waste tank(s) and piping and valves from the waste tank(s).

EXECUTIVE SUMMARY

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

A comprehensive program is under way at ORNL 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 submitted to the U.S. Environmental Protection Agency and the Tennessee Department of Environment and Conservation (EPA/TDEC) as tanks are taken out of service and as required by the remedial investigation/feasibility study (RI/FS) process.

The plans and schedules for implementing the FFA compliance program that were 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,* are updated in the present document. 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 progress to date and the schedule for



future removal from service of tanks that do not meet secondary containment and leak detection standards.

In the two years preceding the FFA effective date, 52 singly contained tanks were removed from service. Implementation activities during 1992 and 1993 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, DOE/OR/01-1159&D1 (supersedes ES/ER-80) for the Category D tanks;
- the Risk Characterization Data Manual ORNL/ER/Sub/90-W068/1 for the Category D tanks, first submittal;
- the Design Demonstrations Category-B Tank Systems, DOE/OR-1047;
- the Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory, LLLW Active Tanks DOE/OR/01-1129&D1;
- 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 Risk Characterization Data Manual for the Category D tanks, ORNL/ER/Sub/90-W068/1, final submittal; and

- the Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee, DOE/OR/03-1195&D1, February 1994.

In addition to the submittals, the following actions have been accomplished:

- installed two new LLLW tanks serving Building 2026 and the transported waste receiving facility;

- removed singly contained Tank LA-104 from service;

- initiated leak testing for all active singly contained tanks and piping;

- eliminated two sources of non-LLLW 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; and

- repaired leaking discharge line on Tank WC-10.

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 Superfund Amendments and Reauthorization Act of 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. Chapter 1 describes the history and operation of the ORNL LLLW System and the objectives of the FFA. Chapters 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). DOE Order 5820.2A defines low-level radioactive waste as waste that contains radioactivity and that is not classified as high-level waste, transuranic waste, or spent nuclear fuel or its byproducts.

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 directly to underground collection tanks or the central waste collection header (CWCH) from laboratory and hot-cell drains 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 most 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 over the long term comply with the design and containment requirements specified in FFA Appendix F, 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.

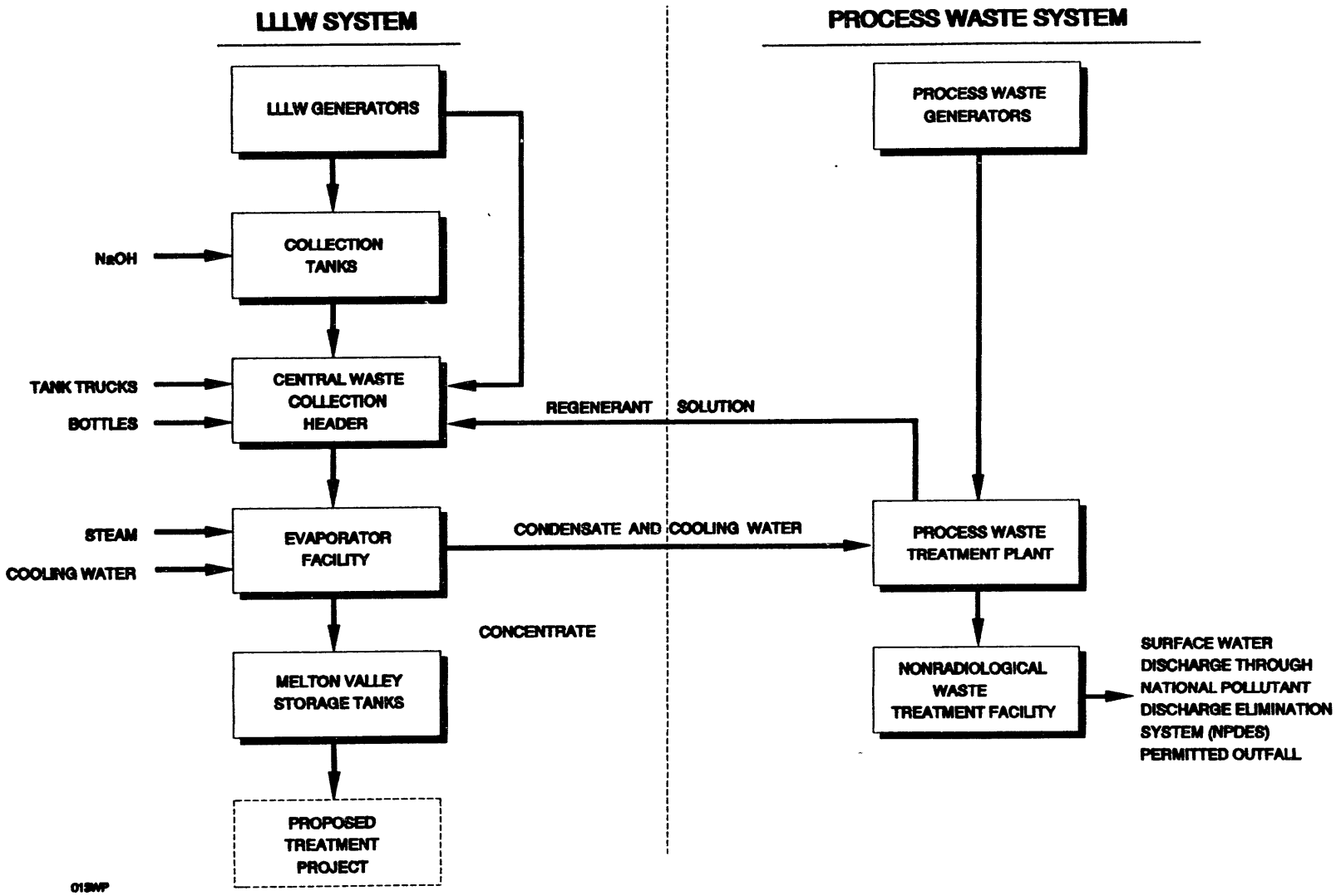


Fig. 1.1. Block flow diagram for the ORNL LLLW system.

