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ENVIRONMENTAL RESTORATION PROGRAM

Waste Management Plan for Inactive LLLW Tanks 3001-B, 3004-B, 3013, and T-30 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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DEPARTMENT OF ENERGY
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ORNL/ER-304

Energy Systems Environmental Restoration Program
ORNL Environmental Restoration Program

Waste Management Plan for Inactive LLLW Tanks 3001-B, 3004-B, 3013 and T-30 at Oak Ridge National Laboratory, Oak Ridge, Tennessee

Date Issued—July 1995

Prepared by
H & R Technical Associates, Inc.
Oak Ridge, Tennessee

Prepared for
U.S. Department of Energy
Office of Environmental Management
under budget and reporting code EW 20

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831-6285
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LOCKHEED MARTIN ENERGY SYSTEMS, INC.
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U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

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APPROVALS

Waste Management Plan for Inactive LLLW Tanks 3001-B, 3004-B, 3013, and T-30 at Oak Ridge National Laboratory, Oak Ridge, Tennessee ORNL/ER-304

Certification:

The information provided in this Project Waste Management Plan has been prepared in accordance with the ORNL Environmental Restoration Document for Preparing Waste Management Plans; the Waste Handling Procedures for Construction Projects, EP-D-21; and the appropriate Waste Acceptance Criteria Documents. All information herein is believed to be true on the basis of project information available at this time:

H L Boston by W D Buchanan
ER Program Manager

7/17/95
Date

C. A. Belmarez by [illegible]
Project Manager

7/12/95
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7/18/95
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7/19/95

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ABBREVIATIONS

ALARA	as low as reasonably achievable
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CH	contact-handled
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
ENSR	ENSR Remediation and Construction
ER	Environmental Restoration
IH	Industrial Hygiene Section
LLLW	liquid low-level radioactive waste
M&O	managing and operating contractor
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
PPE	personal protective equipment
PWMP	Project Waste Management Plan
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RP	Radiation Protection
SARA	Superfund Amendments and Reauthorization Act
SEG	Scientific Ecology Group, Inc.
SLLW	solid low-level radioactive waste
TRU	transuranic
TSCA	Toxic Substances Control Act
WAC	waste acceptance criteria
WC	Waste Certifier
WCG	Waste Certification Group
WMRAD	Waste Management and Remedial Action Division

PREFACE

EXECUTIVE SUMMARY

This Project Waste Management Plan identifies the waste that is expected to be generated in connection with the removal and disposition of inactive liquid low-level radioactive waste tanks 3001-B, 3004-B, and T-30, and grouting of Tank 3013 at the Oak Ridge National Laboratory and the isolation of these tanks' associated piping systems. The plan also identifies the organization, responsibilities, and administrative controls that will be followed to ensure proper handling of the waste.

PROJECT WASTE MANAGEMENT PLAN

General Information:

Waste Management Plan Number: _____

Project Name: Inactive LLLW Tanks Program:
3001-B, 3004-B, 3013, and
T-30

Contractors: TO BE DESIGNATED

Construction - Start: 7/95
End: 8/95

Location: ORNL (see Appendix A)
ESO No.:
Project Manager/Phone No.: Clay Bednarz/241-3926
Construction Engineer/Phone No.: Rudy Williams/574-7985

Is radioactive waste expected to be encountered?	Yes X	No __
Is RCRA waste expected to be encountered?	Yes _	No X
Is TSCA (PCBs) waste expected to be encountered?	Yes _	No X

1. INTRODUCTION

The main purpose of this Project Waste Management Plan (PWMP) is to identify the waste that is expected to be generated in connection with the removal and disposition of inactive liquid low-level radioactive waste (LLLW) tanks 3001-B, 3004-B, T-30, and filling Tank 3013 with grout at the Oak Ridge National Laboratory (ORNL) and the isolation of their associated piping systems (see Appendix A for tank locations). Another purpose of this plan is to identify the organization, responsibilities, and administrative controls that will be followed to ensure proper handling of the waste.

2. GENERAL PROJECT INFORMATION

2.1 SITE HISTORY

Tank 3001-B is a 300-gal stainless steel tank located in an in-ground vault. The tank is thought to have been a hold-up tank for hot lab drains in Bldg. 3001. Tank 3001-B was installed in 1943 and taken out of service in 1965.

Tank 3004-B is a 100-gal stainless steel tank located in an in-ground vault. The tank was a waste holding tank for the Low Intensity Test Reactor. Tank 3004-B was installed in 1956 and taken out of service in 1968.

Tank 3013 is a buried 400-gal stainless steel tank. Drawings show that the tank is connected to a drain from the cell beneath 3013. Building 3013 was originally an environmental processing laboratory that dealt with radioactively contaminated environmental samples. Tank 3013 was installed in 1949. The removal-from-service date is unknown.

Tank T-30 is an 825-gal stainless steel tank located in an in-ground vault. T-30 was used to store radioactive materials for the Curium Recovery Facility, Bldg. 4507, which later became the High Radiation Level Chemical Recovery Facility. T-30 was installed in 1961 and removed from service in 1980.

The tank locations are shown in Appendix A.

2.2 PROJECT DESCRIPTION

The purpose of this project is to remove and dispose of LLLW tanks 3001-B, 3004-B, and T-30 and to fill Tank 3013 with grout as part of the Inactive Tank Remediation Program. The program designates these tanks as Batch 1, Series 1.

Waste Management Operations will remove the liquid contents of tanks 3004-B and 3013. Tanks 3001-B, 3004-B, and T-30 will be removed from their respective vaults. All pipelines connected to tanks 3004-B and T-30 will be cut and capped near the vault walls. The inlet and outlet lines of tank 3001-B will be connected to allow 3001 canal demineralizer waste water to flow to the LLLW system. The 3001-B vault will be surveyed for contamination and rinsed with water as appropriate. Recent investigation of the 3004-B vault has shown that no further decontamination will be required. The T-30 vault will be decontaminated before this project begins. All three vaults will be filled with grout.

Tank 3013 will be filled with grout and all pipelines connected to the tank will be cut and capped near the tank.

The tanks and all removed piping may be transferred to Scientific Ecology Group, Inc. (SEG) for smelting, pending determination of U.S. Department of Transportation (DOT) shipping package requirements.

2.3 SCHEDULE

Tank disposition activities are expected to begin in July 1995 and to be completed in August 1995.

3. ORGANIZATION STRUCTURE AND RESPONSIBILITY

The organizational structure for this project is not finalized at present. Specific waste management responsibilities are listed in Appendix B. This project will be addressed with the joint resources of the following participants:

- U.S. Department of Energy (DOE),
- Martin Marietta Energy Systems, Inc. (Energy Systems) - Managing and Operating contractor (M&O), and
- service subcontractor to Energy Systems.

A brief summary of responsibilities and duties follows.

3.1 U.S. DEPARTMENT OF ENERGY

DOE will furnish overall program management and provide project support as required through the DOE/ORNL site office. In addition, all coordination with the U.S. Environmental Protection Agency and the Tennessee Department of Environment and Conservation will be DOE's responsibility.

3.2 MARTIN MARIETTA ENERGY SYSTEMS, INC.

Energy Systems, as the M&O, is responsible for managing and operating ORNL under prime contract to DOE. The Inactive Tanks Remediation Program will be conducted and supervised by the ORNL Environmental Restoration (ER) program. Various groups within Energy Systems have specific responsibility related to waste management as follows.

a. Energy Systems ER Program:
   1. Provide overall project oversight and assume ultimate responsibility for Energy Systems
   2. Provide FM support

b. Energy Systems Engineering:
   1. Manage the project
   2. Prepare standard project documentation
   3. Prepare Certified for Construction package

c. Energy Systems Plant Support:
   1. Provide Radiation Protection (RP) oversight
   2. Provide Industrial Hygiene (IH) oversight
   3. Provide RP support (liquid removal only)
   4. Porvide IH support (liquid removal only)
   5. Provide Environmental Compliance support

d. Energy Systems Waste Management and Remedial Action Division (WMRAD):
   1. Provide Waste Certifier (WC)
   2. Provide Waste Operations support
   3. Provide Waste Generator (liquid removal only)

3.3 GENERATOR

Energy Systems Wast Management Operations will remove the liquid contents of tanks 3004-B and 3013 prior to tank excavation. Waste Management Operations will act as the waste generator during this activity. A service subcontractor to Energy Systems will perform the tank excavation activites; the contractor will provide RP and IH support and will act as the waste generator for tank removal activities. The generator's specific responsibilities are as follows:

- Properly containerizes, packages, and segregates all waste generated as part of the project.
- Completes and signs box S1 of UCN Form 2109, *Waste Item Description*, and completes all parts of the form for which he has obtained information.
- If hazardous waste is generated, completes UCN Form 2109. This form is completed for all wastes.
- Minimizes solid low-level radioactive waste (SLLW) production.
- Attends and successfully completes current ORNL SLLW generator training and facility-specific training prior to generating SLLW.
- Interfaces with the WC to ensure that any issues in SLLW characterization are promptly brought to the attention of the responsible individuals and that any new certification requirements or procedures are promptly instituted.
- Provides as much information as possible for certification of SLLW and documents the data on UCN Form 2109.
- Assists the WC with the preparation of the Waste Pickup Request form and Container Packing List.

