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ENVIRONMENTAL RESTORATION PROGRAM

Waste Characterization Data Manual for the Inactive Liquid Low-Level Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee

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Oak Ridge, Tennessee

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ORNL/ER-80

Environmental Restoration Division
ORNL Environmental Restoration Program

Waste Characterization Data Manual for the Inactive Liquid Low-Level Radioactive Waste Tank Systems at Oak Ridge National Laboratory, Oak Ridge, Tennessee

Date Issued—June 1992

Prepared by
Engineering Division
Oak Ridge National Laboratory

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Oak Ridge, Tennessee 37831-6285
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	Tank No.	*Rev*	*Date Issued*
2.1	W-5	0	6/92
2.2	W-6	0	6/92
2.3	W-7	0	6/92
2.4	W-8	0	6/92
2.5	W-9	0	6/92
2.6	W-10	0	6/92
2.7	W-11	0	6/92
2.8	T-1	0	6/92
2.9	T-2	0	6/92
2.10	T-3	0	6/92
2.11	T-4	0	6/92
2.12	T-9	0	6/92
2.13	TH-1	0	6/92
2.14	TH-2	0	6/92
2.15	TH-3	0	6/92
2.16	TH-4	0	6/92
2.17	WC-1	0	6/92
2.18	WC-15	0	6/92
2.19	WC-17	0	6/92
2.20	W-1	0	6/92

	Tank No.	*Rev*	*Date Issued*
2.21	W-1A	0	6/92
2.22	W-2	0	6/92
2.23	W-3	0	6/92
2.24	W-4	0	6/92
2.25	W-13	0	6/92
2.26	W-14	0	6/92
2.27	W-15	0	6/92
2.28	7560	0	6/92
2.29	7562	0	6/92
2.30	T-30	0	6/92
2.31	W-19	0	6/92
2.32	W-20	0	6/92
2.33	3001-B		TBD
2.34	3003-A		TBD
2.35	3004-B		TBD
2.36	3013		TBD
2.37	H-209		TBD
2.38	7503-A		TBD
2.39	3001-S		TBD
2.40	3002-A		TBD
2.41	4501-P		TBD
2.42	S-424		TBD
2.43	T-14		TBD
2.44	W-1I		TBD
2.45	WC-4		TBD
2.46	W-17		TBD
2.47	W-18		TBD
2.48	WC-5		TBD
2.49	WC-6		TBD
2.50	WC-8		TBD
2.51	WC-11		TBD
2.52	WC-12		TBD
2.53	WC-13		TBD
2.54	WC-14		TBD

ACRONYMS

AA	atomic absorption
CLP	Contract Laboratory Procedure
CRQL	contract required detection limit
DAI-GC	direct aqueous injection–gas chromatography
EPA	U. S. Environmental Protection Agency
EP-TOX	Extraction Procedure Toxicity
ER	Environmental Restoration
FFA	Federal Facility Agreement
GC–MS	gas chromatography–mass spectrometry
HRE	Homogenous Reactor Experiment
HRLAL	High Radiation Level Analytical Laboratory
ICP	inductively coupled plasma
LLLW	liquid low-level radioactive waste
OHF	Old Hydrofracture Facility
ORNL	Oak Ridge National Laboratory
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA	quality assurance
RCRA	Resource Conservation and Recovery Act
SVOA	semivolatile organic analysis
TBP	tributylphosphate
TCL	Target Compound List
TDEC	Tennessee Department of Environment and Conservation
TIC	tentatively identified compound
TOC	total organic carbon
VOA	volatile organic analysis

EXECUTIVE SUMMARY

This Waste Characterization Data Manual contains the results of an analysis of the contents of liquid low-level waste (LLLW) tanks that have been removed from service in accordance with the requirements of the Oak Ridge Reservation (ORR) Federal Facility Agreement (FFA), Sect. IX.G.1.

Pursuant to the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendment and Reauthorization Act, the ORR, consisting of ~58,000 acres owned by the United States and under the jurisdiction of the U. S. Department of Energy (DOE), was placed on the National Priorities List on December 21, 1989. An FFA for the ORR, which was signed by the U. S. Environmental Protection Agency (EPA), Region IV; DOE; and the Tennessee Department of Environment and Conservation (TDEC), became effective January 1, 1992. The objective of the agreement is to ensure that environmental impacts resulting from operations at the ORR, both present and past, are thoroughly investigated and remediated to protect the public health, welfare, and environment.

The FFA (Sect. IX.G.1) requires that waste characterizations be conducted and provided to EPA and TDEC for all LLLW tanks that are removed from service. These waste characterizations will include the results of sampling and analysis of the tank contents, including wastes, liquids, and sludges.

This manual contains the results of sampling activities that were conducted at the Oak Ridge National Laboratory in 1988. Thirty-three tanks were sampled and analyzed at that time. Sampling of the remaining inactive tanks is currently underway, and data from these tanks will be added to this manual as they become available. Data are presented from analysis of volatile organic compounds, semivolatile organic compounds, polychlorinated biphenyls, radiochemical compounds, and inorganic compounds.

Most of the liquid samples were collected with a small vacuum pump. Although it could volatize the lighter organics in the liquid, this procedure minimized exposure of collection personnel to radiation. Liquid samples were collected into 250-mL glass sample jars with Teflon-lined caps. Each sample was given a unique identification number.

No standard EPA methods exist for the preparation and analysis of mixed wastes, and very few laboratories have experience in this area. Therefore, the organic chemical characterization in this project required that much of the methodology be developed as needed rather than during a preliminary development phase.

Quality assurance (QA) during tank sampling activities was maintained primarily through the use of tank-specific procedures for the sampling crew to follow. These procedures provided step-by-step instructions for the collection, labeling, and shipping of each sample. If any procedural changes were required, the Project Manager was notified, and approval was required from the appropriate levels of management before operations

could begin. Independent surveillance by the QA Specialist verified that sampling procedures, chain-of-custody criteria, radiation protection, and operator training were in compliance with all written procedures. Sampling activities that followed EPA procedures met analysis-level-III quality requirements. Analyses that required modifications of EPA procedures met analysis-level-V quality requirements.

The sample results are organized in this manual by individual tanks. Data reporting conventions and notations are defined in Sect. 2.

1. INTRODUCTION

1.1 BACKGROUND

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

Most of the liquid low-level waste (LLLW) system was installed more than 30 years ago. The initial system and its subsequent modifications were designed to minimize radiation exposure to LLLW system users and operators. System features include provisions for remote operations to minimize personnel exposure and unvalved, gravity-drained transfer lines to prevent waste backup into generator areas. Over the years, tank systems were abandoned as their integrity was breached or as programs were terminated. Some of the tanks were abandoned in place with liquid waste and sludge left in them. As-built drawings for most of the tank systems do not exist. The out-of-service portion of the system consists almost entirely of tanks without secondary containment. Figures 1.1 and 1.2 show the LLLW tank locations in Bethel Valley and Melton Valley, respectively.

1.2 PURPOSE

Section IX.G.1 of the Oak Ridge Reservation Federal Facility Agreement (FFA) requires the completion of waste characterizations for all out-of-service tank systems. Tank contents must be sampled and analyzed for hazardous and radioactive constituents and the data presented in the waste characterization. The purpose of this data manual is to present waste characterization data for the Category D LLLW tanks to the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC).

1.3 SCOPE

The methodology described in this manual and the data shown in Revision 0 of Sects. 2.1 through 2.32 have been extracted from ORNL reports published by Autrey et al.[1,2] Data for the remaining Category D tanks will be included as they become available. As additional tanks are accepted into the Environmental Restoration (ER) Program, their waste characterization data will also be incorporated into this manual.

1.4 DEFINITIONS

Category D tank system. A singly contained LLLW tank system that is removed from service and will no longer receive program-generated waste.

LLLW. Hazardous, radioactive, and mixed liquid waste having an activity greater than the trace levels permitted in process wastes but less than 5 Ci/gal of beta-gamma emitters (≤ 2 Ci/gal by the revised waste acceptance criteria) and less than 100 nCi/gal of alpha-emitting transuranic elements.

1.5 SAMPLING OF CONTENTS FOR CATEGORY D LLLW TANK SYSTEMS

Because of the physical design of the tanks (Fig. 1.3), sample collection could take place from only a very limited area within the tank. Sample quantities were also limited to minimize exposure of the field personnel to radiation while collecting the samples. However, because of the length of time the tank contents have had to settle, the liquid contents of most of the tanks were expected to be relatively homogeneous.

Most of the liquid samples were collected with a small vacuum pump. Although it could volatize the lighter organics in the liquid, this procedure minimized exposure of collection personnel to radiation. Liquid samples were collected into 250-mL glass sample jars with Teflon-lined caps. Each sample was given a unique identification number.

Vertical stratification of the liquid was expected in several tanks; therefore, if liquid depths were greater than 5 ft, samples were usually taken near the top, at the midpoint, and at the bottom of the liquid. If the liquid depth was 1–5 ft, samples were collected from the top and bottom. For very shallow liquid depths (<1 ft), double samples were collected at only one depth.

Sludge has been found in a number of the tanks. The liquid–sludge interface in these tanks was located using the Markland model 10 sludge gun. This tool measures the amount of light transmitted across a fixed gap in the probe to detect changes in the percentage of solids in the liquid. As the probe enters the sludge, an alarm sounds, and the operator records the depth.

Based on earlier reports, soft and hard sludges were expected to be found in the tanks. Two different sludge collectors were prepared to accommodate the varying sludge conditions. The soft sludge collector has an open-ended sample collection tube at the bottom. After the sludge enters the tube, a flat, neoprene-coated plate is rotated over the opening. The hard sludge collector uses a beveled cutting edge to core samples as it is driven into the sludge. The collector was not used on steel tanks because of the possibility of puncturing the tank shell. All sludge was cored, and the samples were homogenized before they were analyzed.

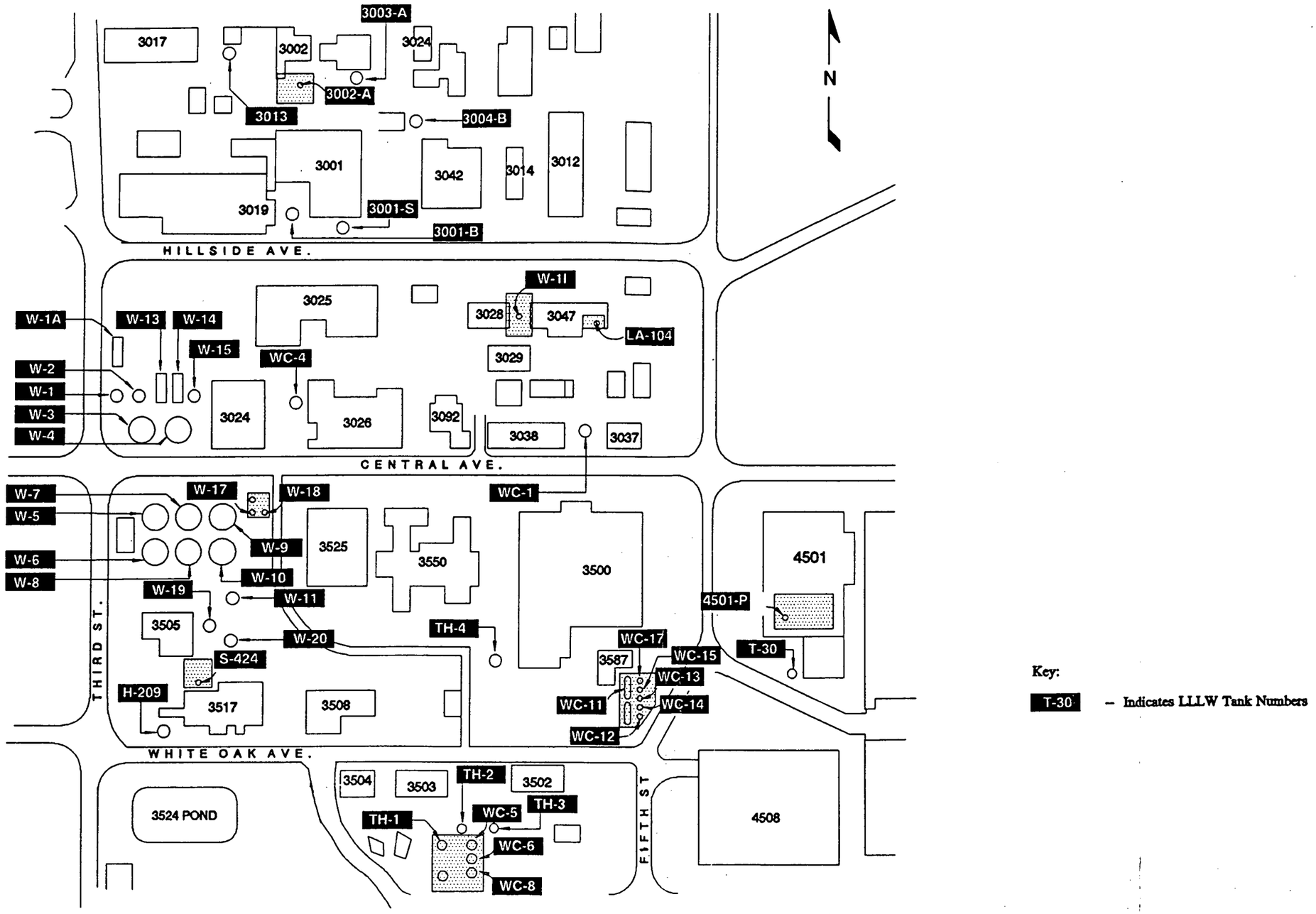
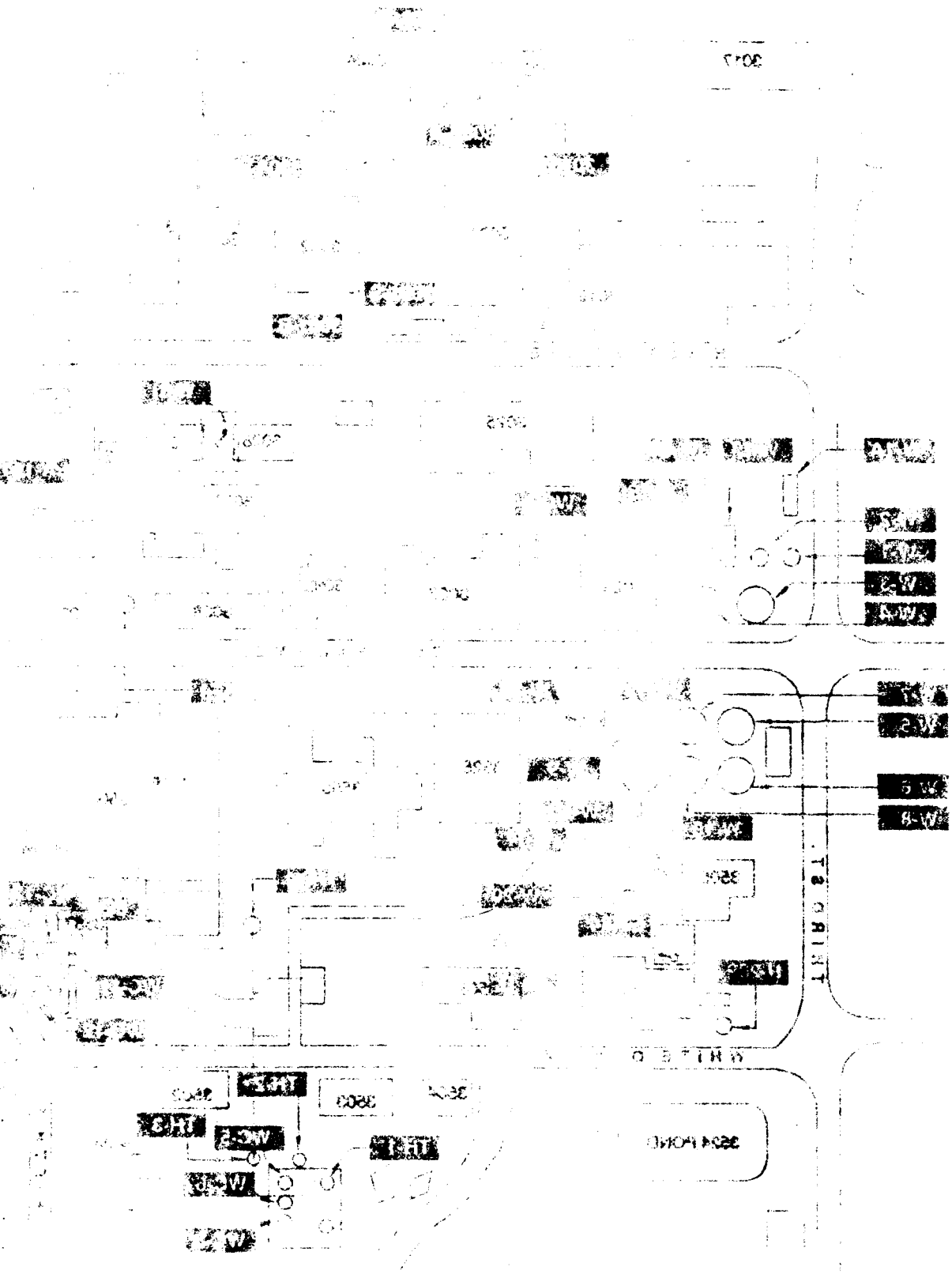


Fig. 1.1. Location of inactive LLLW tanks in the Bethel Valley main laboratory area.


3017
3860
3864 ROAD
ORBIT
W-2
W-8

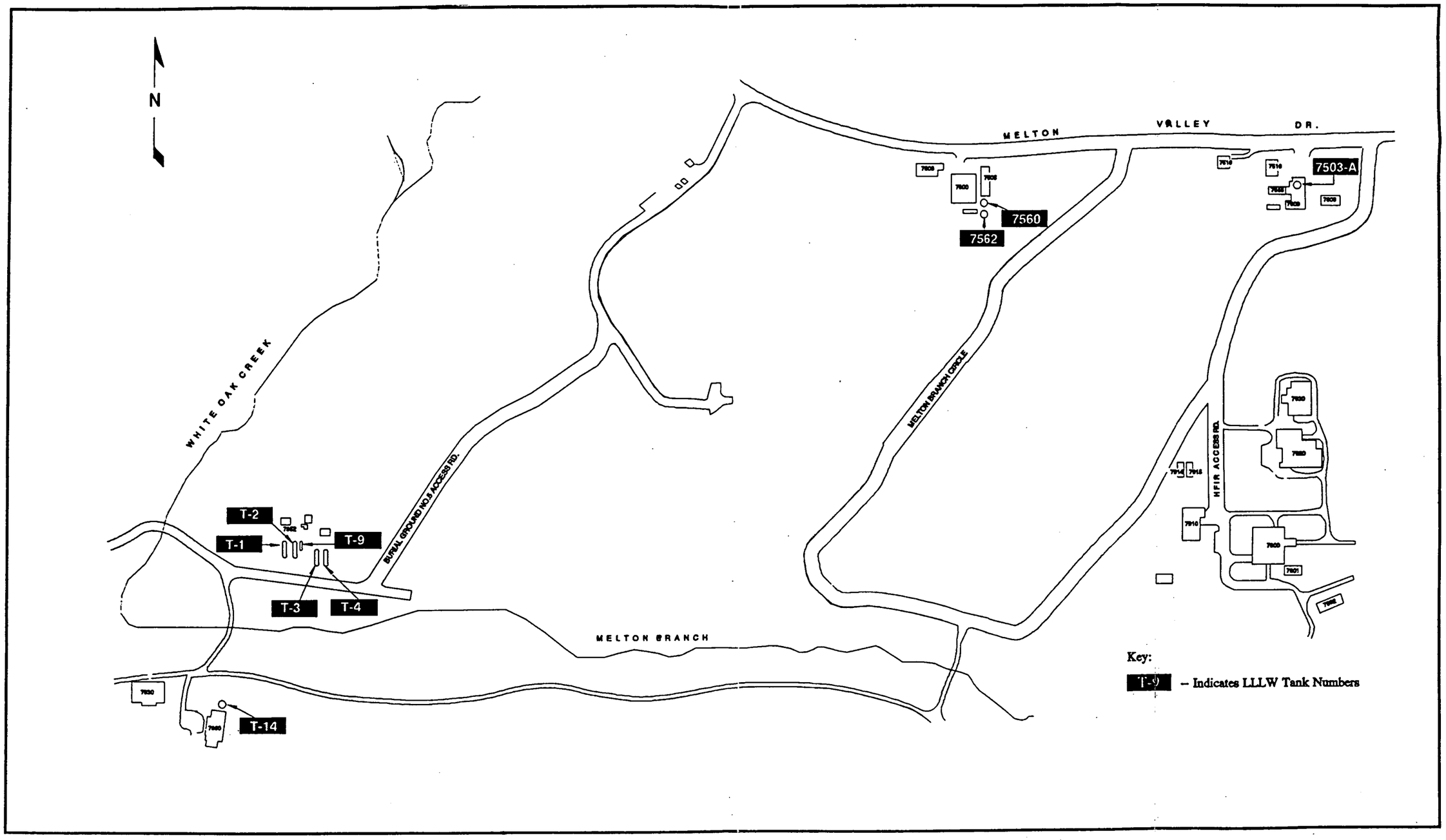


Fig. 1.2. Location of inactive LLLW tanks in the Melton Valley area.