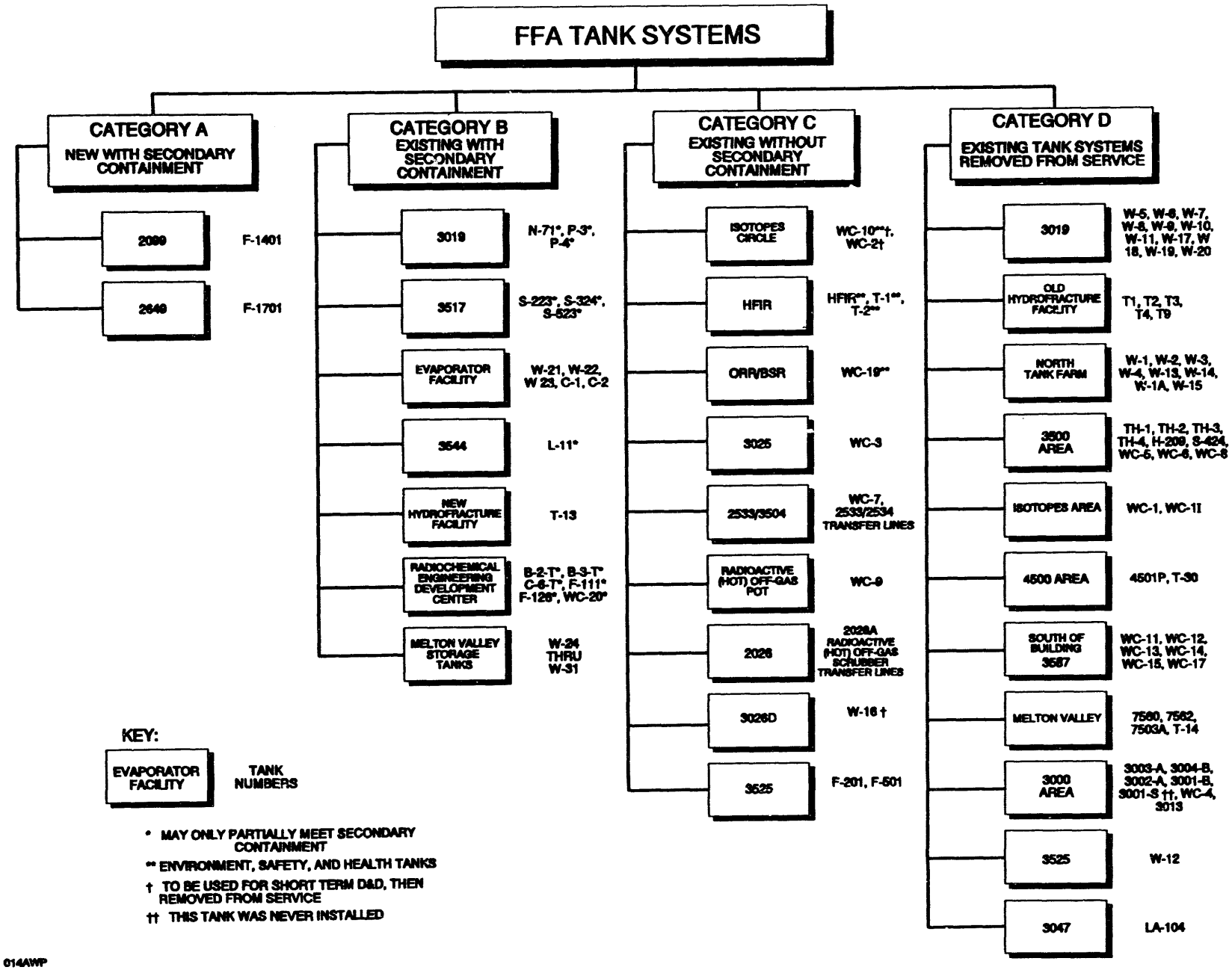


Fig. 1.2. ORNL LLLW tank systems by FFA category.

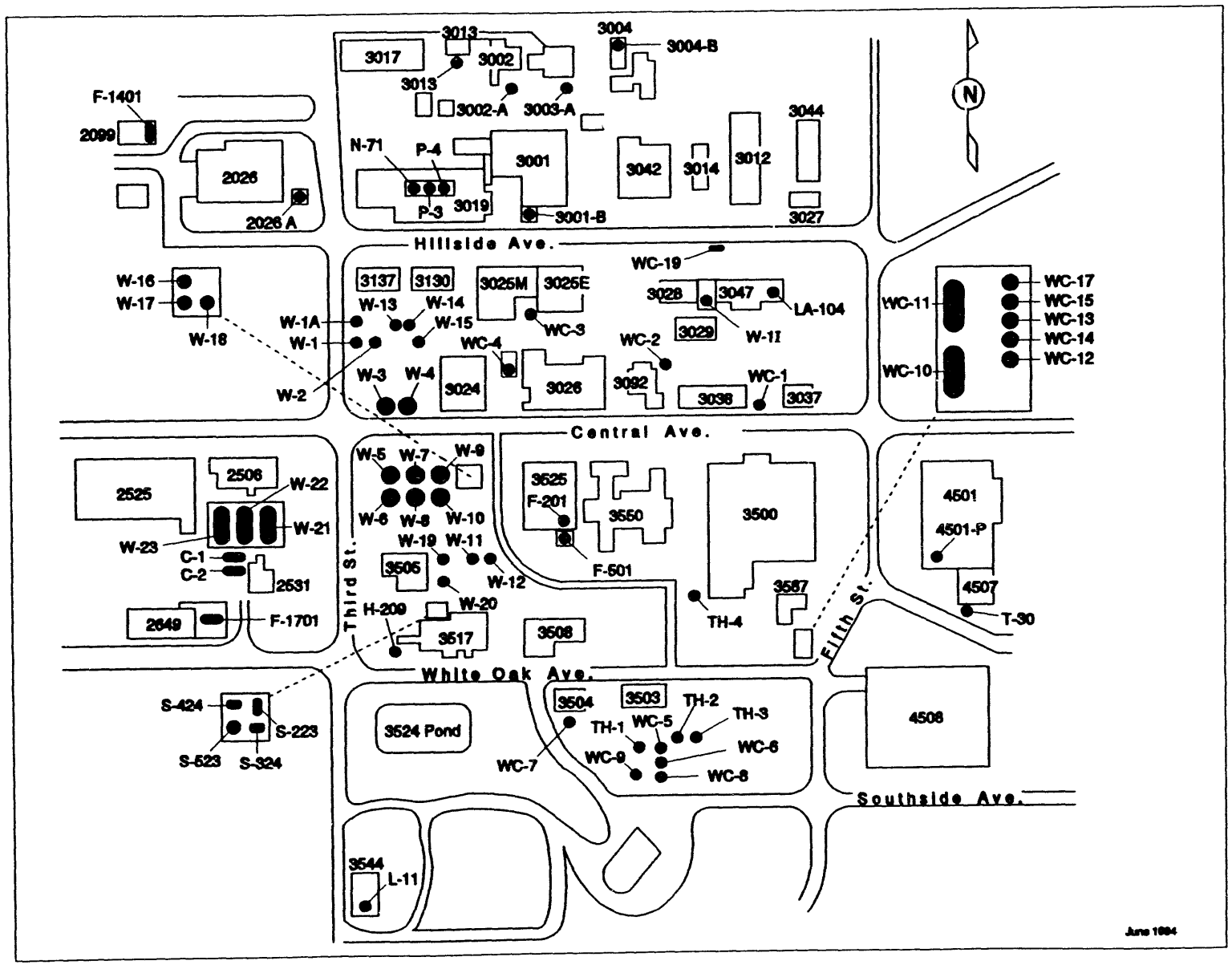


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Fig. 1.3. Bethel Valley LLLW tank systems.