3.4 WASTE CERTIFIER

The WC must be an Energy Systems employee (unless the ORNL Laboratory Certification Official waives this requirement) who has successfully completed waste generator training for SLLW, WC training, 90-day accumulation area training and satellite accumulation area training (required only for hazardous waste), 40-hour HAZWOPER training, and Radiation Worker II training. The WC's specific responsibilities are as follows:

- Serves as the interface between the project, the ORNL Laboratory Certification Official, and the ORNL Waste Management Organization in addressing generator problems and waste certification requirements.
- Initiates and completes the WC section of UCN Form 2109 and the applicable attachment.
- Certifies by signing the attachment to UCN Form 2109 that the waste was packaged in accordance with the ORNL waste acceptance criteria (WAC), ORNL SLLW certification program, and SLLW quality assurance (QA) plan requirements.

- Ensures that each containerized waste item is identified with a properly completed Waste Item Description form and barcode label and verifies that the container is sealed and labeled and meets all applicable criteria for transfer to Waste Management.

- Certifies that the information on the Container Packing List is complete and accurate and that the waste was packaged by personnel with appropriate training.

- Ensures that waste generation follows a documented and Waste Management-approved certification program.

- Periodically inspects or audits waste-generating and waste-managing activities to ensure that they meet the requirements of an approved certification program.

- Reviews and approves nonconformance reports and trends, log-in sheets, training records, and facility-specific procedures for the proper packaging and handling of SLLW.

- Reviews and approves all PWMPs and PWMP checklists.

- Ensures that SLLW is properly classified, adequately characterized, and packaged in accordance with PWMP criteria and applicable WAC.

- Makes arrangements or has his designee make arrangements with Waste Management Operations for pickup and transfer of waste packages to the designated storage or treatment facility.

3.5 WASTE CERTIFICATION GROUP

The Waste Certification Group (WCG) implements and manages the ORNL SLLW Certification Program. The WCG reviews and approves all PWMPs and PWMP checklists.

4. WASTE GENERATION

4.1 WASTE-GENERATING ACTIVITIES

During the activities discussed in Sect. 2.2, liquid process waste, LLLW, contact-handled (CH) SLLW in the form of concrete rubble, asphalt rubble, steel tanks, steel piping, miscellaneous steel, personal protective equipment (PPE), and possibly some contaminated soil will be generated.

During field operations, Radiological Control Technicians (RCTs) will use portable alpha and beta/gamma detectors to monitor for radioactivity in the material removed. IH personnel will use portable ionization detectors to monitor for volatile organics. Energy Systems Plant Support will provide RP and IH support for tank contents removal. The subcontractor will provide RP and IH support for tank excavation and associated activities.

4.2 WASTES TO BE GENERATED

The estimates of the wastes that will be generated by the field work are tabulated in Appendix B, Sect. 4.

4.3 CHARACTERIZATION OF WASTE STREAMS

Liquid samples from Tanks 3001-B, 3004-B, 3013, and T-30 were analyzed as reported in the *Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at ORNL*, DOE/OR/01-1159&D1(see Appendix D). Characterization of liquid to be removed from tanks 3004-B and 3013 will be characterized based on these analyses. Analyses indicated that all liquid samples met the SEG WAC. Tanks 3001-B, 3004-B, 3013, and T-30 will be characterized through the combined use of the DOE/OR/01-1159&D1 data and field monitoring by subcontractor RP and IH personnel. The methodology for field monitoring is detailed in Appendix B, Sect. 4.2.

Laboratory isotopic analyses (reported in DOE/OR/01-1159&D1) identified radioactive isotopes and their respective contributions to the total activity of the contamination present in the liquid. By assuming a constant concentration of the identified isotopes (and neglecting the nonlinearity of ionization potential as isotopic concentration is varied), the approximate curie content of each isotope present on subsequently contaminated PPE, sampling, and handling equipment may be calculated as in Sect. 8.1.1 of the *Waste Management/Waste Certification Plan for the ORNL Environmental Restoration Program*, ORNL/ER-288. All calculations made in determining isotopic breakdown will be recorded for use in completing waste transfer documentation (see Sect. 5.3).

Subcontractor IH personnel will use portable ionization detectors to monitor excavated soil for the presence of volatile organics. Subcontractor RP personnel will use portable alpha and beta/gamma detectors to monitor the soil for the presence of radioactivity. If screening indicates the presence of volatile organics or radioactive contamination above Category 2 limits as defined in the *Health, Safety, and Environmental Protection Procedure for Excavating*

ORNL/M-116/R1, the WC shall ensure that appropriate analyses are performed in accordance with ORNL/ER-288.

The waste generator shall ensure the integrity of the samples by following the chain of custody procedure described in the *Test Methods for Evaluating Solid Waste*, EPA-SW-846.

5. WASTE HANDLING

5.1 GENERATING

DOE and Energy Systems control programs governing engineering, construction, and waste disposal activities will be implemented for this project. These programs include sampling and analysis, waste certification, hazardous waste and radiation worker training, quality assurance, environmental safety and health, and health physics. These programs will ensure compliance with all applicable state and federal regulatory requirements including the Resource Conservation and Recovery Act (RCRA); Toxic Substances Control Act (TSCA); Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the associated Superfund Amendments and Reauthorization Act (SARA); Occupational Safety and Health Administration (OSHA); and DOT regulations for the proper handling and control of radioactive and hazardous wastes.

5.2 SEGREGATING

Subcontractor RP personnel will use portable alpha and beta/gamma detectors to monitor the excavated soil, concrete, and asphalt for the presence of radioactivity. Subcontractor IH personnel will use portable ionization detectors to monitor the material for the presence of volatile organics. Soil meeting ORNL/M-116/R1 Category 1 or 2 will remain on-site for use as backfill. Category 3 soil will be isolated from the environment until properly packaged for disposal. Uniformly contaminated waste will be segregated from surface-contaminated waste.

5.3 PACKAGING AND HANDLING

Waste will be packaged under the guidance of the WC. The individual signing as the waste generator shall be present during all waste packaging. The SLLW waste tanks, piping, and any radionuclide-contaminated soil, asphalt, and concrete waste will be packaged to comply with the ES/WM-10, *Waste Acceptance Criteria for the Oak Ridge Reservation*. For any SLLW, the WC and the generator shall complete UCN Form 2109, Attachment A, and UCN Form 20116, *Process Knowledge Documentation*. Waste transfer documentation shall be revised if the level of contamination is found to be greater than expected. The WC shall ensure that RP Form UCN-2785, *Radiation Tag*, and a packing list barcode label are attached to the waste container. The WC shall ensure that a barcode is attached to each waste package within the container and that a duplicate barcode is attached to UCN Form 2109. The WC will request pick-up of the package after acceptance by Radioactive Solid Waste Operations.

5.4 WASTE CERTIFICATION

Waste generated under this project shall be certified in accordance with ORNL/ER-288.

5.5 DECONTAMINATION OF EQUIPMENT

All tools and related equipment will be screened for radioactive contamination and volatile organics. Contaminated equipment will be decontaminated if feasible.

6. WASTE MINIMIZATION

All efforts will be made to minimize waste generation during the course of this project. As a minimum, the following actions will be taken.

- All generated waste will be segregated to minimize the disposal of recyclable, noncontaminated, and nonhazardous wastes.
- As little water as possible will be used in decontamination operations.
- Where appropriate, excavated soil will be used as backfill at the project site.
- The liquid contents of tank 3013 will be sent to the Process Waste Treatment Plant for treatment.

7. CONTROL PROGRAMS

7.1 CONTROLS/SURVEYS

RP and IH will perform surveillance during field activities to identify radioactive contamination and organic vapors. The WC will be responsible for determining whether additional testing or sampling is required.

7.2 PERSONNEL EXPOSURE CONTROL

RP and IH will perform surveillance during field activities to identify radioactive contamination and organic vapors. Standard radiation protection measures to ensure personnel safety will be defined in the site safety and health plan. Work exposure times and other conditions will be established by the RCT in charge. The Construction Manager will ensure that personnel exposure is as low as reasonably achievable (ALARA) during all work in contaminated areas or areas subject to radiation exposure.

7.3 TRAINING

Personnel involved in on-site activities must have training and a preemployment medical assessment. They must also have 40-hour SARA/OSHA training and Radiation Worker II training. Personnel responsible for completing and signing waste tracking and disposal forms must also have SLLW generator training and must be present during packaging. All individuals packaging SLLW must have SLLW generator training. The generator and the WC must have training as described in Sects. 3.3 and 3.4, respectively. If hazardous waste is encountered, the generator must also have Waste Generator Training for Satellite Accumulation Areas, 90-Day Accumulation Areas, and Hazardous Waste Characterization.

7.4 QA REQUIREMENTS

Energy Systems, in its role as M&O, will track participant activities and consolidate records and reports to ensure that project QA activities are performed and that required documentation is complete. Surveillance will be conducted as defined in the QA Plan.