M-1
T-3
T-1
T-5
WHITE OAK CREEK

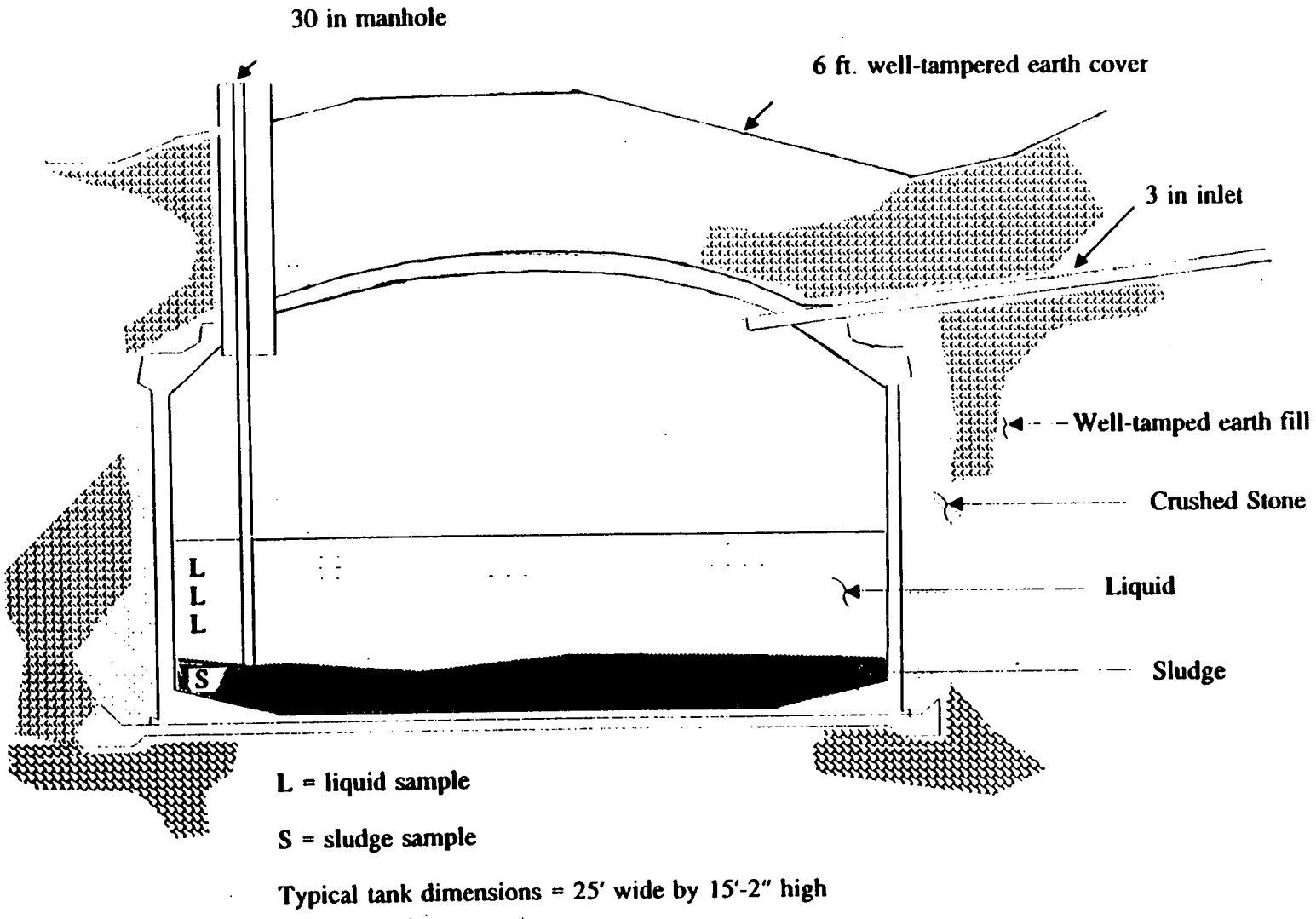


Fig. 1.3. Typical tank configuration showing sample locations.

Quality assurance (QA) during tank sampling activities was maintained primarily through the use of tank-specific procedures for the sampling crew to follow. These procedures provided step-by-step instructions for the collection, labeling, and shipping of each sample. If any procedural changes were required, the Project Manager was notified, and approval was required from the appropriate levels of management before operations could begin. An independent surveillance by the QA Specialist verified that sampling procedures, chain-of-custody criteria, radiation protection, and operator training were in compliance with all written procedures. Sampling activities that followed EPA procedures met analysis-level-III quality requirements. Analyses that required modifications of EPA procedures met analysis-level-V quality requirements.

All field data, such as liquid and sludge depths, sample identification numbers, location of the sampling port on the tank, and field surveys, were recorded on data forms to ensure an accurate account of the sampling activities. Chain-of-custody forms were used to track individual samples from their collection point to the individual laboratories conducting the analyses.

1.6 ANALYTICAL METHODS

No standard EPA methods exist for the preparation and analysis of mixed wastes, and very few laboratories have experience in this area. Therefore, the organic chemical characterization in this project required that much of the methodology be developed as needed rather than during a preliminary development phase.

The approach taken for the determination of regulated organic compounds in the samples collected from the inactive tanks was to prepare extracts in (radioactive) contamination-zoned facilities and to perform the analytical measurements in analytical laboratories. The preparation methodologies followed EPA SW-846[3] or Contract Laboratory Program (CLP) methodology[4] as closely as possible. Method deviations required by the radioactive nature or other characteristics of the samples were documented. These deviations are explained in the ORNL report published by Autry et al.[1] The quantitative measurements were conducted by EPA CLP methods.

The staff of the High Radiation Level Analytical Laboratory (HRLAL) received and logged in the samples and transferred aliquots to the Separations and Synthesis Group for organic analytical preparation. Except for the direct aqueous injection–gas chromatographic (DAI–GC) determination of major volatile organic compounds, all the quantitative measurements were performed by the Organic Analysis Group. All sample transfers were accompanied by chain-of-custody documentation.

The CLP analyses were specifically calibrated for the EPA CLP Target Compound List (TCL). Because EPA Region IV staff suggested analyzing for as much of the 40 CFR 261, Appendix VIII, list as possible within the constraints of worker protection, the detection of such compounds as tentatively identified compounds (TICs) was also investigated.

The subsections that follow describe the analytical methods used in this project for each type of compound investigated.

1.6.1 Volatile Organic Compound Analysis

Volatile organic compounds in the liquid samples were determined using modifications of SW-846 method 5030 and the CLP method for volatiles in water by purge-and-trap gas chromatography–mass spectrometry (GC-MS), which is very similar to SW-846 method 8240. The main deviation from EPA methodology was that the purge-and-trap step was conducted in a glove box remote from the GC-MS laboratory. Sludge samples were not analyzed for volatile organic compounds.

At the same time that aliquots were taken for purge-and-trap in the glove box, 1.5-mL aliquots were taken in small vials for analysis of major volatile organic compounds. This analysis was conducted to "protect" the GC-MS system used for volatile analysis by identifying those samples that were heavily contaminated with higher-boiling compounds (boiling point ≥ 100°C). These higher-boiling compounds might be collected in the adsorbent trap and subsequently would contaminate the GC column or overload the GC-MS detector.

This analysis was also used to supplement the purge-and-trap analysis by providing data on highly polar, water-soluble organic compounds that are not determined effectively by the purge-and-trap method (e.g., methyl and ethyl alcohols). Such compounds were suspected because of processes used at ORNL.

1.6.2 Semivolatile Organic Compound Analysis

Semivolatile organic compounds were extracted from the liquid and sludge samples after completion of the gross alpha and beta/gamma activity measurements. The gross alpha and beta/gamma measurements had to be taken first to determine if the sample could be extracted in a contamination zone hood or if the extraction had to be conducted in a hot cell. The samples were extracted by a modification of SW-846 method 3510.

Semivolatile organic compounds from the sludge samples were also extracted, using a modification of SW-846 method 3550. Most of the extractions were performed in a hot cell because of the high levels of radioactivity in the sludges, although a few sludges were low enough in radioactivity to allow extraction in a contamination zone hood. Since only limited amounts of sludges were collected, the extracts varied in mass from only 2 to 20 g. The amount of organic material extractable from the sludges for GC required dilution of the extracts or extraction of smaller masses (2–5 g). The reporting limits varied from about 500–2500 to 5000–25,000 μg/kg, depending upon the mass extracted and the dilution of the extract.

Two tanks contained organic layers. Samples from these tanks required only dilution and addition of internal standard, per SW-846 method 3580. After testing various dilution ratios with the GC screening method, it was determined that a 100-fold dilution would keep most of the major constituents detectable by GC within the calibration range of the GC-MS.

All of the extracts were screened using a Megabore capillary column GC with flame-ionization detection. This screening was conducted to identify those samples requiring dilution to "protect" the GC-MS system and to screen out those samples that contained little organic matter and would not require GC-MS.

After GC screening, the extracts were measured for total alpha and beta/gamma activity and then examined for contact and smear alpha and beta/gamma by the Health Physics Inspector. They were than sent to the sample-receiving laboratory for GC-MS analysis. The extracts were analyzed by the CLP GC-MS procedure, which utilizes the method of internal standards.

1.6.3 Polychlorinated Biphenyl Analysis

Two tanks contained layers of organic liquids or oils. These layers were analyzed for polychlorinated biphenyls (PCBs) in addition to volatiles and semivolatiles. The preparation method was a modified version of method 3580.

PCBs were measured by a capillary-column GC method, which is similar to SW-846 method 8080, except that only the capillary column was used. The samples were injected into a GC device equipped with a 10-m × 0.53-mm-(interior diameter) × 5-μm film of bonded SE-30, a fused silica capillary column, and an electron-capture detector. The flow rate of the helium carrier gas was 6 mL/min, and the total flow rate to the detector was adjusted to 45 mL/min with argon/methane (95/5, vol/vol). The column oven was programmed from 140° to 250°C at 8°C/min, with a 16-min final isothermal hold, and the injector and detector temperatures were maintained at 250° and 300°C respectively. Quantitation was by the method of internal standards; manually measured peak heights were used for peaks characteristic of each Arochlor mixture. The reporting limit was about 10 to 20 mg/kg.

Data reported were the concentration of each Arochlor and the matrix spike and matrix spike duplicate recoveries.

1.6.4 Radiochemical and Inorganic Compound Analysis

The EPA sample preservation procedures that involve maintenance of samples at 4°C were avoided for two reasons: (1) the lack of refrigeration facilities for radioactive samples and (2) the possibility of shifts in the equilibrium states of solutions with elevated levels of both pH and dissolved solids. In addition, on-site filtration upon collection and on-site acid preservation of metals in aqueous samples were not performed because of the danger of handling radioactive materials.

The EPA requirement that states that all samples must initially be run undiluted was not met for samples with high radiation levels or high salt content. Liquid samples were diluted fourfold with nitric acid (1 mol) prior to analysis to reduce the concentrations of salt and radionuclides to a level that enabled use of existing instrumentation.

Finally, it was not possible to meet the holding time requirements for mercury (26 d) and cyanide (14 d) because of the additional time necessary to analyze radioactive samples. This problem was discussed prior to and during the sampling campaign with both Martin Marietta Energy Systems, Inc., ER peronnel and the EPA Region IV pesonnel and is now being addressed at the national level by the Laboratory Management Division of DOE Headquarters.

To meet the analytical requirements of this project, a new facility for atomic emission and atomic absorption (AA) spectroscopy was established. This facility included specially adapted instrumentation for inductively coupled plasma (ICP) atomic emission spectroscopy and an AA spectrometer for graphite furnace work and mercury analysis by the cold-vapor technique. Each of these systems was set up and modified for operation in stainless steel enclosures. Both the ICP and the AA spectrometer were equipped with auxiliary exhaust systems to handle the bulk of radioactive aerosols generated during sample analysis. A preoperational readiness review was conducted by the Radioactive Operations Committee on each of these systems prior to their operation with radioactive samples.

The inactive waste tank samples were inspected by a Health Physics representative, and a field survey was performed on each sample before it was packaged and delivered to the HRLAL. On the basis of the field survey results, all liquid samples were handled in radiochemical laboratories (classified as radiation contamination zones). Most of the sludge samples required remote handling for dissolution and dilution before their removal from the hot cell and distribution to various laboratories.

Sample volumes or weights were adjusted to comply with Appendix 7 of the ORNL Health Physics Manual. The limiting factors for laboratory operations were based upon the ^{90}Sr (Class 1; very high radiotoxicity) and ^{137}Cs (Class 2; high radiotoxicity) content.

Most of the laboratory procedures were simple wet operations, permitting the application of a tenfold modifying factor to the activity levels allowed. Dose rates did not exceed 200–400 mrad/h at 1.5 in. for laboratory operations; the ^{90}Sr activity levels were maintained below 0.1–0.2 mCi, and the ^{137}Cs below 1–2 mCi. The only problem involved the determination of total and dissolved solids. This required weighing the residue from dried samples. Special care and handling were exercised with the dry samples to prevent dispersing or dusting of the material.

Many of the samples obtained from the inactive waste tanks have high dissolved solids; this phenomenon translates into a high ionic strength. The effects of high ionic strength can have a significant effect on the solution chemistry and various chemical measurements. For example, a potentiometric pH measurement is actually based upon the hydronium ion activity and not the hydronium activity. The hydronium activity will differ considerably at high ionic strengths. Therefore, the pH measurements on many of the tank samples can be considered only as apparent pH values that are not directly related to hydronium ion concentration. The ionic strength will also affect the kinetics of ionic reactions and result in deviations from solubility product behavior. In general, the solution chemistry is far from ideal, and the expected behavior for many species may not be observed.

The physical, inorganic, and radiochemical analyses were conducted at the HRLAL (Building 2026) and the Transuranium Laboratory (Building 7920), both of which serve in the Radioactive Materials Analysis Section, and the Chemical and Physical Analysis Laboratory (Building 4500S), which serves the Inorganic Chemistry Section. The sample receiving, sample distribution, sample preparation, physical measurements, metal analyses, cyanide and sulfide analyses, total organic carbon (TOC), ^{14}C and ^{3}H analyses, and some of the other radiochemical measurements were performed by HRLAL. The general anion (F^-, Cl^-, PO_4^{-2}, NO_3^-, and SO_4^{-2}) measurements by ion chromatography were performed by the Chemical and

Physical Analysis Laboratory group. The bulk of the radiochemical data, which include the gross alpha, gross beta, gamma emitters, ^{90}Sr, and alpha emitters analyses, were provided by the Transuranium Laboratory.

1.6.5 Resource Conservation and Recovery Act

The inactive tanks are categorized as solid waste and are classified as hazardous if the contents of a tank exhibits any of the following specific characteristics: (1) ignitability, (2) reactivity, (3) corrosivity, or (4) toxicity according to an extraction procedure or Extraction Procedure Toxicity (EP-TOX) test. The Toxicity Characteristic Leaching Procedure was not used to determine if the sludge were classified as Resource Conservation and Recovery Act (RCRA) hazardous because EPA had not developed this procedure at the time of the sampling.

The inorganic regulatory characterization for the inactive tanks is separated into classification of the liquid and solid phase for each tank. The following discussion concerning the sludge sample is preliminary because the measurements are based upon the total metal content obtained with a nitric acid leach and not the EP-TOX results. The current available data show only that if a sludge completely dissolves in the EP-TOX acetate buffer, the data are applicable for the determination of RCRA classification because the measurements would be equivalent to the extraction procedure. Therefore, to arrive at the following classifications, the total metal content has been compared to an EP-TOX equivalent, which accounts for the 20-fold dilution obtained with the extraction procedure. Only the metals whose total metal content exceeded the EP-TOX equivalent limit were measured in the EP-TOX leachate.

The results of the extraction procedure show that the toxic metals of interest (Cr, Pb, and Hg) are weakly extracted into the 0.05 mol acetate buffer. Although ~50% of the solid material from the sludge below dissolved in the buffer solution, the toxic metals are present as insoluble species. Therefore, supported by the EP-TOX results for the inorganic metals which had non-RCRA liquids with an apparent sludge are not RCRA according to the inorganic contents.

In addition, a group from the Analytical Spectroscopy Section located at HRLAL provided surrogate standard and matrix spike data on each sample. Because of the complexity of the chemical composition of the inactive tank samples, the surrogate standard and matrix spike technique was employed as a screening tool to provide qualitative information. This information alerted the analyst to possible elemental and spectral interferences in the variety of different analytical procedures employed.

1.7 REFERENCES

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2. J. W. Autrey et al., *Sampling and Analysis of Inactive Waste Tanks TH-2, WC-1, and WC-15*, ORNL/ER-19, Office of Environmental, Safety, and Health Compliance, Oak Ridge National Laboratory, Oak Ridge, Tennessee, September 1990.

3. U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid Waste*, SW-846, 3rd ed., Office of Solid Waste and Emergency Response, Washington, D.C., November 1986.

4. Oak Ridge National Laboratory, *U.S. EPA Contract Laboratory Program, Statement of Work for Inorganic Analysis,* SOW No. 787, Oak Ridge, Tennessee, 1987.

2. WASTE CHARACTERIZATION SUMMARY FOR THE ORNL CATEGORY D LLLW TANKS

This section presents the results of the chemical analyses of the Category D (inactive) LLLW tanks. The order in which the tanks are listed corresponds to the priority groups (Groups 1–4) as determined in the risk characterization data manual.

Data reporting conventions

Some explanation of the reporting conventions is necessary to clarify how the data are presented. Some data are listed in the tables with letters that indicate important qualifications. The qualifiers present the following information.

J. The compound was identified by the appropriate retention time and mass spectrum but was observed at a concentration lower than the reporting limit. The reporting limit is the lowest concentration of that compound that can be measured accurately in that sample. The quantitation is therefore an estimate. Only one significant digit is used in the discussion of the results for TIC.

In the discussion that follows, the notation "TIC" means that the compound has been identified solely by its mass spectrum in a machine search of spectra contained in a computer's library. The quantitation is based upon the response factor of the nearest internal standard present in the gas chromatograph. Because of the nature of the quantitation procedure, all values reported are, by definition, estimates and bear the J qualifier.

E. The concentration of the compound exceeded the calibration range of the instrument; therefore, the result must be considered an estimate.

B. The compound was detected either in the instrumental or sample preparation blank. The blanks usually contained low μg/L levels of several species, as indicated in one of the later subsections of this section.

BE. The analyte was detected in the sample at concentrations exceeding the usual calibration range, but low levels were also detected in the blank. In almost all cases, the levels observed in the sample considerably exceeded that of the blank.

The absence of data qualifiers indicates that a compound was (1) identified on the basis of retention time and mass spectrum, (2) measured within the calibration range of the instrument, and (3) not found in the associated blank sample.

Some other clarifiers are as follows:

1. The units for suspended solids, total dissolved solids (TSD), total solids, inorganic carbon (IC), and total carbon (TC) are mg/mL rather than mg/L.

2. The units for metals and anions are mg/L for aqueous solutions and mg/kg for solids.

3. The units for CO_3^{2-}, HCO_3^{2-}, OH^-, and H^{3+} are moles (mol).

4. The units for volatiles and semivolatiles are μg/L for aqueous solutions and μg/kg for solids.

5. The detection limits given for physical properties, metals, anions, and alkalinity are those supplied by the laboratory.

6. The detection limits given for the organics are the contract required detection limits (CRQLs) given in the EPA "Statement of Work for Organics," February 1988. These do not represent instrumental detection limits but required reporting limits. Generally, detection limits are not required to be determined for GC/MS and GC analysis. The instrument must only be able to achieve CRQLs. Therefore, all sample results have been compared to the CRQLs.

7. RCRA limits for metals in soil are derived limits and represent units equivalent to EP-TOX. They are obtained by multiplying the aqueous limit by 20. If a particular metal failed the total limitation for a sample, the sample was extracted and analyzed for the metal(s) that failed soil characterization.

8. RCRA limits for organics are given in μg/L for the sake of clarity. Where no entry is made, no limit exists at this time.

The tank sample table headings refer to sample identification numbers. The "L" prefix indicates a liquid sample; the "S" prefix indicates a sludge sample. In cases where both hard and soft sludge were encountered, the sample is understood to be soft sludge unless the sample prefix is an "H." An "O" prefix on the sample number indicates an organic sample.

Reference is made to the TOC data where such data aid in the interpretation of the organic compound analyses. The surrogate standard and matrix spike recoveries are not discussed in detail in this report because there are no established quality control limits for analysis of these sample matrices by modified EPA methods.

2.1 TANK W-5

2.1.1 Tank Description

Tank W-5 is a 170,000-gal storage tank that was built in 1943 for the storage of LLLW. The tank is located in the South Tank Farm in Bethel Valley. The reinforced concrete (Gunite) tank is buried below grade.

2.1.2 Characterization Summary

2.1.2.1 Aqueous liquid

The results for Tank W-5 are shown in Tables 2.1.1 and 2.1.2. The major constituents detected by the volatile organic analysis (VOA) were trichloroethenes and tetrachloroethenes at 138 μg/L and 267 μg/L concentrations respectively. Other target analytes were observed, but at much lower levels. The semivolatile organic analysis (SVOA) did not detect any significant material in the liquids. The aqueous liquid sample foamed upon acidification during the preparation for the SVOA.

2.1.2.2 Sludge

Tributylphosphate (TBP) was found as a TIC in the sludge at 8 mg/kg. The SVOA suggested the presence of phthalates.

Table 2.1.1. Analytical data for tank W-5

Parameter	D L (mg/L)	L73	S75	RCRA limit mg/L	RCRA limit mg/kg
		Physical properties and miscellaneous data			
Density (g/mL)		1.044	NA		
Depth (inches)		4	NA		
Suspended solids (mg/mL)	0.1	0.7	NA		
TDS (mg/mL)	0.1	47.5	NA		
TOC (L=mg/L, S=mg/kg)	~1.0	700	4020		
TS (L=mg/mL, S=mg/g)	0.1	48.2	348		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.002	0.26	5.0	100
As	0.40	<4	<1	5.0	100
Ba	0.02	<0.2	140	100.0	2000
Cd	0.01	<0.08	10	1.0	20.0
Cr	0.10	2.7	(580)	5.0	100
Hg	0.005	0.41	18	0.2	4.0
Ni	0.10	<1	52	NA	NA
Pb	0.50	<2	388	5.0	100
Se	0.05	<0.09	(0.81)	1.0	20.0
Tl	0.05	<0.09	(<0.5)	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	12.9	NA		
U	0.1	296	1420		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	8.6	<84		
Cn	0.24	•	0.01		
F^-	1.0	56	1300		
NO_3^-	5.0	21	•		
PO_4^{-2}	5.0	420	<840		
SO_4^{-2}	5.0	26	<840		
		Alkalinity			
CO_3^{-2} (mol)	0.01	0.16	•		
HCO_3^- (mol)	0.01	0.26	•		
pH (units)	0.1	10.6	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		6.0E+00	1.3E+03		
Gross beta		4.2E+03	1.8E+05		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g			
^{137}Cs		5.5E+03	3.0E+04		
^{3}H		1.9E+00	1.1E+01		
^{60}Co		1.6E+02	2.6E+02		
^{90}Sr		9.0E+00	2.9E+04		
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		•	4.6E+01		
^{238}Pu		<2	5.4E+01		
^{239}Pu		<4	6.2E+02		
^{244}Cm		<0.4	3.5E+02		
^{252}Cf		<0.2	<4		

D L = Detection limit

Table 2.1.2. Organic analytical data hits for tank W-5

Parameter	CRQL (µg/L)	L73	S75	RCRA unit (µg/L)	CRQL soil (µg/kg)
		Volatile organic compound analysis (L=µg/L, S=µg/kg)			
Acetone	10	19 B			
Carbon tetrachloride	5	68 B		500	
Chloroform	5	6		6,000	
Methylene chloride	5	6 B			
Tetrachloroethene	5	267 B		700	
Trichloroethene	5	138		500	
		Semivolatile compound analysis (L=µg/L, S=µg/kg)			
Bis(2-ethylhexyl)phthalate			28,000		330
Di-n-butylphthalate	10 (H_2O)	18 J	350 J		330
Diethylphthalate			230 J		330
Fluoranthene			230 J		330
Phenanthrene			440 J		330
Pyrene			230 J		330

CRQL = contract required quantitation limit

2.2 TANK W-6

2.2.1 Tank Description

Tank W-6 is a 170,000-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 for the storage of LLLW.