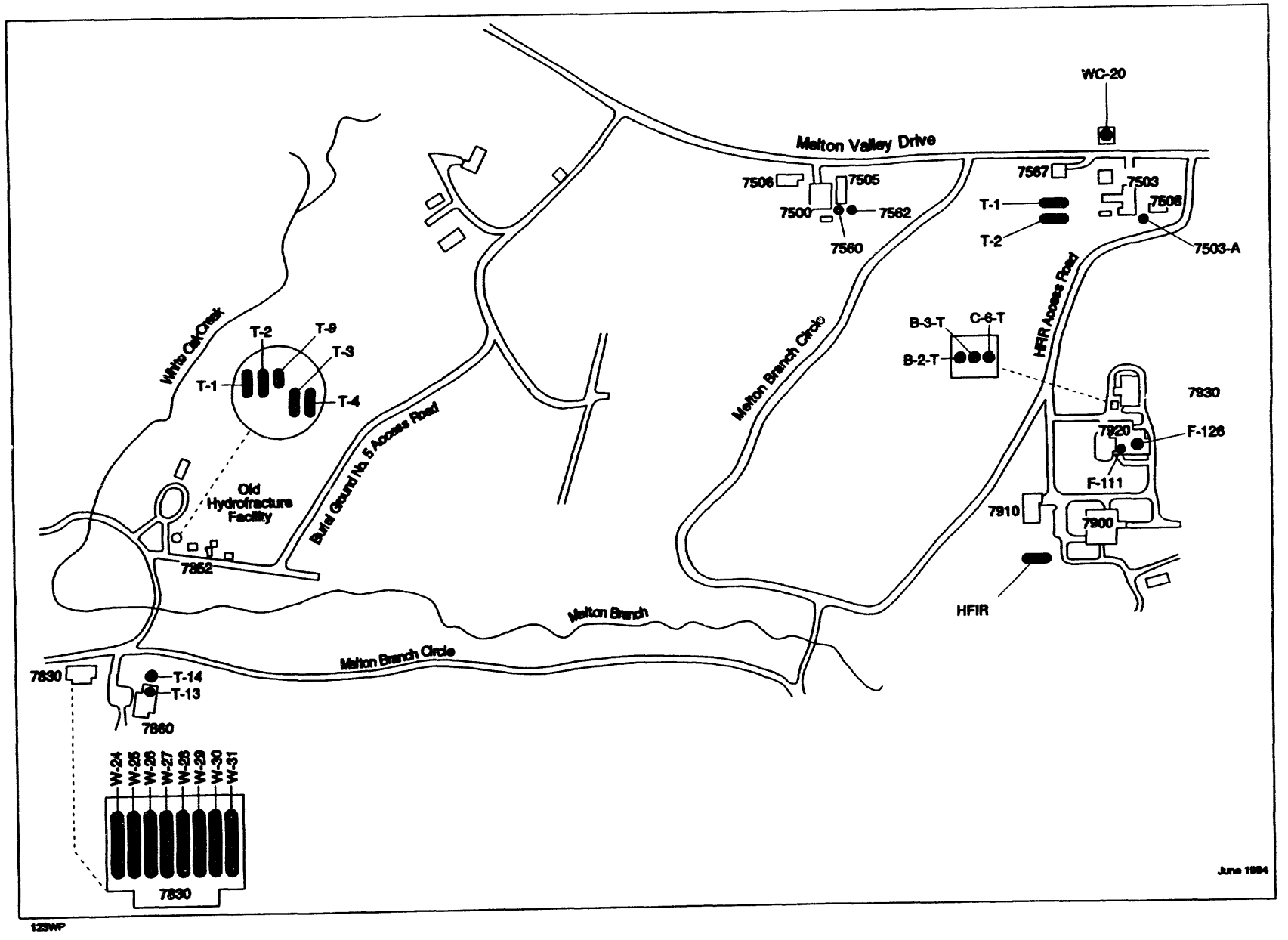

Fig. 1.4. Melton Valley LLLW tank systems.

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 assessment will be on file.

2.2 STATUS

Design assessments are being prepared for projects that install, upgrade, and/or replace deficient LLLW systems at ORNL. The first assessment was submitted for the general plant project FFA Compliance, Building 3019A,[1] which upgrades the LLLW system for Bldg. 3019A by installing a new doubly contained discharge line and a new valve box to tie the new line into the existing discharge line from the facility. The second assessment covered the upgrades to take place in the Melton Valley LLLW Collection and Transfer (CAT) System line item project.[2] This line item project installs new LLLW discharge lines from the Radiochemical Engineering Development Center (REDC) and a Monitoring and Control Station (MCS) with a local collection tank, and replaces the existing LLLW transfer line that runs between Melton and Bethel Valleys. Line item project Bethel Valley LLW-CAT System Upgrade installed an MCS with a local collection tank to serve buildings 2026 and an MCS equivalent in the new Transferred Waste Receiving Facility (TWRF). Phase II of the line item project will install an MCS to serve Bldgs. 3525 and 3025. The Bethel Valley FFA Upgrade line item project will connect Bldg. 3025 to this MCS. Line item project Melton Valley Storage Tank Capacity Increase will install new tanks to increase the storage capacity for concentrates from the central LLLW evaporator. The schedule for installing Category A systems is shown in Table 2.1.

Future design assessments will be submitted at least 90 days prior to the start of project construction. The current schedule for submitting these documents is shown in Fig. 2.1.

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

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
1988	1994	Bethel Valley LLLW-CAT System Upgrade Phase I	Deletes, replaces or upgrades LLW-CAT system for Bldg. 2026	Installs MCS with local collection tank. Installs MCS equivalent in Bldg. 2649.	line item project
1988	1997	Bethel Valley LLW-CAT System Upgrade Phase II	Deletes, replaces or upgrades LLW-CAT systems for Bldgs. 3092, and 3525	Installs MCS with local collection tank	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 1996 Activity Data Sheets (ADS), target funding levels.

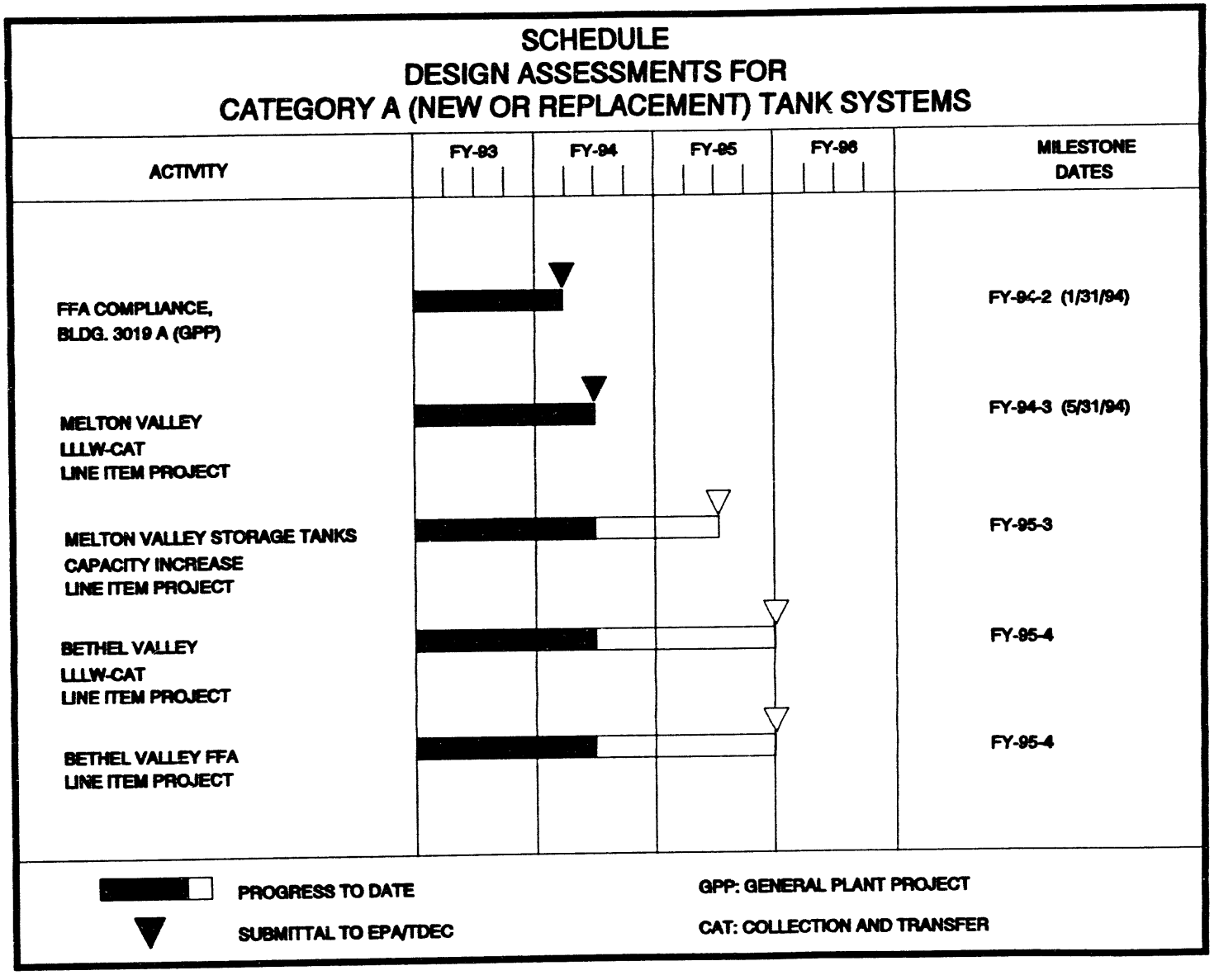

Fig. 2.1. Design assessment schedule.