7.5 SPILL CONTROL

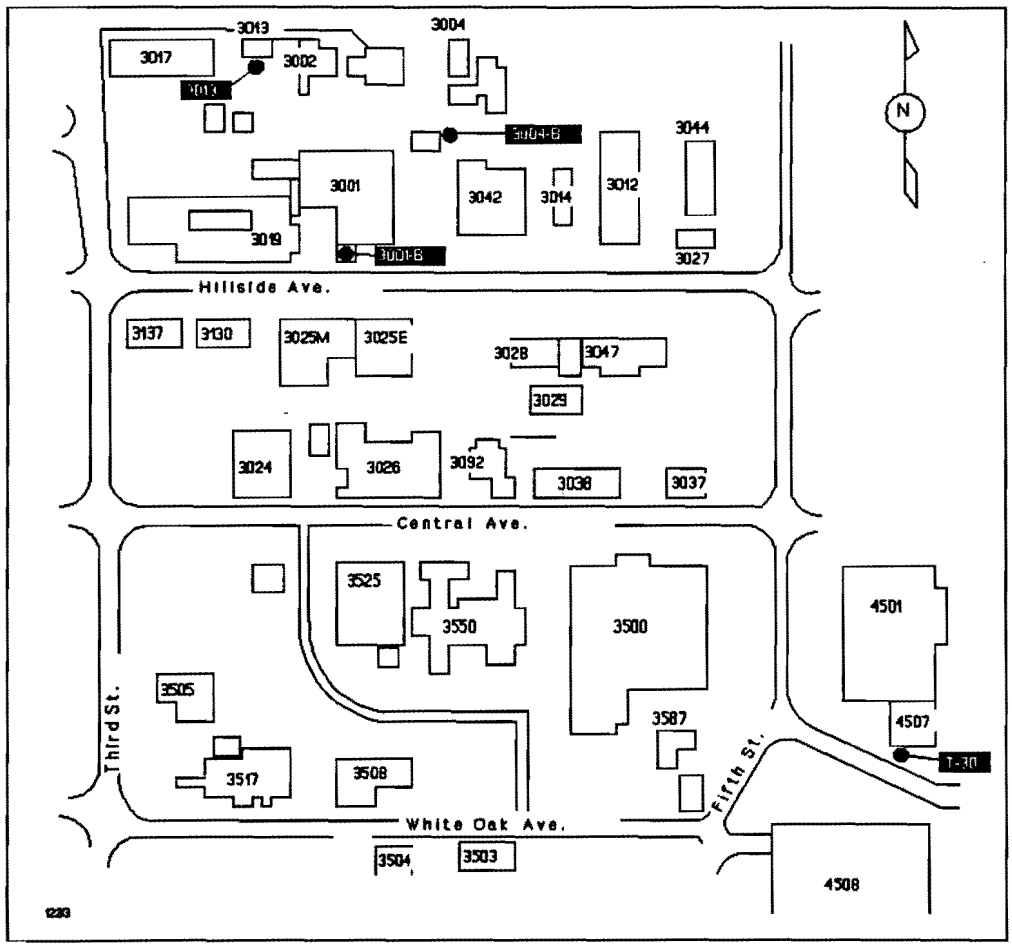
The need for a spill control kit and a first responder action plan will be addressed when the site safety and health plan is developed.

8. WASTE TEMPORARY STORAGE

Asphalt, concrete, and any ORNL/M-116/R1 Category 3 soil will be isolated from the environment until properly packaged for disposal. The subcontractor will transfer the excavated tanks and piping to "sea/land" container(s) for shipment to SEG pending determination of DOT shipping requirements. This container will remain at ORNL until all three tanks and associated piping are deposited.

Appendix A

LOCATION OF TANKS 3001-B, 3004-B, 3013, AND T-30



LOCATION OF TANKS 3001-B, 3004-B, 3013, and T-30

Appendix B

ORNL ER PROGRAM PROJECT
WASTE MANAGEMENT CHECKLIST

ORNL/ER Program Project-Specific Waste Management Checklist

Project Name: **Inactive LLLW Tanks Program: 3001-B, 3004-B, 3013, and T-30**

ER Waste Management Checklist # 001-228/0004-0795

The WM checklist number will be assigned by the ORNL Environmental Restoration Document Management Center Manager

ORNL Waste Management Organization # _____

ORNL/ER PROJECT WASTE MANAGEMENT CHECKLIST APPROVAL FORM

001-228/0004-0795

WM CHECKLIST #

ORNL WMO #

ER Project Manager — Date: 7/17/95

for C. Carter

ER Waste Management Manager — Date: 7/13/95

ER Waste Management Certification Official — Date: 7/13/95

Waste management does not approve check lists. 7/18/95

ORNL Waste Management Organization — Date

Approval plan - no issue with project.

7/18/95

ORNL/ER PROJECT
WASTE MANAGEMENT CHECKLIST

Project Name: Inactive LLLW Tanks Program: 3001-B, 3004-B, 3013, and T-30

ORNL WMO #:

ER WM Checklist #:

Location: See PWMP, A 1

Est. Start Date: June 1995

Date Form Completed:

Charge # For WM:

1. KEY PROJECT PERSONNEL

ER Project Manager: C. A. Bednarz

Address: 7078-F / 6402

Phone: 241-3926

ER WC: Kent DeRoos

Address: 3001 / 6029

Phone: 241-2811

Facility Manager: M. L. Whitehead

Address: 7078-D / 6402

Phone: 576-9928

Waste Generator: Subcontractor (tank excavation), Waste Management Operations (liquid removal)

Address:

Phone:

Packager: Subcontractor

Address:

Phone:

SSHO (if applicable): Subcontractor (tank excavation) Measurment Applications Division (liquid removal)

Address:

Phone:

ER WM Coordinator: Charles Clark

Address: 7078B / 6410

Phone: 574-8268

Construction Engineer: R. C. Williams

Address: 1000 / 6338

Phone: 574-7985

2. INTRODUCTION

2.1 PROJECT DESCRIPTION

The purpose of this project is to remove and dispose of LLLW tanks 3001-B, 3004-B, T-30, and fill tank 3013 with grout as part of the Inactive Tank Remediation Program. The program designates these tanks as Batch 1, Series 1.

Waste Management Operations will remove the liquid contents of tanks 3004B and 3013. Tanks 3001-B, 3004-B, and T-30 will be removed from their respective vaults. All pipelines connected to tanks 3004-B and T-30 will be cut and capped near the vault walls. The inlet and outlet lines of tanks 3001-B will be connected to allow 3001 canal demineralizer waste water to flow to the LLLW system. The 3001-B vault will be surveyed for contamination and rinsed with water as appropriate. Recent investigation of the 3004-B vault has shown that no further decontamination will be required. The T-30 vault will be decontaminated before this project begins. All three vaults will be filled with grout.

Tank 3013 will be filled with grout and all pipelines connected to the tank will be cut and capped near the tank.

The excavated tanks and all removed piping may be transferred to SEG for smelting.

2.2 BRIEF SITE HISTORY

Tank 3001-B is located south of Bldg. 3001, under the concrete stairway landing adjacent to the building's foundation. This 300-gal stainless steel tank is contained within an unlined concrete vault and cap with limited access through a 1¾-in. diam riser. The tank was installed in 1943 and was used as a holding tank for radioactive laboratory waste from Bldg. 3001 and was taken out of service in 1965. Tank dimensions are approximately 4 ft O.D. and 4 ft long. The bottom of the tank is approximately 8 ft below the existing grade. RP surveys reported 0.4 mrad/h at the top of the riser increasing to 80 mrad/h at the bottom of the tank.

Tank 3004-B is located east of building 3008, underneath landscape rocks adjacent to the public access walkway to the Graphite Reactor. This 100-gal stainless steel tank is located within an in-ground unlined concrete vault with a removable vault cap. The tank was installed in 1956 and was used as a waste holding tank for the Low Intensity Test Reactor. The tank was taken out of service in 1968. Tank dimensions are approximately 2 ft 6 in. O.D. and 3 ft long. The bottom of the tank is approximately 5 ft 6 in. below grade. Vault dimensions are 50 × 50 × 71 in. RP surveys reported no detectable contamination except 1400 dpm/100 cm^2 around the edge of the vault wall.

Tank 3013 is located east of Bldg. 3017 and south of Bldg. 3013. This 400-gal stainless steel tank is direct buried. The tank was installed in 1949 and received waste from Bldg. 3013, which was an environmental processing laboratory that dealt with radioactively contaminated environmental samples. The date when the tank was taken out of service is not known. Tank dimensions are approximately 3 ft 6 in. O.D. and 5 ft 6 in. long. The tank is bolted to a 5-ft. diam, 12-in.-thick concrete pad. The bottom of the tank is approximately 12 ft below the ground surface. RP surveys reported 0.01 mrad/h at the riser top and 0.02 mrad/h in the tank.

Tank T-30 is located south of Bldg. 4507 in an in-ground unlined concrete vault. This 825-gal stainless steel tank was installed in 1961 and received radioactive waste from Bldg. 4507 hot cells. The tank was removed from service in 1980. Tank dimensions are approximately 4 ft 6 in. O.D. and 8 ft 2 in. long. Vault dimensions are approximately 15 ft (East-West), 8 ft deep west end and 10 ft deep east end, and 8.5 ft (North-South).

