Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

**FY 1994 Annual Summary Report of the Surveillance and
Maintenance Activities for the Oak Ridge National Laboratory
Environmental Restoration Program**

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CONTENTS

FIGURES	v
TABLES	v
ABBREVIATIONS	vii
EXECUTIVE SUMMARY	ix
1. INTRODUCTION	1
1.1 THE SURVEILLANCE AND MAINTENANCE PROGRAM	1
1.2 SURVEILLANCE AND MAINTENANCE PROGRAM OBJECTIVES	1
2. FY 1994 ACCOMPLISHMENTS	4
2.1 SURVEILLANCE AND MAINTENANCE PRELIMINARY INVESTIGATIONS	4
2.1.1 FY 1992 and FY 1993 Surveillance Evaluation	4
2.1.2 Revised Surveillance Criteria	4
2.1.2.1 Surveillance Criteria	5
2.1.3 ORNL/ER Plans and Reports	5
2.1.4 FFA CERCLA Sites Verification	5
2.1.5 ORNL WAG Boundary Definition	8
2.1.6 Homogenous Reactor Experiment Wells	8
2.1.7 Radiological Surveys	8
2.1.7.1 No Further Investigation Sites	8
2.1.7.1.1 No Further Investigation Site Determinations	9
2.1.7.2 Melton Valley Drive and Lagoon Road	9
2.1.7.3 State Highway 95	11
2.1.7.4 Tennessee Valley Authority Access Area	11
2.1.7.5 WAG 13 (0800 Research Area)	11
2.1.7.6 Freels Bend Sheep Barn	11
2.1.7.7 Area East of White Wing Scrap Yard	13
2.1.7.8 Hot Spot Remediation	13
2.1.7.9 Contaminated Trees	13
2.1.8 ER/WM Data Management	13
2.2 SPECIAL PROJECTS	14
2.2.1 Impoundment 3513	14
2.2.2 Solid Waste Storage Area 4 Diversion Ditch Repair	14
2.2.3 Solid Waste Storage Area 5 Diversion Ditch Repair	14
2.2.4 White Wing Scrap Yard Fence	17
2.2.5 Chestnut Ridge Fence	17

CONTENTS (Continued)

2.3 ROUTINE SURVEILLANCE AND MAINTENANCE	17
2.3.1 Vegetation Maintenance	17
2.3.2 RCRA Caps	17
2.3.3 Access Control, Safety Improvements, and Signage	22
2.3.4 Deficiency Corrections	22
2.3.5 Facility Inspections	22
2.3.6 Tank Related Activities	22
2.3.7 Occurrence Reports	23
2.3.8 White Wing Scrap Yard	28
2.4 INACTIVE GROUNDWATER WELLS	28
2.4.1 Well Surveillance and Maintenance Activities	28
2.4.2 Well Data Management	28
 Appendix A: Evaluation of FY 1992 and FY 1993 Weekly Site/Facility Inspections ..	A-1
 Appendix B: Sites/Facilities Managed by the ORNL ER S&M Program	B-1
 Appendix C: Summary of Tank Level Trending Activities	C-1

FIGURES

1	CERCLA sites in WAG 1	6
2	CERCLA sites in WAGs 2-13	7
3	WAG 13	12
4	Impoundment 3513	15
5	SWSA 5 diversion ditches	16
6	White Wing Scrap Yard fence	18
7	Chestnut Ridge fence	19
8	Chestnut Ridge fence	20
9	Vegetation maintenance	21
10	7562 tank excavation	24
11	7562 tank excavation	25
12	7562 tank excavation	26
13	Inactive groundwater well	29

TABLES

1	NFI determinations	10
2	FY 1994 occurrence report status	27

ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DOE	U.S. Department of Energy
ER	environmental restoration
ERPSD	Environmental Restoration Program Support Department
FFA	Federal Facilities Agreement
FS	feasibility study
FY	fiscal year
HRE	Homogenous Reactor Experiment
HSRD	Health Sciences Research Division
LLW	low-level waste
LLLW	liquid low-level waste
MAD	Measurement Applications and Development
MMES	Martin Marietta Energy Systems, Inc.
NaI	sodium iodide
NFI	no further investigation
ORNL	Oak Ridge National Laboratory
ORP	Office of Radiation Protection
ORR	Oak Ridge Reactor
R&D	research and development
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
S&M	surveillance and maintenance
SWSA	solid waste storage area
WAG	waste area grouping
WM	waste management
WMRAD	Waste Management and Remedial Action Division
WWSY	White Wing Scrap Yard

EXECUTIVE SUMMARY

The Oak Ridge National Laboratory (ORNL) Environmental Restoration (ER) Surveillance and Maintenance (S&M) Program was initiated to manage former waste management and environmental research sites contaminated with radioactive materials and/or hazardous chemicals. The S&M Program is responsible for managing designated sites/facilities from the end of their operating lives until final disposition or site stabilization. Though administered by the Environmental Restoration Program Support Department (ERPSD) of ORNL's Waste Management and Remedial Action Division (WMRAD), oversight of the S&M Program is ultimately provided by the ER Program.

To effectively manage and perform the various S&M Program responsibilities, five summary-level work breakdown structure (WBS) elements have been established: S&M Preliminary Investigations, Special Projects, Routine S&M, Inactive Groundwater Wells, and Project Management.

Routine S&M activities were conducted as scheduled throughout fiscal year (FY) 1994 at applicable inactive waste management (WM) and other contaminated areas. Overall, the ER S&M Program maintains 47 facilities (buildings), performs vegetation maintenance on approximately 230 acres, maintains 54 inactive tanks (38 of which are owned by the ER Program), and provides overall site management on over 700 acres. In addition to the routine S&M activities, detailed site inspections were conducted at established frequencies on appropriate sites in the ER S&M Program. The inspections typically focused on perimeter fences, barrier chains, vegetation, diversion systems, warning signs, access roads, asphalt caps, housekeeping, and general site conditions and appearance. Because of potential vulnerabilities (safety hazards to grounds maintenance personnel and equipment, the spread of contamination, or direct radiation exposure), thorough attention was given to the solid waste storage area (SWSA) surface areas for the presence of subsided trenches. Results of these inspections were documented on checklists and the data were archived for future reference.

This document provides a summary of the FY 1994 ORNL ER S&M Program accomplishments.

1. INTRODUCTION

During fiscal year (FY) 1990, the Environmental Restoration (ER) Program was formed to research and conduct remedial actions at Oak Ridge National Laboratory's (ORNL's) contaminated areas. For the purposes of Surveillance and Maintenance (S&M), the various Site Corrective Measures Program sites were combined with storage tanks and impoundments that were formerly supported by the Decontamination and Decommissioning Program to form the current ER S&M Program.

The ORNL ER S&M Program was established to manage and control areas contaminated with radioactive materials and/or hazardous chemicals. By means of the S&M Program, applicable areas/facilities are managed from the end of their operating life until final disposition or site stabilization (whichever is deemed most appropriate based upon environmental regulations and/or best management practices). The ER S&M Program is intended to (1) provide routine (or non-routine) S&M of applicable sites/facilities and (2) plan for safe and orderly final closure at each site/facility.

1.1 THE SURVEILLANCE AND MAINTENANCE PROGRAM

The ORNL ER S&M Program provides the essential S&M functions at applicable sites/facilities in an attempt to ensure that they remain in acceptable condition without undue risks to human health or the environment. The inventory of sites and facilities managed by the ER S&M Program includes a variety of former waste management (WM) areas, environmental research sites, and areas of contamination from past research and development (R&D) operations. The majority of these facilities are inactive, however, if deemed appropriate (determined by the nature of a facility itself), the scope of the S&M Program allows for the routine surveillance of additional facilities.

1.2 SURVEILLANCE AND MAINTENANCE PROGRAM OBJECTIVES

The principal objectives of the ORNL ER S&M Program are as follows:

1. to ensure adequate containment of the residual radioactive materials remaining at the applicable sites/facilities,
2. to provide safety and security controls to minimize the potential hazards to human health and the environment,

3. to strategically evaluate and plan final closure activities at appropriate sites/facilities, and
4. to successfully manage its facilities in a cost-effective and efficient manner.

These objectives are met through a structured program of routine S&M actions and through the implementation of special maintenance activities when site surveillance activities indicate such a need. The scope of activities performed under the S&M Program provides assurance that adequate site control is achieved and maintained during periods of remedial investigation (RI) and feasibility study (FS) until final site decommissioning or closure is accomplished. The S&M Program activities are organized and conducted in the five principal areas as described below:

1. **S&M Preliminary Investigations.** The scope for the S&M Preliminary Investigations includes strategic programmatic planning, documentation, and reporting. It ensures that regulatory compliance and milestone related issues are incorporated into the development of technical, schedule, and cost baselines. All S&M programmatic documents are written, edited, revised, published, and distributed through this element. Meeting award fee, Federal Facilities Agreement (FFA), or ER S&M milestones, if applicable, is the responsibility of this element. It provides the scope under which preliminary radiological assessments of potentially contaminated sites are performed, and access to the solid and liquid buried waste data for the inactive and active sites. A database is currently being developed to be utilized in preliminary assessments, RI scoping projects, and risk prioritization activities.
2. **Special Projects.** This element supports special maintenance activities which are not routine in nature. It allows for the assessment, development, design, and implementation of Special Project scopes. It also allows for project documentation, including National Environmental Policy Act, Health and Safety Plans, and final reports (as required). These activities are non-repetitive and planning is dictated solely by site conditions. Special Projects are planned for and prioritized as far in advance as is possible. Specific actions might include limited site characterization, engineering design, contract procurement, and oversight of all field activities.
3. **Routine S&M.** The scope for routine S&M provides the field crew and support personnel to perform routine S&M of ER Program sites until the completion of chosen remedial actions. Routine S&M actions are necessary to ensure that ER Program sites are routinely maintained in a manner that protects human health, safety, and the environment. For such protective purposes, this element provides two distinct tasks: (1) routine site inspections, consisting of the completion of facility checksheets and logbooks, radiological and industrial hygiene surveillance, and inactive tank level monitoring, and (2) maintenance activities that are required as a result of routine site inspections or regularly scheduled maintenance. Also included is the routine maintenance of containment systems and equipment, general facility upkeep, grounds maintenance, and oversight of all field activities.
4. **Inactive Groundwater Wells.** This scope provides for the management of ORNL groundwater monitoring and investigatory wells that have been identified as unusable or non-essential. These activities are necessary to prevent potential contaminant migration.

5. **Project Management.** The scope for Project Management includes oversight of programs, integration of prime contract and subcontract actions, and interfacing among various ER Program elements. It supports the S&M Program elements by directing, staffing, coordinating, developing, receiving, and planning for each of the ER Program's S&M activities. It provides program support staff for the S&M Program activities and furnishes a means by which the roles and responsibilities of multiple Department of Energy (DOE) contractors and Martin Marietta Energy Systems, Inc. (MMES) subcontractors are integrated. Also, it provides for the assignment of administrative duties that are required for the S&M Program's financial tracking system.

2. FY 1994 ACCOMPLISHMENTS

The FY 1994 ORNL ER S&M Program accomplishments were primarily concentrated in four of the program's five work breakdown structure (WBS) elements as defined in activity data sheet 3314 "Remedial Action Surveillance and Maintenance." These elements are (1) S&M Preliminary Investigations, (2) Special Projects, (3) Routine S&M, and (4) Inactive Groundwater Wells.

2.1 SURVEILLANCE AND MAINTENANCE PRELIMINARY INVESTIGATIONS

The primary purposes of the S&M preliminary investigations element are to provide strategic planning, develop defensible well-documented project baselines, fulfill documentation and reporting requirements, ensure the successful completion of appropriate S&M milestones, provide the scope under which preliminary radiological assessments of potentially contaminated sites are performed, and provide access to the solid and liquid buried waste data for the inactive and active sites.

2.1.1 FY 1992 and FY 1993 Surveillance Evaluation

Historically, the S&M Program conducted its facility inspections at weekly intervals. With the original number of sites/facilities subject to routine surveillance, this meant that a total of 429 facility inspections were performed during a given quarter. It was evident that weekly inspections of an increased number of facilities would not be possible for the existing S&M Program staff, nor could it be considered cost-effective. It was also clear, since routine site inspections are performed to avoid risk to human health and the environment, an assessment needed to be made as to the efficiency of historical surveillance activities. Accordingly, the results of weekly facility inspections performed during FY 1992 and FY 1993 were compiled, and the number of site/facility deficiencies found during those inspections were tallied (see Appendix A).

2.1.2 Revised Surveillance Criteria

To manage and satisfy the new requirements of the increased S&M Program surveillances, it was determined that a value ranking must be developed and applied to all applicable facilities, new and old. This new value ranking consisted of a risk-based formula to determine the appropriate facility inspection interval. The result of this effort has been an accommodation of the increased number of facilities inspected with a minimal reduction in risk aversion. Some of the facilities, such as the deep injection wells, ponds, and pits, which had been inspected weekly did not have a level of risk to human health or the environment that justified the

inspection interval. With the revised surveillance criteria, inspections were redistributed on the basis of risk, thus accommodating the increased number of facilities.

2.1.2.1 Surveillance Criteria

The following is a list of the newly developed risk-based surveillance criteria utilized to develop the routine site inspections for applicable facilities:

1. Risk

- a. type and degree of contamination (rad/chemical, low- or high-level),
- b. migration or potential migration of contaminants,
- c. type of facility (above/below ground, holding pond, tank farm, etc.),
- d. location of facility (relative to occupied buildings, public highways, etc.),
- e. credible worst-case emergency scenario,
- f. hazard analysis (based upon preliminary hazard screening or Phase 1 Safety Analysis Report Update Program, if available), and
- g. effect/impact of not discovering a deficiency in a timely manner.

2. Effectiveness of surveillance

Can the critical part of the facility be inspected visually?
Are special tests required?