REFERENCES FOR CHAPTER 2

1. *Design Assessment for Federal Facility Agreement Compliance Work, Building 3019A Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory*, Oak Ridge, Tennessee (DOE/OR/03-1097&D1), Ebasco, Oak Ridge, Tennessee, January 1994.

2. *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&D1), Enserch Environmental Corp., Oak Ridge, Tennessee, May 1994.

3. CATEGORY B TANK SYSTEMS

3.1 FFA DELIVERABLE

The FFA requires the 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] as shown in Fig. 3.1. 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. Twelve tank systems (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. Fifteen Tank Systems (N-71, P-3, P-4, C-1, C-2, L-11, B-2-T, B-3-T, C-6-T, F-111, F-126, WC-20, 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 with secondarily contained 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, three tank systems originally considered as Category B (F-201, F-501, and LA-104) do not fully meet the secondary containment requirements and will not be upgraded. Two of these systems (F-201 and F-501) have been transferred to Category C and will be subject to the FFA requirements for Category C until they are removed from service upon completion of the Bethel Valley LLLW CAT System Upgrade Project. Tank system LA-104 has been transferred to Category D.

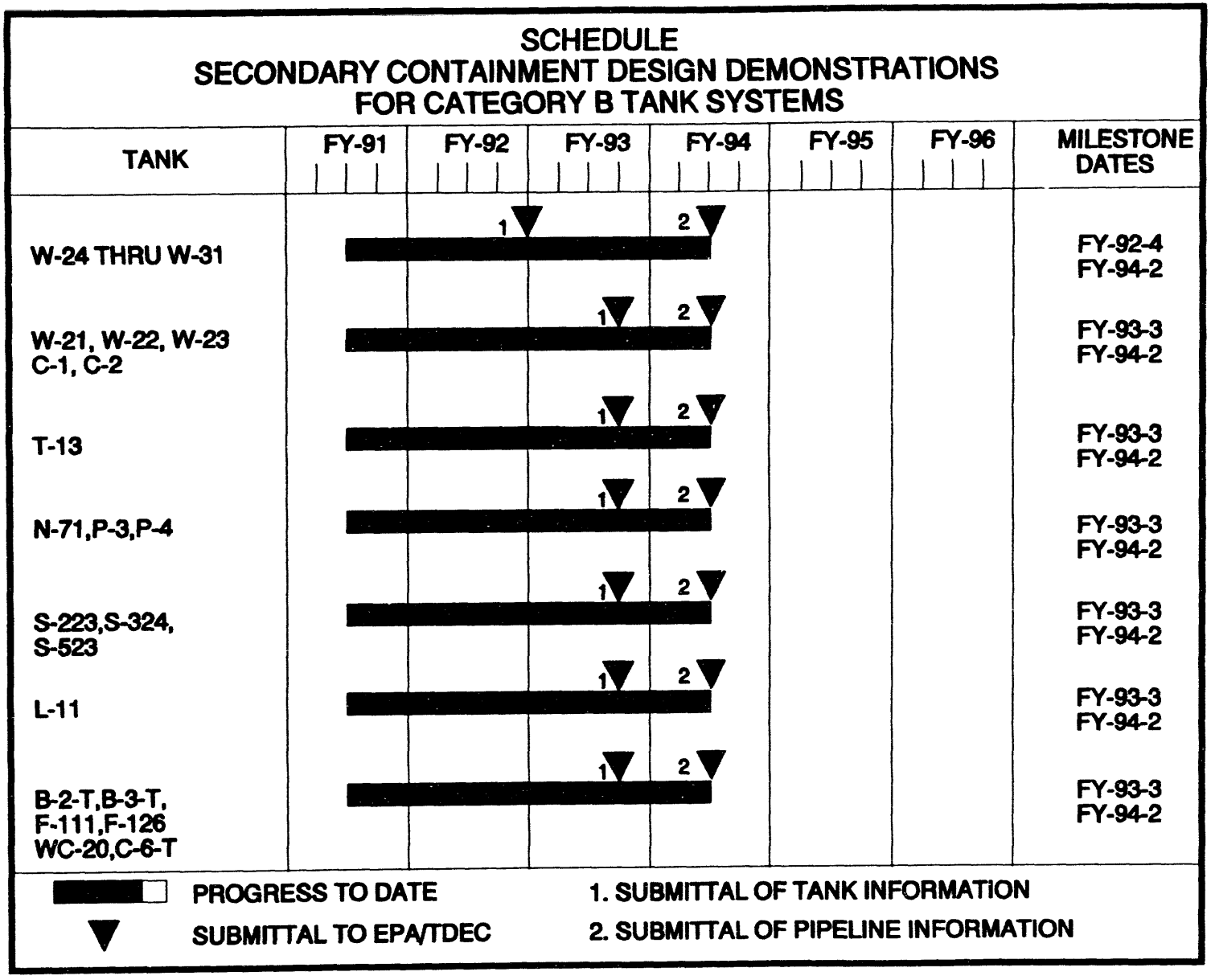

Fig. 3.1. Secondary containment design demonstration schedule.

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
1993	1995	7930 Filter Pit Cover	Encloses filter pit at REDC		GPP
1994	1995	NHF Cell Plugs Enclosures	Eliminates non-programmatic waste generation at 7830 and 7860		GPP
1994	1995	Incinerator Drive/OHF Valve Box Upgrade	Upgrades valve boxes to meet FFA requirements	Melton Valley Facilities	GPP
1992	1996	FFA Compliance Work, Bldg. 3019A	Doubly contains piping for 3019	N-71, P-3, P-4	GPP
1995	1997	W-6 Valve Box Upgrade	Upgrades valve box to meet FFA requirements		GPP
1995	1997	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 HFIR[a] T-1[a] T-2[a]	line item project
1994	1994	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 1996 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 of Category B tank systems

Year	Tank System Upgraded
1996	P-3, P-4, N-71, B-2-T, B-3-T, C-6-T, F-111, F-126
1994	S-223, S-324, S-523

REFERENCES FOR CHAPTER 3

1. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR-1047 & D1, Ebasco, Oak Ridge, Tennessee, May 1993.

2. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1150 & D1, Ebasco, Oak Ridge, Tennessee, June 1993.

3. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/03-1195&D1, Ebasco, Oak Ridge, Tennessee, February 1994.

4. Dennis G. Douglas et al., *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D1, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, September 1993.