2.3 REFERENCE DOCUMENTS

Site Characterization Report for Waste Area Grouping 1 at ORNL, DOE/OR-1043, U.S. DOE, Oak Ridge Office, Oak Ridge, Tennessee, 1992.

Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank System at Oak Ridge National Laboratory, DOE/OR/01-1159&D1, U.S. DOE, Oak Ridge Office, Oak Ridge, Tennessee, 1994. (Applicable pages are included as Appendix D.)

Waste Management/Waste Certification Plan for the ORNL Environmental Restoration Program, ORNL/ER-288, Martin Marietta Energy Systems, Oak Ridge National Laboratory, 1995.

ORNL/ER PROJECT SPECIFIC WASTE MANAGEMENT CHECKLIST

3. WASTE GENERATION ACTIVITIES (SEE SECTION 6 OF ORNL/ER-288)

☐ Coring	☒ PPE	☐ Geophysical Survey	☐ Remedial Actions
☐ Drilling	☒ Excavating	☐ D&D Activities	☐ UST Activity
☒ Deconning	☐ Renovations	☐ Well Installation/Maint.	☐ ISV
☐ Water Sampling	☒ Soil Sampling	☐ Scoping Surveys	☒ Other

Explain Other

Other - Tank Removal

Soil Sampling - The subcontractor will direct sampling of ORNL/M-116/R1 Category 3 soils only. Excavated soils that are within Category 1 or Category 2 limits as defined in ORNL/M-116/R1 will be used for backfill. Category 2 soils must be covered by at least 1 ft of noncontaminated soil. ORNL/M-116/R1 defines Category 1 soils as follows: direct measurements taken at the surface of the soil are less than 300 dpm/100 cm^2 alpha and less than 1000 dpm/100 cm^2 beta/gamma; smear counts from equipment that contacted the soil are less than 20 dpm/100 cm^2 alpha and less than 200 dpm/100 cm^2 beta/gamma.

Category 2 soils are defined as soils that have a direct measurement at the surface equal to or greater than 300 and less than 6000 dpm/100 cm^2 alpha and equal to or greater than 1000 dpm/100 cm^2 and less than 5.0 mrad/h beta/gamma. Category 3 soils may not be used for backfill and will be considered as radiological waste. Category 3 soils are defined as those with surface readings equal to or greater than 6000 dpm/100 cm^2 alpha and equal to or greater than 5.0 mrad/h beta/gamma.

3.1 WASTE GENERATING AREA(S) (SEE SECTION 5 OF ORNL/ER-288)

☒ WAG 1	☐ WAG 4	☐ WAG 7	☐ WAG 10	☐ WAG 21
☐ WAG 2	☐ WAG 5	☐ WAG 8	☐ WAG 11	☐ Other(s)
☐ WAG 3	☐ WAG 6	☐ WAG 9	☐ WAG 13	

Location or Building Number(s)

Location of tanks is shown in Appendix A.

4. WASTE CHARACTERIZATION

4.1 WASTES TYPES AND VOLUME

Waste types and volume estimates are shown in the following tables.

Tank 3001-B **ORNL/ER PROJECT SPECIFIC WASTE MANAGEMENT CHECKLIST**

Type	ER-requested category*	WM category†	Estimated volume‡	Disposal method	Source	Suspected contaminants	Sampling analysis	Process knowledge
Soil	Sanitary	1	350 ft^3	Y-12 Recontour Site or Remain on Site	Excavation	-	Not required	DOE/OR-1043
Asphalt	Sanitary	1	60 ft^3	Y-12 Recontour Site (or SWSA 6)	Pavement	-	Not required	DOE/OR-1043
Concrete	Sanitary	1	8 ft^3	Y-12 Recontour Site (or SWSA 6)	Stair landing	-	Not required	DOE/OR-1043
Personal protective equipment	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Tank removal	Trace only ^{137}Cs, ^{90}Sr	Not required	DOE/OR/01-1159&D1
Plastic sheeting	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Waste staging	Trace only ^{137}Cs, ^{90}Sr	Not required	DOE/OR/01-1159&D1
Decontamination water	Liquid	19	100 gal	Process Waste Treatment Plant	Vault and equipment decon. (if necessary)	Trace only ^{137}Cs, ^{90}Sr	Not required	DOE/OR/01-1159&D1
Tank	SLLW	-	50 ft^3	SEG		Trace only ^{137}Cs, ^{90}Sr	Not required	DOE/OR/01-1159&D1
Piping and valves	SLLW	-	0.5 ft^3	SEG		Trace only ^{137}Cs, ^{90}Sr	Not required	DOE/OR/01-1159&D1

* From Sect. 7 of ORNL/ER-288
† See Appendix C for definition of waste categories
‡ See Appendix C for waste volume estimate justification

Tank 3013

ORNL/ER PROJECT SPECIFIC WASTE MANAGEMENT CHECKLIST

Type	ER-requested category*	WM category†	Estimated volume‡	Disposal method	Source	Suspected contamin-ants	Sampling analysis	Process knowledge
Soil	Sanitary	1	1325 ft^3	Y-12 Recontour Site or remain on site	Excavation	-	Not required	DOE/OR-1043
Personal protective equipment	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Tank removal	-	Not required	DOE/OR/01-1159&D1
Plastic sheeting	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Waste staging	-	Not required	DOE/OR/01-1159&D1
Decontamination water	Liquid	19	20 gal	Process Waste Treatment Plant	Equipment decon. (if necessary)	-	Not required	DOE/OR/01-1159&D1
Tank Contents	Liquid	16	250 gal	Process Waste Treatment Plant		-	Not required	DOE/OR/01-1159 & D1
Personal Protective Equipment	SLLW	11	3 ft^3	SWSA 5 Box Compactor	Tank contents removal	-	Not required	DOE/OR/01-1159 & D1
Tubing/plastic sheeting	SLLW	11	8 ft^3	SWSA 5 Box Compactor	Tank contents removal	-	Not required	DOE/OR/01 1159 & D1

* From Sect. 7 of ORNL/ER-288
† See Appendix C for definition of waste categories
‡ See Appendix C for waste volume estimate justification

Tank 3004-B

ORNL/ER PROJECT SPECIFIC WASTE MANAGEMENT CHECKLIST

Type	ER-requested category*	WM category†	Estimated volume‡	Disposal method	Source	Suspected contaminants	Sampling analysis	Process knowledge
Personal protective equipment	SLLW	11	2 ft^3	SWSA 6	Tank removal	Trace only ^{137}Cs	Not required	DOE/OR/01-1159&D1
Plastic sheeting	SLLW	11	2 ft^3	SWSA 6	Waste staging	Trace only ^{137}Cs	Not required	DOE/OR/01-1159&D1
Decontamination water	Liquid	19	20 gal	Process Waste Treatment Plant	Equipment decon. (if necessary)	Trace only ^{137}Cs	Not required	DOE/OR/01-1159&D1
Tank	SLLW	-	14 ft^3	SEG		Trace only ^{137}Cs	Not required	DOE/OR/01-1159&D1
Piping and valves	SLLW	-	1 ft^3	SEG		Trace only ^{137}Cs	Not required	DOE/OR/01-1159&D1
Tank contents	Liquid	19	120 gal.	LLLW System		Trace only ^{137}Cs	Not required	DOE/OR/01-1159 & D1
Personal protective equipment	SLLW	11	3 ft^3	SWSA 5 Box Compactor	Tank contents removal	Trace only ^{137}Cs	Not required	DOE/OR/01-1159 & D1
Tubing/plastic sheeting	SLLW	11	21 ft^3	SWSA 5 Box Compactor	Tank contents removal	Trace only ^{137}Cs	Not required	DOW/OR/01-1159 & D1

* From Sect. 7 of ORNL/ER-288
† See Appendix C for definition of waste categories
‡ See Appendix C for waste volume estimate justification

Tank T-30 **ORNL/ER PROJECT SPECIFIC WASTE MANAGEMENT CHECKLIST**

Type	ER-requested category*	WM category†	Estimated volume‡	Disposal method	Source	Suspected contaminants	Sampling analysis	Process knowledge
Personal protective equipment	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Tank removal	Trace only ^{137}Cs ^{90}Sr ^{233}U	Not required	DOE/OR/01-1159&D1
Plastic sheeting	SLLW	11	2 ft^3	SWSA 5 Box Compactor	Waste staging	Trace only ^{137}Cs ^{90}Sr ^{233}U	Not required	DOE/OR/01-1159&D1
Decontamination water	Liquid	19	20 gal	Process Waste Treatment Plant	Equipment decon. (if necessary)	Trace only ^{137}Cs ^{90}Sr ^{233}U	Not required	DOE/OR/01-1159&D1
Tank	SLLW	-	127 ft^3	SEG		Trace only ^{137}Cs ^{90}Sr ^{233}U	Not required	DOE/OR/01-1159&D1
Piping and valves	SLLW	-	0.5 ft^3	SEG		Trace only ^{137}Cs ^{90}Sr ^{233}U	Not required	DOE/OR/01-1159&D1

* From Sect. 7 of ORNL/ER-288
† See Appendix C for definition of waste categories
‡ See Appendix C for waste volume estimate justification

What Methodology was used to estimate waste volumes?

See waste volume estimation worksheets in Appendix C of the PWMP.