3. Regulatory drivers

4. Level of activity at the site/facility

Is the facility in or near a populated part of ORNL? If remote, are others routinely at the site for purposes of Remedial Investigation/Feasibility Study (RI/FS), environmental monitoring, D&D, etc.?

5. Track record of deficiencies found in 1992 and 1993 weekly inspections.

For information pertaining to the functions and contaminants of the various inactive sites managed by the ORNL ER S&M Program, refer to Appendix B.

2.1.3 ORNL/ER Plans and Reports

Plans and reports completed during FY 1994 included:

- (1) the *Health and Safety Plan for the Environmental Restoration Program at Oak Ridge National Laboratory* (ORNL/ER-226),
- (2) the *Contingency Plan for ORNL ER Program Activities*, and
- (3) the *Surface Radiological Investigations at Two Creeks Receiving Runoff from White Wing Scrap Yard, Oak Ridge Reservation, Oak Ridge, Tennessee* (ORNL/ER-173).

2.1.4 FFA CERCLA Sites Verification

Efforts to physically locate, identify, and photograph each of the waste area grouping

Fig. 1. CERCLA sites in WAG 1.

WAG 1	120.5 acres
WAG 2	168.4 acres
WAG 3	24.1 acres
WAG 4	31.6 acres
WAG 5	87.2 acres
WAG 6	80.4 acres
WAG 7	130.6 acres
WAG 8	55.7 acres
WAG 9	3.8 acres
WAG 11	30.7 acres
WAG 13	5.33 acres

Fig. 2. CERCLA sites in WAGs 2-13.

(WAG) 1-13 Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites listed in Appendix C of the FFA (see Figs. 1 and 2) were completed. Upon completion of these activities, a photo book was developed showing each of the CERCLA sites, labeled with site numbers and descriptions, and ordered by WAG. Included in this project was the update of all CERCLA-related contaminated site summary sheets.

2.1.5 ORNL WAG Boundary Definition

A WAG boundary document was developed to define and illustrate the approved ORNL WAG boundaries. The boundaries were established to be consistent with the FFA Appendix C data and the ER Program. Included in the document was a formal definition of the change control (configuration management) process accompanied by instructions for completion of the change requests, and the necessary routing requirements. Upon completion of the definition exercise, the boundaries were input and are now maintained in the Oak Ridge Environmental Information System - Geographic Information System.

2.1.6 Homogenous Reactor Experiment Wells

An effort to physically locate and identify the Homogenous Reactor Experiment (HRE) wells was completed. Survey and field reconnaissance reports of the spent nuclear fuel from the HRE buried in WAG 7 were completed. Two separate tours of the HRE fuel wells were conducted with representatives from the criticality safety organization and field engineering. An environmental review and documentation checklist for the work at the HRE was completed. This provided project information to the Environmental Review and Documentation Section which was necessary in the determination of relevant regulatory requirements. The resulting Project Review Summary was used to determine appropriate corrective measures.

2.1.7 Radiological Surveys

In FY 1994, a number of sites were surveyed by the Measurement Applications and Development (MAD) Group of ORNL's Health Sciences Research Division (HSRD). These areas and their surroundings were surveyed to determine the presence, nature, and extent of radiological contamination. Results of the surveys were used to update and better identify site-specific conditions. This information was also used to determine the need (if any) for immediate special actions necessary to correct potential hazards to human health and/or the environment. The FY 1994 scoping survey accomplishments are described individually in the following subsections.

2.1.7.1 No Further Investigation Sites

Many of the no further investigation (NFI) candidate sites located throughout the Oak Ridge Reservation (ORR) are areas of past ecological research which employed a variety of radionuclides. Some of the radionuclides used in these experiments had short half-lives and have since decayed. It is possible, however, for longer-lived radionuclides to remain as residual material at some of the locations. There is a compelling need to determine the current baseline radiological status of these sites. As a result of this need, 22 NFI sites were surveyed for radiological contamination in FY 1994. The sites were prioritized in accordance with the anticipated level of contamination associated with each. The various site identification numbers and descriptions are as follows:

XER-0001 Ca-45 Trees,
 XER-0002 Ca-45 Tagged Soil and Vegetation Site,
 XER-0003 Na-22 Soil (Cricket Pens),
 XER-0005 Hg-197 Tagged Stream,
 XER-0007 Ca-45 Tagged Forest,
 XER-0008 Cs-137, Fe-59 Contaminated Pens,
 XER-0009 Hg-203 Tagged Stream,
 XER-0010 H-3 Contaminated Trees,
 XER-0013 Zn-65 Tagged Red Oak Seedlings,
 XER-0014 Cs-134 Pine and Oak Seedlings,
 XER-0015 Rb-86 Plants,
 XER-0016 Cs-134 Soybean and Sorghum,
 XER-0017 Cs-134 Grasses,
 XER-0018 Cs-134 Lichens and Mosses,
 XER-0019 Tc-95m Soil and Plants,
 XER-0020 Tc-95m Uptake Study,
 XER-0027 Cs-134 Persimmon Tree,
 XER-0028 Co-60, Mn-54 Animal Study Site,
 XER-0031 C-14 Allocation in White Oak Trees,
 X99-0001 Burn Pit,
 X99-0004 Cs-137 Forest Floor, and
 X99-0005 Cs-137 Understory.

2.1.7.1.1 No Further Investigation Site Determinations

The results of FY 1994 (and previously performed) NFI site surveys have been utilized to evaluate whether a site should be included or excluded in the remedial investigation/feasibility study (RI/FS) process. The exclusion of just one site from further regulatory consideration means substantial cost savings, specifically due to costs incurred during the RI/FS process. Of the 22 sites surveyed, during FY 1994, 16 NFI determinations were made and seven of those were submitted to the regulators (see Table 1).

2.1.7.2 Melton Valley Drive and Lagoon Road

Surveys were primarily conducted along the route of underground low-level waste (LLW) lines. The surveyed areas included the road surface, roadside areas, and spot-check measurements of selected vegetation. The types of radiation measured were gamma radiation [detected with a sodium iodide (NaI) detector] and beta-gamma radiation. The total area surveyed along Melton Valley Drive is estimated to be ~133,000 ft² and ~216,000 ft² along Lagoon Road.

Survey Results: Various areas of soil contamination were identified. Most of these contaminated areas were at locations of known leak sites along the LLW lines. Many radioactively contaminated trees were identified. At some of these locations, the presence of "hot" trees indicated residual subsurface contamination. Several hot spots were identified along the sides of both roads and on the surface of Lagoon Road. Frequently, laboratory radionuclide analysis sampling activities remediated the anomaly. An ORNL/ER report describing the results of these surveys is currently in preparation.

Table 1. NFI determinations

Ord. of imp.	Unit id#	Facility name	Date of operation	NFI form submittal (date)		
				ER	Coord	Regulators
H	99.03	Cs-137, Co-60 Contaminated Forest Area	1969-1970	4/25/94	7/26/94	7/29/94
H	ER.04	Cs-137 Bagged Leaves Study	Early 1961	4/25/94	7/26/94	7/29/94
H	12.01	Closed Contractor Landfill	1963-1975	4/25/94	7/26/94	7/29/94
F	16.02	Process Waste Basin	1962 - Never Used	3/2/94	3/20/94	4/28/94
F	20.01	Municipal Sewage Sludge Application Site	1983-1986	3/2/94	3/20/94	4/28/94
H	ER.02	Ca-45 Tagged Soil & Vegetation	1969	4/25/94	7/26/94	7/29/94
H	ER.01	Ca-45 Tagged Trees	Dec. 1969	4/25/94	7/26/94	7/29/94
H	ER.08	Cs-137, Fe-59 Contaminated Animal Pens	1969	7/26/94		
H	ER.27	Cs-134 Contaminated Persimmon Tree	June 1970	7/26/94		
H	ER.28	Co-60 & Mn-54 Animal Study	June 1970	7/26/94		
H	X99.04	Cs-137 Forest Floor	April 1964			
H	ER.19	TC-95m Soil and Plants	Sept. 1978 April 1979 July 1979			
H	ER.20	TC-95m Update Studies	Feb. 1981			
H	X99.01	Abandoned Burn Pit	1959-1969			
H	ER.05	Hg-197 Tagged Stream	Oct. 1971			
H	ER.07	Ca-45 Tagged Forest	May 1966			

L = Low
M = Medium
H = High

A = Active
F = Finished

It should be noted that during the Lagoon Road survey (specifically from the access gate to the intersection with Highway 95), 10 soil hot spots with elevated surface beta-gamma dose rates ranging up to 24 mrad/h were identified. By taking the samples for analysis, the contamination was remediated.

2.1.7.3 State Highway 95

There were two surface surveys completed in the vicinity of state Highway 95. The first survey was conducted along the east side emergency lane from White Oak Dam to the intersection with Lagoon Road. This survey employed floor monitors for the detection of beta-gamma radiation and NaI scintillators for gamma radiation detection. The survey area extended from the east roadside to the edge of the woods. To date, the total area surveyed is estimated to be ~80,000 ft².

Survey Results: No contamination was detected (in the survey area) along the east side of Highway 95 from White Oak Dam to the intersection with Lagoon Road.

A second survey was conducted on the east and west sides of Highway 95 north of the Lagoon Road intersection for a distance of ~900 ft on each side using gamma radiation detectors.

Survey Results: Fifteen hot spots/areas of soil contamination were identified. Sampling and subsequent radiological measurements at two hot spots determined that contamination was present in the soil. Gamma spectrometry analysis of the samples showed the presence of ¹³⁷Cs in concentrations of 540 pCi/g in one sample and 240 pCi/g in the other. Personnel from ORNL's Office of Radiation Protection (ORP) and ER management were immediately notified, and remedial action (soil removal) was conducted at these locations. The scoping survey results will be included in the Melton Valley Drive/Lagoon Road report.

2.1.7.4 Tennessee Valley Authority Access Area

The Tennessee Valley Authority survey area was primarily scanned for gamma radiation anomalies from Highway 95 (for a distance of 500 ft) and covered an area of ~100,000 ft². Twenty-three hot spots and/or soil areas were identified. Elevated surface gamma exposure rates ranging up to 170 μ R/h were found, whereas, the highest surface beta-gamma dose rate measured was 0.2 mrad/h.

2.1.7.5 WAG 13 (0800 Research Area)

A cursory survey was initiated outside the fenced area (see Fig. 3) and several spots of contamination were found. However, because contractor cleanup inside the fenced area had not been completed, the MAD group was directed by ORNL ER to terminate the survey activities until further notice.

2.1.7.6 Freels Bend Sheep Barn

A radiological scoping survey was conducted to determine the barn's radiological status. At the time of the surveying activities, the barn was posted as a Regulated Area (low-level contamination). A gamma scan was performed on all accessible interior areas, and for a

Fig. 3. WAG 13.

distance of approximately 20 ft circumjacent to the exterior of the barn. A beta-gamma scan was conducted on all accessible indoor floor areas, and for a distance of about five feet beyond the exterior structure of the barn. Alpha spot-check measurements were taken on the floor at intervals of approximately seven feet. Two samples were collected outside of the barn, and seven samples were collected inside of the barn at locations where the highest gamma and beta-gamma radiation levels were measured.

The results of the surveying activities performed at the barn showed the only radiological anomaly to be beta-gamma radiation levels slightly greater than usual background. Based upon the findings of the survey, it was recommended that the Radiological Area Low-Level Contamination postings be removed from the site.

2.1.7.7 Area East of White Wing Scrap Yard

A cursory survey was completed including analyses of soil samples. An internal correspondence report is in preparation.

2.1.7.8 Hot Spot Remediation

During scoping surveys, sampling of contaminated media sometimes resulted in the actual cleanup of contamination. In FY 1994, it is estimated that more than 70 hot spots were remediated during sampling efforts.

2.1.7.9 Contaminated Trees

This ongoing effort includes the evaluation of human health risks and ecological consequences from radioactively contaminated trees identified near Lagoon Road and Building 7819. A team consisting of members from the ORNL HSRD's MAD and Risk Analysis Group, ORNL's Environmental Sciences Division, and ORNL's ER Program is determining the radiological status of the site and will further evaluate human health and ecological risks of the site in its current condition. In addition, evaluations will be made regarding remedial action options. To date, core samples have been extracted from four trees displaying elevated beta-gamma radiation levels. Samples of bark and foliage have been collected from each of these trees, and a soil sample has been collected near the trees.

A radioactively contaminated tree located adjacent to the North Tank Farm was removed. The tree was packaged in a lined B-25 box and was disposed of as solid low-level waste.

2.1.8 ER/WM Data Management

Understanding the importance of compiling accurate data and maintaining its integrity, an effort was initiated to capture and centralize all WM Program data. During data compilation activities, document searches have been aggressively initiated and every potential information resource has been utilized, including the hosting of an ORNL "retirees" meeting which was conducted to gather historical information on stored and buried TRU wastes. These ongoing efforts will provide centralized access to the solid and liquid buried waste data associated with active and inactive sites. The resulting database(s) will have the potential to be utilized in preliminary assessments, RI scoping projects, and risk prioritization activities.

MapInfo and FoxPro database structures have been developed to receive the input of research data, and interact with each other. Layers containing various sites/facilities continue to be developed and enhanced within MapInfo. Solid Waste Information Management System Mod I, II, and III waste data continue to be input into appropriate FoxPro databases.

2.2 SPECIAL PROJECTS

In certain instances, site repairs or improvements may be necessary to correct material degradation problems, ensure radionuclide containment, or eliminate a significant safety concern. The scope of such projects can vary from routine construction projects to complex tasks requiring multi-division and subcontractor participation. This element allows for the assessment, development, design, and implementation of special projects which are not routine in nature. These projects are non-repetitive and planning is dictated by site conditions. The S&M Program's special project accomplishments in FY 1994 are presented in the following subsections.