2.2.2 Characterization Summary

The results for this tank are shown in Tables 2.2.1 and 2.2.2.

2.2.2.1 Aqueous liquid

The principal volatile organics were trichloroethene and tetrachloroethenes. The SVOA of the aqueous liquids showed only benzoic acid at 300 μg/L in L79. Sample L78 turned green upon the addition of the SVOA matrix spike, but the surrogate recoveries were acceptable.

2.2.2.2 Sludge

A few polycyclic aromatic hydrocarbons (PAHs) and phthalates were determined in the sludge.

Table 2.2.1. Analytical data for tank W-6

Parameter	D L (mg/L)	L77	L78	L79	S80
		Physical properties and miscellaneous data			
Density (g/mL)		0.999	1.009	1.059	NA
Depth (inches)		4	30	54	NA
Suspended solids (mg/mL)	0.1	<0.1	<0.1	0.1	NA
TDS (mg/mL)	0.1	2.5	14.8	74.0	NA
TOC (L=mg/L, S=mg/kg)	1.0	2.0	2.0	180	9110
TS (L=mg/mL, S=mg/g)	0.1	2.5	14.7	74.1	406
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.002	<0.002	<0.002	0.006
As	0.40	<4	<4	<4	(<2)
Ba	0.02	<0.2	<0.2	<0.2	(350)
Cd	0.01	<0.08	<0.08	<0.08	<1
Cr	0.10	<0.3	2.6	32	(2400)
Hg	0.005	<0.01	<0.01	0.07	36
Ni	0.10	<1	<1	1.5	85
Pb	0.50	<2	<2	<2	1100
Se	0.05	<0.09	<0.09	<0.09	(<2)
Tl	0.05	<0.09	<0.09	<0.09	<2
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	3.99	2.98	1.65	NA
U	0.1	16.2	52.3	69.8	6340
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	1.3	4.5	12.0	<800
Cn	0.01	<0.07	0.05	0.41	•
F^-	1.0	5.1	27	49	4000
NO_3^-	5.0	73	250	710	•
PO_4^{-2}	5.0	<5	31	210	<2500
SO_4^{-2}	5.0	4.8	34	330	<2500
		Alkalinity			
CO_3^{-2} (mol)	0.01	<0.01	0.02	0.18	•
HCO_3^- (mol)	0.01	0.02	0.11	0.10	•
pH (units)	0.1	8.7	10.4	11.8	NA
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		1.0E+00	3.0E+00	3.0E+00	8.0E+03
Gross beta		2.8E+03	6.0E+03	1.9E+04	1.0E+06
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		1.6E+03	5.6E+03	2.0E+04	8.2E+04
^{3}H		6.3E-01	1.4E+00	3.2E+00	9.2E+00
^{60}Co		1.3E+01	2.8E+01	9.0E+01	9.1E+02
^{90}Sr		3.1E+02	7.8E+01	1.9E+02	3.6E+05
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		•	•	•	2.7E+02
^{238}Pu		<2	<2	<2	2.1E+02
^{239}Pu		<4	<4	<4	1.8E+03
^{244}Cm		<0.4	<0.4	<0.4	4.2E+03
^{252}Cf		<0.2	<0.2	<0.2	<8

D L = Detection limit

Table 2.2.2. Organic anaytical data hits for tank W-6

Parameter	CRQL (µg/L)	L77	L78	L79	S080	RCRA limit	CRQL (µg/kg)
			DAI-GC analysis (L=µg/L, S=µg/kg)				
I-Propyl alcohol				3,000			
			Volatile organic compound analysis (L=µg/L, S=µg/kg)				
2-Butanone	10			75		200,000	
2-Hexanone	10			9			
4-Methyl-2-pentanone	10		9 J	91			
Acetone	10	67 B	44 B	111 B			
Benzene	5		2 J	10		500	
Carbon tetrachloride	5	4 JB				500	
Chloroform	5	5 J	9	3 J		6,000	
Methylene chloride	5	9 B	8 B	7 B			
Tetrachloroethene	5	47 B	158 B	507 BE		700	
Toluene	5	6 B	10 B	10 B			
Trichloroethene	5	13	24	82		500	
			Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Benzoic acid	50			290 J			
Bis(2-ethylhexyl)phthalate	10				31,000		1,600
Di-n-butylphthalate	10				210 J		330
Diethylphthalate	10				150 J		330
Fluoranthene	10				340 J		330
Phenanthrene	10				680 J		330
Pyrene	10				350 J		330

CRQL = contract required quantitation limit

2.3 TANK W-7

2.3.1 Tank Description

Tank W-7 is a 170,000-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 for the storage of LLLW.

2.3.2 Characterization Summary

The results for this tank are shown in Tables 2.3.1 and 2.3.2.

2.3.2.1 Aqueous liquid

The major organic constituents were 14 mg/L of methanol and ~1000 μg/L of carbon tetrachloride in L82. The data for the sample identification numbers with A and B suffixes are for duplicate determinations. These data show very good agreement, considering the low concentrations and two purging steps in the analysis. Benzoic acid (2000 μg/L) was the only TCL compound detected. Dibromonitrophenol was estimated at 700 μg/L as a TIC.

2.3.2.2 Sludge

Fluoranthene and several phthalates were detected in the sludges. Four of the five SVOA surrogate standard recoveries (particularly for the acid surrogate standards) from the soft sludge, S84, were very low, suggesting problems with the extraction step. Surrogate standard recoveries were somewhat better for the hard sludge, H85. This difference in recovery for the surrogates between soft and hard sludges was observed in other samples.

The samples for tanks W-8 and W-9, except for the sludges, were prepared together.

Table 2.3.1. Analytical data for tank W-7

Parameter	D L (mg/L)	H85	L82	S84	RCRA limit mg/L	RCRA limit mg/kg
		Physical properties and miscellaneous data				
Density (g/mL)		NA	1.130	NA		
Depth (inches)		NA	3	NA		
Suspended solids (mg/mL)	0.1	NA	11.3	NA		
TDS (mg/mL)	0.1	NA	158.7	NA		
TOC (L=mg/L, S=mg/kg)	1.0	4,010	50.0	9,030		
TS (L=mg/mL, S=mg/g)	0.1	360	170	367		
		RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	0.12	•	0.36	5.0	100
As	0.40	<6	<4	<6	5.0	100
Ba	0.02	(16)	<0.2	(1,300)	10.0	2,000
Cd	0.01	2.2	<0.08	2.0	1.0	20.0
Cr	0.10	(130)	145	(660)	5.0	100
Hg	0.005	52	(11)	141	0.2	4.0
Ni	0.10	22	<1	84	NA	NA
Pb	0.50	(77)	<2	(300)	5.0	100
Se	0.05	(<1)	<2	(<1)	1.0	20.0
Tl	0.05	<1	<2	<1		
		Process metals (L=mg/L, S=mg/kg)				
Si	1.0	NA	7.35	NA		
U	0.1	86,000	8,530	45,000		
		Anions (L=mg/L, S=mg/kg)				
Cl-	1	•	29	<1.2%		
Cn	0.01	•	<0.06	•		
F^-	1	•	11	1,000		
NO_3^-	5	•	440	•		
PO_4^{-2}	5	•	29	•		
SO_4^{-2}	5	•	55	6.7%		
		Alkalinity				
CO_3^{-2} (mol)	0.01	•	0.21	•		
HCO_3^- (mol)	0.01	•	0.33	•		
pH (units)	0.1	NA	10.7	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		8.0E+03	2.0E+02	1.4E+04		
Gross beta		1.7E+06	5.6E+05	3.1E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{134}Cs		•	•	1.0E+02		
^{137}Cs		1.0E+06	6.4E+05	1.2E+06		
^{152}Eu		•	•	1.6E+03		
^{154}Eu		4.5E+02	•	1.3E+03		
^{3}H		8.3E+01	1.9E+01	1.2E+02		
^{60}Co		2.0E+03	2.9E+02	5.0E+03		
^{90}Sr		3.1E+05	6.0E+02	8.1E+05		

Table 2.3.1 (continued)

Parameter	D L (mg/L)	H85	L82	S84	RCRA limit mg/L	RCRA limit mg/kg
		Alpha emitters (L=Bq/mL, S=Bq/g)				
^{233}U		1.7E+03	•	5.4E+02		
^{238}Pu		6.4E+02	<2	1.1E+03		
$^{238}Th/^{232}Th$		•	8.5E+01	•		
^{238}U		1.6E+03	•	•		
^{239}Pu		4.8E+02	<4	2.4E+03		
^{241}Am		•	•	5.7E+02		
^{244}Cm		2.5E+03	<0.4	4.2E+03		
^{252}Cf		<4	<0.2	<14		

D L = Detection limit

Table 2.3.2. Organic analytical data hits for tank W-7

Parameter	CRQL (µg/L)	H85	L82	L82B	S84	RCRA limit µg/L	RCRA limit µg/kg
			DAI-GC analysis (L=µg/L, S=µg/kg)				
Methyl alcohol			14,000				
			Volatile organic compound analysis (L=µg/L, S=µg/kg)				
4-Methyl-2-pentanone	10		7	7			
Acetone	10		26 B	31 B			
Carbon tetrachloride	10		1,088 BE	1,021 BE		500	
Chloroform	5		3 J	3 J		6,000	
Methylene chloride	5		7 B	4 B			
Tetrachloroethene	5		24 B	39 B		700	
Toluene	5		14 B	9 B			
			Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Benzoic acid	50		1,900 J				1,600
Bis(2-ethylhexyl)phthalate	10				57,000		330
Di-n-butylphthalate	10	2,200 J			300 J		330
Diethylphthalate	10	510 J			200 J		330
Fluoranthene	10				260 J		330

CRQL = contract required quantitation limit

2.4 TANK W-8

2.4.1 Tank Description

Tank W-8 is a 170,000-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 for the storage of LLLW.

2.4.2 Characterization Summary

Tables 2.4.1 and 2.4.2 list the findings for this tank.

2.4.2.1 Aqueous liquid

The concentrations of both volatile and semivolatile organic compounds were very low.

The main SVOA TICs were dibromocyclohexane (300 μg/L in L86 alone), dibromonitrophenol (500 and 700 μg/L in L86 and L87, respectively), and TBP (20 mg/L in each liquid). The results suggest bromination reactions may have occurred.

Only the sludge was found to contain significant detectable organic compounds, which were mostly PAHs. The TICs were mostly unidentified hydrocarbons and TBP (700 mg/kg).

The acidic surrogate standard compounds were very poorly recovered from the aqueous liquids, suggesting that acidic compounds, if present in the samples, may not have been extracted or detected. The two chlorinated phenolic matrix spike compounds also were poorly recovered.

Table 2.4.1. Analytical data for tank W-8

Parameter	D L (mg/L)	L86	L87	S88
		Physical properties and miscellaneous data		
Density (g/mL)		1.020	1.027	NA
Depth (inches)		4	16	NA
Suspended solids (mg/mL)	0.1	<0.1	<0.1	NA
TDS (mg/mL)	0.1	29.4	37.8	NA
TOC (L=mg/L, S=mg/kg)	1.0	720	1,460	11,300
TS (L=mg/mL, S=mg/g)	0.1	29.4	37.6	558
		RCRA metals (L=mg/L, S=mg/kg)		
Ag	0.002	0.007	<0.002	1.3
As	0.4	<4	<4	<4
Ba	0.02	<0.2	<0.2	(38)
Cd	0.01	<0.2	<0.2	4.1
Cr	0.1	12	18	(410)
Hg	0.005	0.09	0.17	50
Ni	0.10	<1	<1	160
Pb	0.5	<2	<2	(1,800)
Se	0.05	<0.09	<0.09	(<0.7)
Tl	0.05	<0.09	<0.09	<0.7
		Process metals (L=mg/L, S=mg/kg)		
Si	1.0	1.39	1.14	NA
U	0.1	817	1,760	8,560
		Anions (L=mg/L, S=mg/kg)		
Cl^-	1	290	840	<100
Cn	0.01	0.33	0.58	•
F^-	1	<50	<125	<100
NO_3^-	5	2,700	7,300	•
PO_4^{-2}	5	<250	<625	<500
SO_4^{-2}	5	1,400	4,900	<500
		Alkalinity		
CO_3^{-2} (mol)	0.01	0.01	0.02	•
HCO_3^- (mol)	0.01	0.04	0.07	•
pH (units)	0.1	9.6	9.7	NA
		Radiochemical screening (L=Bq/mL, S=Bq/g)		
Gross alpha		1.5E+02	2.0E+02	2.9E+04
Gross beta		2.4E+05	2.8E+05	6.7E+06
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)		
^{137}Cs		3.4E+05	4.0E+05	4.7E+04
^{152}Eu		•	•	9.0E+01
^{154}Eu		•	•	1.4E+02
^{3}H		8.0E+00	8.8E+00	0.0E+00
^{60}Co		3.0E+02	5.9E+02	4.0E+02
^{90}Sr		6.6E+02	4.6E+02	2.8E+06

Table 2.3.1 (continued)

Parameter	D L (mg/L)	L86	L87	S88
		Alpha emitters (L=Bq/mL, S=Bq/g)		
^{233}U		<2	<2	1.6E+03
^{238}Pu		<2	<2	2.9E+03
^{239}Pu		<2	<2	3.2E+03
^{241}Am		•	•	2.0E+02
^{244}Cm		<2	<2	1.5E+04
^{252}Cf		<2	<2	<4

D L = Detection limit

Table 2.4.2. Organic analytical data hits for tank W-8

Parameter	CRQL (µg/L)	L86	L87	S88	RCRA limit (µg/L)	CRQL (µg/kg)
		DAI-GC analysis (L=µg/L, S=µg/kg)				
Acetone		1,000	3,000			
Methyl alcohol			1,000			
Methyl ethyl ketone			1,000			
N-Butyl alcohol			2,000			
		Volatile organic compound analysis (L=µg/L, S=µg/kg)				
2-Hexanone	10	41				
4-Methyl-2-pentanone	10	15				
Acetone	10	64 B	45 B			
Benzene	5	3 J	6		500	
Methylene chloride	5	12 B	7 B			
Toluene	5	3 BJ	4 BJ			
		Semivolatile compound analysis (L=µg/L, S=µg/kg)				
2-Methylnaphthalene	10			1,300 J		330
Di-n-butylphthalate	10		17 J	630 J		330
Diethylphthalate	10			430 J		330
Fluoranthene	10			740 J		330
Naphthalene	10		28 J	2,600 J		330
Phenanthrene	10			1,300 J		330
Pyrene	10			850 J		330

CRQL = contract required quantitation limit

2.5 TANK W-9

2.5.1 Tank Description

Tank W-9 is a 170,000-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 for the storage of LLLW.

2.5.2 Characterization Summary

The results for this tank are given in Tables 2.5.1 and 2.5.2.

2.5.2.1 Aqueous liquid

The results for this tank were similar to those for W-8. The VOA and SVOA did not reveal any significant levels of TCL constituents, except for the low levels of PAHs and phthalates in the sludge. The SVOA TIC, TBP, was estimated at 10 mg/L in L90. The recoveries of the surrogate standard compounds in L90 were all zero, suggesting either that an error had been made in surrogate standard spiking or that the matrix seriously interfered with the extraction.

Except for the sludges, the samples for tanks W-1, W-2, and W-4 were prepared together.

Table 2.5.1. Analytical data for tank W-9

Parameter	D L (mg/L)	L90	L92	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.017	NA		
Depth (inches)		5	NA		
Suspended solids (mg/mL)	0.1	<0.1	NA		
TDS (mg/mL)	0.1	21.2	NA		
TOC (L=mg/L, S=mg/kg)	1.0	290	13,900		
TS (L=mg/mL, S=mg/g)	0.1	21.2	944		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.002	0.77	5.0	100
As	0.40	<4	<5	5.0	100
Ba	0.02	<0.2	(200)	100	2,000
Cd	0.01	<0.2	4.9	1.0	200
Cr	0.10	7.3	160	5.0	100
Hg	0.005	0.06	40	0.2	4.0
Ni	0.10	<1	110	NA	NA
Pb	0.50	<2	620	5.0	100
Se	0.05	<0.09	<0.7	1.0	20.0
Tl	0.05	<0.09	<0.7	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	2.53	NA		
U	0.1	2,390	25,800		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	340	<100		
Cn	0.01	0.14	*		
F^-	1.0	<50	<100		
NO_3^-	5.0	1,650	*		
PO_4^{-2}	5.0	2,600	<500		
SO_4^{-2}	5.0	900	<500		
		Alkalinity			
CO_3^{-2} (mol)	0.01	0.03	*		
HCO_3^- (mol)	0.01	0.09	*		
OH^- (mol)	0.01	*	*		
pH (units)	0.1	10.2	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		6.0E+01	1.1E+05		
Gross beta		7.1E+04	5.0E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{134}Cs		8.5E+01	2.0E+01		
^{137}Cs		6.3E+04	2.2E+04		
^{152}Eu		*	2.3E+02		
^{154}Eu		*	4.4E+02		
^{155}Eu		*	5.2E+01		
^{3}H		1.0E+01	0.0E+00		
^{60}Co		1.1E+02	7.8E+02		
^{90}Sr		3.7E+02	2.2E+06		

Table 2.5.1 (continued)

Parameter	D L (mg/L)	L90	L92	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		<3	3.1E+03		
^{238}Pu		<3	2.2E+04		
^{239}Pu		<3	9.2E+03		
^{241}Am			7.2E+03		
^{244}Cm		<3	5.4E+04		
^{252}Cf		<3	•		

D L = Detection limit

Table 2.5.2. Organic analytical data hits for tank W-9

Parameter	CRQL (µg/L)	L90	L92	RCRA limit (µg/L)	CRQL (µg/kg)
		Volatile organic compound analysis (L=µg/L, S=µg/kg)			
4-Methyl-2-pentanone	10	11			
Acetone	10	70 B			
Benzene	5	2 J		500	
Chlorobenzene	5	5		100,000	
Chloroform	5	44		6,000	
Methylene chloride	5	13 B			
Tetrachloroethene	5	4 J		700	
Toluene	5	9 B			
Trichloroethene	5	5		500	
		Semivolatile compound analysis (L=µg/L, S=µg/kg)			
Bis(2-ethylhexyl)phthalate	10		160,000		330
Di-n-butylphthalate	10	20 J	760 J		330
Diethylphthalate	10		450 J		330
Fluoranthene	10		1,100 J		330
Naphthalene	10		370 J		330
Phenanthrene	10		1,300 J		330
Pyrene	10		850 J		330

CRQL = contract required quantitation limit

2.6 TANK W-10

2.6.1 Tank Description

Tank W-10 is a 170,000-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 for the storage in LLLW.

2.6.2 Characterization Summary

The results for this tank are given in Tables 2.6.1 and 2.6.2.

2.6.2.1 Aqueous liquid

All the aqueous samples for tank W-10 were processed as a group. DAI-GC indicated the presence of 30 to 40 mg/L of methanol. The acetone determined by DAI-GC was qualitatively confirmed by VOA, but the latter indicated much lower levels. The presence of 2-butanone was not verified by VOA. Except for the methanol, there were only very low levels of volatile organic compounds in the aqueous liquids, and in L93, none were detected at all. This is consistent with TOC in L93 (8.7 mg/L) being much lower than in L94 and L95 (86.4 and 54.6 mg/L, respectively).

The only TCL semivolatile organic compound detected in the liquids was benzoic acid, in L94 and L95 (400 and 2900 μg/L, respectively). The naphthalene detected in L95 was very low (20 μg/L). TBP was indicated as a TIC only in L94, at 2 mg/L.

2.6.2.2 Sludge

Like the sludges from the other tanks, the sludges from tank W-10 contained PAHs and phthalates, with H120 having higher concentrations of PAHs than S96, which is consistent with their TOC levels (14,600 and 8180 mg/kg, respectively). The SVOA TIC, ethylphenyl-ethanone, was estimated at 200 and 2300 μg/L in L94 and L95, respectively, and 9 and 40 mg/kg in S96 and H120, respectively. TBP was detected as a TIC in the sludges at 60 and 300 mg/kg in S96 and H120, respectively. The hard sludges appear to contain generally higher concentrations of organic compounds than do the soft sludges.

The acidic matrix spike recoveries for L93 were very poor; however, the acidic surrogate standard recoveries were good. The reason for this discrepancy is not clear. Two of the acidic compound and two of the neutral compound surrogate standard recoveries were low for S96 but were better for the hard sludge, H120. The hard sludges exhibited better surrogate standard and matrix spike recoveries than did the soft sludges. The reasons for these findings are not clear but may be related to the more aqueous character of the soft sludges.