4.2 WASTE CHARACTERIZATION PLAN (SEE SECTION 8 OF ORNL/ER-288)

Tanks, pipes, and piping scraps will be characterized according to the LLLW that was present in the tanks and piping. Before the project begins, a smear sample will be taken from at least one tank. Results from isotopic analysis of the sample(s) will be compared with the LLLW isotopic content to verify that characterizing tank residue on the basis of LLW characteriaation is appropriate. The analysis of the LLLW is available in the documents listed in Sect. 2.3 of this checklist. These data will be used to identify the radionuclides contaminating the tanks and piping. To obtain the total alpha activity and total beta/gamma activity for the tanks and piping, the following method will be used.

1. Insert the alpha probe into the tank and obtain an activity measurement.

2. Obtain four to five activity measurements over different areas in the tank and calculate an average activity measurement.

3. Use the area of the probe as the basis and calculate the activity per unit area and interpolate the result over the entire surface area of the tank.

4. Record this number as the total alpha activity for the tank.

5. To obtain total alpha activity for pipe sections, use the calculated activity per unit area and interpolate it over the entire surface area of the pipe section(s).

6. Repeat this procedure, but use the beta/gamma probe to obtain total beta/gamma activity.

7. Use the formula in Sect. 8.1.1 of ORNL/ER-288 to calculate the total beta/gamma activity in curies.

8. Record this number as the total beta/gamma activity for the tank and pipe sections.

   PPE, plastic sheeting, tools, etc., will be characterized as stated in Sect. 8.1.1 of ORNL/ER-288.

ER PROJECT SPECIFIC
WASTE MANAGEMENT CHECKLIST

Has the organization or person responsible for obtaining samples been designated?
Yes
List name Subcontractor (Category 3 soils only)

Has the organization responsible for analyzing samples been identified?
Yes
List name ORNL Analytical Chemistry Division

Can the ORNL Hazardous Waste Group take control of the hazardous or mixed waste generated?
Yes (None is expected)
Person Contacted K. G. Edgemon Date 3-20-95

Can the Solid Radioactive Waste Group accept the volume of radiological waste to be generated?
Yes
Person Contacted B. C. McClelland Date 3-20-95

Can the Liquid Gaseous Waste Group accept the liquid that will be generated?
Yes
Person Contacted C. B. Scott Date 3-22-95

If any TRU or TRU Mixed Waste is to be generated, contact the Waste Certification Official before project starts.
Person Contacted _____ Date _____

Will TRU or Mixed Waste be generated?
No

Will waste be handled as Investigative Derived Waste?
No

List any specific requirements as requested by any of the above organizations or compliance.

Who will be responsible for completing the weekly ER Waste Management Program Generated Waste form?

Name: Subcontractor Phone: _____

5. HANDLING AND STORAGE REQUIREMENTS

5.1 List special handling procedures for waste or waste containers (see Sect. 14 of ORNL/ER-288)

Tank handling safety will be addressed in the project-specific Lift Plan to be developed.

5.2 List what means will be used to protect the integrity of waste containers from environmental elements. (Examples: lid tops, plastic covering, epoxy, storage shelter)

The sea/land container(s), in which the excavated tanks and piping will be transferred to SEG, will remain closed except during loading.

5.3 Applicable Waste Storage Area(s)

☒ Waste Staging Area ☐ Satellite Accumulation Area ☐ Waste Consolidation Area
☐ 90 Day Storage Facility ☐ AOC ☐ Other _____

5.4 Explain how waste will be managed to ensure that personal safety and the environment will be protected (may refer to specific sections of WM/WC Plan).

Contaminated soil will be isolated from the environment until properly packaged for disposal.

Name of Waste Storage Area Supervisor: Subcontractor

Do supervisor and staff have the appropriate training required? Yes

List training requirements:

See Sect. 7.3 of the PWMP.

Will a spill control kit be required on-site?

This will be addressed in the project-specific safety and health plan to be developed.

List items:

_____

_____

6. WASTE MINIMIZATION

6.1 WASTE MINIMIZATION TECHNIQUES TO BE IMPLEMENTED* (refer to ORNL/ER-288 section 10 for guidance)

- ☒ Segregation
- ☒ Decontamination
- ☒ Compaction
- ☐ Solvent Substitution
- ☐ Sludge Dewatering
- ☐ Selection of PPE
- ☐ Area of Contamination Concept
- ☐ Material Recycle (Solvents, Decon Waters)
- ☐ Cutting Fluids Recovery
- ☐ Selection of Equipment
- ☐ Solidification
- ☐ Other

Explain Specific Techniques*

The excavated tanks and piping will be smelted into ingots.

ORNL/ER PROJECT SPECIFIC

WASTE MANAGEMENT CHECKLIST

7. TREATMENT, STORAGE, AND DISPOSAL OPTIONS

7.1 Potential Treatment, Storage or Disposal Options (if applicable)

Option	Waste Capacity	Responsible Organization

7.2 SPECIAL REQUIREMENTS OF THE WAC TO MEET

_____
_____
_____

7.3 APPLICABLE WASTE MANAGEMENT FORMS:*

☐ UCN-2822	☐ UCN-19611	☐ UCN-20117	☐ TX-5352A
☐ UCN-16114	☐ UCN-11457	☐ UCN-20118	☐ Other
☐ UCN-16114A	☒ UCN-20116	☒ UCN-2109	

***List persons(s) who will be responsible for completing and signing Waste Management form(s):**

Subcontractor (generator)
Kent DeRoos (WC)

8. TRANSPORTATION

8.1 TRANSPORTATION REQUIREMENTS

A. Who or what organization will transport waste to waste consolidation or staging area?

Subcontractor

B. List specific issues for transporting waste and their resolutions.

All off-site waste shipments must meet U.S. Department of Transportation regulations. All on-site waste shipments must comply with the *On-Site Transportation Manual*, ORNL/ER-808 (unless an exception is granted by the Transportation Safety Committee Chairman).

8. TRANSPORTATION

8.1 TRANSPORTATION REQUIREMENTS

A. Who or what organization will transport waste to waste consolidation or staging area?

Subcontractor

B. List specific issues for transporting waste and their resolutions.

All off-site waste shipments must meet U.S. Department of Transportation regulations. All on-site waste shipments must comply with the *On-Site Transportation Manual*, ORNL/ER-808 (unless an exception is granted by the Transportation Safety Committee Chairman).

Appendix C

WASTE VOLUME ESTIMATION WORKSHEETS AND CATEGORY DESCRIPTIONS

Waste Volume Estimation Worksheet
Tank 3001-B

Tank

4 ft diam × 4 ft high

$$\text{Vol.} = \frac{\pi (4)^2}{4} (4) \approx 50\,\text{ft}^3$$

Piping and Valves

4 ft of 3-in. piping

$$\text{Vol.} = \frac{\pi (.25)^2}{4} (4) \approx 0.2\,\text{ft}^3$$

3-in. valve - est. 0.25 ft^3

Total ≈ 0.5 ft^3

Soil

10 ft × 10 ft × 2.5 ft = 250 ft^3

250 × 1.4 (swell factor) = 350 ft^3

Asphalt

10 ft × 10 ft × 4 in. = 33 ft^3

Concrete stair landing

4 ft × 4 ft × 6 in. = 8 ft^3

NOTE: Reference drawings - W-68870, W-68871, and W-69106

Waste Volume Estimation Worksheet
Tank 3004-B

Tank

2.25 ft diam × 2.2 ft long

$$\text{Cylinder Vol.} = \frac{\pi (2.25)^2}{4} (2.2) \approx 10.8\ \text{ft}^3$$

Head Vol. (Buffalo Tanks Handbook) ≈ 3.42

Total vol. ≈ 14 ft^3

Piping and Valves

3 ft of 2-in. piping

$$\frac{\pi (0.16)^2}{4} (3) \approx 0.065\ \text{ft}^3$$

9 ft of 1.5-in. piping

$$\frac{\pi (0.125)^2}{4} (9) \approx 0.037\ \text{ft}^3$$

14 ft of 1-in. piping

$$\frac{\pi (0.083)^2}{4} (14) \approx 0.076\ \text{ft}^3$$

29 ft of 0.75-in. piping

$$\frac{\pi (0.0625)^2}{4} (29) \approx 0.089\ \text{ft}^3$$

16 ft of 0.125-in.piping

negligible

0.75-in. steam trap ≈ 0.1 ft^3
0.75-in. steam jet ≈ 0.1 ft^3
1.5-in. valve ≈ 0.1 ft^3
(2) 0.75-in. valve @ 0.05 ft^3 ≈ 0.1 ft^3

Total ≈ 0.6 ft^3 ≈ 1 ft^3

NOTE: Reference drawing - D-14272

Waste Volume Estimation Worksheet
Tank T-30

Tank

4.5 ft diam × 8 ft high

$$\frac{\pi (4.5)^2}{4} (8) \approx 127 \text{ ft}^3$$

Piping and Valves

13 ft of 1-in. piping

$$\frac{\pi (0.083)^2}{4} (13) \approx 0.071 \text{ ft}^3$$

12 ft of 0.75-in. piping

$$\frac{\pi (0.0625)^2}{4} (12) \approx 0.37 \text{ ft}^3$$

30 ft of 0.5-in. piping

$$\frac{\pi (0.042)^2}{4} (30) \approx 0.041 \text{ ft}^3$$

24 ft of 0.25-in. piping

negligible

NOTE: Reference drawings - D-45657, D-45660, and D-45696

Solid waste categories

A.	Noncontaminated	
	1	Noncontaminated soil, rock, concrete
	2	Noncontaminated wood
	3	Noncontaminated cardboard
	4	Noncontaminated metal (e.g., rebar, wire fence, steel scrap)
	5	Noncontaminated garbage/refuse placed in green dumpster (e.g., metal bands, plastics, silt, fence, wire scraps, conduit scraps, weld rods, glass)
B.	Hazardous	
	6	Nonradioactive, RCRA, asbestos/asbestos contaminated
	7	Nonradioactive, RCRA
C.	Low-level	
	8	Radioactive, non-RCRA, TRU
	9	Radioactive, non-RCRA, LLW (>200 mrem/h)
	10	Radioactive, non-RCRA, noncompactible, LLW (<200 mrem/h)
	11	Radioactive, non-RCRA, compactible, LLW (<200 mrem/h)
	12	Radioactive, RCRA, asbestos/asbestos contaminated
	13	Radioactive, RCRA, TRU
	14	Radioactive, RCRA, LLW

RCRA: Resource Conservation and Recovery Act; TRU: transuranic; LLW: low-level waste.