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, health, or safety 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 updated 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). The schedule for expense-funded projects for FFA early actions for singly contained LLLW tank systems is shown in Table 4.2; the schedule for capital projects 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 modifying FFA singly contained LLLW tank systems

Tank location	Tank system	Project title	Project scope	Funding (FY and type)	Projected completion date (FY)	Removal from service
Isotopes Circle Facilities	WC-10	Isotope facility shutdown	Removes WC-10 from service	Expense	1998	1998
	WC-2	Isotope facility shutdown	Removes WC-2 from service	Expense	1996	1996
HFIR	HFIR T-1 T-2	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	1994	1995
3026D	W-16	Isotope Facilities Shutdown	Removes W-16 from service	Expense	1998	1998

Table 4.1. (concluded)

Tank location	Tank system	Project title	Project scope	Funding (FY and type)	Projected completion date (FY)	Removal from service
Radioactive (hot) Off Gas	WC-9	Upgrade WC-9 Transfer System	Bypasses leaking pump in pump pit	Expense	1994	NA
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 1996 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 1996 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 in accordance with the schedule in Fig. 4.1. The schedule extension beyond the initial submittal of SIAs, as shown in Fig. 4.1, indicates the periodic review of SIAs. The results of the periodic reviews 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 structural integrity assessments and to provide leak detection test results for Category C tank systems. These schedules are updated in Figs. 4.1 and 4.2 respectively.

4.2.3.1 Status

The Category C tank systems will 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 will be included in the Leak Testing Program on the basis of results from the Secondary Containment Design Demonstration documents.[3, 4, 5] The schedule for initial leak testing of the tanks[1] is shown in Table 4.4. Initial pipeline testing for Category C systems as well as for the required (singly contained) parts of the Category B systems was initiated in January 1994 and all systems will have been tested by March 1995.[2] The overall schedule for FFA submittals is shown in Fig. 4.2.

Table 4.4. Schedule for initiating leak testing of tanks

JUN 1993	SEP 1993	DEC 1993	MAR 1994	MAR 1995
WC-3	W-16	T-1	2026A	HFIR
WC-7	WC-10	T-2	F-201	
WC-9		W-12	F-501	
		WC-2		
		WC-19		

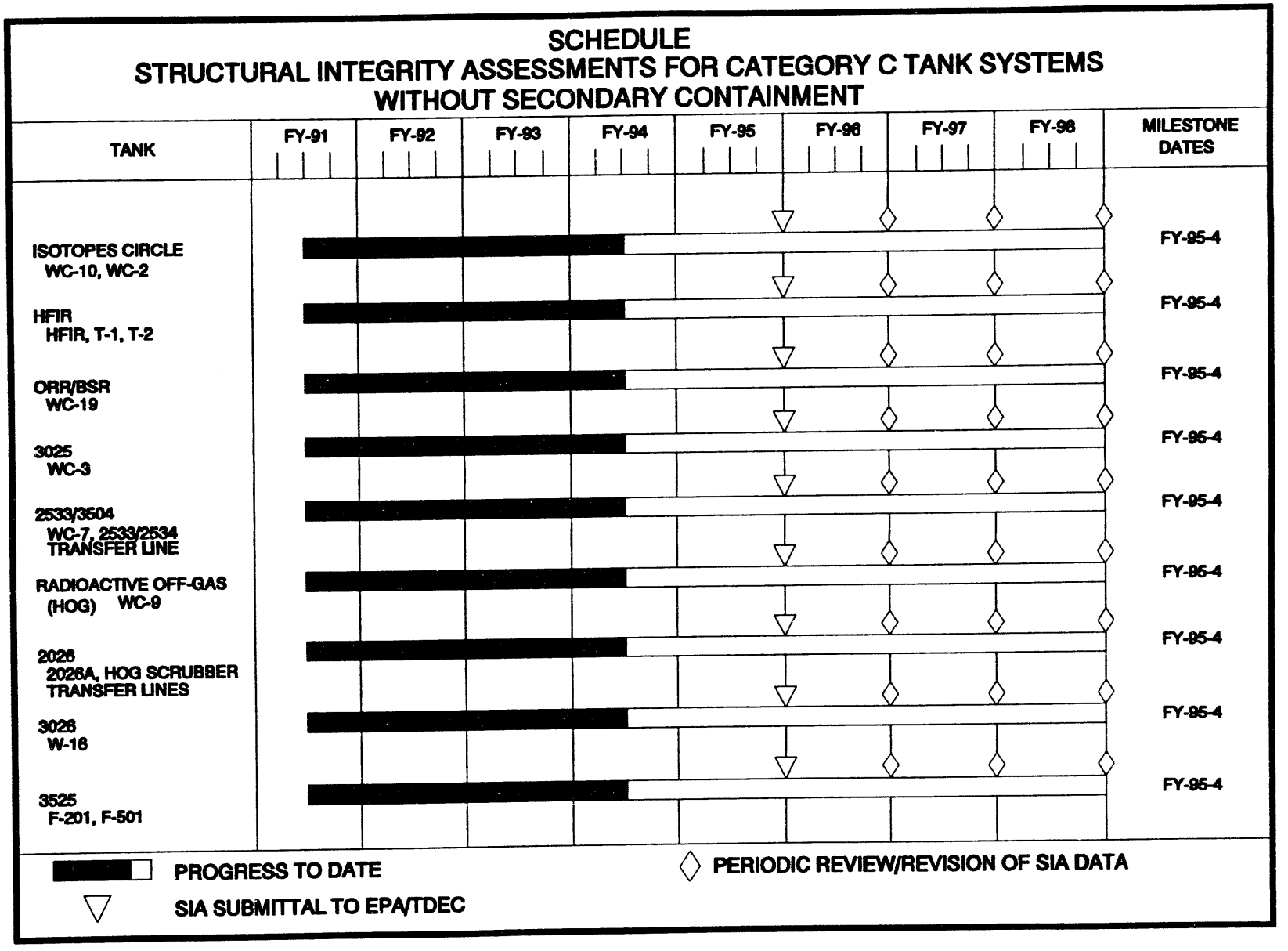

Fig. 4.1. Structural integrity assessments schedule for tank systems not meeting secondary containment standards