Table 2.6.1. Analytical data for tank W-10

Parameter	D L (mg/L)	S96	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data		
Density (g/mL)		NA		
Depth (inches)		NA		
Suspended solids (mg/mL)	0.1	NA		
TDS (mg/mL)	0.1	NA		
TOC (L=mg/L, S=mg/kg)	1.0	8180		
TS (L=mg/mL, S=mg/g)	0.1	449		
		RCRA metals (L=mg/L, S=mg/kg)		
Ag	0.002	0.79	5.0	100
As	0.40	5.7	5.0	100
Ba	0.02	(94)	100.0	2000
Cd	0.01	4.7	1.0	20.0
Cr	0.10	(140)	5.0	100
Hg	0.005	48	0.2	4.0
Ni	0.10	83	NA	NA
Pb	0.50	480	5.0	100
Se	0.05	(<0.9)	1.0	20.0
Tl	0.05	(<0.9)	NA	NA
		Process metals (L=mg/L, S=mg/kg)		
Si	1.0	NA		
U	0.1	10,800		
		Anions (L=mg/L, S=mg/kg)		
Cl^-	1.0	<120		
Cn	0.01	•		
F^-	1.0	<120		
NO_3^-	5.0	•		
PO_4^{-2}	5.0	<600		
SO_4^{-2}	5.0	<600		
		Alkalinity		
CO_3^{-2} (mol)	0.01	•		
HCO_3^- (mol)	0.01	•		
pH (units)	0.1	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)		
Gross alpha		8.4E+04		
Gross beta		5.3E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)		
^{134}Cs		•		
^{137}Cs		8.6E+05		
^{152}Eu		4.6E+03		
^{154}Eu		8.0E+03		
^{3}H		1.4E+02		
^{60}Co		1.3E+04		
^{90}Sr		8.6E+06		

Table 2.6.1 (continued)

Parameter	D L (mg/L)	S96	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)		
^{233}U		<50		
^{238}Pu		2.9E+04		
^{238}U		•		
^{239}Pu		8.2E+03		
^{241}Am		4.5E+03		
^{244}Cm		4.7E+04		
^{252}Cf		<50		

D L = Detection limit

Table 2.6.2. Organic analytical data hits for tank W-10

Parameter	CRQL (µg/L)	H120	L93	L94	L94B	L95	S96	RCRA limit (µg/L)	CRQL (µg/kg)
				DAI-GC analysis (L=µg/L, S=µg/kg)					
Acetone						3,000			
Ethyl alcohol						1,000			
Methyl alcohol			27,000	37,000		41,000			
Methyl ethyl ketone						1,000			
N-Butyl alcohol						1,000			
				Volatile organic compound analysis (L=µg/L, S=µg/kg)					
1,2-Dichloroethene (total)	5			11		31			
4-Methyl-2-pentanone	10					23 B			
Acetone	10					97 B			
Benzene	5			6 B	38 BM	22 B		500	
Chlorobenzene	5					5 B		100,000	
Chloroform	5					16		6,000	
Methylene chloride	5			13 B	19 B	12 B			
Tetrachloroethene	5			21		48		700	
Toluene	5			12		26 B			
Trichloroethene	5			27		81		500	
				Semivolatile compound analysis (L=µg/L, S=µg/kg)					
Benzo(a)anthracene	10						660 J		330
Benzo(a)pyrene	10	1,900 J							330
Benzo(b)fluoranthene	10	2,200 J							330
Benzo(g,h,i)perylene	10	870 J							330
Benzoic acid	50			400 J		2,900			1600
Bis(2-ethylhexyl)phthalate	10						130,000		330
Chrysene	10						760 J		330
Di-n-butylphthalate	10	770 J					2,600 J		330
Fluoranthene	10	8,000 J					1,800 J		330
Naphthalene	10	270 J				20 J			330
Phenanthrene	10	5,100 J					1,700 J		330
Pyrene	10	8,100 J					1,400 J		330

CRQL = contract required quantitation limit

2.7 TANK W-11

2.7.1 Tank Description

Tank W-11 is a 1500-gal Gunite tank located in the Bethel Valley South Tank Farm. The underground tank was constructed in 1943 to serve as a waste collection and monitoring tank for research laboratories in Building 3550.

2.7.2 Characterization Summary

The results for this tank are shown in Tables 2.7.1 and 2.7.2.

2.7.2.1 Aqueous liquid

The volatile organic compounds in tank W-11 samples were very low. Except for sludge samples, no SVOA extracts were submitted for GC-MS analysis because the GC screening did not detect sufficient concentrations of organic compounds for GC. The screening data are consistent with the TOC levels for these samples, which are the lowest TOC levels taken from any of the tanks in this study (2.0, <0.1, and <0.1 mg/L for L3, L114, and L115, respectively). Samples L3 and L115 were sequentially collected and are useful as duplicates, within the usual errors of sampling. The VOA results are in reasonable agreement, considering the very low concentrations (2–30 μg/L).

2.7.2.2 Sludge

The sludge contained several PAHs at concentrations as high as hundreds of mg/kg, as shown in Table 2.7.2. The presence of these species was quite unexpected, since PAH-bearing wastes, such as tars, were not known to be disposed of in the tank. The PAHs were not detected in the liquid samples, as expected from their low aqueous solubilities (low μg/L for the five-ring PAH), and they selectively partitioned into the sludge. This trend was observed for other sludge samples. Phthalates were also present.

Table 2.7.1. Analytical data for tank W-11

Parameter	D L (mg/L)	H5	L114	L115	L3	RCRA limits (mg/L)	RCRA limits (ug/kg)
			Physical properties and miscellaneous data				
Density (g/mL)		2,080	1.000	0.998	0.999		
Depth (inches)		NA	24	4	4		
Suspended solids (mg/mL)	0.1	NA	0.2	0.2	0.2		
TDS (mg/mL)	0.1	NA	0.1	0.1	0.1		
TOC (L=mg/L, S=mg/kg)	1.0	•	<0.1	<0.1	<0.1		
TS (L=mg/mL, S=mg/g)	0.1	1,200	0.3	0.3	0.3		
			RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	2.4	<0.002	(<0.002)	(<0.002)	5.0	100
As	0.40	(1.8)	<0.8	<0.8	<0.8	5.0	100
Ba	0.02	64	0.05	<0.04	<0.04	100	2,000
Cd	0.01	(1.2)	<0.02	<0.02	<0.02	1.0	20.0
Cr	0.10	670	<0.1	<0.1	<0.1	5.0	100
Hg	0.005	17	<0.01	<0.01	<0.04	0.2	4.0
Ni	0.10	10	<0.2	<0.2	<0.2	NA	NA
Pb	0.50	(14,000)	<1	<1	<1	5.0	100
Se	0.05	<0.3	<0.09	<0.09	<0.09	1.0	20.0
Tl	0.05	<0.3	(<0.09)	(<0.09)	(<0.09)	NA	NA
			Process metals (L=mg/L, S=mg/kg)				
Si	1.0	NA	7.29	7.03	6.91		
U	0.1	•	8.82	8.88	12.1		
			Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	•	<1	<1	<1		
Cn	0.01	•	<0.04	<0.04	<0.04		
F^-	1.0	•	<1	<1	<1		
NO_3^-	5.0	•	<5	<5	<5		
PO_4^{-2}	5.0	•	<5	<5	<5		
SO_4^{-2}	5.0	•	<5	<5	<5		
			Alkalinity				
pH (units)	0.01	NA	7.7	7.8	8.0		
			Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		•	<1	<1	<1		
Gross beta		•	<20	<20	<20		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		•	<20	<20	<20		
^{14}C		•	1.0E-01	1.0E-02	2.0E-01		
^{3}H		•	5.0E-01	5.0E-01	6.0E-01		
^{60}Co		•	<20	<20	<20		
^{90}Sr		•	2.1E+01	4.2E+01	2.0E+01		

D L = Detection limit

Table 2.7.2. Organic analytical data hits for tank W-11

Parameter	CRQL (µg/L)	H5	L3	L114	L115	RCRA limit (µg/L)
		Volatile organic compound analysis (L=µg/L, S=µg/kg)				
Acetone	10		27 B	21 B	15 B	
Chlorobenzene	5		5 J	3 J	2 J	100,000
Methylene chloride	5		7 B	8 B	13 B	
Toluene	5		23 B	24 B	13 B	
Trichloroethene	5		4 J			500
		Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Benzo(a)anthracene	10	44,000				
Benzo(a)pyrene	10	64,000				
Benzo(b)fluoranthene	10	160,000 E				
Benzo(g,h,i)perylene	10	22,000				
Bis(2-ethylhexyl)phtha	10	38,000				
Chrysene	10	130,000				
Di-n-butylphthalate	10	17,400				
Fluoranthene	10	240,000 E				
Indeno(1,2,3-cd)pyrene	10	42,000				
Phenanthrene	10	24,000				
Pyrene	10	90,000				

CRQL = contract required quantitation limit

2.8 TANK T-1

2.8.1 Tank Description

Tank T-1 is a 15,000-gal carbon steel tank located in Melton Valley at the Old Hydrofracture Facility (OHF). The underground tank was installed at the site in 1963 to store LLLW for mixing into grout for waste injection by hydrofracture.

2.8.2 Characterization Summary

The results for this tank are shown in Tables 2.8.1 and 2.8.2.

2.8.2.1 Aqueous liquid

Very little organic matter was detected in the samples from this tank. VOA apparently revealed high levels of methylene chloride in both the sample and the blank. These high levels can be attributed to contamination of the solid sorbent traps during storage. When the quantitation procedure was modified to permit analysis of traps within 48 h of receipt, the level of methylene chloride in the blank was reduced to acceptable levels. In the SVOA extraction, the methylene chloride and aqueous layers were difficult to separate for samples L35 and L36. Sample L36 required centrifugation to achieve separation. However, surrogate standard and matrix spike recoveries were good. There were no SVOA TCL hits in the aqueous liquids.

SVOA TICs included diphenyloxazole (300–400 μg/L), hexadecanoic acid (300 µg/L in one sample), and TBP (30–40 mg/L). TBP was often the major organic compound detected.

2.8.2.2 Sludge

Of the SVOA TCL compounds in the sludge, only phthalates were detected. SVOA TICs in the sludge included TBP at 2 mg/kg.

Table 2.8.1. Analytical data for tank T-1

Parameter	D L (mg/L)	L35	L36	S37	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data				
Density (g/mL)		1.005	1.007	NA		
Depth (inches)		4	48	NA		
Suspended solids (mg/mL)	0.1	0.8	<0.1	NA		
TDS (mg/mL)	0.1	6.4	6.9	NA		
TOC (L=mg/L, S=mg/kg)	1.0	836.0	790.0	18,600		
TS (L=mg/mL, S=mg/g)	0.1	7.2	6.9	921		
		RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	0.005	0.005	2.1	5.0	100
As	0.40	<0.8	<0.8	<2	5.0	100
Ba	0.02	<0.04	0.05	88	100	2,000
Cd	0.01	<0.02	<0.02	12.9	1.0	20.0
Cr	0.10	0.29	0.18	(130)	5.0	100
Hg	0.005	0.06	0.07	74	0.2	4.0
Ni	0.10	<0.2	<0.2	190	NA	NA
Pb	0.50	<1	<1	(860)	5.0	100
Se	0.05	<0.2	<0.2	(<2)	1.0	20.0
Tl	0.05	<0.2	<0.2	1.7	NA	NA
		Process metals (L=mg/L, S=mg/kg)				
Si	1.0	9.34	6.81	NA		
U	0.10	172	175	2800		
		Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	7.8	8.0	•		
Cn	0.01	•	0.22	•		
F^-	1.0	1.0	1.0	•		
NO_3^-	5.0	16	17	•		
PO_4^{-2}	5.0	<5	<5	•		
SO_4^{-2}	5.0	7.5	8.1	•		
		Alkalinity				
CO_3^{-2} (mol)	0.01	0.01	0.01	•		
HCO_3^- (mol)	0.01	0.04	0.04	•		
pH (units)	0.1	9.7	9.7	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		1.9E+02	2.1E+02	6.5E+05		
Gross beta		8.1E+04	7.8E+04	5.9E+07		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		7.4E+04	7.5E+0	3.9E+05		
^{14}C		•	•	4.8E+01		
^{152}Eu		•	•	1.4E+05		
^{154}Eu		•	•	1.2E+05		
^{155}Eu		•	•	2.3E+04		
^{3}H		7.1E+01	7.1E+01	2.6E+01		
^{60}Co		<50	<50	2.6E+05		
^{90}Sr		3.3E+03	3.4E+03	3.2E+07		

Table 2.8.1 (continued)

Parameter	D L (mg/L)	L35	L36	S37	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)				
^{233}U		1.8E+02	2.0E+02	•		
^{238}Pu		•	•	3.4E+04		
^{239}Pu		•	•	6.5E+03		

D L = Detection limit

Table 2.8.2. Organic analytical data hits for tank T-1

Parameter	CRQL (µg/L)	L35	L36	S37	RCRA limit (µg/L)	CRQL (µg/kg)
		Volatile organic compound analysis (L=µg/L, S=µg/kg)				
Acetone	10	51 B	27 B			
Benzene	5	130	5 J		500	
Carbon disulfide	5	91				
Carbon tetrachloride	5	2 J			500	
Chloroform	5	12 B	6 B		6000	
Methylene chloride	5	1300 BE	970 BE			
Toluene	5	71 B	12 B			
Trichloroethene	5	4 J			500	
		Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Bis(2-ethylhexyl)phthalate	10	400 J	190 J			
Di-n-butylphthalate	10	75 J	76 J	3500 J		330

CRQL = contract required quantitation limit

2.9 TANK T-2

2.9.1 Tank Description

Tank T-2 is a 15,000-gal carbon steel tank located in Melton Valley at the OHF. The underground tank was installed at the site in 1963 to store LLLW for mixing into grout for waste injection by hydrofracture.

2.9.2 Characterization Summary

The results for this tank are shown in Tables 2.9.1 and 2.9.2.

2.9.2.1 Aqueous liquid

Very little volatile organic matter was detected in the aqueous liquids. Methylene chloride was a probable contaminant, as it was for tank T-1. However, SVOA showed the presence of 2-nitrophenol, 2,4-dichlorophenol, and 2,4,5-trichlorophenol in the liquids. These compounds could represent chemical reactions occurring in the tanks.

SVOA TICs in the three liquids included TBP at 20 mg/L and tetramethylbutylphenoxyethoxyethanol at 800-1000 μg/L. Some foaming was observed in samples L39 and L112 upon acidification.

Samples L38 and L112, which were collected sequentially, are duplicates within the limits of field sampling. The agreement between the results for the two samples is quite good, especially considering the low levels determined.

2.9.2.2 Sludge

The sludge contained the usual phthalates and also naphthalene. The latter could be a component of liquid scintillator solutions. TBP was also detected in the sludge, but the amount could not be estimated because the mass spectrum of the chromatographic peak indicated coeluting interferences.

Table 2.9.1. Analytical data for tank T-2

Parameter	D L (mg/L)	L112	L38	L39	S40	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data				
Density (g/mL)		1.008	1.013	1.013	NA		
Depth (inches)		4	4	48	NA		
Suspended solids (mg/mL)	0.1	0.6	1.1	0.9	NA		
TDS (mg/mL)	0.1	1,100	11.4	10.7	NA		
TOC (L=mg/L, S=mg/kg)	1.0	12.1	1,120	1,310	28,000		
TS (L=mg/mL, S=mg/g)	0.1		12.5	11.6	324		
			RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	<0.002	<0.002	0.002	2.9	5.0	100
As	0.40	<0.8	<0.8	<0.8	<1	5.0	100
Ba	0.02	0.06	<0.04	<0.04	33	100	2,000
Cd	0.01	<0.02	<0.02	<0.02	6.6	1.0	20.0
Cr	0.10	<0.1	0.44	<0.1	(180)	5.0	100
Hg	0.005	0.1	0.1	0.15	70	0.2	4.0
Ni	0.10	<0.2	<0.2	<0.2	72	NA	NA
Pb	0.50	<1	<1	<1	(350)	5.0	100
Se	0.05	<0.09	<0.09	<0.09	(<1)	1.0	20.0
Tl	0.05	<0.09	<0.09	<0.09	<1	NA	NA
			Process metals (L=mg/L, S=mg/kg)				
Si	1.0	6.81	5.07	6.97	NA		
U	0.1	161	166	158	1,000		
			Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	12	12	12	4.9%		
Cn	0.01	0.12	0.14	0.10	*		
F^-	1.0	1.0	1.0	1.0	<0.8%		
NO_3^-	5.0	8.0	8.4	8.2	*		
PO_4^{-2}	5.0	<5	<5	<5	*		
SO_4^{-2}	5.0	21	22	22	14%		
			Alkalinity				
CO_3^{-2} (mol)	0.01	0.04	0.04	0.04	*		
HCO_3^- (mol)	0.01	0.09	0.08	0.09	*		
pH (units)	0.1	9.9	9.9	9.9	NA		
			Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		2.1E+02	2.0E+02	2.0E+02	2.5E+05		
Gross beta		1.4E+05	1.4E+05	1.4E+05	2.0E+07		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		1.4E+05	1.4E+05	1.4E+05	2.5E+05		
^{14}C		3.6E+02	4.8E+02	2.3E+02	1.7E+01		
^{152}Eu		*	*	*	3.8E+04		
^{154}Eu		*	*	*	2.6E+04		
^{155}Eu		*	*	*	3.8E+03		
^{3}H		2.1E+02	2.1E+02	2.1E+02	9.5E+01		
^{60}Co		<75	<75	<75	6.4E+04		
^{90}Sr		2.8E+03	2.5E+03	2.7E+03	1.2E+07		

Table 2.9.1. (continued)

Parameter	D L (mg/L)	L112	L38	L39	S40	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)					
^{233}U		1.8E+02		1.8E+02	8.3E+03		
^{238}Pu		•		•	3.1E+03		
^{239}Pu		•		•	5.1E+03		
^{244}Cm		•		•	<200		
^{252}Cf		•		•	1.8E+05		

D L = Detection limit

Table 2.9.2. Organic analytical data hits for tank T-2

Parameter	CRQL (µg/L)	L38	L39	L112	S40	RCRA limit (µg/L)	CRQL (µg/kg)
		Volatile organic compound analysis (L=µg/L, S=µg/kg)					
Acetone	10	20 B	22 B	17 B			
Benzene	5	3 J				500	
Chloroform	5	340 BE	370 BE	310 BE		6000	
Methylene chloride	5	1000 BE	820 BE	860 BE			
Toluene	5	12 B	7 B	8 B			
		Semivolatile compound analysis (L=µg/L, S=µg/kg)					
2,4,5-Trichlorophenol	10	99 J	110 J	120 J			330
2,4-Dichlorophenol	10	100 J	140 J				330
2-Nitrophenol	10	170 J	200 J	180 J			330
Bis(2-ethylhexyl)phthalate	10	200 J	300 J	280 J	24,000		330
Di-n-butylphthalate	10			24 J	4600 J		330
Diethylphthalate	10				2800 J		330
Naphthalene	10				2300 J		330

CRQL = contract required quantitation limit

2.10 TANK T-3

2.10.1 Tank Description

Tank T-3 is a 25,000-gal carbon steel tank located in Melton Valley at the OHF. The underground tank was installed at the site in 1963 to store LLLW for mixing into grout for waste injection by hydrofracture.

2.10.2 Characterization Summary

2.10.2.1 Aqueous liquid

The results from Tank T-3 are shown in Tables 2.10.1 and 2.10.2. Very little organic matter was detected in the samples from this tank. The major organic compounds were determined by DAI-GC, and consisted of acetone (4 mg/L), methanol (28 mg/L), and n-butyl alcohol (80 mg/L). As noted in Sect. 2, these identifications cannot be considered absolute because the method does not include MS confirmation. However, where the constituent was also identified by VOA, there is more confidence in the DAI-GC result. Of the CLP TCL constituents, only acetone was detected at 180 μg/L by the purge-and-trap GC-MS VOA. The value for the VOA being lower than the value for DAI-GC is probably because of low purging efficiency at high concentration levels.

Volatile TICs were insignificant. Only benzyl alcohol was estimated at 100 μg/L in the aqueous liquid SVOA. Among the TICs were dibromonitrophenol at 2000 μg/L and TBP at 2000 μg/L. Both of these TICs were found in other samples as well. The presence of a nitrated phenol suggests nitration reactions in the tank. The brominated product was unexpected, but TBP has been used in large amounts at ORNL, and its presence was expected.

The SVOA phenol and 2-fluorophenol surrogate standards were not recovered. This may reflect the highly alkaline nature of the samples (the pH of T-3/L-042 was 12.7).

2.10.2.2 Sludge

Two phthalates, diethyl- and di-n-butylphthalate, were detected at 2 and 3 mg/kg, respectively. It is not clear why neither dibromonitrophenol nor TBP was detected in the sludge SVOA TICs, unless the analysis was not sufficiently sensitive.

Table 2.10.1. Analytical data for tank T-3

Parameter	D L (mg/L)	L42	S43	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.035	1.930		
Depth (inches)		5	NA		
Suspended solids (mg/mL)	0.1	1.5	NA		
TDS (mg/mL)	0.1	51.9	NA		
TOC (L=mg/L, S=mg/kg)	1.0	12,600	9,140		
TS (L=mg/mL, S=mg/g)	0.1	53.4	364		
		RCRA metals (L=mg/L, <0.01S=mg/kg)			
Ag	0.002	<0.01	0.15	5.0	100
As	0.40	0.4	<3	5.0	100
Ba	0.02	<0.02	76	100	2,000
Cd	0.01	<0.01	8.5	1.0	20.0
Cr	0.10	14	(69)	5.0	100
Hg	0.005	5.7	40	0.2	4.0
Ni	0.10	<0.1	57	NA	NA
Pb	0.50	<0.5	(300)	5.0	100
Se	0.05	<0.5	(0.74)	1.0	20.0
Tl	0.05	<0.5	<0.6	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	77.1	NA		
U	0.1	0.2	3060		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	7.0	29%		
Cn	0.01	1.10	0.20		
F^-	1.0	1.8	<12.7%		
NO_3^-	5.0	53	•		
PO_4^{-2}	5.0	160	<62.5%		
SO_4^{-2}	5.0	15	<62.5%		
		Alkalinity			
CO_3^{-2} (mol)	0.01	0.08	•		
OH^- (mol)	0.01	0.03	•		
pH (units)	0.1	12.7	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		2.0E+00	2.0E+05		
Gross beta		2.8E+05	2.5E+07		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		2.7E+05	1.3E+06		
^{14}C		•	7.6E+02		
^{152}Eu		•	5.1E+04		
^{154}Eu		•	5.3E+04		
^{3}H		1.7E+02	7.7E+01		
^{60}Co		3.6E+02	1.6E+05		
^{90}Sr		3.0E+02	8.1E+06		

Table 2.10.1 (continued)

Parameter	D L (mg/L)	L42	S43	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		2.0E+00	8.3E+03		
^{238}Pu		•	1.4E+04		
^{239}Pu		•	5.3E+03		
^{244}Cm		•	1.8E+05		
^{252}Cf		•	<200		

D L = Detection limit

Table 2.10.2. Organic analytical data hits for tank T-3

Parameter	CRQL (µg/L)	L42	S43	RCRA limit (µg/L)	CRQL (µg/kg)
		DAI-GC analysis (L=µg/L, S=µg/kg)			
Acetone		4,000			
Methyl alcohol		28,000			
N-Butyl alcohol		80,000			
		Volatile organic compound analysis (L=µg/L, S=µg/kg)			
Acetone	10	180 B			
Chloroform	5	3 JB		6,000	
Methylene chloride	5	3 JB			
Toluene	5	9 B			
		Semivolatile compound analysis (L=µg/L, S=µg/kg)			
Benzyl alcohol	10	120 J			330
Di-n-butylphthalate	10		3,100 J		330
Diethylphthalate	10		2,000 J		330

CRQL = contract required quantitation limit

2.11 TANK T-4

2.11.1 Tank Description

Tank T-4 is a 25,000-gal carbon steel tank located in Melton Valley at the OHF. The underground tank was installed at the site in 1963 to store LLLW for mixing into grout for waste injection by hydrofracture.