2.2.1 Impoundment 3513

Due to the detection and confirmation of seeps, the Impoundment 3513 "Emergency Berm Repair" project was initiated. The specific actions associated with this project involved: (1) lowering the water level within the 3513 Settling Basin by transferring water to the existing Process Waste System and treating it at the existing Process Waste Treatment Plant, (2) mixing approximately 5000 lb of bentonite with locally available clay-soil (approximately three parts native clay-soil to one part bentonite), (3) clearing the existing vegetation on the interior surface of the south berm of the Settling Basin, (4) placing the bentonite/clay-soil mixture on the interior surface of the south berm of the settling basin, and (5) grading and compacting the bentonite/clay-soil mixture. Upon completion, the bentonite/clay-soil mixture formed an approximately 6-in-thick x 4-ft-wide x 220-ft-long blanket covering the entire length of the interior surface of the south berm of the Settling Basin (see Fig. 4).

Additional activities performed at Impoundment 3513 consisted of tracer studies, dye testing, sampling campaigns, the initiation and completion of two occurrence reports, and the replacement of goose control wires which had been removed for sampling activities.

2.2.2 Solid Waste Storage Area 4 Diversion Ditch Repair

Though many of the activities were primarily completed in FY 1993, the solid waste storage area (SWSA) 4 diversion ditch project, which repaired the diversion ditch installed on the north side of Lagoon Road to divert runoff from Haw Ridge around SWSA 4 rather than through it, was officially completed in FY 1994.

2.2.3 Solid Waste Storage Area 5 Diversion Ditch Repair

In FY 1993, Energy Systems Engineering determined that the SWSA 5 diversion ditches (see Fig. 5) did not serve their intended purpose (surface water control), and that the best course of action would be to break up the ditches and cover the areas with soil and vegetation. Accordingly, in FY 1994, the ditches were demolished, the area was backfilled with clean soil, seeded for grass, and straw was placed over the top.

Fig. 4. Impoundment 3513.

Fig. 5. SWSA 5 diversion ditches.

2.2.4 White Wing Scrap Yard Fence

Though many of the activities were primarily completed in FY 1993, the White Wing Scrap Yard (WWSY) fencing project (see Fig. 6), which was designed/intended to provide access control to approximately 35 acres within the WWSY, was officially completed in FY 1994. Project closure/completion activities consisted of the installation of gates and the placement of signs.

2.2.5 Chestnut Ridge Fence

Though many of the activities were primarily completed in FY 1993, the Chestnut Ridge (see Figures 7 and 8) fencing project, designed to provide access control for the Chestnut Ridge Sites, was officially completed in FY 1994. Project closure/completion activities consisted of the installation of gates and the placement of signs.

2.3 ROUTINE SURVEILLANCE AND MAINTENANCE

Routine S&M activities were conducted as scheduled throughout FY 1994 at applicable inactive WM and other contaminated areas. Overall, the ER S&M Program maintains 47 facilities (buildings), performs vegetation maintenance on approximately 230 acres, maintains 54 inactive tanks (38 of which are owned by the ER Program), and provides overall site management on over 700 acres. In addition to the routine S&M activities, detailed site inspections were conducted at established frequencies on appropriate sites in the ER S&M Program. The inspections typically focused on perimeter fences, barrier chains, vegetation, diversion systems, warning signs, access roads, asphalt caps, housekeeping, and general site conditions and appearance. Because of potential vulnerabilities (safety hazards to grounds maintenance personnel and equipment, the spread of contamination, or direct radiation exposure), thorough attention was given to the SWSA surface areas for the presence of subsided trenches. Results of these inspections were documented on checklists and the data were archived for future reference.

2.3.1 Vegetation Maintenance

Vegetation maintenance includes a variety of activities from mowing grass (see Fig. 9) to trimming or removing vegetation and downed trees, and is continuously required for a variety of purposes. Such purposes might include upgrading the appearance of a site or facility, permitting access for surveying activities, and enhancing inspection processes. During FY 1994, vegetation maintenance was routinely performed at numerous areas, including the White Oak Creek Sediment Retention Embayment, various SWSAs, ponds, tank farms, fence lines, deer fences, trenches, pits, and the hydrofracture facilities.

2.3.2 RCRA Caps

The routine Resource Conservation and Recovery Act (RCRA) Cap inspections and repairs were performed as scheduled by internal MMES personnel and off-site contractors (S&ME and Geotek). The inspections consisted of the following activities:

Inspection of all high-density polyethylene panels,

Fig. 6. White Wing Scrap Yard fence.

Fig. 7. Chestnut Ridge fence.

Fig. 8. Chestnut Ridge fence.

Fig. 9. Vegetation maintenance.

Collection of the "sacrificial" liner samples,
Inspection of panel seams,
Inspection of all penetrations to ensure cap integrity,
Inspection of all anchor trenches and pillows, and
Laboratory testing of three 2 ft x 4 ft sacrificial samples.

Geotek repaired all noted deficiencies of the RCRA Caps. Additional activities performed in association with the RCRA caps were (1) the review and approval of a RCRA Caps Training Lesson Plan according to WMRA-RA302-S, (2) the timely submittal of appropriate documentation to Environmental Compliance, (3) the submittal of check sheets and weekly site inspection sheets to the document management center for the purpose of archiving the information, and (4) a corporate audit of the RCRA Closure Plan.

2.3.3 Access Control, Safety Improvements, and Signage

A number of access control, safety improvements, and signage projects were initiated and completed during FY 1994. Roads near the Old Hydrofracture Facility were graveled to improve access to wells in that area. A WAG area access control self-assessment was conducted by posting a roving security inspector at all WAG entrances to determine if access requirements were being followed. A large number of WAG access, radiological, speed limit, and personnel safety signs were ordered and/or fabricated. Where necessary, walk-through gates were installed in deer fences. Jersey barriers were installed around the north-west corners of the North and South Tank Farms. Posts and chains were promptly installed around areas identified as contaminated sites.

2.3.4 Deficiency Corrections

Several electrical deficiencies and a leaking valve were identified in the South Tank Farm during a routine safety walk-through. These deficiencies were corrected or significantly reduced, thus returning the area to an acceptable condition.

2.3.5 Facility Inspections

A number of non-routine facility inspections were completed during FY 1994. Facility 3110 was inspected by DOE and ORP personnel. The purpose of the inspection was to determine the facility's compliance with ORNL Radiation Protection Procedures, DOE Radiological Manual recommendations, and the requirements of 10 CFR 835. In Building 7819, personnel from the Chemical Technology Division, quality assurance, and ORP inspected one of the shielded transfer tanks and planned appropriate decontamination measures. The purpose of this plan was to place the tank (once cleaned) in standby status for use as a transport vehicle in case transfer lines were to fail testing processes and could not be used to transfer Liquid Low-Level Waste (LLLW).

2.3.6 Tank Related Activities

During FY 1994, a variety of tank-related (see Figs. 10, 11, and 12) activities were performed including:

- Monthly level trend data reports were compiled during the year. The data were collected for tanks T-1, T-2, T-3, T-4, T-9, TH-4, W-1, W-2, W-3, W-4, W-5, W-6, W-7, W-8, W-9, W-10, W-11, W-1A, WC-15, and WC-17. Tanks TH-4 and W-3 were close to full capacity throughout the year, but did not overflow. Some tank levels were very sensitive to rainfall. Tanks WC-15 and WC-17 levels were especially sensitive to rainfall and levels rose and fell with respect to groundwater levels. Tank W-1A levels were reported to the Waste Operations Control Center, the levels tripped alarms throughout the year which would lead to Waste Operations emptying some of the tank contents. Further details about the inactive LLLW tank-related activities are presented in Appendix C.
- Typically there were few problems with the inactive tanks. Most level trends indicated either a response to increased rainfall, or that the tanks were just filling very slowly; two of the tanks were affected by ground water table changes. The majority of serious upsets in the level data resulted from instrumentation malfunction or system outages. Afterwards, the level data would return to nearly the same level as previously indicated prior to the failure or downtime, indicating no real change in level, but rather only equipment failure.
- After a major rainfall event, Tank 7562, near the HRE Building, had an overflow episode which was categorized as a Level III Occurrence. An unknown source entered the tank. The tank, welded shut and buried, was unearthed, opened for inspection, and emptied. While the source has not yet been identified, future overflow episodes are unlikely as long as the pit does not fill.
- A State of Isolation evaluation for 54 Category D inactive storage tanks was initiated.
- A drafting of procedures for liquid removal from tanks W-1, W-2, W-3, and W-4 was initiated.
- A draft Engineering Service Order for the "Urethane Foam" tank removal project was completed.
- Reports for various tanks, covering the locations of incoming pipelines, capped or uncapped status, locations of other tank core openings, etc. were completed and distributed.
- Level instrumentation repairs were performed.
- The final draft of the Waste Certification Procedure for the pumping of inactive tanks was completed.
- A Readiness Review of the "Guniting and Associated Tanks Operable Unit Sampling Project" was conducted.

2.3.7 Occurrence Reports

One Category II and seven Category III occurrence reports were initiated and closed during FY 1994 (see Table 2).

Fig. 10. 7562 tank excavation.

Fig. 11. 7562 tank excavation.

Fig. 12. 7562 tank excavation.

Table 2. FY 1994 occurrence report status

Occurrence #/Action Item #	Fac. Mgr.	Subject	Area/Bldg.	Category*	Latest Report	Target Completion	Comment
ORO--MMES-ENVRES-1994-0005 I0017804	Holder	Soil contamination found along State Highway 95, adjacent to ORNL	Hwy 95 - East Side	III	Final	8/31/94	Closed 07/06/94
ORO--MMES-ENVRES-1994-0006 I0017851	Holder	Suspected petroleum products discovered in dry well	TH-4 Dry Well	III	10-day update	11/18/94	Extension requested 08/12/94
ORO--MMES-ENVRES-1994-0007 I0015303	Ford	Personnel contamination at Vent House Facility	7500 Area	III	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0008 I0015592	Holder	Contamination discovered along Lagoon Road	Lagoon Road - adjacent to Bldg. 7819	III	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0009 I0015629	Holder	Radiologically contaminated water leak causes unpermitted discharge	3513 Impoundment Pond	III	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0010 I0016266	Hawk	Contamination discovered at construction site	WAG 9	III	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0011 I0016341	Holder	Receipt of Notice of Noncompliance from Tennessee Department of Environment and Conservation	3513 Impoundment Pond	II	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0012 I0016454	Ford	Unexpected accumulation of fissile material within primary confinement boundaries	7500 Area	III	10-day update	7/31/95	Extension requested 08/30/94
ORO--MMES-ENVRES-1994-0013 I0016791	Nelson	WAG 5 contaminated water seepage	WAG 5	III	Final	8/31/94	Closed 08/30/94
ORO--MMES-ENVRES-1994-0014 I0016915	Wilson	Contaminated tractor	WAG 6	III	Final	8/31/94	Closed 08/30/94

* Category Codes:

I - Emergency

II - Unusual

III - Off-Normal

IV - Non-Routine

2.3.8 White Wing Scrap Yard

Hazardous debris cleanup activities were completed in FY 1994.

2.4 INACTIVE GROUNDWATER WELLS

Over the years, groundwater monitoring and investigatory wells were installed to support various study, R&D, and monitoring activities. There are in excess of 6,000 wells on the ORNL site. The scope of this portion of the S&M Program provides for the management of ORNL groundwater monitoring and investigatory wells that have been identified as unusable or non-essential. These activities are necessary to assist in the prevention of potential contamination and contaminant migration.

2.4.1 Well Surveillance and Maintenance Activities

S&M activities are necessary to cap, lock, and verify the overall integrity and general condition of applicable ORNL groundwater monitoring and investigatory wells (see Fig. 13) that are vulnerable to down-hole contamination. In FY 1994, approximately 400 wells were capped and locked, essentially completing the number of wells currently scheduled for such activities. Since March 1994, S&M activities including general and downhole condition inspections have been performed on over 2,000 inactive or non-essential wells.

In an attempt to minimize costs, a full printout of all wells which identifies surface and down-hole radiological contamination information at the time of well construction was requested and received. This information, along with fly-over data, is being used to minimize the need for sampling and analysis prior to the issuance of well maintenance work requests. Prior to this approach, before work could commence, at least two samples were required to prove that sites were not radiologically contaminated.

2.4.2 Well Data Management

Information pertaining to the current status of all ORNL groundwater monitoring and investigatory wells including location, construction, and S&M information is maintained by the inactive groundwater well data management program. In FY 1994, a laptop method of data input was developed and implemented. This method involves taking a laptop computer to the field and entering pertinent data as it is generated. As a result, occurrences such as the loss of paperwork, transposition of numbers, and other potential deficiencies have been minimized. The laptop method also provides for the verification of well locations. This is done by comparing the representative location of the well in MapInfo to the physical location of the well in the field. Once the data input and location validation activities are complete, the information is transferred to a diskette and downloaded into the central database system. This method reduces a number of steps and helps to ensure the well data integrity.

Work continues with the groundwater coordinator to develop a single layer within MapInfo that contains all wells located on the ORR. This will enhance both the effectiveness and efficiency of the well program because, as work is being performed on wells under the control of ORNL, the mobilized equipment can accomplish work on wells under the control of others that are in the same general area.

Fig. 13. Inactive groundwater well.