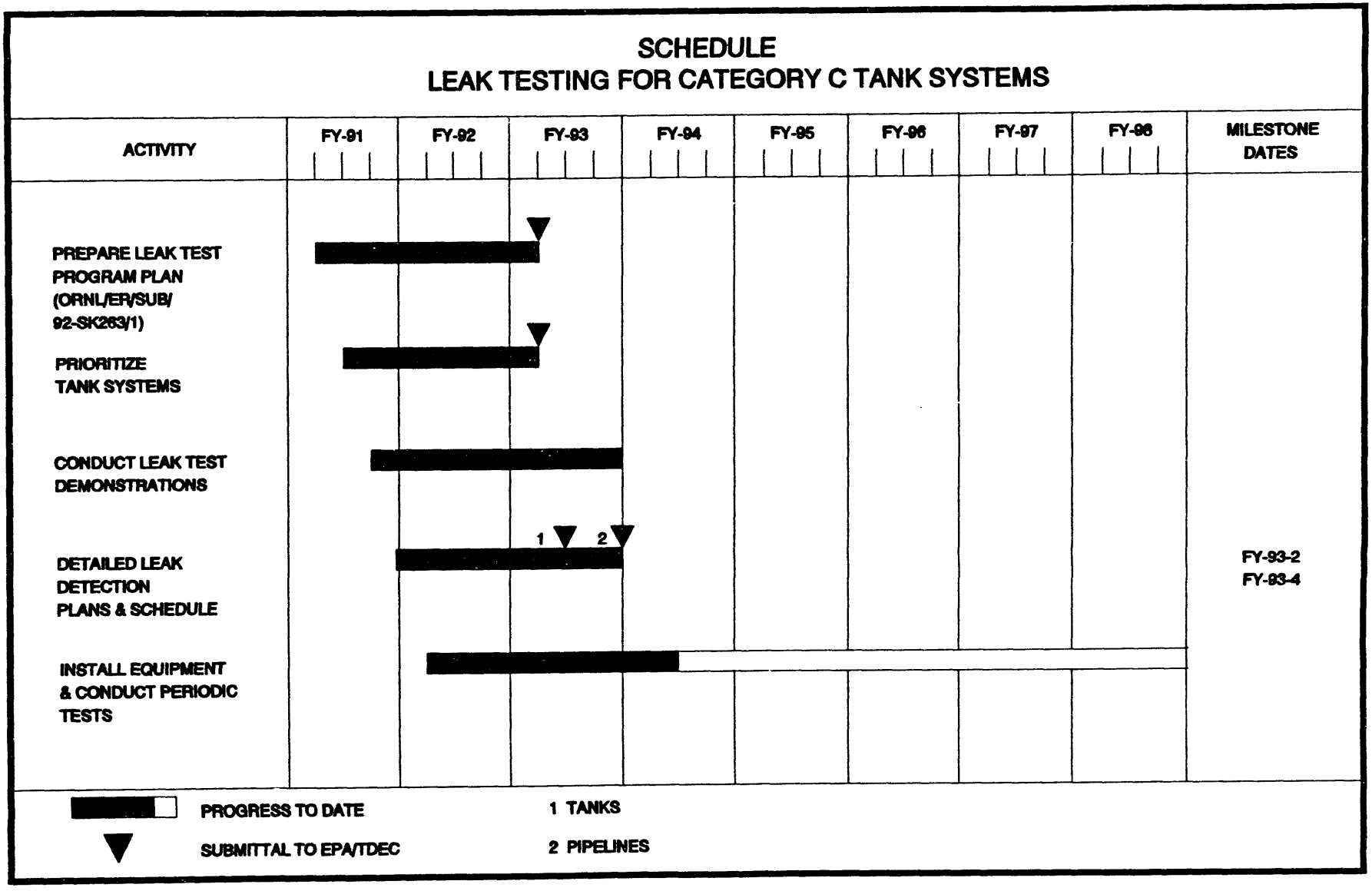

Fig. 4.2. Leak testing schedule for Category C tank systems

REFERENCES FOR CHAPTER 4

1. Dennis G. Douglas and Joseph W. Maresca, Jr., *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, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, March 1993.

2. Dennis G. Douglas et al., *Detailed Leak Detection Test Plan and Schedule for the Oak Ridge National Laboratory LLLW Active Pipelines*, DOE/OR/01-1167&D1, Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, September 1993.

3. *Design Demonstrations for Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR-1047 & D1, Ebasco, Oak Ridge, Tennessee, May 1993.

4. *Design Demonstration for the Remaining 19 Category B Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1150 & D1, Ebasco, Oak Ridge, Tennessee, June 1993.

5. *Design Demonstrations for Category B Tank System Piping at Oak Ridge National Laboratory, Oak Ridge, Tennessee* DOE/OR/03-1195&D1, Ebasco, Oak Ridge, Tennessee, February 1994.

5. CATEGORY D TANK SYSTEMS

5.1 WASTE CHARACTERIZATION SCHEDULE FOR THE CATEGORY D TANK SYSTEMS

Waste characterization data for the tank systems have been submitted to EPA/TDEC.[1] Tanks that have been emptied so that only a very small residue remains will not be characterized. Data will be provided for additional tank systems as they are removed from service.

5.2 SYSTEM CHARACTERIZATION SCHEDULE FOR THE CATEGORY D TANK

Risk characterization data has been submitted to EPA/TDEC.[2] An update to the risk characterization to include future Category D tanks will be prepared as waste characterization data for these tanks become available.

5.3 REMEDIATION SCHEDULE FOR THE CATEGORY D TANK SYSTEMS

The long-term strategy for the Category D tanks is to remediate individual tanks or tank farms under the CERCLA process as part of the waste area grouping (WAG) in which each tank is located. Each tank will be evaluated to determine if a removal action or removal of liquid contents is necessary to reduce to an acceptable level the risk associated with the tank. Final remediation of sludge, tank shells, and associated piping will be evaluated during the remedial investigation/feasibility study (RI/FS) for the WAG. A schedule for remediation of Category D tanks was submitted to EPA/TDEC in March 1993[3]. This schedule will be renegotiated annually, if necessary.

5.4 PROPOSED ACTIVITIES

This chapter contains the proposed schedules for the Category D LLLW tank systems for which liquid contents will be removed, for which early actions will be evaluated, or for which early actions will be initiated. A remediation schedule submitted in March, 1993 reflected the plans at that time. Information on current status and planned activities for Category D tanks is contained in Table 5.1.

The proposed schedules presented in this chapter are for proposed activities and are based on the latest information. The implementation and duration of these proposed activities are subject to change due to changes in priority, funding, and resolution of technical issues.

Table 5.1. Status and planned activities for Category D LLLW tank systems

Tank number	Capacity (gal)	Actual volume (gal)	Curie content		Schedule to empty	Inleakage/ outleakage	Monitor
			Alpha	Beta			
W-5	170,000	21,805	1.0	144.4	GAAT OU	Inleakage	CT[a]
W-6	170,000	126,190	6.32	940.0	GAAT OU	Inleakage	CT[a]
W-7	170,000	3,220	11.14	2800.0	GAAT OU	Probably not	CT[a]
W-8	170,000	51,933	11.58	3410.0	GAAT OU	Inleakage	CT[a]
W-9	170,000	38,319	43.08	2094.0	GAAT OU	Very slight inleakage	CT[a]
W-10	170,000	99,074	83.2	13,400.0	GAAT OU	Very slight inleakage	CT[a]
W-11	1500	Transient	None	None	GAAT OU	Inleakage during heavy rain	Staff
T1[g]	15,000	8,479	79.24	7292.0	FY 94/95	No	DP[b]
T2[g]	15,000	10,544	46.24	3860.0	FY 94/95	No	DP[b]
T3[g]	25,000	2,918	62.0	7859.0	FY 94/95	No	DP[b]
T4[g]	25,000	14,668	75.05	7600.0	FY 94/95	No	DP[b]
T9[g]	13,000	4,981	11.09	1245.0	FY 94/95	No	DP[b]
W-1	4800	1,013	None	0.11	FY 94 GAAT OU	Inleakage	CT[a]
W-2	4800	1,527	None	0.05	FY 94 GAAT OU	Inleakage	CT[a]
W-3	42,500	41,000	2.96	523.9	FY 94 GAAT OU	Inleakage	Staff
W-4	42,500	25,578	4.0	194.5	FY 94 GAAT OU	Inleakage	Staff
W-13	2000	Empty Sept. 92	0.40	65.0	GAAT OU Empty	No evidence of leaks	Staff
W-14	2000	Empty Sept. 92	0.22	26.0	GAAT OU Empty	No evidence of leaks	Staff
W-15	2000	Empty Sept. 92	None	None	GAAT OU Empty	No	Staff
W-1A	4000	Varies	Transient	Transient	GAAT OU	Inleakage	DP[b]
TH-1	2500	Empty Sept. 92	None	None	Empty	No evidence of leaks	None[c]

Table 5.1. (continued)