2.11.2 Characterization Summary

2.11.2.1 Aqueous liquid

The results from tank T-4 are shown in Tables 2.11.1 and 2.11.2. The three aqueous liquid samples for tank T-4 yielded very similar results, as shown in Table 2.11.2. DAI-GC showed concentrations exceeding 1000 μg/L each of acetone, ethyl alcohol, isopropyl alcohol, methanol, and n-butyl alcohol. VOA confirmed the presence of acetone and also indicated chloroform. Other TCL volatile organics were present at very low levels.

Volatile TICs were low in concentration; the major one was heptanone (80 μg/L, found in L44). No semivolatile TCL organic compounds were detected in the liquids. Major SVOA TICs were methylhexanone (800 μg/L in L45) and TBP (3000 μg/L in L111).

2.11.2.2 Sludge

The sludge contained only the ubiquitous phthalates.

Two of the neutral and two of the acid surrogate standard recoveries were low for the sludge. Low recoveries of acidic surrogate standards from the alkaline sludges were often encountered, suggesting a need for pH adjustment currently unspecified in EPA method 3550. Studies are under way to improve the surrogate standard recoveries in such sample matrices.

The samples for tanks T-1, T-2, and T-9 were each prepared as a group.

Table 2.11.1. Analytical Data for Tank T-4

Parameter	D L (mg/L)	L44	L45	S46	L111	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data				
Density (g/mL)		1.020	1.016	1.235	1.016		
Depth (inches)		4	34	NA	0		
Suspended solids(mg/mL)	0.1	2.7	<0.1	NA	0.3		
TDS (mg/mL)	0.1	23.6	23.7	NA	23.6		
TOC (L=mg/L, S=mg/kg)	1.0	460	473	4620	460		
TS (L=mg/mL, S=mg/g)	0.1	26.3	23.4	253	23.9		
			RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	0.017	0.02	(1.7)	0.018	5	100
As	0.40	<0.8	<0.8	<4	<0.4	5	100
Ba	0.02	<0.04	<0.04	<50	<0.02	100	2000
Cd	0.01	<0.02	<0.02	10	<0.01	1	20
Cr	0.10	9.4	14	(102)	13	5	100
Hg	0.005	1.1	2.7	585	7.9	0.2	4.0
Ni	0.10	<0.2	<0.2	160	<0.1	NA	NA
Pb	0.50	<1	<1	(510)	<0.5	5	100
Se	0.05	<0.09	<0.09	(1.5)	<0.23	1	20
Tl	0.05	<0.09	<0.09	0.73	<0.23	NA	NA
			Process metals (L=mg/L, S=mg/kg)				
Si	1.0	1.96	1.45	NA	1.96		
U	0.1	25.7	27.8	1850	23.3		
			Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	3.1	3.4	<0.83%	3.4		
Cn	0.01	0.54	0.59	*	*		
F^-	1.0	1.1	1.3	<0.83%	1.1		
NO_3^-	5.0	26	25	*	26		
PO_4^{-2}	5.0	51	50	<42%	50		
SO_4^{-2}	5.0	6.3	5.9	<42%	6.3		
			Alkalinity				
CO_3^{-2} (mol)	0.01	0.05	0.05	*	0.05		
OH^- (mol)	0.01	0.01	0.01	*	0.01		
pH (units)	0.01	11.7	11.7	NA	11.7		
			Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		3.6E+01	4.9E+01	3.7E+05	3.8E+01		
Gross beta		2.8E+05	3.1E+05	3.6E+07	3.1E+05		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		3.0E+05	3.0E+05	4.5E+05	3.0E+05		
^{14}C		*	*	5.1E+02	*		
^{152}Eu		*	*	5.2E+04	*		

Table 2.11.1 (continued)

Parameter	D L (mg/L)	L44	L45	S46	L111	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Beta/gamma emitters (L=Bq/mL, S=Bq/g) (continued)				
^{154}Eu		*	*	4.4E+04	*		
^{155}Eu		*	*	7.0E+03	*		
^{3}H		1.1E+02	1.1E+02	2.8E+01	1.1E+02		
^{60}Co		6.4E+01	5.2E+01	6.0E+04	5.2E+01		
^{90}Sr		1.2E+03	1.4E+03	2.2E+07	1.4E+03		
			Alpha emitters (L=Bq/mL, S=Bq/g)				
^{233}U		2.2E+01	2.9E+01	7.1E+03	2.3E+01		
^{238}Pu		*	*	2.2E+04	*		
$^{238}Th/^{232}Th$		*	*	5.8E+02	*		
^{238}U		*	*	*	*		
^{239}Pu		*	*	4.6E+03	*		
^{241}Am		*	*	8.2E+03	*		
^{244}Cm		*	*	2.1E+05	*		

D L = Detection limit

Table 2.11.2. Organic analytical data hits for tank T-4

Parameter	CRQL (µg/L)	L44	L45	S46	L111	RCRA limit (µg/L)	CRQL (µg/kg)
			DAI-GC analysis (L=µg/L, S=µg/kg)				
Acetone		7,000	8,000		7,000		
Ethyl alcohol		37,000	37,000		37,000		
I-Propyl alcohol		3,000	3,000		3,000		
Methyl alcohol		46,000	27,000		42,000		
N-Butyl		3,000	6,000		3,000		
			Volatile organic compound analysis (L=µg/L, S=µg/kg)				
2-Hexanone	10		20				
4-Methyl-2-pentanone	10	11	10				
Acetone	10	400 BE	220 BE		72 B		
Benzene	5	7	10		7	500	
Bromodichloromethane	5	7 B					
Chlorobenzene	5		4 J			100,000	
Chloroform	5	170 B	160 B		120 B	6,000	
Ethylbenzene	5	20	20		5		
Methylene chloride	5	12 B	14 B		12 B		
Toluene	5	78 B	99 B		60 B		
Trichloroethene	5		3 J			500	
Xylene (total)	5		170		36		
			Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Di-n-butylphthalate				3,400 J			330
Diethylphthalate				2,400 J			330

CRQL = contract required quantitation limit

2.12 TANK T-9

2.12.1 Tank Description

Tank T-9 is a 25,000-gal carbon steel tank located in the Melton Valley at the OHF. The underground tank was installed at the site in 1963 to store LLLW for mixing into grout for waste injection by hydrofracture.

2.12.2 Characterization Summary

2.12.2.1 Aqueous liquid

The results for Tank T-9 are shown in Tables 2.12.1 and 2.12.2. Tank T-9 did not contain appreciable concentrations of either volatile or semivolatile organic compounds, except for 17 mg/L of methanol determined by DAI-GC. Sample L47 contained 400 μg/L of benzoic acid and 200 μg/L of benzyl alcohol. TBP at 30 mg/L was the main TIC.

2.12.2.2 Sludge

Only phthalates were determined as TCL constituents in the sludge; TBP was determined as a TIC at 2 mg/kg.

Samples from tanks TH-2, TH-3, and W-11 were each processed together.

Table 2.12.1. Analytical data for tank T-9

Parameter	D L (mg/L)	L47	L48	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		10.34	NA		
Depth (inches)		6.5	NA		
Suspended solids (mg/mL)	0.1	0.7	NA		
TDS (mg/mL)	0.1	41.5	NA		
TOC (L=mg/L, S=mg/kg)	1.0	850	7620		
TS (L=mg/mL, S=mg/g)	0.1	42.2	343		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	0.01	0.21	5	100
As	0.40	<0.8	<2	5	100
Ba	0.02	0.12	115	100	2000
Cd	0.01	<0.02	7.8	1	20
Cr	0.10	0.4	(<10)	5	100
Hg	0.005	3.4	39	0.2	4
Ni	0.10	<0.2	390	NA	NA
Pb	0.50	<1	(540)	5	100
Se	0.05	<0.09	(<2)	1	20
Tl	0.05	<0.09	<2	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	9.76	NA		
U	0.1	852	2930		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	290	3%		
F^-	1.0	1.0	<0.7%		
NO_3^-	5.0	110	•		
PO_4^{-2}	5.0	<5	•		
SO_4^{-2}	5.0	37	6.8%		
		Alkalinity			
CO_3^{-2} (mol)	0.01	<0.01	•		
HCO_3^- (mol)	0.01	0.03	•		
pH (units)	0.1	9.1	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		7.0E+02	1.5E+05		
Gross beta		3.4E+05	1.6E+07		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		2.9E+05	4.0E+05		
^{14}C		•	2.2E+03		
^{152}Eu		•	3.5E+04		
^{154}Eu		•	8.9E+03		
^{3}H		1.6E+02	3.4E+01		
^{60}Co		6.0E-03	4.3E+04		
^{90}Sr		3.6E+04	1.4E+07		

Table 2.12.1 (continued)

Parameter	D L (mg/L)	L47	L48	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		6.6E+02	4.4E+03		
^{238}Pu		•	1.0E+04		
^{239}Pu		•	4.3E+03		
^{244}Cm		•	9.7E+04		
^{252}Cf		•	<2		

D L = Detection limit

Table 2.12.2. Organic analytical data hits for tank T-9

Parameter	CRQL (µg/L)	L47	S48	RCRA limit (µg/L)	CRQL (µg/kg)
		DAI-GC analysis (L=µg/L, S=µg/kg)			
Methyl alcohol		17,000			
		Volatile organic compound analysis (L=µg/L, S=µg/kg)			
1,1-Dichloroethene	5	2 J		700	
Acetone	10	23 B			
Benzene	5	11		500	
Carbon disulfide	5	4 J			
Chlorobenzene	5	6		100,000	
Chloroform	5	13 B		6,000	
Methylene chloride	5	600 BE			
Toluene	5	19 B			
Trichloroethene	5	5 J		500	
		Semivolatile compound analysis (L=µg/L, S=µg/kg)			
Benzoic acid	50	340 J			
Benzyl alcohol	10	160 J			
Di-n-butylphthalate	10		3,700 J		330
Diethylphthalate	10		3,000 J		330

CRQL = contract required quantitation limit

2.13 TANK TH-1

2.13.1 Tank Description

Tank TH-1 is a 2500-gal stainless steel tank located in the Bethel Valley central laboratory area south of Building 3503. The underground tank was installed in 1948 and received waste from the thorium pilot plant project in Building 3503.

2.13.2 Characterization Summary

2.13.2.1 Aqueous liquid

The results for Tank TH-1 are shown in Tables 2.13.1 and 2.13.2. The samples from this tank were not significantly different from the blank. The TOC was among the lowest determined. None of the SVOA extracts was submitted for GC-MS because the GC screening did not reveal any constituents different from the blank. A precipitate was formed when sodium hydroxide was added to sample L50, and it was difficult to increase the pH above 10 even when concentrated sodium hydroxide solution was employed.

Table 2.13.1. Analytical data for tank TH-1

Parameter	D L (mg/L)	L49	L50	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.034	1.034		
Depth (inches)		4	10		
Suspended solids (mg/mL)	0.1	<0.1	<0.1		
TDS (mg/mL)	0.1	44.4	43.6		
TOC (L=mg/L, S=mg/kg)	1.0	26.0	22.0		
TS (L=mg/mL, S=mg/g)	0.1	41.3	35.5		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	0.003	0.005	5	100
As	0.40	<4	<4	5	100
Ba	0.02	<0.2	0.23	100	2,000
Cd	0.01	<0.2	<0.2	1	20
Cr	0.10	1.2	1.4	5	100
Hg	0.005	16	16	0.2	4.0
Ni	0.10	1.5	1.7	NA	NA
Pb	0.50	<2	2.2	5	100
Se	0.05	<0.09	<0.09	1	20
Tl	0.05	<0.09	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	35.3	38.3		
U	0.1	0.5	0.4		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	<1	<1		
Cn	0.01	<0.04	<0.10		
F^-	1.0	<1	<1		
NO_3^-	5.0	1,400	1,300		
PO_4^{-2}	5.0	<250	<250		
SO_4^{-2}	5.0	<250	<250		
		Alkalinity			
H+ (mol)	0.01	0.41	0.40		
pH (units)	0.1	1.8	1.8		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		3.9E+02	4.2E+02		
Gross beta		3.2E+04	3.9E+04		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		9.0E+03	9.1E+03		
^{14}C		5.0E-01	5.0E-01		
^{3}H		5.0E+00	4.9E+00		
^{60}Co		<20	<20		
^{90}Sr		1.0E+04	1.0E+04		
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		7.5E+01	8.8E+01		
^{238}Pu		<6	<5		
$^{238}Th/^{232}Th$		4.0E+01	5.1E+01		
^{239}Pu		<3	<3		
^{244}Cm		<2	<2		
^{252}Cf		<5	<4		

D L = Detection limit

Table 2.13.2. Organic analytical data hits for tank TH-1

Parameter	CRQL µg/L	L49	L50
Volatile organic compound analysis (L=µg/L, S=µg/kg)			
Acetone	10	18 B	15 B
Methylene chloride	5	6 B	6 B
Toluene	5	44 B	45 B

CRQL = contract required quantitation limit

2.14 TANK TH-2

2.14.1 Tank Description

Tank TH-2 is a 2400-gal stainless steel tank located in the Bethel Valley central laboratory area south of Building 3503. The underground tank was installed in 1952 and received waste from the thorium pilot plant project in Building 3503.

2.14.2 Characterization Summary

The results for this tank are shown in Tables 2.14.1 and 2.14.2.

2.14.2.1 Aqueous liquid

Two aqueous liquid samples, L131 and L132, were taken from tank TH-2. No sludge or organic layers were found. No TCL constituents were measured above the reporting limits (5–10 μ/L) except for toluene (6 μg/L in both samples). The toluene was also found in the blank (5 μg/L); thus, it cannot be attributed to the tank contents. The main TICs were iodomethane and trichloroflouromethane, but they also were found in the blank; thus, they cannot be positively ascribed to the tank contents. Only in L132 were the TICs more concentrated (230 and 190 μg/L respectively) than in the blank (44 and 29 μg/L respectively). The very low results for the VOAs are consistent with the very low TOC content of 13.6 mg/L for L131 and 7.8 mg/L for L132.

Surrogate standard and matrix spike recoveries were generally good. One sample apparently had been double spiked with the surrogate standard. After correction for this mistake, the recoveries were very good. The matrix spike was omitted from the matrix spike duplicate sample, but the recoveries of the first matrix spike were very good. The blank was clean.

No compounds were detected in the major VOA compounds analysis. Matrix spike recoveries were very good, and the blank was clean.

No TCL constituents measured above the reporting limits (250–1300 μg/L) in either sample in the SVOA, although 52 μg/L of 2-chlorophenol was estimated in sample L132. Neither sample had TICs. The surrogate standard and matrix spike recoveries all were very good, and the blank was clean.

Table 2.14.1. Analytical data for tank TH-2

Parameter	D L (mg/L)	L131	L132	RCRA limits (µg/L)	RCRA limits (µg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		0.9989	1.0002		
IC (mg/L)	0.1	<0.1	0.2		
TC (mg/L)	1.0	13.6	8.0		
TDS (mg/mL)	0.1	4.9	5.0		
TOC (L=mg/L, S=mg/kg)	1.0	13.6	7.8		
TS (L=mg/mL, S=mg/g)	0.1	5.1	5.3		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.2	<0.2	5	100
As	0.40	<2	<2	5	100
Ba	0.02	<0.1	<0.1	100	2000
Cd	0.01	0.083	<0.08	1	20
Cr	0.10	0.80	0.68	5	100
Hg	0.005	2.8	2.7	0.2	4
Ni	0.10	0.58	0.43	NA	NA
Pb	0.50	1.9	2.1	5	100
Se	0.05	<1	<1	1	20
Tl	0.05	<0.5	<0.5	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
B	NA	<0.7	<0.7		
Si	1.0	<1	<1		
Th	NA	1.68	1.71		
U	0.1	<8	<8		
		Anions (L=mg/L, S=mg/kg)			
Br^-	1.0	1510	1510		
Cl^-	1.0	18	18		
Cy^-	0.01	0.28	0.22		
F^-	1.0	17	17		
NO_3^-	5.0	<10	<10		
PO_4^{-2}	5.0	<10	<10		
S_2	1.0	<0.1	<0.1		
SO_4^{-2}	5.0	26	26		
		Alkalinity			
H+ (mol)	0.01	0.056	0.056		
pH (units)	0.1	244 (212)	2.46		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		87.6 (58)	84.5		
Gross beta		9280 (8690)	9450 (8730)		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		2710 (2730)	2740 (2640)		
^{14}C		2350	<1		
^{3}H		2.34	2.39		
^{60}Co		4 (3.6)	<3 (2.2)		
^{90}Sr		2820 (2780)	2920 (2720)		

Table 2.14.1 (continued)

Parameter	D L (mg/L)	L131	L132	RCRA limits (µg/L)	RCRA limits (µg/kg)
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{232}U		ND	5		
^{233}U		15	17		
^{238}Pu		ND	ND		
$^{239}Pu/^{240}Pu$		ND	ND		
^{241}Am		ND	ND		
^{244}Cm		ND			

D L = Detection limit

Table 2.14.2. Organic analytical data hits for tank TH-2

Parameter	CRQL (µg/L)	L131 (µg/L)	L132 (µg/L)
	Volatile organic compound analysis		
Toluene	5	6	6
	Semivolatile compound analysis		
2-Chlorophenol	10		52

CRQL = contract required quantitation limit

2.15 TANK TH-3

2.15.1 Tank Description

Tank TH-3 is a 3300-gal stainless steel tank located in the Bethel Valley central laboratory area south of Building 3503. The underground tank was installed in 1952 and received waste from the thorium pilot plant project in Building 3503.

2.15.2 Characterization Summary

The results for this tank are shown in Tables 2.15.1 and 2.15.2.

2.15.2.1 Aqueous liquid

These samples were very similar to those drawn from tank TH-1. The lack of significant levels of organic compounds is reflected by the low TOC values, viz., 6.1, 5.1, and 0.8 mg/L for L52, L53, and L113, respectively. A precipitate formed during the basic pH adjustment of L53, and achieving pH > 10 for the base/neutral extraction was difficult.

The absence of detectable compounds in L113, a blank submitted blind as a regular sample, is a good check of the entire handling, preparation, and analytical procedures for contamination. The toluene VOA matrix spike was not recovered, but the perdeuterated toluene surrogate standard was recovered well.

Table 2.15.1. Analytical data for tank TH-3

Parameter	D L (mg/L)	L52	L53	L113	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data				
Density (g/mL)		1.015	1.015	1000		
Depth (inches)		2.5	5	NA		
Suspended solids (mg/mL)	0.1	<0.1	<0.1	0.1		
TDS (mg/mL)	0.1	18.0	18.6	<0.1		
TOC (mg/L)	1.0	6.1	5.1	0.8		
TS (mg/mL)	0.1	15.1	15.6	0.1		
		RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	<0.002	<0.01	<0.002	5	100
As	0.40	<2.1	<2.1	<02	5	100
Ba	0.02	0.89	0.86	<0.1	100	2000
Cd	0.01	<0.08	<0.08	<0.08	1	20
Cr	0.10	202	2.2	<0.1	5	100
Hg	0.005	11	9	<0.01	0.2	4
Ni	0.10	2.6	2.5	<0.2	NA	NA
Pb	0.50	1.9	2.2	<1.4	5	100
Se	0.05	<0.09	<0.5	<0.09	1	20
Tl	0.05	<0.09	<0.5	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)				
Si	1.0	15.7	18.2	3.23		
U	0.1	<0.1	<0.1	<0.1		
		Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	<1	<1	<1		
Cn	0.01	<0.04	<0.04	<0.05		
F^-	1.0	<1	<1	<1		
NO_3^-	5.0	510	500	<5		
PO_4^{-2}	5.0	<50	<50	<5		
SO_4^{-2}	5.0	<50	<50	<5		
		Alkalinity				
H+ (mol)	0.01	0.17	0.18	•		
pH (units)	0.1	1.8	1.8	6.6		
		Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		1.5E+02	1.4E+02	<1		
Gross beta		3.2E+04	3.0E+04	<20		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		7.7E+03	8.4E+03	<27		
^{14}C		•	•	2.0E-01		
^{3}H		2.6E+00	9.4E+00	1.7E-01		
^{60}Co		<20	<20	<20		
^{90}Sr		8.8E+03	8.7E+03	7.2E-01		
		Alpha emitters (L=Bq/mL, S=Bq/g)				
^{233}U		2.6E+01	7.1E+01	<1		
^{238}Pu		<2	<1	<1		
$^{238}Th/^{232}Th$		1.7E+01	1.5E+01	<1		
^{239}Pu		<1	<1	<1		
^{244}Cm		<1	<1	<1		
^{252}Cf		<2	<2	•		

D L = Detection limit

Table 2.15.2. Organic analytical data hits for tank TH-3

Parameter	CRQL (μg/L)	L52	L53	L113	RCRA limit (μg/L)
	Volatile organic compound analysis (L=μg/L, S=μg/kg)				
Acetone	10	16 B	14 B	45 B	
Chlorobenzene	5			2 J	100,000
Methylene chloride	5	8 B	6 B	4 JB	
Toluene	5	7 B	65 B		
	Semivolatile compound analysis (L=μg/L, S=μg/kg)				
Bis(2-ethylhexyl)phthalate	5		79 J		

CRQL = contract required quantitation limit

2.16 TANK TH-4

2.16.1 Tank Description

Tank TH-4 is a 14,000-gal Gunite tank located in the Bethel Valley central laboratory area south of Building 3503. The underground tank was installed in 1952 and received waste from the thorium and uranium pilot plant development projects in Building 3550.

2.16.2 Characterization Summary

Results for this tank are shown in Tables 2.16.1 and 2.16.2.

2.16.2.1 Aqueous liquid

The aqueous samples from tank TH-4 were processed together. There was an insufficient amount of sample L117 for the SVOA extractions, so this sample received only the DAI-GC and VOA characterization.

The DAI-GC analysis indicated that the aqueous liquids contained methanol, acetone, 2-butanone, and 4-methyl-2-pentanone at high concentrations. VOA confirmed the presence of acetone, 4-methyl-2-butanone, and benzene; did not confirm the presence of 4-methyl-2-pentanone; and did not detect methanol. The lower quantitative results for acetone and 4-methyl-2-pentanone are probably because of the reduced purging efficiency of these species when present at milligram-per-liter levels.