Appendix A

EVALUATION OF FY 1992 AND FY 1993 WEEKLY SITE/FACILITY INSPECTIONS

Table A.1. Evaluation of FY92 weekly inspections

[illegible]

[illegible]

Table A.1 (continued)

[illegible]

Table A.1 (continued)

[illegible]

Table A.1 (continued)

[illegible]

Table A.2 (continued)

[illegible]

Table A.2 (continued)

[illegible]

Table A.2 (continued)

[illegible]

Appendix B

FUNCTIONS AND WASTE CHARACTERISTICS OF THE SITES/FACILITIES MANAGED BY THE ORNL ER S&M PROGRAM

Table B.1. WAG 1 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
01.01	Mercury Contaminated Soil - (3503)	Building 3503 was used in the PUREX spent fuel reprocessing program	Major contaminant is liquid mercury
01.02	Mercury Contaminated Soil - (3592)	The building around which the soil is located was used in component development activities for a lithium separation process	Major contaminant is liquid mercury
01.03	Mercury Contaminated Soil - (4501)	The building around which the soil is located was used in a small pilot plant supporting the lithium separation process	Major contaminant is liquid mercury
01.04	Mercury Contaminated Soil - (4508)	General research and development activities	Contaminant of concern is liquid mercury
01.05A	Liquid Low-Level (radioactive) Waste LLLW Lines and Leak/Spill Sites - South of Building 3020	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	strontium (Sr)-90, cesium (Cs)-137, cobalt (Co)-60, plutonium (Pu), uranium (U), transuranic (TRU) isotopes, nitrate solutions, acid chlorides
01.05B	LLLW Lines and Leak/Spill Sites - East of the Building 3020	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05C	LLLW Lines and Leak/Spill Sites - West of Building 3082	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05D	LLLW Lines and Leak/Spill Sites - North of Building 3019	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.05E	LLLW Lines and Leak/Spill Sites - Southwest Corner of Building 3019	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05F	LLLW Lines and Leak/Spill Sites - Between W-5 and WC-19	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05G	LLLW Lines and Leak/Spill Sites - Underneath Building 3047	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05H	LLLW Lines and Leak/Spill Sites - General Isotopes Area (3037, 3038, 3034)	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05I	LLLW Lines and Leak/Spill Sites - Building 3092 Area	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.05J	LLLW Lines and Leak/Spill Sites - Underneath Building 3026	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05K	LLLW Lines and Leak/Spill Sites-Between WC-1 and W-5	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05L	LLLW Lines and Leak/Spill Sites - Oak Ridge Research Reactor Water Line (Building 3085)	The water line transports cooling water from the Oak Ridge Research Reactor to its heat exchangers	Water is the primary coolant for the Oak Ridge Research Reactor and contains activation products
01.05M	LLLW Lines and Leak/Spill Sites - Building 3028	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05N	LLLW Lines and Leak/Spill Sites - East of Building 2531	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.05O	LLLW Lines and Leak/Spill Sites - Underneath Building 3515	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	The area under Building 3515 is contaminated as a result of past use as a radioactive chemical processing plant. Other than that, no information is available
01.05P	LLLW Lines and Leak/Spill Sites - Building 3525 to a Sump	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05Q	LLLW Lines and Leak/Spill Sites - Underneath Building 3550	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05R	LLLW Lines and Leak/Spill Sites - Sewer Near Building 3500	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05S	LLLW Lines and Leak/Spill Sites - Abandoned Line Central Avenue	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.05T	LLLW Lines and Leak/Spill Sites - Building 4508, North	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05U	LLLW Lines and Leak/Spill Sites - Building 3518, West	The PWTP treats the low-level liquid wastes termed process waste (normally does not contain radioactivity but could be contaminated as the result of equipment failure or human error)	Sr-90, Cs-137
01.05V	LLLW Lines and Leak/Spill Sites - Northwest of SWSA 1	The LLLW system at ORNL was designed to collect radioactive waste solutions from the various sources at the Laboratory. Virtually all of the buildings within the Laboratory that were involved in radionuclide operations were served by this system	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.05W	LLLW Lines and Leak/Spill Sites - Building 3503, Ground Contamination	The Main Plant Area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines, others are along the lines themselves, and still others are not leaks at all but are spills, e.g., from pumping accidents	Sr-90, Cs-137, Co-60, Pu, U, TRU isotopes
01.06	Contaminated Surfaces and Soil from 1959 Explosion in 3019 Cell	Building 3019 houses the Radiochemical Processing Plant (RPP)	Pu-239
01.07	Contamination at Base of 3019 Stack	Data unavailable	Elevated levels of gross alpha and gross beta, Pu, americium (Am), curium (Cm), Cs, Co
01.08	Graphite Reactor Storage Canal Contaminated Soil (3001/3019)	The Oak Ridge Graphite Reactor fuel storage canal connected the fuel discharge pit to the adjoining chemical-processing building (3019). It is currently used for storage of radioisotopes but was originally used for storage and handling of irradiated fuel and radioisotope targets	Co-60, Sr-90, Pu-239, Pu-238, Am-241, Cm-244
01.09	Oak Ridge Research Reactor Decay Tank Rupture Site - (3087)	The tank contains water coolant	Isotopes present in the primary coolant water include sodium (Na)-24, Sr-90, iodine (I)-131, ruthenium (Ru)-106, Cs-137

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.11	Decommissioned Waste Holding Basin - (3512)	The pond was dug up and back-filled with gravel during construction of the Process Waste Water Treatment Plant (3544). Used as a retention pond for storage tank drainage from 1944 to 1950, it is presumed to have handled hazardous substances	Information concerning waste characteristics could not be found. During the late 1940s, isobutyl methyl ketone was discharged to the pond
01.12	Waste Holding Basin - (3513)	The impoundment was constructed to act as a settling basin for wastes prior to their discharge into White Oak Creek (WOC). It was in operation until 1976 when a new PWTP began operation	Cs-137, Sr-90, Co-60, europium (Eu)-154, Pu-238, Pu-239, Am-241, Cm-244, Mercury
01.13	Equalization Basin - (3524)	Process wastes from the ORNL building complexes were delivered to the Equalization Basin prior to discharge to the process waste treatment facility (Building 3544). Basin 3524 normally received process wastes from the Bethel Valley ORNL facility, but on occasion some waste from the Melton Valley facilities was received	Cs-137, Sr-90, thorium (Th), U, TRU, benzene, chloroform, methylene chloride
01.14	Process Waste Pond - (3539)	The two 190 Process Waste ponds (also see 01.15) are paired surge basins, designed to receive process waste streams from the Building 4500 complex. Waste streams from Building 4500 are split into the basins and monitored for radionuclide content before discharge to WOC or to the Equalization Basin (3524) and the process waste treatment system (Building 3544). The basins are operated in such a manner that when one pond is filling the other is empty or in the process of being emptied	Metal, pesticide, herbicide, methylene chloride, 1,2-transdichloroethylene
01.15	Process Waste Pond - (3540)	The two 190 Process Waste ponds (also see 01.15) are paired surge basins, designed to receive process waste streams from the Building 4500 complex. Waste streams from Building 4500 are split into the basins and monitored for radionuclide content before discharge to WOC or to the Equalization Basin (3524) and the process waste treatment system (Building 3544). The basins are operated in such a manner that when one pond is filling the other is empty or in the process of being emptied	Metal, pesticide, herbicide, methylene chloride, 1,2-transdichloroethylene
01.19	Low Intensity Test Reactor (LITR) Pond - (3085W)	These ponds were used to retain process waste water before its release into the Fifth Street branch of WOC. In 1964, the ponds were filled with clay and earth and covered with grass	Very little information is available. Principal contamination was probably Na-24
01.20	3517 Filter Pit (Fission Product Development Laboratory [FPDL]) - (3517)	The unit was designed to filter building air exhaust from the FPDL	Present levels of radiation at the filters measure approximately 200 R/h. The main radionuclides are Cs-137 and Sr-90

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.21	FPDL LLLW Transfer Line	The line was designed to transfer LLLW from the FPDL to collection tanks at the South Tank Farm (area 3507)	No inventory of radiological wastes exists. The line is thought to be contaminated with Cs-137 and Sr-90
01.23A	Inactive LLLW Collection/Storage Tank W-1	The tank was designed to hold waste from the 3019 RPP	Sr-90, Cs-137, Eu-152, TRU, Pu-238
01.23B	Inactive LLLW Collection/Storage Tank W-2	This tank was designed to hold the overflow from tank W-1	Sr-90, Cs-137, Eu-152, TRU, Pu-238
01.24A	Inactive LLLW Collection/Storage Tank W-3	The tank was designed to hold metal waste from Building 3019. Tank W-3 received Pu waste	Cs-137, Sr-90, TRU, Pu-238, Pu-239, Am-241, Cm-244, U-233, U-238
01.24B	Inactive LLLW Collection/Storage Tank W-4	The tank was designed to hold metal waste from Building 3019. Tank W-4 received Pu waste	Cs-137, Sr-90, U-238, U-233, Pu-238, Pu-239, Am-241, Cm-244, U-235, TRU
01.25A	Inactive LLLW Collection/Storage Tank W-13	Tank W-13 collected waste from the Chemistry Division (CD) Hot Laboratory Group	Sr-90, Cs-137, TRU
01.25B	Inactive LLLW Collection/Storage Tank W-14	Tank W-14 collected wastes from the Operations Division	Sr-90, Cs-137, TRU
01.25C	Inactive LLLW Collection/Storage Tank W-15	Tank W-15 collected wastes from the Operations Division	No inventory estimate available for Tank W-15
01.26A	Inactive LLLW Collection/Storage Tank W-5	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.26B	Inactive LLLW Collection/Storage Tank W-6	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.26C	Inactive LLLW Collection/Storage Tank W-7	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.26D	Inactive LLLW Collection/Storage Tank W-8	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.26E	Inactive LLLW Collection/Storage Tank W-9	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.26F	Inactive LLLW Collection/Storage Tank W-10	The tank was designed to store wastes from various ORNL projects and programs	Sr-90, Cs-137, Th-232, U-238, TRU
01.27	Inactive LLLW Collection/Storage Tank W-11	The tank was designed to serve in waste collection and monitoring for research laboratories in Building 3550	Cs-137, Sr-90, Pu-238, TRU, transferable beta-gamma and alpha activities

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.28	Inactive LLLW Collection/Storage Tank W-1A	Tank W-1A collected wastes from the high radiation level analytical facilities of Buildings 2026, 3019-B, and the RPP (3019)	Major contaminants are Sr-90, Cs-137, U-233 and TRU. Radionuclide inventory is unknown
01.29	Inactive LLLW Collection/Storage Tank WC-1	The tank was used for the collection and monitoring of process liquid waste from isotope production and development laboratories (Buildings 3038, 3029, 3030, 3031, 3032, 3033, and 3047). The tank also collected waste from the Building 3110 filter, 3039 stack, and 3092 scrubber	Sr-90, Cs-137, TRU, Co-60
01.30A	Inactive LLLW Collection/Storage Tank WC-15	Tank was designed to receive waste from research laboratories in Building 4500	Cs-137, Sr-90, TRU
01.30B	Inactive LLLW Collection/Storage Tank WC-17	Tank was designed to receive waste from research laboratories in Building 4500	Major radionuclides are Cs-137, Sr-90, TRU. The tank is full of oil and water
01.31A	Inactive LLLW Collection/Storage Tank TH-1	Tank received waste from the thorium pilot plant project in Building 3503	Cs-137, Co-60, Sr-90, TRU
01.31B	Inactive LLLW Collection/Storage Tank TH-2	Tank received waste from the thorium pilot plant project in Building 3503	alpha, beta-gamma
01.31C	Inactive LLLW Collection/Storage Tank TH-3	Tank received waste from the thorium pilot plant project in Building 3503	Cs-137, Co-60, Sr-90, TRU
01.32	Inactive LLLW Collection/Storage Tank TH-4	Tank was placed in service to receive waste from the irradiated thorium and uranium pilot plant development projects	Presently, the tank is filled with alkaline thorium and U sludge. Most of the radiation is due to Cs-137 and small amounts of TRU. Major rad. inventory is Sr-90, Cs-137, and TRU
01.36	Inactive LLLW Collection Tank WC-4	The tank receives waste from Building 3026 and discharges to Valve Box No. 2 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.37A	Inactive LLLW Collection Tank WC-5	The tank receives waste from Building 3503 and discharges to Valve Box No. 2 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.37B	Inactive LLLW Collection Tank WC-6	The tank receives waste from Buildings 3508, 3541, and 3592. It discharges to Valve Box No. 2 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.37C	Inactive LLLW Collection Tank WC-8	The tank receives waste from Building 3503 and discharges to Valve Box No. 2 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.39B	Inactive LLLW Collection Tank WC-11	The tank receives waste from Buildings 4500N Wing 1, 4505, 4507, and 4556. It discharges to Valve Box No. 1 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.39C	Inactive LLLW Collection Tank WC-12	The tank receives waste from Buildings 4505 and 4507. It discharges to Valve Box No. 1 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.39D	Inactive LLLW Collection Tank WC-13	The tank receives waste from Buildings 4500S, 4500N, 4501, and 4508. It discharges to Valve Box No. 1 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.39E	Inactive LLLW Collection Tank WC-14	The tank receives waste from Building 4501. It discharges to Valve Box No. 1 at the South Tank Farm	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.42B	Inactive LLLW Collection Tank W-17	This tank collects LLLW from hot cells in Building 3026	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.42C	Inactive LLLW Collection Tank W-18	This tank collects LLLW from hot cells in Building 3026 and liquids from the 3500 area cell ventilation duct	The major nuclides of concern are Sr-90, Cs-137, Co-60, and TRU. Some tanks also contain small amounts of U and Pu isotopes
01.46	SWSA 1 - (2624)	SWSA 1 was the first area used for burial of low-level solid wastes	The burial ground is contaminated with unknown radionuclides and unidentified chemical constituents. Only a small amount of solid radioactive waste was buried in SWSA 1
01.47	SWSA 2 - (4003)	The area was the second used to dispose of solid waste contaminated with beta or gamma activity, liquid waste contaminated with Pu in stainless steel drums, and alpha-contaminated material from off-site	The burial site is reported to contain no waste. The burial waste and contaminated soil were moved to another site (SWSA 3) some time after the site was closed in 1946
01.56A	Inactive LLLW Collection Tank W-19	This tank [and W-20 (SWMU 01.56B)] were installed for the purpose of collecting LLLW solutions from Building 3505. After closure of the Metal Recovery Facility (MRF) in 1960, the tanks were used for a period of 1-2 years by the FPD for LLLW collection	Sr-90, Cs-137, Pu-238, Pu-239, Pu-240, Ce-144, promethium (Pm)-147