Solid waste packaging requirements and destinations

A. Noncontaminated solid	Package requirements	Destination
1	Package to prevent loss during transport	Y-12 Recontour Site
2	Package to prevent loss during transport	Wood Storage Area off Bethel Valley Road
3	Package to prevent loss during transport	7000 Area Compactor
4	Package to prevent loss during transport	7000 Area Metal Recycle Area
5	Plastic bags in garbage cans at site	Y-12 landfill (quantity limited by quota)
B. Hazardous	**Package requirements**	**Destination**
6	Package per HWOS	Site designated by HWOS
7	Package per HWOS	Site designated by HWOS
C. Low-Level	**Package requirements**	**Destination**
8	Package per RSWO instructions	SWSA 5 site designated by RSWO
9	Package per SWSA 6 WAC instructions*	SWSA 6
10	Package per SWSA 6 WAC instructions*	SWSA 6
11	Package per SWSA 6 WAC instructions*	SWSA 5 box compactor
12	Package per ORNL IH procedure and SWSA 6 WAC instructions*	SWSA 6 asbestos disposal site
13	Package per RSWO and HWOS instructions	Site designated by HWOS
14	Package per RSWO and HWOS instructions	Site designated by HWOS

**Waste Acceptance Criteria for Radioactive Solid Waste Disposal at SWSA-6* (WMRA-WMPC-203).
IH: Industrial Hygiene; HWOS: Hazardous Waste Operations Supervisor; WAC: Waste Acceptance Criteria; RSWO: Radioactive Solid Waste Operations

Liquid waste categories

A. Liquid Low-Level Waste		
Category	Package requirements*	Destination
15	2.5-gal polyethylene bottles	Radioactive Waste Evaporation Facility
16	LGWOD tanker truck	Valve Box 2
17	LGWOD dumpster truck	Valve Box 2

*Arrangements for receipt of bottles, tanker trucks, and dumpster trucks must be made with LGWOD

B. Process Waste		
Category	Package requirements	Destination
18	55-gal drums	Process Waste Treatment Plant
19	Other - arrange with LGWOD	Process Waste Treatment Plant

C. Nonradiological Waste		
Category	Package requirements	Destination
20	55 gal drums	Nonradiological Waste Treatment Plant
21	Other - arrange with LGWOD	Nonradiological Waste Treatment Plant

D. Noncontaminated waste		
Category	Requirements	Destination
22	Written consent of the Liquid Waste Certification Officer and consultation with the Environmental Compliance Section	Storm Sewer System

Note: Waste acceptance criteria for the waste categories shown here may be found in Oak Ridge National Laboratory Liquid Waste Treatment Systems Waste Acceptance Criteria, WM-WMCO-201, July 1991.

LGWOD: Liquid and Gaseous Waste Operations Division

Appendix D

TANK CHARACTERIZATION DATA

2.33 TANK 3001-B

2.33.1 Tank Description

Tank 3001-B is a 75-gal stainless steel tank located south of Building 3001 under the concrete stairway landing. The tank was installed in 1943 and is believed to have been a holding tank for radioactive laboratory drains in Building 3001.

2.33.2 Characterization Summary

Sampling of the tank was performed on July 17, 1992, through a 2-in.-diameter access. Monitored radiation levels at the ground surface and at the tank access were less than 0.1 mR/h. No vapor monitoring was performed during sampling because the tank is equipped with an offgas system. The distance measured from the top of the tank access to the bottom of the tank was 7 ft 8 in. The liquid depth in the tank was 3/4 in., and therefore only one clear-liquid sample (L186) was pulled from the tank. No sludge was encountered.

The liquid sample was submitted to the ORNL laboratories for measurement of various physical properties, inorganic analyses, and organic analyses. The sample volume was adequate for the requested analyses. The analytical results are shown in Tables 2.33.1 and 2.33.2.

The results of the physical measurements for the liquid sample were generally unremarkable. The density of 1.072 g/mL was well within the range of 0.9982 to 1.1303 g/mL observed for aqueous samples from other tanks. Low total solids (1.232 mg/mL), of which approximately 2/3 were dissolved and 1/3 suspended, were observed in the sample. No organic carbon was evident; however, the total carbon measured was 46.7 mg/L.

RCRA metals were detected at concentrations ranging from less than 0.002 to 0.216 mg/L. The two proposed RCRA metals, Ni and Tl, were detected at 0.0105 and 1.76 mg/L, respectively. Uranium was detected at 30 mg/L, a concentration that is relatively low compared to the range of uranium concentrations in other tanks, but a concentration that may still be high enough to interfere (i.e., cause false positives) in the detection of other elements. Thorium was not detected (<2 mg/L). With the exception of Na (191 mg/L), K (108 mg/L), and Ca (6.57 mg/L), the other process metals were present in the sample at concentrations less than 2 mg/L.

Cyanide and sulfide analyses were not performed for tank 3001-B because the holding times were exceeded. A semiqualitative analytical method (EM strips) was attempted for cyanide; however, the results were negative. The highest anion concentration detected was for sulfate at 287 mg/L. A high level of sulfate, such as was found in L186, may interfere with accurate detection of other elements; for example, a high sulfate level may cause selenium, which was detected in L186 at a concentration of 0.002 mg/L, to be detected at a lower concentration than actually exists (a possible false negative). The concentrations of other anions (maximum of 12.2 mg/L) were generally low compared to other tanks tested. Carbonates were not detected in the 8.2-pH liquid sample.

Table 2.33.1. Analytical data for tank 3001-B

Parameter	L186(a)
Physical properties and miscellaneous data	
Density (g/mL)	1.072
TDS (mg/mL)	0.816
TS (L=mg/mL, S=mg/g)	1.232
TOC (L=mg/L, S=mg/kg)	<1
TC (L=mg/L, S=mg/kg)	46.7
RCRA metals (L=mg/L, S=mg/kg)	
Ag	<0.002
As	<0.002
Ba	0.0179
Cd	0.01
Cr	0.0149
Hg	0.0044
Ni	0.0105
Pb	0.216
Se	0.002
Tl	1.76
Process metals (L=mg/L, S=mg/kg)	
Al	0.375
B	1.76
Be	0.0029
Ca	6.57
Co	0.0112
Cu	0.022
Fe	1.03
K	108
Mg	0.923
Mn	0.0149
Na	191
Sb	0.0735
Th	<2
U	30
V	0.0211
Zn	0.077
Anions (L=mg/L, S=mg/kg)	
Cl^-	3.4
F^-	0.8
NO_3^-	12.2
PO_4^{-3}	<0.5
SO_4^{-2}	287
Alkalinity	
CO_3^{-2} (moles/L)	<0.02
HCO_3^- (moles/L)	<0.02
pH (units)	8.2
Radiochemical screening	
Gross alpha (L=Bq/mL, S=Bq/g)	3.02E+00
Gross beta (L=Bq/mL, S=Bq/g)	2.92E+02
Gross fissile--^{239}Pu equiv (L=mg/L, S=mg/kg)	2.79E-01
Gross fissile--^{235}U equiv (L=mg/L, S=mg/kg)	1.9E-01
Beta/gamma emitters (L=Bq/mL, S=Bq/g)	
^3H	4.9E-01
^{14}C	<2.0E+0

Table 2.33.1 (continued)

Parameter	L186(a)
^{60}Co	1.47E+00
^{90}Sr	8.33E+01
^{137}Cs	2.89E+02
^{152}Eu	<1.76E+00
^{154}Eu	<2.2E-01
^{155}Eu	<8.8E-01

a) Tank 3001-B was sampled on July 17, 1992. The sample was collected within 3/4-inches of the bottom of the tank.