Among the volatile TICs was di-isopropylether at 20 μg/L, 1000 μg/L, 1000 μg/L, and 50 μg/L for L55, L56, L57, and L117, respectively.

Except for three two-ring and three-ring PAHs in L56, no semivolatile TCL organics were detected in the aqueous liquid samples. The major TIC was TBP, at 20 and 30 mg/L in L56 and L57, respectively.

2.16.2.2 Sludges

PAHs were found at milligram-per-kilogram concentrations in the sludges. TBP also was found as a TIC at 2 mg/kg in both sludges.

The sludges were hard to dry, even with an approximately fourfold-mass excess of sodium sulfate. However, the surrogate standard recoveries were good, except for nitrobenzene, which was usually recovered poorly, possibly because of evaporative loses during solvent concentration by nitrogen blowdown.

Except for the sludges, the samples for tanks W-5, W-6, and W-7 were each processed as a group.

Table 2.16.1. Analytical data for tank TH-4

Parameter	D L (mg/L)	L55	L56	L57	S58	S59	L116	L117	RCRA limits (mg/L)	RCRA limits (mg/kg)
Physical properties and miscellaneous data										
Density (g/mL)		1.003	1.056	1.083	NA	NA	1.000	1.007		
Depth (inches)		4	39	72	NA	NA	0	6		
Suspended solids (mg/mL)	0.1	0.1	<0.1	0.3	NA	NA	<0.1	0.1		
TDS (mg/mL)	0.1	1.4	70.6	103.8	NA	NA	<0.1	0.5		
TOC (L=mg/L, S=mg/kg)	1.0	19.4	352	2,170	6,940	7,530	1,406	31.6		
TS (L=mg/mL, S=mg/g)	0.1	1.5	70.6	104.1	256	405	<0.1	0.6		
RCRA metals (L=mg/L, S=mg/kg)										
Ag	0.002	<0.002	<0.002	<0.005	0.068	0.15	<0.002	•	5	100
As	0.40	<2	<4	<10	(4.6)	(2.1)	<2	<5	5	100
Ba	0.02	<0.02	<0.2	<0.6	5.6	(12)	<0.02	<0.3	100	2,000
Cd	0.01	<0.06	<0.2	<0.5	<0.3	0.37	<0.06	<0.2	1	20
Cr	0.10	<0.1	1.6	5.6	(72)	(290)	<0.1	<0.4	5	100
Hg	0.005	<0.01	0.25	0.04	3.6	4.9	<0.01	<0.05	0.2	4
Ni	0.10	<0.1	<1	<3	16	20	<0.1	<0.5	NA	NA
Pb	0.50	<2	<2	<5	38	99	<2	<4	5	100
Se	0.05	<0.1	<0.1	<0.2	(<0.4)	(<0.2)	<0.1	<3	1	20
Tl	0.05	<0.09	<0.09	<0.2	<0.4	<0.2	<0.09	<4	NA	NA
Process metals (L=mg/L, S=mg/kg)										
Si	1.0	0.95	3.3	2.66	NA	NA	0.57	1.52		
U	0.1	15.3	7,230	16,700	4,530	2,590	0.84	24		
Anions (L=mg/L, S=mg/kg)										
Cl^-	1.0	8.2	140	160	<0.4%	370	1.7	6.9		
Cn	0.01	<0.07	•	•	•	0.16	<0.05	91		
F^-	1.0	2.0	86	80	<0.4%	960	1.3	5.7		
NO_3^-	5.0	1,300	25,000	31,000	•	•	49	1.0		
PO_4^{-2}	5.0	<50	<2,500	<2,500	•	•	6.6	550		
SO_4^{-2}	5.0	140	83,000	14,000	4.8%	0.47%	17	<50		

Table 2.16.1 (continued)

Parameter	D L (mg/L)	L55	L56	L57	S58	S59	L116	L117	RCRA limits (mg/L)	RCRA limits (mg/kg)
					Alkalinity					
CO_3^{-2} (mol)	0.01	<0.01	<0.01	0.02	•	•	<0.01	•		
H+ (mol)	0.01	•	•	•	•	•	•	<0.02		
HCO_3^- (mol)	0.01	•	•	•	•	•	•	<0.01		
OH^- (mol)	0.01	<0.01	<0.02	0.02	•	•	<0.02	•		
pH (units)	0.01	6.9	7.1	7.8	NA	NA	7.1	6.9		
					Radiochemical screening (L=Bq/mL, S=Bq/g)					
Gross alpha		<20	1.1E+02	1.6E+02	1.7E+03	2.9E+03	<20	<20		
Gross beta		<10	3.7E+02	7.0E+02	7.0E+03	9.9E+03	<20	<20		
					Beta/gamma emitters (L=Bq/mL, S=Bq/g)					
^{137}Cs		7.4E+00	1.8E+02	2.4E+02	3.9E+02	4.2E+02	5.4E-01	3.6E+00		
^{14}C		5.0E-03	•	•	•	•	•	•		
^{3}H		3.0E-02	5.0E-02	•	1.3E+01	2.2E+01	3.0E-03	•		
^{60}Co		<20	2.2E-01	3.7E-01	3.0E+00	4.5E+00	<20	<20		
^{90}Sr		1.4E-01	2.5E+01	2.0E+01	1.9E+03	2.2E+03	3.0E-02	4.6E-01		
					Alpha emitters (L=Bq/mL, S=Bq/g)					
^{233}U		<0.2	<0.3	<0.4	<25	1.2E+03	<0.2	<0.2		
^{238}Pu		<0.2	<0.3	<0.4	<180	<2	<0.2	<0.2		
$^{238}Th/^{232}Th$		•	•	•	1.9E+02	4.4E+02	1.3E-01	1.3E-01		
^{239}Pu		<0.2	<0.3	<0.4	4.2E+01	1.3E+02	<0.2	<0.2		
^{244}Cm		<0.2	<0.3	<0.4	<55	<124	<0.2	<0.2		
^{252}Cf		<0.2	<0.3	<0.4	<239	<310	<0.2	<0.2		

D L = Detection limit

Table 2.16.2. Organic analytical data hits for tank TH-4

Parameter	CRQL µg/L	L55	L56	L57	L57B	S58	S59	L116	L117	RCRA limit (µg/L)	CRQL (µg/kg)
DAI-GC analysis (L=µg/L, S=µg/kg)											
Acetone			22,000								
Methyl I-butyl ketone			15,000								
Methyl alcohol		13,000	27,000	12,000					20,000		
Methyl ethyl ketone			2,000								
N-Butyl alcohol			20,000								
Volatile organic compound analysis (L=µg/L, S=µg/kg)											
2-Butanone	10		85					298 B	9 B		
4-Methyl-2-pentanone	10		2,682 BE	397 BE	179 B			150 B	16 B		
Acetone	10	22 B	630 BE	71 B	54 B						
Benzene	5	3	149	115	118			10	21	500	
Carbon tetrachloride	5		11								
Chlorobenzene	5							8	4	100,000	
Chloroform	5	5	11	7	5				210 B	6,000	
Methylene chloride	5	8 B	8 B	7 B	6 B			6 B	79 B		
Toluene	5	4 B	18 B	21 B	23 B			13 B		500	
Trichloroethene	5							5			
Xylene (total)	5			10	22						
Semivolatile compound analysis (L=µg/L, S=µg/kg)											
Acenaphthene	10		42 J			4,600 J	6,700				330
Anthracene	10					2,600					330
Benzo(a)anthracene	10					6,300	5,800				330
Benzo(a)pyrene	10					4,300 J					330
Benzo(b)fluoranthene	10					5,600	8,100				330
Benzo(g,h,i)perylene	10					3,400 J					330
Bis(2-ethylhexyl)phthalate	10					20,000	26,000				330
Chrysene	10					6,800	6,200				330

Table 2.16.2 (continued)

Parameter	CRQL µg/L	L55	L56	L57	L57B	S58	S59	L116	L117	RCRA limit (µg/L)	CRQL (µg/kg)
Semivolatile compound analysis (µg/L) (continued)											
Di-n-butylphthalate	10					17,000	13,000				330
Dibenzofuran	10						4,100 J				330
Fluoranthene	10					23,000	20,000				330
Fluorene	10					2,800 J	3,700 J				330
Indeno(1,2,3-cd)pyrene	10					3,600 J					330
Naphthalene	10		110 J			8,400	17,000				330
Phenanthrene	10		56 J			26,000	30,000				330
Pyrene	10					18,000	21,000				330

CRQL = contract required quantitation limit

2.17 TANK WC-1

2.17.1 Tank Description

Tank WC-1 is a 2150-gal stainless steel tank located in the Isotopes Circle area of the Bethel Valley main laboratory area. The underground tank was installed in 1950 to collect LLLW from isotope production and development.

2.17.2 Characterization Summary

The results from this tank are shown in Tables 2.17.1 and 2.17.2.

2.17.2.1 Aqueous liquid

Two aqueous liquids samples, L124 and L134, were collected from this tank.

Two TCL constituents, methylene chloride and carbon disulfide, were detected in L134 at levels below the reporting limits. Methylene chloride was also detected in the blank at a comparable level. The carbon disulfide was very low (estimated at 3 μg/L). Two unknown TICs were detected at a total of 44 μg/L in L134. These results are consistent with the low TOC found in these samples (35 mg/L for L124 and 38 mg/L for L134).

The recoveries of both the surrogate standards and the matrix spike were very low (<14%) for these samples. The most likely cause is leakage in the new purge-and-trap apparatus used in the glove box. These samples will be rechecked after the apparatus is leak-checked and its performance is verified with the control samples.

No volatile organic compounds were detected in these samples. Matrix spikes were good, and the blanks were clean. These results support VOA findings.

No TCL constituents were found in either sample. Thirteen TICs totaled 13,000 μg/L in sample L134. Surrogate standard recoveries were good (but tribromophenol was above quality control limits for water), and matrix spike recoveries were good except for phenol, 2-chlorophenol, 1,4-dichlorobenzene, and 1,2,4-trichlorobenzene in the matrix spike duplicate. The blank was clean.

Table 2.17.1. Analytical data for tank WC-1

Parameter	D L (mg/L)	L124	L134	L134S	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data			
Density (g/mL)		0.9750	0.9760	NA		
IC (L=mg/L, S=mg/kg)	0.1	32	23	560		
TC (L=mg/L, S=mg/kg)	1.0	67	61	9930		
TDS (mg/mL)	0.1	<1	<1	NA		
TOC (L=mg/L, S=mg/kg)	1.0	35	38	9370		
TS (L=mg/mL, S=mg/g)	0.1	<1	<1	NA		
			RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.04	0.33	<40	5	100
As	0.40	1.3	2.0	<300	5	100
Ba	0.02	<0.02	93	927	100	2,000
Cd	0.01	<0.02	0.10	4.0	1	20
Cr	0.10	<0.02	2.9	112	5	100
Hg	0.005	<2	<2	193	0.2	4
Ni	0.10	<0.1	<0.1	10	NA	NA
Pb	0.50	<0.2	61	771	5	100
Se	0.05	2.4	<0.02	<20	1	20
Tl	0.05	<0.1	<0.1	<90	NA	NA
			Process metals (L=mg/L, S=mg/kg)			
B	NA	<0.04	<0.04	<40		
Si	1.0	10	90	NA		
Th	NA	<0.3	<0.3	<200		
U	0.1	<2	<2	<100		
			Anions (L=mg/L, S=mg/kg)			
Br^-	1.0	<10	<10	<495		
Cl^-	1.0	113	114	220		
Cy^-	0.01	<0.05	<0.05	0.33		
F^-	1.0	0.60	0.70	75		
NO_3^-	5.0	<10	<10	3,680		
PO_4^{-2}	5.0	<10	<10	<99		
S_2	1.0	<0.1	1.4	0.99		
SO_4^{-2}	5.0	196	204	449		
			Alkalinity			
pH (units)	0.1	8.25 (6.50)	7.46 (6.39)	NA		
			Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		5 (<50)	286 (1,560)	8.07E+04 (8.62E+04)		
Gross beta		64,200 (68,600)	73,000 (110,000)	1.09E+06 (1.36E+05)		

Table 2.17.1 (continued)

Parameter	D L (mg/L)	L124	L134	L134S	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		59,200 (58,000)	61,700 (56,500)	2.69E+05 (2.73E+05)		
^{14}C		276	375	1.88E+04		
^{152}Eu		<30	<30	<2.68E+02 (<1.86E+03)		
^{154}Eu		<30	<30	4.12E+03 (4.66E+03)		
^{155}Eu		<150	<150	3.16E+03 (4.12E+03)		
^{241}Am		<300	131 (<300)	1.57E+04 (1.73E+04)		
^{3}H		1,600	1,590	4.30E+02		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g) (continued)				
^{60}Co		767 (852)	432 (594)	1.30+05 (1.29E+05)		
^{90}Sr		1,290 (1,270)	1,420 (3,310)	3.03E+05 (4.03E+05)		
		Alpha emitters (L=Bq/mL, S=Bq/g)				
^{232}U		ND	ND	ND		
^{233}U		ND	ND	ND		
^{238}Pu		ND	1110	4.06E+04		
$^{239}Pu/^{240}Pu$		ND	ND	ND		
^{241}Am		ND	200	3.48E+04		
^{244}Cm		ND	251	1.08E+04		

D L = Detection limit

Table 2.17.2. Organic analytical data hits for tank WC-1

Parameter	CRQL (µg/L)	L124	L134	RCRA limit (µg/L)	CRQL (µg/kg)
	Volatile organic compound analysis (L=µg/L, S=µg/kg)				
Carbon disulfide	5		3	5	
Chloroform	5		1	5	6000
Methylene chloride	5	240	160	5	
	Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Butylbenzylphthalate	10		190 J[a]	10	

[a]Inadvertently omitted from the original analysis report, ORNL/ER-19.
CRQL = contract required quantitation limit

2.18 TANK WC-15

2.18.1 Tank Description

Tank WC-15 is a 1000-gal stainless steel tank located in the Building 4500 area of the Bethel Valley main laboratory area. The underground tank was installed in 1951 to collect LLLW from the Building 4500 research laboratories.

2.18.2 Characterization Summary

The results for this tank are shown in Tables 2.18.1 and 2.18.2.

2.18.2.1 Aqueous liquid

The samples from this tank consisted of three aqueous liquids (L126, L127, L128) and a thin oil layer (O130) that appeared much like 90-weight oil. These samples had very low levels of radioactivity. Because of the low radioactivity of these samples, the aqueous liquids were not prepared offline by remote purge-and-trap in a glove box, but rather they were prepared by direct purge-and-trap GC-MS. TCL constituents measured included traces of methylene chloride and 1,1,1-trichloroethane (also found in the blank) and traces of 1,2-dichloroethene (14–15 μg/L). Carbon disulfide in L128 (estimated at 1 μg/L) was essentially insignificant. All three samples contained the TIC ethyl ether (~15–17 μg/L), and L128 also exhibited two unknown TICs totalling 9 μg/L. These very low concentrations of volatile organic compounds are consistent with the low TOC determinations of 21 mg/L, 19 mg/L, and 24 mg/L for L126, L127, and L128, respectively. Surrogate standard recoveries were all within quality control limits, but the holding time for groundwater samples exceeded the time allowed by 7 d.

The oil sample did not contain TCL compounds or TICs detectable by the VOA; this indicates that it is a relatively heavy oil devoid of volatile organic matter. It apparently does not have an appreciable solubility in the aqueous layer.

No major volatile organic compounds were detected in the aqueous samples. Major VOA is not appropriate for the oil layer, and that sample was not analyzed. Matrix spike recoveries were good, and the blank was clean.

SVOA did not reveal any TCL constituents or TICs for the aqueous samples. The oil layer did have one TCL, di-n-butylphthalate, at 1900 μg/L. The essentially hydrocarbon nature of the oil is suggested by the 15 unknown hydrocarbon TICs totalling ~189,000 μg/kg, the 3 unknown TICs totally ~39,000 μg/kg, and the 2 TICs apparently consisting of brominated benzene derivatives (possibly bromodiethyl benzenes), all of which added up to ~14,000 μg/kg. The sum of the TCL constituents and the TICs is ~243,800 μg/kg (~0.02 wt %). The bulk of the GC-MS profile was a large unresolved hump (typical of heavy oil).

The surrogate standard and matrix spike recoveries were all good except for the slightly low 2-fluorobiphenyl in L-127 and the lack of recovery of 4-nitrophenol in both the matrix spike and matrix spike duplicate. The blank was clean.

Negative ion, chemical ionization GC-MS was used to examine the oil sample (O-130) for PCBs and polybrominated biphenyls. Neither were detected. However, chlorinated aromatic compounds were detected, and these would explain the response observed in the PCB analysis. Identification of these chlorinated compounds is continuing.

Table 2.18.1. Analytical data for tank WC-15

Parameter	D L (mg/L)	L126	L127	L128	O130	RCRA limits (mμg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data				
Density (g/mL)		0.950	0.9610	0.9620	0.9570		
IC (mg/L)	0.1	98	99	102	100		
TC (mg/L)	1.0	119	118	126	435		
TDS (mg/mL)	0.1	<1	<1	<1	<1		
TOC (mg/L)	1.0	21	19	24	335		
TS (mg/mL)	0.1	<1	<1	<1	<1		
			RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	<1	0.22	0.16	<1.0	5	100
As	0.40	<8	<8	<8	<8	5	100
Ba	0.002	0.10	0.03	0.08	0.05	100	2000
Cd	0.01	<0.5	<0.5	<0.5	<0.5	1	20
Cr	0.10	<0.5	<0.5	0.3	<0.5	5	100
Hg	0.005	<2	<2	<2	<2	0.2	4
Ni	0.10	0.11	<2	0.11	0.16	NA	NA
Pb	0.50	<5	<5	<5	<5	5	100
Se	0.05	0.58	0.05	0.3	<0.5	1	20
Tl	0.05	<2	<2	<2	<2	NA	NA
			Process metals (L=mg/L, S=mg/kg)				
B	NA	<1	<1	<1	<1		
Si	1.0	5.2	<2	<2	<2		
Th	NA	<7	<7	<7	<7		
U	0.1	1.4	3.7	<50	2.4		
			Anions (L=mg/L, S=mg/kg)				
Br^-	1.0	<10	<10	<10	<10		
Cl^-	1.0	89	87	89	85		
Cy^-	0.01	<0.005	<0.05	<0.05	<0.05		
F^-	1.0	1.2	1.2	1.2	1.2		
NO_3^-	5.0	<10	<10	<10	<10		
PO_4^{-2}	5.0	<10	<10	<10	<10		
S_2	1.0	<0.01	<0.01	0.2	1.3		
SO_4^{-2}	5.0	50	50	38	41		
			Alkalinity				
pH (units)	0.1	8.8 (8.52)	8.7 (8.50)	707 (8.53)	6.5 (8.39)		

Table 2.18.1 (continued)

Parameter	D L (mg/L)	L126	L127	L128	O130	RCRA limits (mμg/L)	RCRA limits (mg/kg)
			Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		0.89 (<1)	0.13 (<1)	0.43 (<1)	0.56 (<1)		
Gross beta		11.7 (<10)	10.3 (<10)	14.6 (<10)	15.4 (<10)		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		3.0 (<5)	3.1 (<5)	4.0 (<5)	3.5 (<5)		
^{14}C		<1	<1	33	95		
^{3}H		18.4	18.6	18.9	18.5		
^{60}Co		<0.2	<0.2	<0.2	<0.3		
^{90}Sr		1.40 (<10)	1.71 (<10)	1.93 (<10)	3.36(<10)		

D L = Detection limit

Table 2.18.2. Organic analytical data hits for tank WC-15

Parameter	CRQL μg/L	L126	L127	L128	O130	RCRA limit (μg/L)	CRQL (μg/kg)
		Volatile organic compound analysis (L=μg/L, S=μg/kg)					
1,1,1-Tricholoroethane	5	16					
1,2-Dichloroethene (total)	5	15[a]	15	14			
Carbon disulfide	5			1			
Chloroform	5	18				6000	
Methylene chloride	5						
		Semivolatile compound analysis (L=μg/L, S=μg/kg)					
Di-n-butylphthalate					1900 J		1100

[a]Did not appear in the RAP data base.
CRQL = contract required quantitation limit

2.19 TANK WC-17

2.19.1 Tank Description

Tank WC-17 is a 1000-gal stainless steel tank located in the Building 4500 area of the Bethel Valley main laboratory area. The underground tank was installed in 1951 to collect LLLW from the Building 4500 research laboratories.

2.19.2 Characterization Summary

The results for this tank are shown in Tables 2.19.1 and 2.19.2.

2.19.2.1 Aqueous liquid

This complex sample set, prepared as a group, consisted of three samples having an organic layer floating on an aqueous liquid, as well as two additional aqueous liquids. The activity of these samples was low enough that both the aqueous and organic layers could be subjected to purge-and-trap GC-MS in the GC-MS laboratory. Small volumes were diluted in water at the time of purge and trap because of the expected high concentrations of volatile organic compounds. There was insufficient sludge S106 for SVOA.

The main compounds identified in the VOA were acetone, benzene, methylene chloride, and xylene. However, considering the high blank levels, only xylene appears to be present in the sample at 50–80 μg/L. The reason for the high blank level is not known. The lack of detectable organic compounds in the DAI-GC supports the contention that most of the VOA results were blank-related.

In the SVOA, only phthalates were detected at levels similar to those in the blank.

Considering the elevated levels of compounds detected in the VOA blank, only styrene (at 5000 to 8000 μg/L) can be confidently identified in the organic layer. Trichloroethylene and vinyl acetate also were found, but in only one of the samples. SVOA detected only phthalates, which appear to be related to the blank. TICs were mostly unknown hydrocarbons, except for 1,1-biphenyl-2-o1 (200 mg/kg in all three organic layers). A low level of PCBs was determined in the organic layers. This appeared to be a mixture of Aroclors 1254 and 1260, with a total concentration of 29–33 mg/kg.

The samples from tanks W-13, W-14, W-15, and W-1A were each processed together.