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.56B	Inactive LLLW Collection Tank W-20	This tank [and W-19 (SWMU 01.56A)] were installed for the purpose of collecting LLLW solutions from Building 3505. After closure of the MRF in 1960, the tanks were used for a period of 1-2 years by the FPD for LLLW collection	Sr-90, Cs-137, Pu-238, Pu-239, Pu-240, Ce-144, Pm-147
01.58	Former Waste Pile Area (South of Nonradiological Wastewater Treatment Plant [NRWTP])	Apparently used for disposal of waste from construction operations. May be an extension of solid waste management unit (SWMU) 01.57	Construction trash and debris
01.62	Waste Evaporator Facility (3506)	The Waste Evaporator Facility was used for concentration and volume reduction of the liquid waste prior to its final disposal in excavated pits and trenches	Sr-90, Cs-137, Ru-106, Co-60, Pu, U, TRU isotopes, nitrate solutions, acid chlorides
01.63	Transfer Canal and Dissolver Pit (3505)	Used to handle fuel elements (slugs) prior to dissolving the fuel element cladding for U recovery. Water was used as shielding	Canal wall and water probably contaminated with Sr-90, Cs-137, Co-60, and U and Pu isotopes.
01.64C	Inactive LLLW Collection Tank S-424	Tank S-424 is designed to collect radioactive low-level waste prior to transfer to the LLLW treatment plant	LLLW resulting from fission product separations in Building 3517
01.66	Inactive LLLW Collection Tank W-II	Collects LLLW from hot cell in Building 3028 and discharge from tank is pumped to tank WC-10	No reported chemical or radionuclide analyses
01.67A	Inactive LLLW Collection Tank 4501-C	Used to Collect LLLW from cells and laboratories in the High Level Radiochemical Laboratory (4501). Tank 4501-C is not currently in use and has been disconnected from ancillary piping	No analyses have been reported for tank contents
01.67B	Inactive LLLW Collection Tank 4501-D	Used to Collect LLLW from cells and laboratories in the High Level Radiochemical Laboratory (4501). Tank 4501-D is not currently in use and has been disconnected from ancillary piping	No analyses have been reported for tank contents
01.67C	Inactive LLLW Collection Tank 4501-P	Tank 4501-P was installed in 1955 to serve the aqueous Homogeneous Reactor Project (HRP) as a holding tank for Pu solutions prior to treatment in the LLLW system. In 1963, the tank was used with the Thorium Utilization Project as a holding tank for thorium solutions. The tank is inactive, it has been out of service for many years. All of the entries to the tank are sealed or valved	The tank contains an estimated 7 gallons of liquid. A rad survey indicates alpha activity. No analyses of hazardous constituents are available
01.68	Inactive Filter House Seal Tank 3002-A	Tank 3002-A collects drainage from the 3002 filter house; effluent is transferred to tank WC-19. This tank is no longer in use	No analyses have been reported for hazardous waste components or radionuclides

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
01.71	Inactive LLLW Collection Tank H-209	Used to collect condensate and contaminated process waste from the floor drains in Building 3517	Unknown
01.73	Inactive LLLW Collection Tank 3001-B	This tank is thought to have been a hold up tank for the hot lab drains in Building 3001. This hot lab handled mostly irradiated samples, and any radioactive waste from it has probably decayed to very low levels	Unknown
01.74	Inactive LLLW Collection Tank 3003-A	Collects waste from floor drains in cells in Building 3003 (Fan House for Graphite Reactor), and from the Graphite Reactor Stack	Unknown
01.75	Inactive LLLW Collection Tank 3004-B	Tank 3004-B is called the Low-Intensity Test Reactor (LITR) Hot Waste Holdup Tank. It appears that this tank, similar to the other hold-up tanks, could be emptied to the process water system or the LLLW system, depending on the contamination level of the water	Unknown
01.76	Inactive LLLW Collection Tank 3013	This tank is connected to the drains in Building 3013. Building 3013 was originally an environmental processing lab that dealt with very low level contaminated environmental samples. It was later a source storage building that held sealed sources, which should not have led to contaminated discharges	Unknown
01.78	Inactive LLLW Collection Tank T-30	Collect LLLW from hot cell operations in the High Radiation Level Chemical Development Laboratory (4507)	LLLW from hot cell operations. Sampling of liquid contents indicate that liquid phase is not a Resource Conservation and Recovery Act (RCRA) waste. No sludge reported in the tank
01.79	3001 Storage Canal	The 3001 Storage Canal connected the fuel discharge pit to the adjoining chemical-processing building (3019). It is currently used for storage of radioisotopes but was originally used for storage and handling of irradiated fuel and radioisotope targets	Canal wastes may be contaminated with radionuclides and RCRA heavy metals released from ruptured fuel slugs. Activity levels should be low with Sr-90 and Co-60 as main constituents
01A.01E	Underground Exhaust Ducts Soil Contamination 3001-3003	The underground duct system transmits the Graphite Reactor cooling air from the reactor (3001) to the Filter House (3002), the Fan House (3003), and then to the stack (3010)	Unknown, duct walls are probably contaminated with fission products. Both alpha and beta-gamma contamination has been reported on the duct walls
01A.06	Fission Product Pilot Plant (3515)	From 1950-1951, the facility functioned as a hot cell facility. It was then used to separate curie quantities of various radionuclides from low-level liquid wastes	Specific waste information is not available

Table B.1. (continued)

ID Number	Name	Function	Waste Characteristics
00.33	Fission Product Pilot Plant Contaminated Soil		
00.50	WAG 1 Groundwater		
00.51	WAG 1 WOC Floodplain Soils and Sediments		

Table B.2. WAG 2 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
02.01	White Oak Lake and Embayment (7846)	The site is a surface impoundment for radioactive and other hazardous wastes that drain from ORNL via the WOC Watershed. It serves as a final settling basin for waste released from ORNL operations and waste storage areas	Sr-90, Cs-137, Th, U, TRU, cadmium (Cd), Cr, Co-60, histone (H)-3
02.02	WOC and Tributaries (0853)	The creek drains the ORNL installation. Treated sewage and process wastes are released to the creek after treatment. LLLW after treatment in the PWTP is also discharged to the creek	Main contaminants are Sr-90, Co-60, Cs-137, H-3, and metals (mercury (Hg), zinc (Zn), and Cr). Hazardous Chemicals, including PCBs, may be present in the stream sediments. Pu-239 also detected
00.53	WAG 2 Groundwater		

Table B.3. WAG 3 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
03.01	SWSA 3 (1001)	The site was used as a landfill for the storage of LLLW. The site was also used to store scrap metal (See 03.02)	Little is known about the kinds of wastes stored at this site. Large items were stored aboveground within the fenced-in area. Alpha wastes contained in drums were deposited in concrete-lined trenches and covered with concrete. Beta-gamma wastes were buried in unlined trenches and backfilled with soil
03.02	Scrap Metal Area (1562)	The purpose of the site was to serve as a storage site for contaminated metal. Most of the scrap has now been buried in other SWSAs (1984), and the area is posted	Some contaminated tanks and equipment are still stored aboveground. Tanks may be contaminated. The amount of material stored is not reported
03.03	Contractors' Landfill - (1554)	The purpose of the landfill is disposal of debris from construction sites and noncontaminated demolition activities. The site is also used as a disposal area for fly ash from the ORNL steam plant	This facility is now permitted by TDHE. Only non-contaminated debris and construction materials are allowed in the landfill. No hazardous or radioactive wastes are allowed

Table B.4. WAG 4 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
04.01	Low-Level Waste Line North of Lagoon Road (7800)	The first 1.5-mile (2.4-km) section of the waste transfer line is 2-in.-diam (5-cm-diam) cast-iron pipe installed in June 1954 to transfer LLLW from the Bethel Valley waste storage tanks to Waste Pit 2. Carbon steel extensions to Trench 5 (1960), Trench 6 (1961), and finally to Trench 7 (1962) completed the transfer line to the waste pit area. In 1966, a cast-iron line was installed from Trench 7 to the Old Hydrofracture Facility (OHF) (1.5 miles). This line was replaced in 1971 by a stainless steel line installed next to the old cast-iron line. This line was taken out of service in 1975	Wastes handled in the transfer system were routinely generated laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60 and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources
04.03	SWSA 4 (7800)	The unit was a solid waste landfill designed to contain radioactive solid waste. For a period of time, the landfill was designated as the Southern Regional Burial Ground by the Atomic Energy Commission (AEC) and received wastes from nuclear installation in the eastern United States	Little information exists to characterize the type, concentration, or quantity of radionuclides placed in SWSA 4. Radioactive elements include Sr-90, Cs-137, Co-60, polonium (Po)-210, H-3, antimony (Sb)-125, and Pu-239

Table B.5. WAG 5 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
05.01A	LLLW Lines and Leak Site - OHF, Release of Grout	The well was being drilled as a part of research related to the grout sheets produced at the OHF	The waste is water containing Sr-90
05.01B	LLLW Lines and Leak Site - OHF Contaminated Soil	The leak occurred because a valve failed at the OHF. Waste grout was directed to the waste pit	Major radionuclides are Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams
05.02	OHF Pond/Pits	The pond was designed to receive the accidental release of waste grout mixture in the event of a wellhead rupture	Main radionuclides include Cs-137, Sr-90, Co-60, and Cs-134
05.05A	Inactive OHF Waste Storage Tank T-1	The site is used to store radioactive waste prior to blending with grout	Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials
05.05B	Inactive OHF Waste Storage Tank T-2	The site is used to store radioactive waste prior to blending with grout	Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials
05.05C	Inactive OHF Waste Storage Tank T-3	The site is used to store radioactive waste prior to blending with grout	Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials
05.05D	Inactive OHF Waste Storage Tank T-4	The site is used to store radioactive waste prior to blending with grout	Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials
05.05E	Inactive OHF Waste Storage Tank T-9	The site is used to store radioactive waste prior to blending with grout	Major radionuclides are Cs-137, Sr-90, Co-60, and TRU materials
05.05F	LLLW Line from Valve Box to OHF	Data not yet available	Data not yet available
05.06	Process Waste Sludge Basin (PWSB) (7835)	The basin was used to contain and settle sludge produced by the ORNL PWTP (3544). Supernatant was pumped back to the PWTP (3544)	Sludge constituents are primarily ferrous sulfate and ferric hydroxide, with fission products present
05.07	SWSA 5 South (Trenches, Undefined Area, Dump, Auger Holes)	The site is composed of two distinct geographical areas providing different solid waste storage functions. SWSA 5 (south) was used for disposing of routine buried waste; SWSA 5 (north) is used to retrievably store TRU contaminated waste	Retrievable wastes are TRU isotopes and U-233. Major wastes are contaminated with Sr-90, Cm-244, Pu-238, Ru-106, Cs-137, Co-60, and H-3
05.07A	PWSB Pipeline from PWSB to PWTP	Data not yet available	Data not yet available
05.07B	Drainage 1,2 in WAG 5	Data not yet available	Data not yet available

Table B.5. (continued)

ID Number	Name	Function	Waste Characteristics
05.14	Old Landfill (NE edge of SWSA 5)	Apparently used as a dump site for noncontaminated rubbish from ORNL operations.	General rubbish, debris, metal containers and other noncontaminated items
05.16	Inactive LLLW Tank T-14	Tank T-14 is designed to collect drainage from the well cell. The tank currently contains some sludge. The tank drains the overflow from the well cell	Wastes handled in the collection system were routinely generated Laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources

Table B.6. WAG 6 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
06.01	SWSA 6 (7822)	This site is a waste burial ground; its purpose is to contain LLLW	Hazardous chemicals include lead, toluene, and xylene. Main radionuclides include Co-60, H-3, Sr-90, Cs-137, Eu-152, Eu-154, Eu-155, U-235, Th-232, U-233, and U-238
06.02	Emergency Waste Basin (7821)	The basin was constructed as an LLLW or process waste holding basin for use when ORNL might be unable to release wastes to WOC. The basin has never been used	No wastes have been added. Water in the basin is the result of runoff from the surrounding areas
06.03	Explosives Detonation Trench (7822A)	The site was used to detonate explosives and shock-sensitive chemicals requiring disposal. Waste was laid in the bottom of the trench and detonated with a small plastic explosive charge	Items detonated at the trench included chemicals such as picric acid, phosphorus, nitromethane, hydrogen peroxide, and ammonium nitrate

Table B.7. WAG 7 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
07.02	Homogeneous Reactor Experiment (HRE) Fuel Wells (7809)	Designed to hold residual fuel solution from the Homogeneous Reactor. Fuel was stored in the Homogeneous Reactor Chemical Plant decay tanks	U, fission products, Sr-90, and Ru-106
07.03	Hydrofracture Experimental Site 1, Soil Contamination (HF-S1A)	The spill occurred when the injected grout sheet intercepted a nearby open core hole and overflowed from the core hole. Grout was being injected to investigate the feasibility of using hydrofracturing as a means of LLLW disposal	Grout was tagged with Cs-137 and Ce-144 prior to injection. No LLLW was used. The grout should not contain hazardous constituents other than radioactivity
07.04A	Gauging Station Northwest of Building 7852	The LLLW line transports evaporator-concentrated low-level radioactive liquid wastes to waste disposal facilities in Melton Valley	Wastes handled in the transfer system were routinely generated laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources
07.04B	Pit 6 Southeast (Leak Site 1)	The leak was in the cast-iron LLLW transfer line between ORNL and the OHF, approximately 150 ft (45 m) south of Trench 6. The line was used to transfer waste for disposal by hydrofracture	Wastes handled in the transfer system were evaporator-concentrated LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams
07.04C	End of Trench 7 Access Road (Leak Site 2)	The transfer line was designed to transport LLLW from Bethel Valley Storage tanks to the OHF	The waste was evaporator concentrated LLLW
07.04D	Leak in Transfer Line from Decontamination Facility (7819) to Pit 1 (7805)	A 6-in. (15-cm) drain line served to transfer decontamination waste solutions from the Decontamination Facility (Bldg. 7819, SWMU 07.01) to LLLW Pit 1 (bldg. 7805, SWMU 07.05)	Cs-137 is the dominant radionuclide in soils around the facility. It is believed that the wastes from Building 7819 would consist of corrosive wastes (i.e., acids) and radionuclides associated with the equipment being decontaminated
07.04E	Leak in Line Between Pit 3 (7807) and Trench 6 (7810)	The valve box was used to divert waste from the Main Plant Area (WAG 1) to either Waste Pit 3 or Waste Trench 6	Wastes handled in the collection system were routinely generated Laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources

Table B.7. (continued)

ID Number	Name	Function	Waste Characteristics
07.04F	Leak at Valve Pit North of Trench 7 (7818)	Transfer LLLW from the Main Plant Area (WAG 1) to Waste Trench 7 and the OHF (SWMU 05.03)	Wastes handled in the collection system were routinely generated Laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources
07.05	Pit 1 (7805)	The purpose of the pit was to hold concentrated liquid waste	Cs-137, Ru-106, U, and Pu. The nature of the waste that was discharged into the pit between 1962 and 1964 is unknown. The total activity was probably small
07.06A	Pit 2 (7806)	The pit was built to dispose of LLLW	Ru-106, Cs-137, Sr-90, TREs
07.06B	Pit 3 (7807)	The pit was built to dispose of LLLW	Sr-90, Cs-137, Ru-106, TREs
07.06C	Pit 4 (7808)	The pit was built to dispose of LLLW	Sr-90, Cs-137, Ru-106, TREs
07.07	Trench 5 (7809)	The site was built to dispose of LLLW	Cs-137, Ru-106, Sr-89, Sr-90, Co-60
07.08	Trench 6 (7810)	The site was built to dispose of LLLW	Cs-137, Ru-106, Sr-90, Co-60
07.09	Trench 7 (7818)	The site was built to dispose of LLLW	Cs-137, Ru-106, Sr-90, Co-60
07.11	Septic Tank 7819	Septic tank is used to collect and dispose of raw domestic sewage from Building 7819 (Decontamination Facility)	Only domestic sewage from building 7819 has been collected/stored in the tank. No hazardous or radioactive wastes have been added to the system
07.12	Equipment Storage Area (7841)	Used as an aboveground storage area for surplus tanks and other equipment	Soil may be contaminated with fission products

Table B.8. WAG 8 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
08.01A	High Flux Isotope Reactor (HFIR)/TRU Waste Collection Basin - (7905)	This basin was called the Cold Pond and was formerly used as an intermediate storage and collection basin for liquid wastes from the HFIR facility. The basin also served as an emergency storage basin for the radiologically contaminated blowdown water from the cooling tower in Building 7902. The waste streams collected consist of floor drain, laboratory drains, steam condensates, process vessel cooling water, and precipitation falling directly on the basin	Co-60 is the major radionuclide that is present. Waste streams consisted of floor drains, laboratory drains, steam condensates, and process vessel cooling water containing nitric acid, sodium hydroxide, and sulfuric acid
08.01B	HFIR/TRU Waste Collection Basin - (7906)	In addition to receiving liquid wastes from HFIR, Basin 7906 could also receive diverted waste streams from Thorium-Uranium Recycle Facility (TURF) and the Transuranium Processing Plant (TPP). This basin was called the Hot Pond because it received wastes that were thought to contain radionuclides	Co-60, sodium, potassium hydroxide, acids
08.01C	HFIR/TRU Waste Collection Basin - (7907)	The basin was designed to receive process waste streams from the TPP. During operation, Basin 7907 was filled and emptied alternately with Basin 7908. Waste streams were derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters. The basin was also called the Number 3 Pond or the TPP A Pond	The major radionuclide in the process waste was Cm-244
08.01D	HFIR/TRU Waste Collection Basin - (7908)	The basin was designed to receive process waste streams from the TPP. During operation, Basin 7908 was filled and emptied alternately with Basin 7907. Waste streams were derived from floor drains, laboratory drains, steam condensates, and process vessel cooling waters. The basin was also called the TPP B Pond	The major radionuclide in the process waste was Cm-244
08.02	Hydrofracture Experimental Site 2 (HF-S2A)	This site was the second test facility for testing the use of hydrofracturing as a method of LLLW disposal. It was set up so that a deeper injection well could be used in an area of known geology	A total of 50 Ci of Cs-137 was injected. No hazardous chemicals other than the radioactivity were added
08.03A	LLLW Lines and Leak Sites - Lagoon Road and Melton Valley Drive	The Melton Valley transfer line was installed to allow wastes generated in Buildings 7500 and 7503 to be pumped to the main plant storage tanks and the evaporator prior to disposal	Waste handled in the collection system were routinely generated Laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams

Table B.8. (continued)

ID Number	Name	Function	Waste Characteristics
08.03B	LLLW Lines and Leak Sites - Melton Valley Drive and SWSA 5 Access Road	The main plant area LLLW collection system was installed in the 1940s to transfer wastes from various sources to the collection and storage tanks. The original system was constructed of cast-iron pipe; more recent additions and modifications are of stainless steel. Many of the reported leak/spill sites are located near the collection and storage tanks serving the LLLW lines; others are along the lines themselves; and still others are not leaks at all but are spills, e.g., from pumping accidents	Wastes handled in the collection system were routinely generated laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams
08.03C	LLLW Lines and Leak Sites - 7500 Area	The Melton Valley waste transfer line was used to transport LLLW from Melton Valley reactor facilities to the main ORNL plant area for storage and treatment prior to disposal	Wastes handled in the collection system were routinely generated laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams. The contamination was Cm-244 and a mixture of fission products
08.03D	LLLW Lines and Leak Sites - West of Melton Valley Pumping Station	This line was used to transfer liquid waste from Melton Valley to the Tank Farm	Wastes handled in the collection system were routinely generated Laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams
08.03E	LLLW Lines and Leak Sites - Building 7920 and Melton Valley Pumping Station	The transfer line is used to transport waste from the TPP (Building 7920) to the Melton Valley Pumping Station and then to the main ORNL plant area	LLLW resulting from hot cell operations in Building 7920 related to recovery of certain transuranic elements for R&D operations. LLLW should contain some Pu, U, and transuranic isotopes plus the usual nuclides found in ORNL LLLW
08.03F	LLLW Lines and Leak Sites - 7920 Ditch Line	The transfer line transports waste from Building 7920 to the Melton Valley Pumping Station	LLLW resulting from hot cell operations in Building 7920 related to recovery of certain transuranic elements for R&D operations. LLLW should contain some Pu, U, and transuranic isotopes plus the usual nuclides found in ORNL LLLW

Table B.8. (continued)

ID Number	Name	Function	Waste Characteristics
08.03G	LLLW Lines and Leak Sites - Melton Valley Transfer Line	The new line connects the Melton Valley Pumping Station and the evaporator service tanks	Wastes handled in the collection system were routinely generated laboratory LLLW. Major radionuclides were Sr-90, Cs-137, Ru-106, Co-60, and various rare earths. Some Pu, U, and TRU isotopes were also present in the waste streams from certain sources
08.13	Contractor Spoils Area - Melton Valley, W-SW of 7900	This site is believed to have been used as a dump site for the disposal of general construction debris. It was used during construction operations at the 7900 Area, the HFIR/TPP facilities	Materials observed at the site include scrap wood and metal, empty paint cans, empty drums and 5-gallon cans, and asphalt. In addition to the general construction debris, a small piece of sheet lead was found. The presence of any additional hazardous material is undetermined
08.14	HFIR Cooling Tower Surface Impoundment	Used to contain cooling tower blowdown during experiments related to chromate removal	Typical cooling tower blowdown which contained Co-60 and chromium
08.15	Aircraft Reactor Experiment (ARE) Surface Impoundment	Was to be used to handle water used to flood the reactor pits after operation. Following operation of the reactor the liquid fuel could be drained from the reactor, leaving about 15 percent of the fuel in the reactor and piping. Apparently water flooding was not used in the ARE. The ARE was located in Building 7503, the current site of the inactive Molten Salt Reactor Experiment (MSRE)	No reported information
08.16	MSRE Storage Well	Used to store radioactively contaminated maintenance tools	Sample of water in the well was reported to contain Cs-137
08.17	Abandoned Sanitary Waste Pipeline and Septic Tank North of 7917	Septic tank was used to collect and dispose of raw domestic sewage from Building 7910	Only domestic sewage has been collected/stored in the tank. No hazardous or radioactive wastes should have been added to the system
08.20	Inactive LLLW Collection Tank 7503A	Collect LLLW from MSRE reactor operations	Not reported. Probably contained Sr-90, Cs-137, Co-60, and U isotopes
08A.01G	HRE Contaminated Tool Storage	Apparently used for storage of contaminated items from the ARE (ARE)	Unknown

Table B.9. WAG 9 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
09.01	HRE Settling Pond (7556)	The pond was supposed to receive contaminated condensate from the reactor evaporator. Later, shield water was also added to the pond	Contamination is mainly from Cs-137 and Sr-90, with trace amounts of Pu-238, Pu-239, Am-241, and Cm-244
09.02A	LLLW Collection and Storage Tank 7560	This tank held condensed clean vapor from the evaporator cell; this liquid was stored for sampling. Depending on its radioactivity, the condensate was either sent to the retention pond or to the 12,000-gal tank for recycling	Major radionuclides of concern in LLLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Some U or Pu isotopes may also be contained in the waste
09.02B	LLLW Collection and Storage Tank 7562	The 12,000-gal (45,425-L) tank was designed to hold high-level waste. Tank functioned as feed to the evaporator	Major radionuclides of concern in LLLW are considered to be Sr-90, Cs-137, Co-60, and TRU. Some U or Pu isotopes may also be contained in the waste
09.04	Trash Area East of HRE Parking Lot	The site formerly contained an old farm house that was used by HRE-1 and HRE-2 for storage. During the early to middle 1960's, all stored material, some contaminated with radioactivity, was removed for disposal. The farm house was demolished and most of the debris was removed. The site was leveled and converted into a parking lot. Later the parking lot was expanded and it appears that the visible debris (wood, concrete, plastic) at the east end of the area may have been placed at this site at the time of expansion. Current use of the site includes a packing lot and a storage area for construction materials	Construction debris, perhaps some waste contaminated with radionuclides

Table B.10. WAG 10 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
10.01	Hydrofracture Experiment Site 1	This site was the first experimental injection of grout as a testing program for observing the fracture pattern created in the shale and to identify potential operating problems	Waste injected was water tagged with Cs-137 and cerium (Ce)-141. Grout consisted of diatomaceous earth and cement. No LLLW was used. No hazardous waste constituents should have been present in the grout
10.02	Hydrofracture Experiment Site 2	The second hydrofracture experiment was designed to duplicate in scale an actual disposal operation. However, radioactive tracers were used instead of actual waste	Water tagged with Cs-137, cement, and bentonite was used in formulating the grout. No nonradioactive hazardous constituents should be contained in the grout
10.03	Old Hydrofracture Injection Well (7852)	The facility served as a pilot plant to demonstrate the feasibility of permanent disposal of liquid radioactive waste in impermeable shale formations by hydrofracture methods	Sr-90, Cs-137, Cm-244, TRU, and other unidentified radionuclides
10.04	New Hydrofracture Injection Well	The facility was constructed to replace the OHF and serve as the operational LLW waste disposal system for ORNL	Waste use in the injections was concentrated LLLW and sludge removed from the gunite tanks in the South Tank Farm. The grout contained Sr-90, Cs-137, Cm-244, TRU and other nuclides
10.04A	Grout Sheets	Data not yet available	Data not yet available
00.52	WAG 10 Groundwater		

Table B.11. WAG 11 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
11.01	WWSY (XD0751)	The site was used to store contaminated materials (equipment, tanks, and trucks) from the three Oak Ridge plants. Waste was stored aboveground. Much of the stored materials and contaminated soils was removed in 1966-1971; however, some scrap metal, concrete, and other waste remains at the site	About 0.05 lb (25 g) of Pu-239 was estimated to be on or in the material from ORNL that was stored at the site. No records are available on wastes from other Oak Ridge plants. In 1971, a radiation survey detected 0.8 to 6.0 mR/h gamma exposure rate and 0.5 to 4.0 mR/h exposure rate for Cs-137. An aerial survey in 1974 indicated the presence of Cs-137 (estimated at 25 to 100 mCi), Th-234, and U-235

Table B.12. WAG 13 site/facilities managed by the S&M program

ID Number	Name	Function	Waste Characteristics
13.01	Cs-137 Contaminated Plots (0816)	The area was set aside to study simulated fallout of Cs-137, which would occur in the event of a nuclear war	The contaminant consisted of Cs-137 fused at high temperature to silica particles. Each of the four enclosures received about 2.2 Ci of radioactivity, for a total of 8.8 Ci. After 20 years (since contamination), about 5.5 Ci of activity should remain
13.02	Cs-137 Erosion/Runoff Study Area (0807)	The objective was to use the field contamination to study runoff, erosion, and infiltration of Cs-137 on a silt-loam soil	Cs-137 was applied to the soil in a liquid spray

Appendix C

SUMMARY OF TANK LEVEL TRENDING ACTIVITIES

C.1. INTRODUCTION

ORNL has a total of 54 inactive LLLW tanks. In the past, these tanks were used to contain radioactive liquid wastes from various research programs, decontamination operations, and reactor operations. The tanks have since been removed from service for various reasons; the majority were retired because of their age, some due to integrity compromises, and others because they did not meet the current standards set by the Federal Facilities Agreement (FFA). Many of the tanks contain residual radioactive liquids and/or sludges. Plans are to remediate all tanks; however, until remediation, each tank requires monitoring to ensure the safety and inventory containment of these tanks. The ER Program, as Operations Manager of the inactive LLLW tanks, manages all programs associated with the inactive LLLW tanks. Personnel within the line organization of the Waste Management and Remedial Action Division (WMRAD) at ORNL have been commissioned by the ORNL ER Program Managers to operate as FMs for the inactive LLLW tanks.

