0059443

DOE/RL-2002-14
Revision 0

Tanks/Lines/Pits/Boxes/ Septic Tank and Drain Fields Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan

Includes: 200-IS-1 and 200-ST-1 Operable Units

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management
Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

RECEIVED
MAY 19 2003
EDMC

Approved for public release; further dissemination unlimited

Date Received for Clearance Process (MM/YY/DD)
05/03/01

INFORMATION CLEARANCE FORM

A. Information Category

- [ ] Abstract
- [ ] Journal Article
- [ ] Summary
- [ ] Internet
- [ ] Visual Aid
- [ ] Software
- [ ] Full Paper
- [x] Report
- [ ] Other _____

B. Document Number DOE/RL-2002-14, Rev. 0

C. Title
Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling Plan Includes: 200-IS-1 and 200-ST-1 Operable Units

D. Internet Address

E. Required Information

1. Is document potentially Classified? [x] No [ ] Yes (MANDATORY)

   Manager's Signature Required

   If Yes _____ [ ] No [ ] Yes Classified
   ADC Signature Required

2. References in the Information are Applied Technology [x] No [ ] Yes

   Export Controlled Information [x] No [ ] Yes

3. Does Information Contain the Following: (MANDATORY)
   a. New or Novel (Patentable) Subject Matter? [x] No [ ] Yes
      If "Yes", Disclosure No.: _____
   b. Information Received in Confidence, Such as Proprietary and/or Inventions?
      [ ] No [ ] Yes If "Yes", Affix Appropriate Legends/Notices.
   c. Copyrights? [ ] No [ ] Yes If "Yes", Attach Permission.
   d. Trademarks? [ ] No [x] Yes If "Yes", Identify in Document.
4. Is Information requiring submission to OSTI? [ ] No [x] Yes
5. Release Level? [x] Public [ ] Limited

F. Complete for a Journal Article

1. Title of Journal

G. Complete for a Presentation

1. Title for Conference or Meeting _____
2. Group Sponsoring _____
3. Date of Conference _____
4. City/State _____
5. Will Information be Published in Proceedings? [ ] No [ ] Yes
6. Will Material be Handed Out? [ ] No [ ] Yes

H. Author/Requestor
M E Todd
(Print and Sign)

Responsible Manager
B H Ford
(Print and Sign)

I. Reviewers

	Yes	Print	Signature	Public Y/N (If N, complete J)
General Counsel	[x]	Stephen B. Cherry	Stephen B. Cherry	(Y) / N
Office of External Affairs	[x]	Michael J. Turner	Michael J. Turner	(Y) / N
DOE-RL	[x]	Bryan T. Foley	Bryan T. Foley	(Y) / N
Other	[ ]			Y / N
Other	[ ]			Y / N

J. If Information Includes Sensitive Information and is not to be released to the Public indicate category below.

- [ ] Applied Technology
- [ ] Protected CRADA
- [ ] Personal/Private
- [ ] Export Controlled
- [ ] Proprietary
- [ ] Procurement-Sensitive
- [ ] Business-Sensitive
- [ ] Patentable
- [ ] Predecisional
- [ ] Other (Specify) _____
- [ ] UCNI

Information Clearance Approval

APPROVED FOR RELEASE
OFFICIAL DOCUMENT
Date 5-1-2001

K. If Additional Comments, Please Attach Separate Sheet

A-6001-401 (12/00)

DOE/RL-2002-14
Revision 0

Tanks/Lines/Pits/Boxes/ Septic Tank and Drain Fields Waste Group Operable Units RI/FS Work Plan and RCRA TSD Unit Sampling

Includes: 200-IS-1 and 200-ST-1 Operable Units

B. H. Ford
Fluor Hanford, Inc.

Date Published
May 2003

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Project Hanford Management Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

United States Department of Energy
P.O. Box 550
Richland, Washington 99352

J. Aardal 5-1-2003
Release Approval Date

Approved for public release; further dissemination unlimited

LEGAL DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, nor any of their contractors, subcontractors or their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or any third party's use or the results of such use of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

This report has been reproduced from the best available copy.