Table 2.19.1. Analytical data for tank WC-17

Parameter	D L (mg/L)	L103	L104	L105	O101	O102	S106	RCRA limits (mg/L)	RCRA limits (mg/kg)
				Physical properties and miscellaneous data					
Density (g/mL)		0.989	1.005	1.004	0.996	0.999	NA		
Depth (inches)		6	14	26	0	1	NA		
Suspended solids (mg/mL)	0.1	0.4	0.4	<0.1	0.3	0.3	NA		
TDS (mg/mL)	0.1	309	153	0.4	0.3	0.4	NA		
TOC (L=mg/L, S=mg/kg)	1.0	0.7	0.5	127	191	143	•		
TS (L=mg/mL, S=mg/g)	0.1			0.3	0.6	0.7	122		
				RCRA metals (L=mg/L, S=mg/kg)					
Ag	0.002	(<0.001)	<0.001	<0.001	<0.001	<0.001	4.5	5	100
As	0.40	<2	<2	<2	<2	<2	(0.76)	5	100
Ba	0.02	0.17	0.18	0.14	0.19	0.15	1400	100	2000
Cd	0.01	<0.09	<0.09	<0.09	<0.09	<0.09	79	1	20
Cr	0.10	<0.1	<0.1	<0.1	<0.1	<0.1	(2000)	5	100
Hg	0.005	49	0.04	0.005	0.78	0.08	380	0.2	4
Ni	0.10	<0.6	<0.6	<0.6	<0.6	<0.6	270	NA	NA
Pb	0.50	<1	<1	<1	<1	<1	390	5	100
Se	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	1	200
Tl	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	(<0.5)	NA	NA
				Process metals (L=mg/L, S=mg/kg)					
Si	1.0	4.51	4.66	7.64	4.7	4.67	NA		
U	0.1	0.03	0.01	0.01	0.02	0.01	60.4		
				Anions (L=mg/L, S=mg/kg)					
Cl^-39	1.0	39	30	31	35	32	<50		
Cn	0.01	<0.06	0.06	<0.06	<0.06	0.06	•		
F^-	1.0	1.0	1.0	<1	<1	<1	<50		
NO_3^-	5.0	<5	15	16	8.2	13	•		
PO_4^{-2}	5.0	<5	<5	<5	<5	<5	<300		
SO_4^{-2}	5.0	89	82	91	99	98	<300		
				Alkalinity					
HCO_3^- (mol)	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	•		
pH (units)	0.1	7.6	7.6	7.9	7.6	7.6	NA		

Table 2.19.1 (continued)

Parameter	D L (mg/L)	L103	L104	L105	O101	O102	S106	RCRA limits (mg/L)	RCRA limits (mg/kg)
				Radiochemical screening (L=Bq/mL, S=Bq/g)					
Gross alpha		<10	<10	<10	<10	<10	2.7E+03		
Gross beta		<20	<20	<20	<20	<20	3.5E+03		
				Beta/gamma emitters (L=Bq/mL, S=Bq/g)					
^{137}Cs		1.3E+00	4.8E-01	9.7E-01	1.2E+00	1.3E-01	1.5E+01		
^{154}Eu		•	•	•	•	•	3.3E+00		
^{155}Eu		•	•	•	•	•	5.6E-01		
^{3}H		8.2E-01	1.6E-01	2.7E-01	9.4E-01	4.0E-01	9.1E+01		
^{60}Co		•	•	•	•	•	8.2E-01		
^{90}Sr		<1	<1	<1	<1	<1	2.9E+02		
				Alpha emitters (L=Bq/mL, S=Bq/g)					
^{238}Pu		•	•	•	•	•	4.3E+02		
$^{238}Th/^{232}Th$		•	•	1.6E-02	•	•	•		
^{239}Pu		•	•	•	•	•	6.2E+01		
^{241}Am		•	•	•	•	•	2.6E+02		
^{244}Cm		•	•	•	•	•	1.6E+03		
^{252}Cf		•	•	•	•	•	<3		

D L = Detection limit

Table 2.19.2. Organic analytical data hits for tank WC-17

Parameter	CRQL (µg/L)	L103AQ	L103ORG	L104AQ	L105AQ	RCRA limit (µg/L)	CRQL (µg/kg)
			Volatile organic compound analysis (L=µg/L, S=µg/kg)				
Acetone	10	170 B	6,400 B	150 B	130 B		
Benzene	5	10 JB	420 JB	10 JB	10 JB	500	
Methylene chloride	5	38 JB	5,300 B	44 JB	40 JB		
Styrene	5		7,500				
Trichloroethene							
Vinyl acetate							
Xylene (total)	5	50 J	2,500 B	59	50 J		
			Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Bis(2-ethylhexyl)phthalate	10	38 J					330
Di-n-butylphthalate	10	56 JB	68,000 JB (µg/kg)				330
Di-n-octylphthalate	10	93 JB		33 JB			330
			PCB analysis				
PCB (Aroclor-1254)			20,000 (µg/kg)				160
PCB (Aroclor-1260)			13,000 (µg/kg)				160

CRQL = contract required quantitation limit

2.20 TANK W-1

2.20.1 Tank Description

Tank W-1 is a 4800-gal Gunite tank located in the Bethel Valley North Tank Farm. The underground tank was constructed in 1943 and received LLLW from the Building 3019 Radiochemical Processing Facility.

2.20.2 Characterization Summary

The results from this tank are shown in Tables 2.20.1 and 2.20.2.

2.20.2.1 Aqueous liquid

No significant concentrations of TCL compounds were detected in the samples from this tank. This is consistent with the very low TOC, 6.4 and 10.1 mg/L for L7 and L8, respectively. Two aliquots from L7 underwent VOA. The VOA surrogate standard recoveries were very poor for the A aliquot (10–19%) but were good for the B aliquot. The latter should be considered the more accurate analysis.

Table 2.20.1. Analytical data for tank W-1

Parameter	D L (mg/L)	L7	L8	RCRA limits (mg/L)
		Physical properties and miscellaneous data		
Density (g/mL)		1.002	1.002	
Depth (inches)		4	9	
Suspended solids (mg/mL)	0.1	<0.1	<0.1	
TDS (mg/mL)	0.1	0.2	0.2	
TOC (mg/L)	~1.0	6.4	10.1	
TS (mg/mL)	0.1	0.2	0.2	
		RCRA metals (L=mg/L, S=mg/kg)		
Ag	0.002	<0.002	<0.002	5.0
As	2.0	<2	<2	5.0
Ba	0.2	0.13	0.11	100.0
Cd	0.04	<0.04	<0.04	1.0
Cr	0.1	<0.1	<0.1	5.0
Hg	0.01	<0.01	<0.01	0.2
Ni	0.6	<0.6	<0.6	NA
Pb	1.0	<1	<1	5.0
Se	0.09	<0.09	<0.09	1.0
Tl	0.09	(<0.09)	(<0.09)	NA
		Process metals (L=mg/L, S=mg/kg)		
Si		8.38	8.69	NA
U	0.1	<0.1	<0.1	NA
		Anions (L=mg/L, S=mg/kg)		
Cl^-	1.0	13	13	
Cn	~0.01	<0.06	<0.05	
F^-	1.0	6.1	6.2	
NO_3^-	5.0	32	32	
PO_4^{-2}	5.0	<5	<5	
SO_4^{-2}	5.0	47	47	
		Alkalinity		
CO_3^{-2} (mol)	0.01	<0.01	<0.01	
HCO_3^- (mol)	0.01	<0.01	<0.01	
pH (units)	0.1	7.9	8.0	
		Radiochemical screening (L=Bq/mL, S=Bq/g)		
Gross alpha		<3	<3	
Gross beta		8.7E+02	8.7E+02	
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)		
^{137}Cs		1.8E+01	1.8E+01	
^{3}H		3.9E+00	2.5E+00	
^{60}Co		<10	<10	

D L = Detection limit

Table 2.20.2. Organic analytical data hits for tank W-1

Parameter	CRQL (μg/L)	L7	L7B	L8
	Volatile organic compound analysis (L=μg/L, S=μg/kg)			
Methylene chloride	5		10 B	11 B
Toluene	5		5 B	11 B
	Semivolatile compound analysis (L=μg/L, S=μg/kg)			
Di-n-butylphthalate	10	9 J		8 J

CRQL = contract required quantitation limit

2.21 TANK W-1A

2.21.1 Tank Description

Tank W-1A is a 4000-gal stainless steel tank located in the Bethel Valley North Tank Farm. The underground tank was installed in 1951 and received waste from the Radiochemical Processing Facility (Building 3019) and the HRLAL (Buildings 3026 and 3019-B).

2.21.2 Characterization Summary

The results for this tank are shown in Tables 2.21.1 and 2.21.2.

2.21.2.1 Aqueous liquid

The results for this tank were very similar to the results for WC-15, WC-17, and W-1. DAI-GC determined 7 mg/L of methanol, and only very low levels of volatiles were detected by VOA. SVOA determined only a phthalate. TICs included C_4-benzenes (probably diethylbenzenes used in radiochemical extractions) at 5 mg/L and ethylphenylethanone at 3 mg/L.

The samples for tanks T-30 and 7562 were each processed together.

Table 2.21.1. Analytical data for tank W-1A

Parameter	D L (mg/L)	L1	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data		
Density (g/mL)		1.002		
Depth (inches)		2		
Suspended solids (mg/mL)	0.1	0.3		
TDS (mg/mL)	0.1	0.4		
TS (L=mg/mL, S=mg/g)	0.1	0.7		
		RCRA metals (L=mg/L, S=mg/kg)		
Ag	0.002	0.008	5	100
As	0.40	<4	5	100
Ba	0.02	<0.2	100	2000
Cd	0.01	7.3	1	20
Cr	0.10	0.33	5	100
Hg	0.005	0.96	0.2	4
Ni	0.10	<1	NA	NA
Pb	0.50	<2	5	100
Se	0.05	<0.09	1	20
Tl	0.05	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)		
Si	1.0	4.47		
U	0.1	477		
		Anions (L=mg/L, S=mg/kg)		
Cl^-	1.0	33		
Cn	0.01	<0.06		
F^-	1.0	1.0		
NO_3^-	5.0	<5		
PO_4^{-2}	5.0	<5		
SO_4^{-2}	5.0	58.0		
		Alkalinity		
HCO_3^- (mol)	0.01	<0.01		
pH (units)	0.1	8.8		
		Radiochemical screening (Bq/mL)		
Gross alpha		1.1E+03		
Gross beta		1.3E+03		
		Beta/gamma emitters (Bq/mL)		
^{134}Cs		4.6E+00		
^{137}Cs		1.4E+02		
^{3}H		2.6E+00		
^{60}Co		4.4E+00		
^{90}Sr		3.2E+02		
		Alpha emitters (Bq/mL)		
^{232}U		2.7E+02		
^{233}U		7.3E+02		
^{238}Pu		1.9E+01		
^{238}U		5.0E+00		
^{239}Pu		6.7E+01		
^{241}Am		5.4E+01		
^{244}Cm		9.0E+00		
^{252}Cf		<2		

D L = Detection limit

Table 2.21.2. Organic analytical data hits for tank W-1A

Parameter	CRQL (µg/L)	L1	RCRA limit (µg/L)
	DAI-GC analysis (L=µg/L, S=µg/kg)		
Methyl alcohol		7000	
	Volatile organic compound analysis (L=µg/L, S=µg/kg)		
Acetone	10	17 B	
Benzene	5	3 JB	500
Chlorobenzene	5	3 J	100,000
Ethylbenzene	5	4 J	
Methylene chloride	5	4 JB	
Toluene	5	63 B	
Trichloroethene	5	20 B	500
Xylene (total)	5	13	
	Semivolatile compound analysis (µg/L)		
Diethylphthalate	10	24 J	

CRQL = contract required quantitation limit

2.22 TANK W-2

2.22.1 Tank Description

Tank W-2 is a 4800-gal Gunite tank located in the Bethel Valley North Tank Farm. The underground tank was constructed in 1943 and received LLLW from the Building 3019 Radiochemical Processing Facility.

2.22.2 Characterization Summary

The results for this tank are shown in Tables 2.22.1 and 2.22.2.

2.22.2.1 Aqueous liquid

Neither sample contained significant levels of TCL constituents. This is consistent with the low TOCs of 18.9 mg/L for L11 and 22.6 mg/L for L118. These samples were collected in series and are useful as field duplicates, within normal sampling errors.

The acidic surrogate standard compounds were very poorly recovered from the aqueous liquids, suggesting that acidic compounds, if present in the samples, may not have been extracted or detected. The two chlorinated phenolic matrix spike compounds were also poorly recovered.

Table 2.22.1. Analytical data for tank W-2

Parameter	D L (mg/L)	L11	L118	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.002	1.003		
Depth (inches)		4	4		
Suspended solids (mg/mL)	0.1	<0.1	0.2		
TDS (mg/mL)	0.1	0.4	0.3		
TOC (mg/L)	1.0	18.9	22.6		
TS (mg/mL)	0.1	0.3	0.5		
		RCRA metals (mg/L)			
Ag	0.002	<0.002	<0.002	5	100
As	0.40	<2	<2	5	100
Ba	0.02	0.19	0.14	100	2000
Cd	0.01	<0.04	<0.04	1	20
Cr	0.10	<0.1	<0.1	5	100
Hg	0.005	<0.01	<0.01	0.2	4
Ni	0.10	<0.5	<0.6	NA	NA
Pb	0.50	1.1	<1	5	100
Se	0.05	<0.09	<0.09	1	20
Tl	0.05	(<0.09)	(<0.09)	NA	NA
		Process metals (mg/L)			
Si	1.0	4.94	4.5		
U	0.1	0.18	0.17		
		Anions (mg/L)			
Cl^-	1.0	7.2	7.6		
Cn	0.01	<0.05	<0.05		
F^-	1.0	9.2	9.9		
NO_3^-	5.0	<5	<5		
PO_4^{-2}	5.0	<5	<5		
SO_4^{-2}	5.0	15	15		
		Alkalinity			
CO_3^{-2} (mol)	0.01	<0.01	<0.01		
$HC)_3^-$ (mol)	0.01	<0.01	<0.01		
pH (units)	0.1	8.5	8.5		
		Radiochemical screening (Bq/mL)			
Gross alpha		<3	<3		
Gross beta		7.1E+02	7.4E+02		
		Beta/gamma emitters (Bq/mL)			
^{137}Cs		2.2E+01	2.0E+01		
^{3}H		1.5E+00	1.7E+00		
^{60}Co		<10	<10		

D L = Detection limit

Table 2.22.2. Organic analytical data hits for tank W-2

Parameter	CRQL (μg/L)	L11	L118
	Volatile organic compound analysis (μg/L)		
Methylene chloride	5	10 B	9 B
Toluene	5		15 B
	Semivolatile compound analysis (μg/L)		
Di-n-butylphthalate	10	10 J	

CRQL = contract required quantitation limit

2.23 TANK W-3

2.23.1 Tank Description

Tank W-3 is a 42,500-gal Gunite tank located in the Bethel Valley North Tank Farm. The underground tank was constructed in 1943 and received LLLW from the Building 3019 Radiochemical Processing Facility.

2.23.2 Characterization Summary

The results for this tank are shown in Tables 2.23.1 and 2.23.2.

2.23.2.1 Aqueous liquid

The analytical results for these samples, which were prepared as a group, are listed in Table 2.23. The major organic compound was methanol. DAI-GC also determined mg/L levels of acetone and 2-butanone that were not confirmed by VOA. Very low concentrations of other volatiles were detected by VOA. SVOA determined very low levels of phthalates that were not significantly different from those in the blank. PAHs were also detected in L18, which had a TOC approximately double that of the other two liquids. TBP was estimated at 30 mg/L as a TIC in L16, L17, and L18.

2.23.2.2 Sludge

As in other samples, somewhat higher levels of PAHs and phthalates were measured in the sludge. The latter were not significantly different in concentration from the blank. TBP was estimated at 4 mg/kg as a TIC.

Table 2.23.1. Analytical data for tank W-3

Parameter	D L (mg/L)	L16	L17	L18	S19	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data				
Density (g/mL)		1.004	1.006	1.009	NA		
Depth (inches)		4	60	106	NA		
Suspended solids (mg/mL)	0.1	<0.1	<0.1	<0.1	NA		
TDS (mg/mL)	0.1	2.9	4.6	8.6	NA		
TOC (L=mg/L, S=mg/kg)	1.0	772	1130	1500	3410		
TS (L=mg/mL, S=mg/g)	0.1	2.7	4.4	8.4	300		
			RCRA metals (L=mg/L, S=mg/kg)				
Ag	0.002	0.002	0.002	0.002	0.05	5	100
As	0.40	<4	<4	<4	(<2)	5	100
Ba	0.02	<0.2	<0.2	<0.2	(6.4)	100	2000
Cd	0.01	<0.2	<0.2	<0.2	0.52	1	20
Cr	0.10	3.3	6.8	20	1300	5	100
Hg	0.005	<0.01	0.01	0.02	0.83	0.2	4
Ni	0.10	<1	<1	<1	<7	NA	NA
Pb	0.50	<2	<2	<2	52	5	100
Se	0.05	<0.09	0.09	<0.09	(<0.3)	1	20
Tl	0.05	<0.09	<0.09	<0.09	<0.3	NA	NA
			Process metals (L=mg/L, S=mg/kg)				
Si	1.0	6.5	5.3	7.2	NA		
U	0.1	88	163	285	61300		
			Anions (L=mg/L, S=mg/kg)				
Cl^-	1.0	7.8	7.9	10.0	<100		
Cn	0.01	<0.08	<0.07	0.10	•		
F^-	1.0	<10	<10	<10	<100		
NO_3^-	5.0	<50	<50	<50	•		
PO_4^{-2}	5.0	490	600	800	<500		
SO_4^{-2}	5.0	280	430	620	<500		
			Alkalinity				
CO_3^{-2} (mol)	0.01	<0.01	0.02	0.05	•		
HCO_3^- (mol)	0.01	0.03	•	•	•		
pH (units)	0.1	9.0	10.1	11.1	NA		
			Radiochemical screening (L=Bq/mL, S=Bq/g)				
Gross alpha		6.0E+00	1.2E+01	1.7E+01	8.4E+03		
Gross beta		4.9E+02	6.7E+02	1.2E+03	1.5E+06		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)				
^{137}Cs		5.8E+02	8.4E+02	1.3E+03	4.7E+04		
^{154}Eu		•	•	•	7.6E+01		
^{3}H		6.9E-01	9.4E-01	1.1E+00	2.2E+00		
^{60}Co		<10	1.0E-01	2.6E-01	2.4E=01		
^{90}Sr		4.0E+01	6.4E=01	9.0E+01	1.5E+05		

Table 2.23.1 (continued)

Parameter	D L (mg/L)	L16	L17	L18	S19	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Alpha emitters (L=Bq/mL, S=Bq/g)				
^{233}U		<5	<5	<5	1.1E+03		
^{238}Pu		<5	<5	<5	1.7E+02		
^{238}U		•	•	•	4.3E+02		
^{239}Pu		<5	<5	<5	3.9E+03		
^{241}Am		•	•	•	2.6E+02		
^{244}Cm		<5	<5	<5	<10		
^{252}Cf		<5	<5	<5	<10		

D L = Detection limit

Table 2.23.2. Organic analytical data hits for tank W-3

Parameter	CRQL (µg/L)	L16	L17	L18	S20	RCRA limit (µg/L)
			DAI-GC analysis (L=µg/L, S=µg/kg)			
Acetone				7,000		
Methyl alcohol		38,000	40,000	20,000		
Methyl ethyl ketone				5,000		
N-Butyl alcohol				7,000		
			Volatile organic compound analysis (L=µg/L, S=µg/kg)			
4-Methyl-2-pentanone	10			18		
Acetone	10	2 JB	26 B	5 JB		
Benzene	5			4 J		
Chlorobenzene	5			8		100,000
Chloroform	5		1 J			6,000
Methylene chloride	5	4 JB	4 JB	3 JB		
Tetrachloroethene	5	6 B	8 B			700
Toluene	5	5 JB	14 B	37 B		
Trichloroethene	5	11 B	14 B	11 B		500
			Semivolatile compound analysis (L=µg/L, S=µg/kg)			
2-Nitrophenol	10			53 J		
Bis(2-ethylhexyl)phthalate	10				23 JB	330
Chrysene	10				4 J	330
Di-n-butylphthalate	10	60 J	48 J	230 J	47 JB	330
Di-n-octylphthalate	10	49 J	80 J			
Fluoranthene	10			56 J		
Phenanthrene	10			33 J	12 J	330
Pyrene	10			60 J		

CRQL = contract required quantitation limit

2.24 TANK W-4

2.24.1 Tank Description

Tank W-4 is a 42,500-gal Gunite tank located in the Bethel Valley North Tank Farm. The underground tank was constructed in 1943 and received LLLW from the Building 3019 Radiochemical Processing Facility.

2.24.2 Characterization Summary

The results from this tank are shown in Tables 2.24.1 and 2.24.2.

2.24.2.1 Aqueous liquid

Some of the samples from this tank contained elevated levels of organic compounds. Sample L23 contained 4-methyl-2-pentanone (7 mg/L by DAI-GC, 1.1 mg/L by VOA). The VOA was not effective for determining mg/L concentrations of volatile organics, and the DAI-GC result probably is more accurate. Sample L23 also contained 200 μg/L of naphthalene. These data are consistent with the elevated TOC in L23 (558.5 mg/L) compared to the other liquids (49.5 and 59.9 mg/L for L22 and L119, respectively).

2.24.2.2 Sludge

The two sludges contained PAHs and phthalates at levels of hundreds of milligrams per kilogram. Their SVOA extracts had to be filtered twice because of crystal precipitation. The surrogate standard recoveries of nitrobenzene, 2-fluorophenol, and fleorobiphenyl were low for the soft sludge, but better for the hard sludge. The SVOA extraction for S24 was repeated, using a pH adjustment to obtain base/neutral and acid fractions. Two organic layers separated when the extracts were concentrated to 1 mL. Also, a lump of dark tar was found in the S24 sample and could be a source of the PAHs that were detected previously.