Table 1 is a summary of pertinent information concerning the inactive LLLW tanks such as location, capacities, material of construction, and level measurement instrumentation of the tank contents. Figure C-1 shows the location of the 45 tanks in the main plant area, and Fig. C-2 shows the location of the nine tanks in Melton Valley.

Table C.1. Summary of inactive liquid low-level waste (ILLW) tanks

Tank	Location	Material of construction	Tank capacity (gal)	Level detection	Frequency of level measurement
W-5	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-6	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-7	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-8	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-9	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-10	South Tank Farm	Gunitite	170,000	conductivity probe	continuous
W-11	SE of South Tank Farm	Gunitite	1,500	staff gauge	daily
T-1	Old Hydrofracture Facility	Carbon steel	15,000	pneumatic gauge	daily
T-2	Old Hydrofracture Facility	Carbon steel	15,000	pneumatic gauge	daily
T-3	Old Hydrofracture Facility	CS/rubber lined	25,000	pneumatic gauge	daily
T-4	Old Hydrofracture Facility	CS/rubber lined	25,000	pneumatic gauge	daily
T-9	Old Hydrofracture Facility	Carbon steel	13,000	pneumatic gauge	daily
TH-1	S. of Bldg. 3503	SS	2,500	none	yearly
TH-2	S. of Bldg. 3503	SS	2,400	none	yearly
TH-3	S. of Bldg. 3503	SS	3,300	none	yearly
TH-4	S. of Bldg. 3500	Gunitite	14,000	conductivity probe	daily
W-1	North Tank Farm	Gunitite	4,800	conductivity probe	daily
W-2	North Tank Farm	Gunitite	4,900	conductivity probe	daily
W-3	North Tank Farm	Gunitite	42,500	staff gauge	daily
W-4	North Tank Farm	Gunitite	42,500	staff gauge	daily
W-13	North Tank Farm	SS	2,000	staff gauge	yearly
W-14	North Tank Farm	SS	2,000	staff gauge	yearly
W-15	North Tank Farm	SS	2,000	staff gauge	yearly
W-1A	North Tank Farm	SS	2,000	pneumatic gauge	continuous
WC-1	E. of Bldg. 3038	SS	2,150	none	yearly

Table 1. (continued)

Tank	Location	Material of construction	Tank capacity (gal)	Level detection	Frequency of level measurement
WC-15	S. of Bldg. 3587	SS	1,000	conductivity probe	daily
WC-17	S. of Bldg. 3587	SS	1,000	pneumatic gauge	continuous
7560	E. of Bldg. 7500	SS	1,000	none	yearly
7562	SE of Bldg. 7500	SS	12,000	pneumatic gauge	daily
T-30	S. of Bldg. 4507	SS	825	pneumatic gauge	daily
W-19	S. of South Tank Farm	SS	2,250	none	yearly
W-20	S. of South Tank Farm	SS	2,250	none	yearly
3001-B	S. of Bldg. 3001	SS	75	none	yearly
3003-A	S. of Bldg. 3003	Concrete	16,000	none	biannually
3004-B	NE of Bldg. 3017	SS	30	none	biannually
3013	E. of Bldg. 3017	SS	400	none	biannually
7503-A	Inside Bldg. 7503	SS	11,000	none	once/3 years
H-209	SW of Bldg. 3517	SS	2,500	none	biannually
3002-A	S. of Bldg. 3002	SS	1,600	none	daily
4501-P	Under Basement of Bldg. 4501	SS	140	none	yearly
S-424	NW of Bldg. 3517	SS/Glass lined	500	pneumatic gauge	daily
T-14	New Hydrofracture Facility	Concrete	48,500	pneumatic gauge	daily
W-17	South Tank Farm	SS	1,000	pneumatic gauge	continuous
W-18	South Tank Farm	SS	1,000	pneumatic gauge	continuous
W-1-I	Under Bldg. 3028	SS	500	pneumatic gauge	daily
WC-4	W. of Bldg. 3026	SS	1,700	pneumatic gauge	continuous
WC-5	S. of Bldg. 3503	SS	1,000	pneumatic gauge	continuous
WC-6	S. of Bldg. 3503	SS	500	pneumatic gauge	continuous
WC-8	S. of Bldg. 3503	SS	1,000	pneumatic gauge	continuous

Table 1. (continued)

Tank	Location	Material of construction	Tank capacity (gal)	Level detection	Frequency of level measurement
WC-11	S. of Bldg. 3587	SS	4,000	pneumatic gauge	continuous
WC-12	S. of Bldg. 3587	SS	1,000	pneumatic gauge	continuous
WC-13	S. of Bldg. 3587	SS	1,000	pneumatic gauge	continuous
WC-14	S. of Bldg. 3587	SS	1,000	pneumatic gauge	continuous
W-12	SE of South Tank Farm	SS	700	pneumatic gauge	continuous

Fig. C-2. Location of the Melton Valley ILLW tanks.

C.2. TANK LEVEL TREND ANALYSIS

The following section contains tank data, information regarding level trends, and factors affecting them.

C.2.1 GUNITE STORAGE TANK W-5; SOUTH TANK FARM SITE, 3507, NORTH ROW

Tank W-5 level has been increasing slowly; this is attributed to inleakage, probably due to rainfall. At the end of FY 1994 the tank was only about 16% full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. There were apparently no reported instrumentation problems.

C.2.2 GUNITE STORAGE TANK W-6; SOUTH TANK FARM SITE, 3507, SOUTH ROW

Tank W-6 level has been increasing at a greater rate than the other tanks; this is attributed to inleakage, probably due to rainfall. At the end of FY 1994 the tank was about 81% full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. There was a brief instrument failure in December 1993, but it was quickly repaired and there was no real change in level during the measurement outage.

C.2.3 GUNITE STORAGE TANK W-7; SOUTH TANK FARM SITE, 3507, SOUTH ROW

Tank W-7 level has increased slightly over several years; at the end of FY 1994 it was only about three percent full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. There was a brief problem with the instrument system in August 1994, but there were quick repairs and no real level changes occurred during the instrument outage.

C.2.4 GUNITE STORAGE TANK W-8; SOUTH TANK FARM SITE, 3507, SOUTH ROW

Tank W-8 level has been increasing slowly; this is attributed to inleakage, probably due to rainfall. At the end of FY 1994 the tank was about 35% full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. No instrument problems were reported during FY 1994.

**C.2.5 GUNITE STORAGE TANK W-9; SOUTH TANK FARM SITE, 3507,
NORTH ROW**

Tank W-9 level has been increasing slowly; this is attributed to inleakage, probably due to rainfall. At the end of FY 1994 the tank was about 26% full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. No instrument problems were reported during FY 1994.

**C.2.6 GUNITE STORAGE TANK W-10; SOUTH TANK FARM SITE, 3507,
SOUTH ROW**

Tank W-10 level has been increasing slowly; this is attributed to inleakage, probably due to rainfall. At the end of FY 1994 the tank was about 61% full. The level instrument is a Robertshaw Inven-Tel-185 conductivity probe. No instrument problems were reported during FY 1994.

C.2.7 TANK W-11; SOUTH EAST OF SOUTH TANK FARM

Tank W-11, at the end of FY 1994, is approximately 53% full of liquid with a small amount of sludge. The inleakage appears to be from rain water. Approximately 2670 gal were removed from the tank during FY 1994. The tank has a staff gauge for level measurement. The T-bar broke in May 1994, but was repaired with no real change in level occurring during the instrument outage.

**C.2.8 OLD HYDROFRACTURE TANK T-1; OLD HYDROFRACTURE
FACILITY, 7852, MELTON VALLEY**

At the end of FY 1994, tank T-1 is about 58% full of liquid and sludge. The tank structure is sound, therefore there is no rain water infiltration, nor are there concerns for loss of tank contents. Tank T-1 has a Foxboro Model 13A DP transmitter for level measurement. Various instrument problems occurred throughout the year including instrument freezing, power outages and instrument air supply failures. None of the incidents had any real effect on the tank level.

**C.2.9 OLD HYDROFRACTURE TANK T-2; OLD HYDROFRACTURE
FACILITY, 7852, MELTON VALLEY**

At the end of FY 1994, tank T-2 is about 70% full of liquid and sludge. The tank structure is sound, therefore there is no rain water infiltration, nor are there concerns for loss of tank contents. Tank T-2 has a Foxboro Model 13A DP transmitter for level measurement. Various instrument problems occurred throughout the year including instrument freezing, power outages and instrument air supply failures. None of the incidents had any real effect on the tank level.

C.2.10 OLD HYDROFRACTURE TANK T-3; OLD HYDROFRACTURE FACILITY, 7852, MELTON VALLEY

At the end of FY 1994, tank T-3 is about 11% full of liquid and sludge. The tank structure is sound, therefore there is no rain water infiltration, nor are there concerns for loss of tank contents. Tank T-3 has a Foxboro Model 13A DP transmitter for level measurement. Various instrument problems occurred throughout the year including instrument freezing, power outages and instrument air supply failures. None of the incidents had any real effect on the tank level.

C.2.11 OLD HYDROFRACTURE TANK T-4; OLD HYDROFRACTURE FACILITY, 7852, MELTON VALLEY

At the end of FY 1994, tank T-4 is about 60% full of liquid and sludge. The tank structure is sound, therefore there is no rain water infiltration, nor are there concerns for loss of tank contents. Tank T-4 has a Foxboro Model 13A DP transmitter for level measurement. Various instrument problems occurred throughout the year including instrument freezing, power outages and instrument air supply failures. None of the incidents had any real effect on the tank level.

C.2.12 OLD HYDROFRACTURE TANK T-9; OLD HYDROFRACTURE FACILITY, 7852, MELTON VALLEY

At the end of FY 1994, tank T-9 is about 40% full of liquid and sludge. The tank structure is sound, therefore there is no rain water infiltration, nor are there concerns for loss of tank contents. Tank T-9 has a Foxboro Model 13A DP transmitter for level measurement. Various instrument problems occurred throughout the year including instrument freezing, power outages and instrument air supply failures. None of the incidents had any real effect on the tank level.

C.2.13 THORIUM TANK TH-1; SOUTH OF BUILDING 3503

Tank TH-1 is empty. A conductivity probe is inserted through an access pipe to check for liquid level. No permanent level instrumentation is mounted to the tank.

C.2.14 THORIUM TANK TH-2; SOUTH OF BUILDING 3503

Tank TH-2 is empty. A conductivity probe is inserted through an access pipe to check for liquid level. No permanent level instrumentation is mounted to the tank.

C.2.15 THORIUM TANK TH-3; SOUTH OF BUILDING 3503

Tank TH-3 is empty. A conductivity probe is inserted through an access pipe to check for liquid level. No permanent level instrumentation is mounted to the tank.

C.2.16 THORIUM TANK TH-4; SOUTH OF BUILDING 3500

Tank TH-4 has been very full throughout FY 1994. None of the contents were drawn off during this year. The level instrument is a Robertshaw Inven-Tel-185 model conductivity probe. The instrumentation required frequent recalibration activities throughout the year. Only one power outage in November 1993 occurred, but did not effect the real level of the tank.

C.2.17 TANK W-1; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

At the end of FY 1994, tank W-1 is about 50% full. The level increase is mostly due to rain water accumulation. The level instrument is a Robertshaw Inven-Tel-185 model conductivity probe. In July 1994, there was a power outage and a brief problem with instrument failure in both October 1993 and July 1994. Repairs were made and there was no real effect on the tank level.

C.2.18 TANK W-2; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-2, at the end of FY 1994, is approximately 40% full. The level instrument is a Robertshaw Inven-Tel-185 model conductivity probe. A power outage in August 1994 is the only incident that was reported against this system, but there was no real effect on the tank level.

C.2.19 TANK W-3; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-3 is known to collect surface water. At the end of FY 1994, the tank is approximately 20% full. A total of 7600 gal were removed from the tank during FY 1994. Tank W-3 has a staff gauge to measure the level in the tank. No instrument-related problems were reported.

C.2.20 TANK W-4; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-4 is known to collect water, possibly through inlet piping to the tank. At the end of FY 1994, the tank is over 60% full. Tank W-4 has a staff gauge to measure the level in the tank. No instrument problems were reported in FY 1994.

C.2.21 TANK W-13; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-13 was checked in November 1993 and is empty. Tank W-13 has a staff gauge for level measurement. No instrument problems were reported in FY 1994.

C.2.22 TANK W-14; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-14 was checked in November 1993 and is empty. Tank W-14 has a staff gauge for level measurement. No instrument problems were reported in FY 1994.

C.2.23 TANK W-15; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Tank W-15 was checked in November 1993 and is empty. Tank W-15 has a staff gauge for level measurement. No instrument problems were reported in FY 1994.

C.2.24 TANK W-1A; NORTH TANK FARM, NORTH OF CENTRAL AVENUE, SITE 3023

Many rain events affected levels in tank W-1A throughout FY 1994. At the end of FY 1994, the tank is approximately 25% full. Throughout the year a total of 31,125 gal were emptied to the active LLLW system. Figure C-3 is a sample of a more active tank level trending analysis. Tank W-1A is monitored with a Foxboro 823 pneumatic gauge. No instrument problems were reported this year.

C.2.25 TANK WC-1; BETWEEN BLDG. 3038 AND 3037, NORTH OF CENTRAL AVENUE

Tank WC-1 was checked again in May 1994 and is empty. A conductivity probe is inserted through an access pipe to check for liquid level. No permanent level instrumentation is mounted to the tank.

C.2.26 TANK WC-15; SOUTH OF BUILDING 3587, CORNER OF WHITE OAK AVE. AND FIFTH ST.