Table 2.33.2. Organic analytical data hits for tank 3001-B

Parameter	L186
Semivolatile organic compound analysis (L=µg/L, S=µg/kg)	
Bis(2-ethylhexyl)phthalate	620 B
Di-n-butylphthalate	220 B
Semivolatile organic compound analysis TICs (L=µg/L, S=µg/kg)	
Unknown TICs (a)	42,350 J (4)

(a) Result is the sum of the concentrations of the tentatively identified compounds (TICs). The number of TICs is shown in parenthesis.

The gamma scan indicated that the highest activity radionuclide in the sample is ^{137}Cs (289 Bq/mL). Other radionuclides detected at levels above their detection limit were ^{90}Sr at 83.3 Bq/mL, ^{60}Co at 1.47 Bq/mL, and ^{3}H at 0.49 Bq/mL. Alpha spectrometry was not performed on the sample because the gross alpha measurement of 3.02 Bq/mL did not warrant it. The gross fissile measurements, performed for purposes of criticality and accountability, were 0.279 Bq/mL, in terms of ^{239}Pu equivalency, and 0.19 Bq/mL, in terms of ^{235}U equivalency.

No VOCs were detected at concentrations above the reporting limits of 5 to 10 µg/L. The absence of VOCs is partially confirmed by the DAI-GC analysis that was performed even though the reporting limits are much higher; the result for allyl or n-propyl alcohol was less than 2 ppm (< 2,000 µg/L), and the results for the eight other reported analytes were less than 1 ppm (< 1,000 µg/L). In addition, no pesticides or PCBs were detected at concentrations above the reporting limits of 0.33 to 6.7 µg/L.

With regard to semivolatile organic compounds (SVOCs), two phthalates, bis(2-ethylhexyl)-phthalate and di-n-butylphthalate, were detected at 620 B and 220 B µg/L, respectively. It is likely, however, that the two phthalates are laboratory artifacts because the laboratory blank analysis revealed the same two phthalates at corresponding concentrations

of 690 J and 200 J μg/L, respectively. Four "unknown" SVOA TICs were detected in the aqueous liquid at concentrations ranging from 750 J to 38,000 J μg/L, the sum of the 4 concentrations equaling 42,350 J μg/L. No TICs were found in the laboratory blank. The TIC concentrations in the aqueous liquid are rough estimates; i.e., the GC-MS results are not compared to those of a specific standard.

2.35 TANK 3004-B

2.35.1 Tank Description

Tank 3004-B is a 30-gal stainless steel tank located east of Building 3008 in the Bethel Valley main laboratory area. The tank was installed in an in-ground vault in 1956 and was used as a waste holding tank for the Low Intensity Test Reactor.

2.35.2 Characterization Summary

Sampling of the tank was performed on May 27, 1992, through a 0.8-ft-diameter access. The monitored radiation level at the ground surface was less than 0.1 mR/h, and at the tank access was 0.8 mR/h. The distance measured from the top of the tank flange (access) to the bottom of the tank was 35 in. Clear liquid was found in the tank with the liquid level up to the top of the tank flange; no sludge was encountered. Liquid samples L183, L184, and L185 were pulled from the tank at a point near the liquid surface, at the liquid midpoint, and at the bottom of the tank, respectively.

The liquid samples were submitted to the ORNL laboratories for a limited set of analyses: ICP metals, AA metals (i.e., Hg, As, and Se), pH, some radionuclides (gross alpha, gross beta, and gamma scan), and organic compounds (i.e., VOCs, SVOCs, and pesticides/PCBs). The analytical results for tank 3004-B are shown in Table 2.35.1.

The RCRA metal investigation indicated the presence of Ba in all three liquid samples. Sample L184 additionally contained Hg, and L185 additionally contained Ag, As, and Cr. Concentrations of these analytes reached a maximum at 0.0237 mg/L. Nickel, a proposed RCRA metal, was also present in measurable quantities in all three samples at a maximum concentration of 0.00847 mg/L. The process metals with the greatest concentrations were Ca at 40.5 mg/L, Mg at 4.64 mg/L, K at 3.59 mg/L, and Na at 1.41 mg/L. Uranium and thorium analyses were not performed.

Radiochemical screening of the 8.3- to 8.5-pH liquid samples indicated gross beta results at a maximum of 0.3 Bq/mL; no gross alpha activity was measured above the detection limit of 0.1 Bq/mL. The gamma scan indicated the presence of ^{137}Cs in all three samples in the activity range of 0.159 to 0.558 Bq/mL.

No VOCs were detected at concentrations above the reporting limits of 25 to 50 μg/L for any of the three liquid samples, nor were any VOC TICs reported for any of the samples. The absence of VOCs is partly substantiated by the DAI-GC analysis that was performed (although the detection limit for the DAI-GC is significantly higher than that for GC-MS): the results for the nine reported analytes for all three samples were less than 1 ppm (<1,000 μg/L).

No SVOCs were detected at concentrations above the reporting limits of 52 to 260 μg/L, and no SVOC TICs were encountered. In addition, no pesticides or PCBs were detected at concentrations above the reporting limits of 0.26 to 5.3 μg/L for any of the samples.

Table 2.35.1. Analytical data for tank 3004-B

Parameter	L183 (a,b)	L184 (a,c)	L185 (a,d)
	RCRA metals (L=mg/L, S=mg/kg)		
Ag	<0.02	<0.002	0.00517
As	<0.002	<0.002	0.00264
Ba	0.0237	0.0229	0.0233
Cd	<0.004	<0.004	<0.004
Cr	<0.005	<0.005	0.00627
Hg	<0.0002	0.00055	<0.0002
Ni	0.00847	0.00671	0.00814
Pb	<0.0940	<0.094	<0.094
Se	<0.002	<0.002	<0.002
Tl	<0.147	<0.147	<0.147
	Process metals (L=mg/L, S=mg/kg)		
Al	<0.016	<0.016	0.0384
B	0.0107	0.00825	0.0248
Be	<0.0003	<0.0003	<0.0003
Ca	40.7	40.5	40.5
Co	0.00935	0.00935	0.0099
Cu	<0.002	0.00418	0.00462
Fe	<0.021	<0.021	0.0287
K	3.60	3.59	3.59
Mg	4.66	4.63	4.64
Mn	<0.0004	<0.0004	<0.0004
Na	1.61	1.36	1.41
Sb	0.125	0.106	0.133
V	<0.002	<0.002	0.00462
Zn	0.016	0.0131	0.0171
	Alkalinity		
pH (units)	8.5	8.5	8.3
	Radiochemical screening (L=Bq/mL, S=Bq/g)		
Gross alpha	<1.0E-01	<1.0E-01	<1.0E-01
Gross beta	<2.0E-01	1.0E-01	3.0E-01
	Beta/gamma emitters (L=Bq/mL, S=Bq/g)		
^{60}Co	<7.35E-02	<9.87E-02	<8.7E-02
^{137}Cs	2.07E-01	1.59E-01	5.58E-01
^{152}Eu	<1.68E-01	<2.05E-01	<2.06E-01
^{154}Eu	<2.22E-01	<2.22E-01	<2.80E-01
^{155}Eu	<1.16E-01	<1.34E-01	<1.28E-01

(a) Sampling of tank 3004-B occurred on May 27, 1992.

(b) The liquid sample was collected at a point near the liquid surface located approximately 35 inches from the bottom of the tank.

(c) The liquid sample was collected near the liquid midpoint located approximately 17 to 18 inches from the bottom of the tank.

(d) The liquid sample was collected at a point near the bottom of the tank.

2.36 TANK 3013

2.36.1 Tank Description

Tank 3013 is a 400-gal stainless steel tank located south of Building 3013 in the Bethel Valley main laboratory area. The tank was installed in 1949 and served an environmental processing laboratory in Building 3013 that dealt with environmental samples that had very low-level contamination.

2.36.2 Characterization Summary

Sampling of the tank was performed through a 0.8-ft-diameter access. Monitored radiation levels at the ground surface and at the tank access were less than 0.1 mR/h. Vapor monitoring was performed during sampling because of ES&H considerations. The distance measured from the top of the tank flange (access) to the tank bottom was 11 ft 10 in. The liquid level in the tank was 4 ft 11 in. below the top of the tank access. On May 19, 1992, three liquid samples (L171, L172, and L173) were pulled from the tank at points near the surface, midpoint, and bottom of the liquid, respectively. The first two samples were clear, but the third sample was "tan" in color. No sludge was detected. On June 26, 1992, three additional samples (L192, L193, and L194) were pulled from the tank at the same depths sampled in the first event.

The first set of three liquid samples (L171, L172, and L173) was submitted to the ORNL laboratories for a limited set of analyses: ICP metals, AA metals (i.e., Hg, Se, and Tl), pH, some radionuclides (gross alpha, gross beta, and gamma scan), and organic compounds (i.e., VOCs, SVOCs, pesticides/PCBs). The analytical results for these tank samples are shown in Tables 2.36.1 and 2.36.2. The second set of three samples (L192, L193, and L194) was submitted for mercury and VOC analyses due to missed holding times for the first sample set. The analytical results for these tank samples are shown in Tables 2.36.3 and 2.36.4.

The RCRA metals investigation of the liquid samples revealed the presence of As, Ba, Cr, Hg, and Pb; the highest concentration detected was for Pb in sample L173 at 5.89 mg/L. Nickel, a proposed RCRA metal, was detected at concentrations below 0.1 mg/L. The process metals with the greatest concentrations were Ca at 49.9 mg/L; Fe, Mg, and Na in the 12- to 14-mg/L range; and Al and Zn in the 1- to 6-mg/L range. Uranium and thorium analyses were not performed.