Printed in the United States of America

EXECUTIVE SUMMARY

This work plan supports the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA)[1] remedial investigation/feasibility study (RI/FS) activities for the 200-IS-1 Tanks/Lines/Pits/Boxes Waste Group Operable Unit (OU) and the 200-ST-1 Septic Tanks and Drain Fields Group OU. This work plan also integrates the *Resource Conservation and Recovery Act of 1976* (RCRA)[2] facility investigation/corrective measures study (RFI/CMS) requirements for these OUs and supports the framework established in DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program,* [3] for integrating the RCRA treatment, storage, and disposal (TSD) closure process with the OU RI/FS process. RCRA TSD units included in this work plan that require investigation to comply with RCRA closure/postclosure requirements are the CX Tank System (241-CX-70, 241-CX-71, and 241-CX-72) and the Hexone Storage and Treatment Facility (276-S-141 and 276-S-142).

The U.S. Department of Energy (DOE), Washington State Department of Ecology, and U.S. Environmental Protection Agency have agreed on an implementation approach for the RI/FS process in the Hanford Site 200 Areas. The Implementation Plan (DOE/RL-98-28) addressed more than 800 waste sites grouped into 23 process-based OUs. This grouping facilitates the use of an analogous-sites approach, which involves combining waste sites with similar process histories, structures, and contaminants and choosing at least one representative waste site from each group for comprehensive field investigations. Findings from the field sampling of representative waste sites are used to make remedial decisions for all of the waste sites in that waste group.

Modifications to the M-013 series of *Hanford Federal Facility and Consent Order* (Tri-Party Agreement)[4] milestones for non-tank farm past-practice waste site investigations approved in June 2002 (Tri-Party Agreement Change Number M-13-02-01) included an approach to investigate at least one OU in a single RI/FS. This reduces the number of non-tank farm work plans and remedial investigation reports that must be prepared and feasibility studies that must be conducted.

The Tri-Party Agreement milestones applicable for implementing the 200-IS-1 and 200-ST-1 OU RI/FS process are as follows.

---

1 *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, 42 USC 9601, et seq.

[2] *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq.

[3] DOE/RL-98-28, Rev. 0, 1999, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[4] Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Richland, Washington.

- M-013-00M: "Submit one 200 RI/FS (RFI/CMS) Work Plan for the 200-IS-1, Tanks/Lines/Pits Diversion Boxes OU (includes waste sites in the 200-ST-1, Septic Tank and Drain Fields OU) by December 31, 2002."

- M-020-00B: "Submit Closure/Post-Closure Plans for 216-A-10, 216-A-36B, 216-A-37-1, 207-A South Retention Basin, 216-S-10 Pond, 216-S-10 Ditch, 241-CX-70, 241-CX-71, and 241-CX-72 by December 31, 2008."

- M-20-54: "Submit 241-CX-70 Storage Tank, 241-CX-71 Neutralization Tank, 241-CX-72 Storage Tank Closure/Post Closure Plan to Ecology in coordination with the 200-IS-1 Tanks/Lines/Pits/Boxes and 200-ST-1 Septic Tank Operable Units Work Plan Feasibility Study scheduled under M-13-00M by December 31, 2008."

- M-15-00C: "Complete all 200 Area non-Tank Farm OUs pre-ROD site investigations under approved work plan schedules by December 31, 2008."

The original set of waste sites assigned to these OUs in the Implementation Plan (DOE/RL-98-28, Rev. 0) was based on the following rationale.

200-IS-1 Tanks/Lines/Pits/Boxes. The OU was created for the structures used to handle the high-level plant waste generated from separations or volume-reduction processes outside tank farms and processing facilities, recognizing that remediation of these facilities ultimately would be associated with tank farms stabilization. An attempt was made to place diversion boxes, valve pits, sampler pits, pipelines, and other similar structures constructed to support a soil column disposal waste site in the same group as the soil column disposal waste site. This complex web of concrete-encased pipelines, which also connects facilities inside the 200 East and 200 West Areas, was only partially identified in the *Waste Information Data System* (WIDS)[5]. Although an effort was started recently to identify, map, and assign site names to all these structures, the activity has been only partially completed.