Tank number	Capacity (gal)	Actual volume (gal)	Curie content		Schedule to empty	Inleakage/ outleakage	Monitor
			Alpha	Beta			
TH-2	2400	Empty Sept. 92	None	None	Empty	No evidence of leaks	None[c]
TH-3	3300	Empty Sept. 92	None	None	Empty	No evidence of leaks	None[c]
TH-4	14000	16,982	3.08	10.5	GAAT OU FY 94 Remove ~7,000 gal	Full beyond capacity since sampling in 1988	CT[a]
WC-1	2150	Empty Sept. 92	None	None	Empty	No (since March)	None[c]
WC-15[g]	1000	1000	0.0001	0.002	Aug. 93 Empty	Inleaks groundwater	CT[a]
WC-17[d]	1000	400	None	None	Dec. 92 Empty	Inleaks groundwater	DP[2]
T-30	825	400	0.0004	0.001	Emptied Sept. 93	No	DP[b]
7560	1000	Empty Dec. 92	None	None	Empty	No evidence of leaks	None[c]
7562[e]	12,000	12,000	None	3.0	Tank Evaluation	Non-programmatic waste input	DP[b]
W-19	2250	Empty 1988	None	None	Empty	Dry when last inspected	None[c]
W-20	2250	Empty 1988	None	None	Empty	Dry when last inspected	None[c]
H-209	2500 (est.)	380 (est.)	None	None	Emptied Sept. 93	Unknown	None[c]
3001-B	75	Empty	None	None	Empty	Empty when last inspected	None[c]
7503-A	11,000	1500 (est.)	None	None	Empty	No	None[c]
3003-A	16,000	4000 (est.)	None	0.25	Emptied Sept. 93	Unknown	None[c]
3004-B	30	30	None	None	Emptied Sept. 93	Unknown	None[c]
3013	400	235 (est.)	None	None	Emptied Sept. 93	Unknown	None[c]

Table 5.1. (continued)

Tank number	Capacity (gal)	Actual volume (gal)	Curie content		Schedule to empty	Inleakage/ outleakage	Monitor
			Alpha	Beta			
3002-A[f]	1600	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input (Filter House)	None[c]
T14[f]	48500	Empty Sept. 92	None	None	Empty	No	None[c]
4501-P[f]	100	Empty Sept. 92	None	None	Empty	No	None[c]
S-424[f]	500	Sept. 92 Empty	None	None	Empty	No	None[c]
WC-4[f]	1700	Transient	Transient	Transient	Tank evaluation	Very slight inleakage	DP[b]
WC-5[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input	DP[b]
WC-6[f]	500	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input	DP[b]
WC-8[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input (Pump prime water)	DP[b]
W-1I[f]	500	Empty Sept. 92	None	None	Empty	No	DP[b]
W-17[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input	DP[b]
W-18[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input	DP[b]
WC-11[f]	4000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input (Filter pit, cell ventilation pump)	DP[b]

Table 5.1. (concluded)

Tank number	Capacity (gal)	Actual volume (gal)	Curie content		Schedule to empty	Inleakage/ outleakage	Monitor
			Alpha	Beta			
WC-12[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input (Sump)	DP[b]
WC-13[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input (Floor sump)	DP[b]
WC-14[f]	1000	Transient	Transient	Transient	Tank evaluation	Non-programmatic waste input	DP[b]
W-12[f]	700	Transient	Transient	Transient	Tank evaluation	Inleakage	DP[b]

[a]Conductivity tape.

[b]Differential pressure method.

[c]These tanks have been emptied. These tanks have no level monitors, but they are being incorporated into a comprehensive surveillance and maintenance plan that will specify regular inspections of these tanks to monitor for inleakage.

[d]A review of historical data for Tank WC-17 indicated potential outleakage. In December 1992, Tank WC-17 was emptied and rinsed three times. A video inspection of the tank indicated two holes in the bottom of the tank, which allow groundwater to enter the tank.

[e]Tank 7562 was scheduled to be emptied in FY 1993; however, an unidentified source of input was discovered. An evaluation is under way to identify and stop the input. Once this has been accomplished, we will be able to schedule this tank to be emptied.

[f]Out-of-service tanks that belong to Waste Management (WM). Some of these tanks are receiving nonprogrammatic input, the source of which WM is identifying. After the sources have been identified, a tank-by-tank evaluation will be initiated to identify which inputs can be eliminated or diverted. Projects to eliminate inputs were initiated in FY 1993. All tanks were emptied in FY 1993; however, some tanks may have some inleakage or nonprogrammatic inputs that cannot be economically diverted until the facility or area causing the input is remediated.

[g]Tank WC-15 was taken out of service due to leaks. The level monitor indicated a sudden change in the liquid level on August 9, 1993. After confirming that the level monitor was functioning properly, the tank was physically accessed and determined to have leaked ~500 gal. The rest of the contents were pumped out, and a video inspection indicated groundwater was entering at the bottom of the tank. The water level has stabilized at ~40% of capacity, which is similar to Tank WC-17.

5.4.1 Liquid Content Removal Schedule

The liquid contents in the Old Hydrofracture (OHF) Tanks (T-1, T-2, T-3, T-4, and T-9) will be removed by using the existing piping system if possible. If the existing system cannot be used, a valve box will be built that will bypass the old pumps and tie into the active LLLW system. Some liquid will be left in the tanks to prevent the sludge from drying out.

Tank TH-4 will have approximately 7,000 gal of the liquid contents removed this year. This tank is already in the CERCLA process as part of the Gunite and Associated Tanks Operable Unit (GAAT OU). At present, this tank is full beyond its design capacity. The purpose of partially removing the liquids is to prevent the tank from overfilling and potentially releasing liquid to the environment. Since this tank is not connected to an active LLLW system, the tank will have to be emptied by trucking the liquid to the LLLW system.

Gunite tanks W-1, W-2, W-3, and W-4 will have their liquid contents removed. Should using the existing system pose a problem, a submersible pump will be used to transfer the liquids to the active LLLW system.

Gunite tanks W-6 and W-10 are 170,000-gal-capacity tanks that are nearing tank capacity. The liquid in these tanks may be used to support a treatability study to be conducted in FY 1996 for the GAAT OU (i.e., sluicing campaign). If the GAAT OU wants to use these liquids, and the tanks reach capacity before the sluicing campaign can begin, the liquids will be transferred to another tank until they are ready to begin. If the liquids are not needed, then W-6 and W-10 will be partially emptied of liquids to (1) prevent these tanks from overfilling, and (2) demonstrated the ability to empty the gunite tanks as a routine operation. Because of the radioactive content of the sludge, enough liquid (50,000) should be left in each tank to provide shielding.

5.4.2 Early Action Schedule

Stainless steel tanks WC-15 and WC-17 have been confirmed as leaking. The liquid contents were removed and groundwater has entered the tanks. The liquid level in the tanks corresponds with the groundwater level. It is planned to remove the liquid contents and pump foam into the tanks, which will prevent groundwater from entering the tanks. This should keep the tanks stable until remediation is completed.

The gunite tanks in the South Tank Farm (W-5, W-6, W-7, W-8, W-9, and W-10) will have survey markers installed on one of the manways on each tank. The elevation of these markers will be monitored for any unusual fluctuations which may give an early warning of impending dome failure.

Tanks T-30, 3013, 3001-B, 3004-B, and H-209 are considered candidates for removal as a routine maintenance activity. These tanks are either empty and stay empty or the contents of the tank are below reportable quantities (RQ) and should be considered for removal outside the CERCLA requirements.

Tanks that receive inleakage will continue to be evaluated and attempts made to identify ways to stop or divert inputs to the tanks. Progress will primarily be communicated to EPA and TDEC in periodic working group meetings.

A removal action is being considered for the Thorium Tank Farm (Tanks WC-5, WC-6, WC-8, TH-1, TH-2, and TH-3). Some of the tanks receive inleakage and have sludge in them. Owing to the cost of maintaining these tanks and the period of time before these tanks are scheduled to enter the CERCLA process, a removal may be appropriate to begin the remediation process sooner. However, before a removal action can be initiated, all non-programmatic inputs must be stopped or diverted and the risk associated with these tanks must be shown to justify the action. Other tank farms are being evaluated for removal actions as well.