Ground water infiltrates tank WC-15 causing the tank level to rise and fall as the level of the ground water table rises and falls. Apparent "spikes" in the levels throughout the year coincide with rain fall events. A Robertshaw Inven-Tel-185 model conductivity probe measures the level for WC-15. There was a brief instrument failure in May 1994, but it was repaired and did not effect the real tank level. A power outage in November 1993 also had no real effect on the tank level.

C.2.27 TANK WC-17; SOUTH OF BUILDING 3587, CORNER OF WHITE OAK AVE. AND FIFTH ST.

Ground water infiltrates tank WC-17 through two holes in the bottom causing tank levels to rise and fall as the level of the ground water table rises and falls. Apparent "spikes" in the levels throughout the year coincide with rain fall events. A Foxboro 823

Tank Levels for W-1A
Capacity: 4,000 Gallons Best Fit Slope: -0.4612

Fig. C-3. Tank W-1A level trend graph.

pneumatic gauge measures the level for WC-17. There were no instrument-related problems reported this year.

C.2.28 TANK 7560; EAST OF BUILDING 7500, MELTON VALLEY

Tank 7560 is empty. A conductivity probe is inserted through an access pipe to check for liquid level. No permanent level instrumentation is mounted to the tank.

C.2.29 TANK 7562; EAST OF BUILDING 7500, MELTON VALLEY

Tank 7562 is receiving inleakage from an unknown source. During FY 1994, the tank overflowed causing a Category III Occurrence. The Occurrence was resolved by unearthing and uncovering the tank and pumping out 8800 gal of liquid. As long as the contents are periodically pumped to a transfer truck, there is little risk of another overflow incident. At the end of FY 1994, the tank is approximately 20% full. A pneumatic gauge measures the level in Tank 7562. No instrument-related problems were reported this year.

C.2.30 TANK T-30; SOUTH OF BUILDING 4507, UNDERGROUND IN CONCRETE PIT

Tank T-30 was emptied just prior to the start of FY 1994. Previously accumulated data indicates the tank structure is sound and that the tank is expected to still be empty. Tank T-30 and the associated sump have differential pressure instruments which have readouts at the control panel in Building 4507. The level status has been monitored daily by Waste Management personnel.

C.2.31 TANK W-19; SOUTH OF SOUTH TANK FARM, NORTH OF BUILDING 3517

Tank W-19 was checked in May 1994; it is empty. Tank W-19 has no level measurement instrumentation.

C.2.32 TANK W-20; SOUTH OF SOUTH TANKS FARM; NORTH OF BUILDING 3517

Tank W-20 was checked in May 1994; it is empty. Tank W-20 has no level measurement instrumentation.

C.2.33 TANK 3001-B; SOUTH OF BUILDING 3001

Tank 3001-B, with only 1/2 inch of liquid in it, is considered to be empty. Tank 3001-B has no level measurement instrumentation.

C.2.34 TANK 3003-A; SOUTH OF BUILDING 3003

Tank 3003-A is empty. Tank 3003-A has no level measurement instrumentation.

**C.2.35 TANK 3004-B; EAST OF BUILDING 3008; UNDERGROUND,
UNDERNEATH LANDSCAPE ROCKS ON PUBLIC ACCESS WALK TO
GRAPHITE REACTOR**

Tank 3004-B is empty. Tank 3004-B has no level measurement instrumentation.

C.2.36 TANK 3013; EAST OF BUILDING 3017, SOUTH OF BUILDING 3013

Tank 3013 is empty. Tank 3013 has no level measurement instrumentation.

C.2.37 TANK 7503-A; NORTHWEST OF BUILDING 7503, MELTON VALLEY

Tank 7503-A contains only a thin layer of dry sludge. The tank is empty at this time. Tank 7503-A does not have working level instrumentation.

**C.2.38 TANK H-209; SOUTHWEST OF BUILDING 3517, NEXT TO WHITE OAK
AVE.**

Tank H-209 is empty. The tank has no level measurement instrumentation.

C.2.39 TANK 3002-A; SOUTH OF BUILDING 3002, NORTH OF BUILDING 3001

Tank 3002-A is approximately half full. The tank still collects drainage from the Building 3002 Filter House, probably from rain water infiltration. The tank has no level measurement instrumentation.

C.2.40 TANK 4501-P; UNDERNEATH BASEMENT FLOOR OF BUILDING 4501

Tank 4501-P contains approximately two gal of liquid as residual from a 1990 emptying and rinse operation. A conductivity probe is inserted into the tank dip leg to detect the presence of liquid. In addition, there is a manometer type level indicator, which is a little more difficult to use.

C.2.41 TANK S-424; NORTHWEST OF BUILDING 3517

Tank S-424 is empty. S-424 has a pneumatic gauge and has a readout at Building 3517. No instrument-related problems were reported this year.

C.2.42 TANK T-14; NEW HYDROFRACTURE FACILITY (MELTON VALLEY)

Tank T-14 has some residual, sludge-like grout mixture in the tank. Tank T-14 has a pneumatic liquid-level gauge. No instrument-related problems were reported this year.

C.2.43 TANK W-17; SOUTH TANK FARM

Tank W-17 collects leakage which is routinely emptied and processed at the LLLW evaporator. An inlet line to W-17 is thought to be the source of the leakage. Tank W-17 collected a total of 792 gal by the end of FY 1994. W-17 is equipped with a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported this year.

C.2.44 TANK W-18; SOUTH TANK FARM

Tank W-18 collects leakage which is routinely emptied and processed at the LLLW evaporator. An inlet line to W-18 is thought to be the source of the leakage. Tank W-18 had 518 gal at the end of FY 1994. A total of 5075 gal were removed during FY 1994. W-18 is equipped with a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported this year.

C.2.45 TANK W-1-I; UNDER BUILDING 3028

Tank W-1-I is empty of liquid but probably contains residual solids. The tank has a pneumatic level gauge with a readout at Building 3028 which indicates that the tank is still empty. No instrument-related problems were reported this year.

C.2.46 TANK WC-4; ADJACENT TO BUILDING 3026C, ON WEST SIDE

Tank WC-4 has accumulated approximately 275 gal of liquid at the end of FY 1994. While there is a leaking flange on the tank, it is suspected the primary reason for the increase in liquid volume is an approximately 0.25 gal/day increase from moisture acquired from the tank ventilation. Tank WC-4 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.47 WC-5; SOUTH OF BUILDING 3503

Tank WC-5 contained 476 gal of liquid at the end of FY 1994. The primary source of leakage appears to be rain water. Tank WC-5 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.48 TANK WC-6; SOUTH OF BUILDING 3503

Tank WC-6 contained approximately 217 gal of liquid at the end of FY 1994. The primary source of the inleakage appears to be rain water. Tank WC-6 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.49 TANK WC-8; SOUTH OF BUILDING 3503

Tank WC-8 contained approximately 425 gal at the end of FY 1994. The tank is used to collect pump priming water for a near-by pump. Tank WC-8 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.50 TANK WC-11; SOUTH OF BUILDING 3587

Tank WC-11 contained approximately 1576 gal at the end of FY 1994, some of which is sludge. The tank collects water from the Building 4556 filter pit discharge for Building 4507. Cell ventilation duct work also discharges into Tank WC-11. Tank WC-11 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.51 TANK WC-12; SOUTH OF BUILDING 3587

Tank WC-12 contained approximately 389 gal of liquid at the end of FY 1994. A total of 185 gal were removed from the tank in FY 1994. The tank collects Tank T-30 sump water. Tank WC-12 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.52 TANK WC-13; SOUTH OF BUILDING 3587

Tank WC-13 contained approximately 288 gal at the end of FY 1994. The tank collects water from floor drains in Building 4501. Tank WC-13 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.53 TANK WC-14; SOUTH OF BUILDING 3587

Tank WC-12 contained approximately 650 gal of liquid at the end of FY 1994. Tank WC-14 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

C.2.54 TANK W-12; SOUTH OF BUILDING 3525

Tank W-12 contained approximately 200 gal of liquid at the end of FY 1994. A total of 2181 gal were removed from the tank during this year. The source of inleakage to this tank is still being determined. Tank W-12 has a pneumatic level detector with a continuous readout at the WOCC. No instrument-related problems were reported in FY 1994.

Table C.2 summarizes the incidents affecting the 54 inactive LLLW tanks during FY 1994.

Table C.2. Summary of inac

Tank	October, 1993	November, 1993	December, 1993	January, 1994	February, 1994	March, 1994	April
W-6	No Activity	No Activity	Instrument failure; no real effect on level	No Activity	No Activity	No Activity	No Act
W-7	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-8	No Activity	Instrument anomaly; no real effect on level	No Activity	No Activity	No Activity	No Activity	No Act
W-11	No Activity	No Activity	20% volume increase after 5" rain event; 1400 gallons removed later in month	No Activity	No Activity	15% tank volume level increase due to rain event	1,270 gallons removed; Tank beyond its range, removal allevia
T-1	No Activity	No Activity	No Activity	Instrument failure (frozen); no real effect on level	Instrument failure (frozen); no real effect on level	No Activity	No Act
T-2	No Activity	No Activity	No Activity	Instrument failure (frozen); no real effect on level	Instrument failure (frozen); no real effect on level	Instrument failure; instrument repaired; no real effect on level	No Act
T-3	No Activity	No Activity	No Activity	Instrument failure (frozen); no real effect on level	Instrument failure (frozen); no real effect on level	No Activity	No Act
T-4	No Activity	No Activity	No Activity	Instrument failure (frozen); no real effect on level	Instrument failure (frozen); no real effect on level	No Activity	No Act
T-9	No Activity	No Activity	No Activity	Instrument failure (frozen); no real effect on level	Instrument failure (frozen); no real effect on level	No Activity	No Act
TH-1	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
TH-2	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
TH-3	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
TH-4	Tank full	power outage, no real effect on level; Tank full	Tank full	Tank full	Tank full	New instrument float installed to improve level measurement; Tank full	Calibration of Instrumentation; no
W-1	Instrument problem repaired; no real effect on level	No Activity	10% volume increase after 5" rain event	No Activity	level increases due to rain events	level increases due to rain events	No Act
W-2	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-3	No Activity	No Activity	Tank close to full	Tank full	Tank full	Tank full	Tank full
W-13	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
W-14	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
W-15	No Activity	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity	No Act
W-1A	No Activity	2002 gallons removed; level increases due to rain events	1748 gallons removed after large volume increase after rain event; level again increased throughout the month	Many level increases due to rain events; frequent removals of a total of 6,596 gallons	Many level increases due to rain events; frequent removals of a total of 7,001 gallons	Many level increases due to rain events; frequent removals of a total of 6,222 gallons	Many level increases due to rain e a total of 9,336 gallons
WC-1	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
WC-15	level rose and fell in response to 5" rain event	power outage; no real effect on level	level rose and fell in response to 5" rain event	No Activity	levels rose and fell twice in response to rain events	level rose and fell in response to rain event	level rose and fell in response to r
WC-17	level rose and fell in response to 5" rain event	No Activity	level rose and fell in response to 5" rain event	No Activity	levels rose and fell twice in response to rain events	level rose and fell in response to rain event	level rose and fell in response to rr
7582	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-19	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-20	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-18	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
WC-6	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
WC-11	No Activity	No Activity	No Activity	No Activity	25% tank volume increase in response to rain events	No Activity	No Act
WC-12	No Activity	No Activity	No Activity	No Activity	No Activity	No Activity	No Act
W-12	No Activity	No Activity				No Activity	548 gallons removed

liquid low-level waste (ILLW) tanks.

	May, 1994	June, 1994	July, 1994	August, 1994	September, 1994
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	instrument problem; no real effect on level	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
no full float indicator blem.	readjustment of staff gauge, T-bar broken; previous level indications were incorrect	slowly increasing level, but no major accumulation	No Activity	No Activity	39% increase in level from start of month
	No Activity	power and component failure; no real effect on level;	instrument problem; no real effect on level	instrument air failure; no real effect on level	Power outage; no real effect on level
	No Activity	power and component failure; no real effect on level;	No Activity	instrument air failure; no real effect on level	Power outage; no real effect on level
	No Activity	power and component failure; no real effect on level;	No Activity	instrument air failure; no real effect on level	Power outage; no real effect on level
	No Activity	power and component failure; no real effect on level;	No Activity	instrument air failure; no real effect on level	Power outage; no real effect on level
	No Activity	power and component failure; no real effect on level;	No Activity	instrument air failure; no real effect on level; other instrument problem also taken care of	Power outage; no real effect on level
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
ect on level; Tank full	recalibration of instrumentation; no real effect on level; Tank full	recalibration of instrumentation; no real effect on level; Tank full	recalibration of instrumentation; no real effect on level; Tank full	recalibration of instrumentation; no real effect on level; level instrumentation disconnected temporarily during sampling activities with no real effect on level; Tank full	Power off during sampling activities; no real effect on level; tank full
	No Activity	power outages; no real effect on level	instrument problem; no real effect on level	power outage; no real effect on level	No Activity
	No Activity	No Activity	No Activity	power outage; no real effect on level	No Activity
	level instrumentation operating beyond its range; 7,600 gallons removed alleviated level measurement problem; level begins slow increase after removal	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	No Activity
requent removals of	No Activity	steady level increases with large increase at end of month.	1,938 gallons removed early in month; steady level increases with large increase at end of month.	steady level increase during month	1,880 gallons were removed early in month; level's increase after rain event
	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity
nt	apparent instrument failure; no real effect on level	No Activity	No Activity	No Activity	No Activity
nt	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	8,800 gallons removed after Level III Occurrence	No Activity	No Activity	No Activity
	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity
	Tank checked and determined is empty	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	No Activity	No Activity	5,075 gallons removed
	No Activity	No Activity	No Activity	No Activity	183 gallons removed
	No Activity	No Activity	No Activity	No Activity	No Activity
	No Activity	No Activity	185 gallons removed	No Activity	No Activity
	1,367 gallons removed		266 gallons removed		

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