Table 2.24.1. Analytical data for tank W-4

Parameter	D L (mg/L)	H26	L119	L22	L23	S24	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Physical properties and miscellaneous data					
Density (g/mL)		NA	1.014	1.013	1.027	NA		
Depth (inches)		NA	30	4	54	NA		
Suspended solids (mg/mL)	0.1	NA	0.2	0.2	0.5	NA		
TDS (mg/mL)	0.1	NA	10.1	6.1	27.4	NA		
TOC (L=mg/L, S=mg/kg)	1.0	9020	59.9	49.5	558.5	9190		
TS (L=mg/mL, S=mg/g)	0.1	349	10.3	6.3	27.9	307		
			RCRA metals (L=mg/L, S=mg/kg)					
Ag	0.002	0.06	<0.002	0.003	<0.02	0.08	5	100
As	0.40	<2	<4	<4	<4	<4	5	100
Ba	0.02	(5.8)	<0.2	<0.2	<0.2	(11)	100	2000
Cd	0.01	201	0.09	<0.08	0.09	22	1	20
Cr	0.10	(200)	5	2.8	13.5	(720)	5	100
Hg	0.005	0.82	<0.01	<0.01	<0.01	2.4	0.2	4
Ni	0.10	14	<1	<1	<1	15	NA	NA
Pb	0.50	62	<2	<2	<2	(150)	5	100
Se	0.05	(0.49)	<0.09	<0.09	<0.09	(<0.7)	1	20
Tl	0.05	<0.4	<0.09	<0.09	<0.09	<0.7	NA	NA
			Process metals (L=mg/L, S=mg/kg)					
Si	1.0	NA	2.07	2.55	1.75	NA		
U	0.1	29.6%	1780	910	3680	33.0%		
			Anions (L=mg/L, S=mg/kg)					
Cl^-	1.0	<10	<20	<20	<20	<10		
Cn	0.01	•	<0.04	<0.04	<0.07	•		
F^-	1.0	<10	<20	<20	<20	<10		
NO_3^-	5.0	•	1600	1700	2200	•		
PO_4^{-2}	5.0	<50	<100	<100	250	<50		
SO_4^{-2}	5.0	<50	930	570	2600	<50		
			Alkalinity					
CO_3^{-2} (mol)	0.01	•	0.01	<0.01	0.08	•		
HCO_3^- (mol)	0.01	•	0.04	0.02	0.19	•		
pH (units)	0.1	NA	10.0	9.1	10.9	NA		

Table 2.24.1 (continued)

Parameter	D L (mg/L)	H26	L119	L22	L23	S24	RCRA limits (mg/L)	RCRA limits (mg/kg)
			Radiochemical screening (L=Bq/mL, S=Bq/g)					
Gross alpha		6.6E+03	<3	<3	<3	5.9E+03		
Gross beta		8.7E+04	2.6E+03	1.6E+03	2.2E+03	3.1E+05		
			Beta/gamma emitters (L=Bq/mL, S=Bq/g)					
^{137}Cs		1.3E+04	1.4E+03	8.9E+02	2.1E+03	3.1E+04		
^{3}H		3.3E+00	2.0E+03	1.2E+00	2.1E+00	0.0E+00		
^{60}Co		•	<10	<10	<13	1.2E+01		
^{90}Sr		2.1E+04	•	•	2.9E+02	8.9E+04		
			Alpha emitters (L=Bq/mL, S=Bq/g)					
^{233}U		2.7E+03	•	•	•	2.0E+03		
^{238}Pu		<7	•	•	•	<6		
^{238}U		3.0E+03	•	•	•	2.3E+03		
^{239}Pu		2.1E+02	•	•	•	4.4E+02		
^{244}Cm		<6	•	•	•	<7		
^{252}Cf		<7	•	•	•	<6		

D L = Detection limit

Table 2.24.2. Organic analytical data hits for tank W-4

Parameter	CRQL (μg/L)	H26	L22	L23	L119	S24	RCRA limit (μg/L)
			DAI-GC analysis (L=μg/L, S=μg/kg)				
Methyl 1-butyl ketone							
			Volatile organic compound analysis (L=μg/L, S=μg/kg)				
4-Methyl-2-pentanone	10			1102	3 J		
Acetone	10			55			
Benzene	5			3 J	2 JB		500
Methylene chloride	5		10 B	10 B	10 B		
Toluene	5		13 B	14 B	46 B		
Trichloroethene	5			49	14		500
			Semivolatile compound analysis (L=μg/L, S=μg/kg)				
Bis(2-ethylhexyl)phthalate	10	5700				11,000	330
Chrysene	10					69 J	330
Di-n-butylphthalate	10	1400	11 J			2,100	330
Di-n-octylphthalate	10					51 J	330
Diethylphthalate	10					33 J	330
Fluoranthene	10	49 J				220 J	330
Naphthalene	10			160 J	35 J		330
Phenanthrene	10	110 J				170 J	330
Pyrene	10	130 J				170 J	330

CRQL = contract required quantitation limit

2.25 TANK W-13

2.25.1 Tank Description

Tank W-13 is a 2000-gal stainless steel tank located in the Bethel Valley North Tank Farm. The underground tank was installed in 1945 and received waste from the Radiochemical Processing Facility (Building 3019) and from recovery of fission products.

2.25.2 Characterization Summary

The results from this tank are shown in Tables 2.25.1 and 2.25.2.

2.25.2.1 Aqueous liquid

Very little organic matter was determined in these samples. The main compound measured by DAI-GC was methanol. Toluene was the main TCL species found by the VOA. The VOA surrogate standard recoveries were low for L28, which probably is the reason that the VOA for L27 yielded more hits. The SVOA did not detect any TCL constituents, and the TICs were not significant, except for TBP (90 μg/L in L27). The SVOA extracts for both samples were not different from the blank, and L28 was not submitted for GC-MS. The TOCs for these samples were low, 41.4 and 39 mg/L for L27 and L28, respectively.

Table 2.25.1. Analytical data for tank W-13

Parameter	D L (mg/L)	L27	L28	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.033	1.033		
Depth (inches)		4	18		
Suspended solids (mg/mL)	0.1	0.6	<0.1		
TDS (mg/mL)	0.1	34.2	33.9		
TOC (L=mg/L, S=mg/kg)	1.0	41.4	39.0		
TS (L=mg/mL, S=mg/g)	0.1	34.8	33.6		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	0.003	0.004	5	100
As	0.40	<4	<4	5	100
Ba	0.02	0.69	0.7	100	2000
Cd	0.01	0.22	0.3	1	20
Cr	0.10	2.5	2.7	5	100
Hg	0.005	31	35	0.2	4
Ni	0.10	8.4	8.7	NA	NA
Pb	0.50	8.8	8.9	5	100
Se	0.05	<0.09	<0.09	1	20
Tl	0.05	<0.09	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	14.9	14.5		
U	0.1	18.8	17.4		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	<3	<3		
Cn	0.01	<0.05	<0.05		
F^-	1.0	<3	<3		
NO_3^-	5.0	43	43		
PO_4^{-2}	5.0	<13	<13		
SO_4^{-2}	5.0	<13	<13		
		Alkalinity			
H^+ (mol)	0.01	0.26	0.27		
pH (units)	0.1	3.0	3.0		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		7.4E+02	7.6E+02		
Gross beta		1.4E+06	1.3E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		6.1E+05	5.8E+05		
^{154}Eu		1.6E+03	1.5E+03		
^{3}H		2.8E+03	2.8E+03		
^{60}Co		1.5E+02	1.9E+02		
^{90}Sr		5.5E+05	5.9E+05		
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{238}Pu		5.5E+02	5.5E+02		
$^{238}Th/^{232}Th$		1.2E+02	1.3E+02		
^{239}Pu		5.8E+01	6.9E+01		
^{244}Cm		<4	<4		
^{252}Cf		<4	<4		

D L = Detection limit

Table 2.25.2. Organic analytical data hits for tank W-13

Parameter	CRQL (μg/L)	L27	L28	RCRA limit (μg/L)
		DAI-GC analysis (L=μg/L, S=μg/kg)		
Methyl alcohol		11,000	5,000	
		Volatile organic compound analysis (L=μg/L, S=μg/kg)		
Acetone	10	15 B		
Benzene	5	3 JB		500
Chlorobenzene	5	4 J		100,000
Methylene chloride	5	24 B	14 B	
Styrene	5	3 J		
Toluene	5	100 B		

CRQL = contract required quantitation limit

2.26 TANK W-14

2.26.1 Tank Description

Tank W-14 is a 2000-gal stainless steel tank located in the Bethel Valley North Tank Farm. The underground tank was installed in 1945 and received waste from the Radiochemical Processing Facility (Building 3019) and from recovery of fission products.

2.26.2 Characterization Summary

The results for this tank are shown in Tables 2.26.1 and 2.26.2.

2.26.2.1 Aqueous liquid

The results were essentially the same as for W-13 (i.e., methanol was the major compound detected by DAI-GC, very little was measured by VOA, and only a phthalate was found by SVOA). As from W-13, the SVOA extract of only one sample (L30) from W-14 was submitted for GC-MS. TBP was estimated at 200 μg/L in L30. The TOCs were higher for this tank (121 and 132 mg/L, respectively).

Table 2.26.1. Analytical data for tank W-14

Parameter	D L (mg/L)	L30	L31	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.049	1.052		
Depth (inches)		4	14		
Suspended solids (mg/mL)	0.1	<0.1	1.4		
TDS (mg/mL)	0.1	29.8	27.7		
TOC (L=mg/L, S=mg/kg)	1.0	121	132		
TS (L=mg/mL, S=mg/g)	0.1	27.5	29.1		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.002	0.008	5	100
As	0.40	<4	<4	5	100
Ba	0.02	0.45	0.63	100	2000
Cd	0.01	<0.2	<0.2	1	20
Cr	0.10	60	64	5	100
Hg	0.003	0.08	0.18	0.2	4
Ni	0.10	50	52	NA	NA
Pb	0.50	7.5	7.5	5	100
Se	0.05	<0.09	<0.09	1	20
Tl	0.05	<0.09	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	16.5	16.2		
U	0.1	0.56	0.56		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	<3	<3		
Cn	0.01	<0.05	<0.05		
F^-	1.0	<3	<3		
NO_3^-	5.0	70	70		
PO_4^{-2}	5.0	<13	<13		
SO_4^{-2}	5.0	<13	<13		
		Alkalinity			
H^+ (mol)	0.01	0.19	0.21		
pH (units)	0.01	0.6	0.5		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		8.3E+03	8.4E+03		
Gross beta		9.7E+05	1.0E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		4.1E+05	4.1E+05		
^{3}H		2.4E+00	3.0E+00		
^{60}Co		1.1E+03	1.1E+03		
^{90}Sr		4.5E+05	4.3E+05		
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{238}Pu		<150	<150		
$^{238}Th/^{232}Th$		8.0E+03			
^{239}Pu		<20	8.2E+02		
^{244}Cm		<100	<50		
^{252}Cf		<50	<150		

D L = Detection limit

Table 2.26.2. Organic analytical data hits for tank W-14

Parameter	CRQL (µg/L)	L30	L31	RCRA limit (µg/L)
DAI-GC analysis (L=µg/L, S=µg/kg)				
Ethyl Alcohol		3,000	2,000	
I-Propyl alcohol		2,000		
Methyl alcohol		17,000	15,000	
Volatile organic compound analysis (L=µg/L, S=µg/kg)				
Acetone	10	20 B	25 B	
Benzene	5	3 JB	4 JB	500
Chlorobenzene	5		6	100,000
Methylene chloride	5	22 B	23 B	
Tetrachloroethene	5		5	700
Toluene	5	14 B	21 B	
Trichloroethene	5		6 B	500
Xylene (total)	5		4 J	
Semivolatile compound analysis (L=µg/L, S=µg/kg)				
Di-n-butylphthalate	10	12 B		

CRQL = contract required quantitation limit

2.27 TANK W-15

2.27.1 Tank Description

Tank W-15 is a 2000-gal stainless steel tank located in the Bethel Valley North Tank Farm. The underground tank was installed in 1945 and received waste from the Radiochemical Processing Facility (Building 3019) and from recovery of fission products.

2.27.2 Characterization Summary

The results for this tank are shown in Tables 2.27.1 and 2.27.2.

2.27.2.1 Aqueous liquid

The results were very similar to those for tanks W-13 and W-14. The DAI-GC indicated 7 mg/L of methanol for both samples, and VOA detected very little material. No TCL compounds were detected by SVOA. TBP was estimated at 400 µg/L in both L32 and L33. This is consistent with the low TOCs, 53.7 mg/L for L32 and 42.7 mg/L for L33. The deuterated perylene internal standard was missing from the L32 SVOA extract. The reason is not clear. A matrix effect is possible because the other internal standards were found in the extract, and all were added together before the GC screening. It may be significant that the pH for both of these samples was 0.2, which was the lowest of all the inactive tank samples. However, all the internal standards were found in the L33 sample, and the inorganic characterization did not suggest any unusual properties.

Table 2.27.1. Analytical data for tank W-15

Parameter	D L (mg/L)	L32	L33	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.080	1.081		
Depth (inches)		4	21		
Suspended solids (mg/mL)	0.1	2.0	<0.1		
TDS (mg/mL)	0.1	38.1	41.1		
TOC (mg/L)	1.0	53.7	42.7		
TS (mg/mL)	0.1	40.1	38.4		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.002	0.002	5	100
As	0.40	<4	<4	5	100
Ba	0.02	3.2	3.4	100	2000
Cd	0.01	<0.2	<0.2	1	20
Cr	0.10	53	55	5	100
Hg	0.005	0.40	0.39	0.2	4
Ni	0.10	48	48	NA	NA
Pb	0.50	7.5	7.5	5	100
Se	0.05	<0.09	<0.09	1	20
Tl	0.05	<0.09	<0.09	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	22.3	21.9		
U	0.1	387	383		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	<4	<4		
Cn	0.01	<0.06	<0.07		
F^-	1.0	<4	<4		
NO_3^-	5.0	120	120		
PO_4^{-2}	5.0	<20	<20		
SO_4^{-2}	5.0	<20	<20		
		Alkalinity			
H^+ (mol)	0.01	0.70	0.73		
pH (units)	0.1	0.2	0.2		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		2.6E+03	2.3E+03		
Gross beta		3.6E+06	3.6E+06		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		1.6E+06	1.5E+06		
^{3}H		3.0E+01	3.2E+01		
^{60}Co		1.4E+03	1.2E+03		
^{90}Sr		1.7E+06	1.5E+06		
		Alpha emitters (L=Bq/mL, S=Bq/g)			
^{233}U		1.1E+02	1.4E+02		
^{238}Pu		2.5E+02	2.4E+02		
$^{238}Th/^{232}Th$		1.5E+03	1.3E+03		
^{239}Pu		6.3E+02	5.8E+02		
^{244}Cm		<25	<15		
^{252}Cf		<10	<10		

D L = Detection limit

Table 2.27.2. Organic analytical data hits for tank W-15

Parameter	CRQL µg/L	L32	L33	RCRA limit (µg/L)
		DAI-GC analysis (L=µg/L, S=µg/kg)		
Methyl alcohol		7,000	7,000	
		Volatile organic compound analysis (L=µg/L, S=µg/kg)		
Acetone	10	24 B	26 B	
Benzene	5	4 JB	3 JB	500
Chlorobenzene	5	5	2 J	100,000
Methylene chloride	5	21 B	24 B	
Styrene	5	2 J		
Toluene	5	29 B	26 B	
Trichloroethene	5	4 JB	1 JB	500
Xylene (total)	5	5 J	4 J	

CRQL = contract required quantitation limit

2.28 TANK 7560

2.28.1 Tank Description

Tank 7560 is a 1000-gal stainless steel tank located in the Melton Valley area east of the Homogenous Reactor Experiment (HRE) facility (Building 7500). The underground tank was installed in 1957 and served as a waste tank for Building 7500.

2.28.2 Characterization Summary

This tank is empty and no samples have been taken.

2.29 TANK 7562

2.29.1 Tank Description

Tank 7562 is a 12,000-gal stainless steel tank located in the Melton Valley area southeast of the HRE facility (Building 7500). The underground tank was installed in 1957 and served as a waste tank for Building 7500.

2.29.2 Characterization Summary

The results from this tank are shown in Tables 2.29.1 and 2.29.2.

2.29.2.1 Aqueous liquid

Very little organic matter was detected in this sample: methanol was detected at 14 mg/L by DAI-GC, VOA results were very low, and there were no SVOA TCL hits. The TOC was 29.6 mg/L. There was insufficient sludge in S98 for SVOA.

Table 2.29.1. Analytical data for tank 7562

Parameter	D L (mg/L)	L97	S98	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data			
Density (g/mL)		1.001	NA		
Depth (inches)		4	NA		
Suspended solids (mg/mL)	0.1	0.1	NA		
TDS (mg/mL)	0.1	0.2	NA		
TOC (L=mg/L, S=mg/kg)	1.0	29.6	•		
TS (L=mg/mL, S=mg/g)	0.1	0.3	75.9		
		RCRA metals (L=mg/L, S=mg/kg)			
Ag	0.002	<0.001	0.0020	5	100
As	0.40	<2	(<2)	5	100
Ba	0.02	<0.1	140	100	2000
Cd	0.01	<0.09	18	1	20
Cr	0.10	<0.1	(2300)	5	100
Hg	0.005	<0.01	1.8	0.2	4
Ni	0.10	<0.6	320	NA	NA
Pb	0.50	<1	900	5	100
Se	0.05	<0.05	<0.006	1	20
Tl	0.05	<0.05	(<0.006)	NA	NA
		Process metals (L=mg/L, S=mg/kg)			
Si	1.0	2.36	NA		
U	0.1	6.77	1990		
		Anions (L=mg/L, S=mg/kg)			
Cl^-	1.0	13	<90		
Cn	0.01	<0.05	•		
F^-	1.0	<10	<90		
NO_3^-	5.0	160	•		
PO_4^{-2}	5.0	<50	<450		
SO_4^{-2}	5.0	120	<450		
		Alkalinity			
HCO_3^- (mol)	0.01	<0.01	•		
pH (units)	0.1	7.4	NA		
		Radiochemical screening (L=Bq/mL, S=Bq/g)			
Gross alpha		<1	<1		
Gross beta		1.2E+03	8.8E+05		
		Beta/gamma emitters (L=Bq/mL, S=Bq/g)			
^{137}Cs		1.7E+00	3.8E+03		
^{3}H		1.6E+00	•		
^{90}Sr		1.7E+03	2.2E+05		

D L = Detection limit

Table 2.29.2. Organic analytical data hits for tank 7562

Parameter	CRQL (µg/L)	L97	RCRA limit (µg/L)
DAI-GC analysis (L=µg/L, S=µg/kg)			
Methyl alcohol		14,000	
Volatile organic compound analysis (L=µg/L, S=µg/kg)			
Acetone	10	15 B	
Benzene	5	3 J	500
Methylene chloride	5	18 B	
Tetrachloroethene	5	4 J	700
Toluene	5	10	

CRQL = contract required quantitation limit

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	D L (mg/L)	L121	RCRA limits (mg/L)	RCRA limits (mg/kg)
		Physical properties and miscellaneous data		
Density (g/mL)		1.001		
Depth (inches)		2		
Suspended solids (mg/mL)	0.1	<0.1		
TDS (mg/mL)	0.1	<0.1		
TOC (mg/L)	1.0	13.7		
TS (mg/mL)	0.1	<0.1		
		RCRA metals (L=mg/L, S=mg/kg)		
Ag	0.002	0.002	5	100
As	0.4	<2	5	100
Ba	0.02	<0.1	100	2000
Cd	0.01	<0.09	1	20
Cr	0.10	<0.1	5	100
Hg	0.005	0.01	0.2	4
Ni	0.10	<0.6	NA	NA
Pb	0.50	<1	5	100
Se	0.05	<0.05	1	20
Tl	0.05	<0.05	NA	NA
		Process metals (L=mg/L, S=mg/kg)		
Si	1.0	0.62		
U	0.1	<1.0		
		Anions (L=mg/L, S=mg/kg)		
Cl^-	1.0	<1		
Cn	0.01	<0.06		
F^-	1.0	<1		
NO_3^-	5.0	<5		
PO_4^{-2}	5.0	<5		
SO_4^{-2}	5.0	<5		
		Alkalinity		
HCO_3^- (mol)	0.01	<0.01		
pH (units)	0.1	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		
^{238}Pu		<2		
^{238}U		4.0E+00		
^{239}Pu		3.5E+00		
^{241}Am		<10		
^{244}Cm		3.1E+01		
^{252}Cf		<2		

D L = Detection limit

2.31 TANK W-19

2.31.1 Tank Description

Tank W-19 is a 2250-gal stainless steel tank located in the ORNL Bethel Valley South Tank Farm area. The underground tank was installed in 1955 and collected waste produced from the recovery and reprocessing of uranium and other nuclear material from the Metal Recovery Facility in Building 3505.

2.31.2 Characterization Summary

This tank is empty and has not been sampled.

2.32 TANK W-20

2.32.1 Tank Description

Tank W-20 is a 2250-gal stainless steel tank located in the ORNL Bethel Valley South Tank Farm area. The underground tank was installed in 1955 and collected waste produced from the recovery and reprocessing of uranium and other nuclear material from the Metal Recovery Facility in Building 3505.

2.32.2 Characterization Summary

This tank is empty and has not been sampled.

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

A risk characterization has not been performed for tank 3001-B. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

2.34 TANK 3003-A

2.34.1 Tank Description

Tank 3003-A is a 16,000-gal concrete tank located south of Building 3003 in the Bethel Valley main laboratory area. The tank was constructed in 1943 and collected drainage from three cells and a stack in Building 3003.

2.34.2 Characterization Summary

A risk characterization has not been performed for tank 3003-A. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

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

A risk characterization has not been performed for tank 3004-B. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

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 very low-level contaminated environmental samples.

2.36.2 Characterization Summary

A risk characterization has not been performed for tank 3013. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

2.37 TANK H-209

2.37.1 Tank Description

Tank H-209 is a 2500-gal (best estimate) stainless steel tank located west of Building 3517 in the Bethel Valley main laboratory area. The tank was installed in 1961 and held condensate and floor drainage from Building 3517.

2.37.2 Characterization Summary

A risk characterization has not been performed for tank H-209. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

2.38 TANK 7503-A

2.38.1 Tank Description

Tank 7503-A is an 11,000-gal stainless steel tank located in an in-ground vault northwest of Building 7503 in the Melton Valley area. The tank was installed in 1962 and was a waste holding tank for the Molten Salt Reactor Experiment.

2.38.2 Characterization Summary

A risk characterization has not been performed for tank 7503-A. A waste characterization of the tank contents is under way. A risk characterization will be performed, and the results will be incorporated in a later revision to this data manual.

2.39 TANK 3001-S

2.39.1 Tank Description

Tank 3001-S is indicated on drawings to be a 2000-gal stainless steel tank located south of Building 3001 in the Bethel Valley main laboratory area. Its use is not known.

2.39.2 Characterization Summary

The location of this tank is unknown. Drawings indicate that a tank was planned to be installed adjacent to the south side of Building 3001. Initial field investigations have not located the tank, and it is possible that the tank was never installed.

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