Radiochemical screening and gamma spectroscopy of the near-neutral liquid (pH of 6.9 to 7.4) did not detect any measurable activity.

Using the GC-MS method, no VOCs were detected at concentrations above the reporting limits of 25 to 50 μg/L for the liquid samples (L171, L172, and L173). However, for

Table 2.36.1. Analytical data for tank 3013

Parameter	L171 (a,b)	L172 (a,c)	L173 (a,d)
	RCRA metals (L=mg/L, S=mg/kg)		
Ag	<0.002	<0.002	<0.002
As	<0.002	<0.002	0.00455
Ba	0.179	0.184	0.201
Cd	<0.004	<0.004	<0.004
Cr	0.0626	<0.005	0.119
Hg	<0.0002	<0.0002	<0.0002
Ni	0.028	0.021	0.0973
Pb	0.752	0.329	5.89
Se	<0.002	<0.002	<0.002
Tl	<0.147	<0.147	<0.147
	Process metals (L=mg/L, S=mg/kg)		
Al	1.22	0.468	5.74
B	0.874	0.875	0.764
Be	<0.0003	<0.0003	<0.0003
Ca	57.3	56.2	49.9
Co	0.0145	<0.007	<0.007
Cu	0.0194	0.00988	0.162
Fe	1.41	0.438	13.4
K	5.15	5.02	5.2
Mg	13.7	13.7	12.9
Mn	0.00329	<0.0004	0.0287
Na	14.2	13.8	12.6
Sb	0.111	0.142	0.207
V	<0.002	<0.002	0.00565
Zn	0.315	0.468	1.96
	Alkalinity		
pH (units)	6.9	7.4	7.4
	Radiochemical screening (L=Bq/mL, S=Bq/g)		
Gross alpha	<1.0E-01	<1.0E-01	<1.0E-01
Gross beta	<2.0E-01	<2.0E-01	<2.0E-01
	Beta/gamma emitters (L=Bq/mL, S=Bq/g)		
^{60}Co	<1.0E+01	<1.0E+01	<1.0E+01
^{137}Cs	<1.0E+01	<1.0E+01	<1.0E+01
^{152}Eu	<1.0E+01	<1.0E+01	<1.0E+01
^{154}Eu	<1.0E+01	<1.0E+01	<1.0E+01
^{155}Eu	<1.0E+01	<1.0E+01	<1.0E+01

(a) Tank 3013 was sampled on May 19, 1992.

(b) The liquid sample was collected at a point near the liquid surface located 6 ft 11 inches above the bottom of the tank.

(c) The liquid sample was collected near the liquid midpoint approximately 3 ft 6 inches above the bottom of the tank.

(d) The liquid sample was collected from a point near the bottom of the tank.

Table 2.36.2. Organic analytical data hits for tank 3013

Parameter	L171	L172	L173
Semivolatile organic compound analysis (L=µg/L, S=µg/kg)			
Bis(2-chloroisopropyl)ether		7 J	

Table 2.36.3. Analytical data for tank 3013

Parameter	L192 (a,b)	L193 (a,c)	L194 (a,d)
RCRA metals (L=mg/L, S=mg/kg)			
Hg	0.00066	<0.0002	<0.0002

(a) Tank 3013 was sampled on June 26, 1992.

(b) The liquid sample was collected at a point near the liquid surface located 6 ft 11 inches above the bottom of the tank.

(c) The liquid sample was collected near the liquid midpoint approximately 3 ft 6 inches above the bottom of the tank.

(d) The liquid sample was collected from a point near the bottom of the tank.

Table 2.36.4. Organic analytical data hits for tank 3013

Parameter	L192	L193	L194
Volatile organic compound analysis (L=µg/L, S=µg/kg)			
Chloroform		10.7	12.8
Water soluble organic compound analysis (L=µg/L, S=µg/kg)			
Methyl Alcohol	29,000	27,000	30,000

samples L192, L193, L194, the GC-MS reporting limits were less than those for the other samples; this enabled the detection of chloroform at a concentration of 10.7 μg/L in L193 and 12.8 μg/L in L194. The lower-sensitivity DAI-GC analyses for water-soluble organics was also conducted for both sets of samples. No VOCs were detected for sample L171, L172, and L173 (i.e., concentrations were all less than the DAI-GC reporting limit of 1000 μg/L). However, for samples L192, L193, and L194, the DAI-GC analyses detected methyl alcohol in all three at concentrations of 27,000 to 30,000 μg/L. No explanation for this apparent discrepancy between the two sets of DAI-GC results has yet been suggested.

The only SVOC detected was bis(2-chloroisopropyl)ehter in sample L172 at 7 J μg/L. Reporting limits for the SVOCs ranged from 68 to 355 μg/L. No SVOC TICs were detected in any of the samples. In addition, no pesticides or PCBs were detected at concentrations above the reporting limits of 0.34 to 7.1 μg/L for the liquid samples.

2.30 TANK T-30

2.30.1 Tank Description

Tank T-30 is an 825-gal stainless steel tank located south of Building 4507 in the ORNL Bethel Valley main plant area. The tank was installed in 1961 in an in-ground vault and was used to store radioactive materials for the Curium Recovery Facility (Building 4507).

2.30.2 Characterization Summary

The results from this tank are shown in Tables 2.30.1 and 2.30.2.

2.30.2.1 Aqueous liquid

DAI-GC determined 11 mg/L of methanol, and very little volatile organics material was found by VOA. SVOA identified only a phthalate. These findings are consistent with the low TOC, 13.7 mg/L.

Table 2.30.1. Analytical data for tank T-30

Parameter	L121
Physical properties and miscellaneous data	
Density (g/mL)	1.001
Depth (inches)	2
Suspended solids (mg/mL)	<0.1
TDS (mg/mL)	<0.1
TOC (mg/L)	13.7
TS (mg/mL)	<0.1
RCRA metals (L=mg/L, S=mg/kg)	
Ag	0.002
As	<2
Ba	<0.1
Cd	<0.09
Cr	<0.1
Hg	0.01
Ni	<0.6
Pb	<1
Se	<0.05
Tl	<0.05
Process metals (L=mg/L, S=mg/kg)	
Si	0.62
U	<1.0
Anions (L=mg/L, S=mg/kg)	
Cl^-	<1
Cn	<0.06
F^-	<1
NO_3^-	<5
PO_4^{-3}	<5
SO_4^{-2}	<5
Alkalinity	
HCO_3^- (mol)	<0.01
pH (units)	8.7
Radiochemical screening (L=Bq/mL, S=Bq/g)	
Gross alpha	9.4E+01
Gross beta	2.7E+02
Beta/gamma emitters (L=Bq/mL, S=Bq/g)	
^{137}Cs	4.0E+00
^{3}H	1.6E+00
^{90}Sr	1.5E+01
Alpha emitters (L=Bq/mL, S=Bq/g)	
^{233}U	<2
^{239}Pu	<2
^{238}U	4.0E+00
^{239}Pu	3.5E+00
^{241}Am	<10
^{244}Cm	3.1E+01
^{252}Cf	<2

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Depth (inches)	2
Suspended solids (mg/mL)	<0.1
TDS (mg/mL)	<0.1
TOC (mg/L)	13.7
TS (mg/mL)	<0.1
RCRA metals (L=mg/L, S=mg/kg)	
Ag	0.002
As	<2
Ba	<0.1
Cd	<0.09
Cr	<0.1
Hg	0.01
Ni	<0.6
Pb	<1
Se	<0.05
Tl	<0.05
Process metals (L=mg/L, S=mg/kg)	
Si	0.62
U	<1.0
Anions (L=mg/L, S=mg/kg)	
Cl^-	<1
Cn	<0.06
F^-	<1
NO_3^-	<5
PO_4^{-3}	<5
SO_4^{-2}	<5
Alkalinity	
HCO_3^- (mol)	<0.01
pH (units)	8.7
Radiochemical screening (L=Bq/mL, S=Bq/g)	
Gross alpha	9.4E+01
Gross beta	2.7E+02
Beta/gamma emitters (L=Bq/mL, S=Bq/g)	
^{137}Cs	4.0E+00
^{3}H	1.6E+00
^{90}Sr	1.5E+01
Alpha emitters (L=Bq/mL, S=Bq/g)	
^{233}U	<2
^{239}Pu	<2
^{238}U	4.0E+00
^{239}Pu	3.5E+00
^{241}Am	<10
^{244}Cm	3.1E+01
^{252}Cf	<2

Table 2.30.2. Organic analytical data hits for tank T-30

Parameter	L121
DAI-GC analysis (L=µg/L, S=µg/kg)	
Methyl alcohol	11,000
Volatile organic compound analysis (L=µg/L, S=µg/kg)	
Acetone	21 B
Benzene	3 J
Methylene chloride	24 B
Tetrachloroethene	9
Toluene	10
Trichloroethene	4 J
Semivolatile compound analysis (L=µg/L, S=µg/kg)	
Bis(2-ethylhexyl)phthalate	37 J

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