REFERENCES FOR CHAPTER 5

1. *Waste Characterization Data for the Oak Ridge National Laboratory Inactive Liquid Low-Level Radioactive Waste Tank Systems*, DOE/OR/01-1159&D1 (Supersedes ORNL/ER-80), Martin Marietta Energy Systems, Inc., Oak Ridge, Tennessee, June 1993.

2. *Risk Characterization Data Manual for Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee*, ORNL/ER/Sub/90-LJ068/1, H&R Technical Associates, Inc., Oak Ridge, Tennessee, September 1992.

3. *Remediation Schedule for Inactive Liquid Low-Level Waste Storage Tanks at the Oak Ridge National Laboratory, Oak Ridge, Tennessee*, DOE/OR/01-1138&D1, H&R Technical Associates, Inc., Oak Ridge, Tennessee, March 1993.

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 [Radiochemical Processing Pilot Plant (RPPP)]

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

C. Tank User Divisions: Analytical Chemistry, Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1401	1993	IGV	1,900	SS	A

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

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 in service in 1994.

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 [Transferred Waste Receiving Facility (TWRF)]

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

C. Tank User Division: Chemical Technology

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
F-1701	1993	AGV	1,900	SS	A

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

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

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	304LSS	B
S-324	1955	IGV	1000	304LSS	B
S-523	1955	IGV	1000	304LSS	B

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

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:

Although less work is currently planned in this facility, future usage is expected to be similar to that in the past (i.e., fission product related) plus facility cleanup.

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: Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
C-1	1964	IGV	50000	SS	B
C-2	1964	IGV	50000	SS	B
W-21	1979	IGV	50000	SS	B
W-22	1979	IGV	50000	SS	B
W-23	1979	IGV	50000	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: Waste Operations

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: Waste Operations

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, Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
WC-20	1976	IGV	10000	SS	B
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 **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable

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: 60%
Length of Buried Piping: 7800 ft
Percent Doubly Contained Buried Pipe: 6%
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: Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
W-24	1980	IGV	50000	SS	B
W-25	1980	IGV	50000	SS	B
W-26	1980	IGV	50000	SS	B
W-27	1980	IGV	50000	SS	B
W-28	1980	IGV	50000	SS	B
W-29	1980	IGV	50000	SS	B
W-30	1980	IGV	50000	SS	B
W-31	1980	IGV	50000	SS	B

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

E. Tank Usage:

These tanks store the evaporator bottoms from the LLLW evaporators in Bethel Valley. 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 **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable

E. Original or Past Tank Usage:

Bldg. 3525 provides for the post-irradiation 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, Waste Operations

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

E. Original or Past Tank Usage:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities serviced 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 serviced 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, Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
HFIR	1961	BT	13000	SS	C
T-1	1963	BT	15000	SS	C
T-2	1963	BT	15000	SS	C

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

E. Original or Past Tank Usage:

These LLLW systems service 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 **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable

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 the regeneration of demineralizers at Bldgs. 3042, 3019, and 3001. Tank WC-19, which is an ES&H tank, will continue to be used to process waste from regeneration of the demineralizers.

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: Waste Operations, 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, Waste Operations

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

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

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. 2026.

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

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

C. Tank User Divisions: Analytical Chemistry, Waste Operations

D. Tank Data:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	FFA Category
2026A	1962	IGV	500	SS	C

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

E. 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.

F. Current or Future Tank Usage:

This tank is being replaced by new tank F-1401 and will be removed from service in 1995.

G. System Component Characteristics:

Percent Doubly Contained Pipe in Facilities: 0%
Length of Buried Piping: 900 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 LLLW tank system at Bldg. 3026D.

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

B. Tank Location: Melton Valley South Tank Farm

C. Tank User Divisions: Waste Operations, 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 serviced 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

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); south of the South Tank Farm (W-18, 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	170000	G	no	NA
W-6	1943	BT	170000	G	no	NA
W-7	1943	BT	170000	G	no	NA
W-8	1943	BT	170000	G	no	NA
W-9	1943	BT	170000	G	no	NA
W-10	1943	BT	170000	G	no	NA
W-11	1943	BT	1500	G	no	NA
W-17	1951	BT	1000	SS	no	no
W-18	1951	BT	1000	SS	no	no
W-19	1955	BT	2250	SS	no	no
W-20	1955	BT	2250	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	15000	CS	no	yes *
T2	1963	BT	15000	CS	no	yes *
T3	1963	BT	25000	CS/RL	no	yes *
T4	1963	BT	25000	CS/RL	no	yes *
T9	1963	BT	13000	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 with high transuranic and toxic metal concentrations.

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	4800	G	no	NA
W-2	1943	BT	4800	G	no	NA
W-3	1943	BT	42500	G	no	NA
W-4	1943	BT	42500	G	no	NA
W-13	1945	BT	2000	SS	no	no
W-14	1945	BT	2000	SS	no	no
W-1A	1951	BT	4000	SS	no	no
W-15	1945	BT	2000	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	2500	SS	no	no
TH-2	1952	BT	2400	SS	no	no
TH-3	1952	BT	3300	SS	no	no
TH-4	1952	BT	14000	G	no	NA
S-424	1955	IGV	500	SS/GL	yes	no
H-209	1961	BT	2500*	SS	no	no
WC-5	1952	BT	1000	SS	no	no
WC-6	1952	BT	500	SS	no	no
WC-8	1952	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; *—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.

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 is a medium-sized gunite tank that 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. Tanks Located at: Bethel Valley, Isotopes Circle. Tank W-11 is located under the floor slab in the east airlock of Bldg. 3028.

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-11	1959	BT	500	SS	no	no
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:

Tank W-11 was used to collect waste liquids from isotope recovery operations in Bldg. 3028. Although the actual date is uncertain, the tank was removed from service by 1987.

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 little or no sludge. The liquid contents have been removed. Tank W-11 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. The out-of- service date for the tank is unknown.

E. Waste Characterization:

The liquid contents were removed from Tank T-30 in Sept. 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, Waste Management

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 (exact date unknown) 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.
T14	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. The removal-from-service date is unknown.

Tank 7503-A was a waste holding tank for the Molten Salt Reactor Experiment. The out-of-service date is unknown.

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, Waste Management

C. Tank Data Table:

Tank No.	Date of Install.	Tank Loc.	Cap. (gal)	Material of Const.	Double Ctnment	Cathodic Prot.
3001-B	1943	BT	75*	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
*—estimated
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 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 out-of-service date is unknown.

Tank 3013 is connected to the drains in Bldg. 3013. Building 3013 was originally an environmental processing laboratory that dealt with low-level contaminated environmental samples. The out-of-service date is unknown.

Tank 3002-A was used to collect liquid condensate from Bldg. 3002. Building 3002 was the filter house for the Old Graphite Reactor. The removal-from-service date is unknown.

Tank WC-4 was used as a waste tank for Bldg. 3026. Wastes were primarily generated 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: Waste Management

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 **SS**—stainless steel
IGV—in-ground vault **CS**—carbon steel
BT—buried tank **G**—gunite
NA—not applicable **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 will be returned to service upon approval of a waiver for short-term operation.

Exhibit B.11. Data summary for the Bldg. 3047 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

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:

Multigram quantities of radioisotopes were separated, purified, stored, and distributed in facilities serviced 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.

E. Waste Characterization:

DATE
FILMED
10/7/94
END