200-ST-1 Septic Tanks and Drain Fields. The OU was created for sites that had received or continue to receive largely nonradioactive, nonhazardous, sanitary sewer waste. A remote possibility of radiological contamination did exist for shower and janitorial sink effluents at radiological facilities. The concern for the active waste sites was for their potential to provide a driving force to adjacent soil column disposal sites or unplanned releases rather than for their potential to add significant contamination to the soil column.

In addition, new waste sites were assigned to these OUs in accordance with RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)".[6] Neither the original sites nor those added since the Implementation Plan was prepared have been screened to determine their

---

[5] *Waste Information Data System* report, a Hanford Site database.

[6] RL-TPA-90-0001, 1998, *Tri-Party Agreement Handbook Management Procedures*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

appropriateness as the subjects of an RI/FS work plan and associated remedial action processes. Therefore, all the WIDS sites currently identified with the 200-IS-1 and 200-ST-1 OUs had to be reviewed before the representative sites for these OUs were selected. The selection approach was designed to ensure that waste sites added to the 200-IS-1 and 200-ST-1 OUs in the future will fit into the subgroups for which representative sites have been selected.

The sites were sorted by WIDS-defined categories (e.g., classification status rejected sites, classification status proposed rejected sites), whether the sites were in use, whether they were covered under another regulatory authority (e.g., the septic systems associated with noncontaminated facilities) or under the DOE program (the Richland Operations Office or the Office of River Protection), and whether they were assigned to an appropriate waste group.

The current lists of waste sites for these OUs are shown in Appendix C, Tables C-1 through C-6. The tables are organized as follows.

- **Table C-1.** This table covers all waste sites identified with the 200-IS-1 and 200-ST-1 OUs as of November 27, 2002.

- **Table C-2.** This table covers all waste sites identified with the 200-IS-1 and 200-ST-1 OUs that are being reclassified in WIDS and subsequently removed or that have been removed from consideration through the Tri-Party Agreement process.

- **Table C-3.** This table covers all waste sites that are identified with the 200-ST-1 OUs septic systems and are designated to be removed from the RCRA past-practice process and categorized with a unit category of "septic." The changes are based on whether the system was connected to a contaminated facility. These data are not yet in WIDS, but will be added when the categorization is approved in accordance with RL-TPA-90-0001. Septic tanks and drain fields still in service were identified as excluded.

- **Table C-4.** This table covers all waste sites identified with the 200-IS-1 and 200-ST-1 OUs that are not included in this work plan because they are the responsibility of other programs.

- **Table C-5.** This table covers all waste sites identified with the 200-IS-1 and 200-ST-1 OUs that currently are included in this work plan as analogous sites, representative sites, or RCRA TSD sites. This table is meant to be a snapshot of the moment and is expected to change as waste sites, particularly pipelines, are identified and the reassignment process continues.

The RCRA past-practice sites and RCRA TSD unit sites identified for this work plan (Table C-5) were reviewed based on their configuration for receiving waste, the source of the waste stream, and contaminants expected to be in the waste stream to identify appropriate subgroups of sites with similar conceptual contaminant distribution models from which representative sites would be selected for characterization.

The following subgroups were selected for development of conceptual contaminant distribution models:

- Tanks
- Diversion boxes (including valve pits)
- Pipelines
- Septic tanks and drain fields.

Conceptual contaminant distribution models were developed (and representative sites were selected) for each subgroup based on the approach outlined in the Implementation Plan (DOE/RL-98-28). The following representative sites were selected:

- **Tanks:**
  - CX Tank System, which includes the 241-CX-70 Tank, the 241-CX-71 Neutralization Tank, and the 241-CX-72 Tank
  - Hexone Storage and Treatment Facility, which includes Tanks 276-S-141 and 276-S-142.
- **Diversion Boxes, Including Valve Pits:** The 200-W-59 Diversion Box for diversion box sources
- **Pipelines:** The 200-E-111 Encased Pipeline for pipeline sources
- **Septic Tanks and Drain Fields:** The 2607-W3 Septic Tank for septic tank drain field sources.

The conceptual contaminant distribution model and associated representative sites, RCRA TSD units, and analogous sites are presented in Appendix C, Table C-6.

This work plan follows an integrated process for characterizing the 200-IS-1 and 200-ST-1 OUs by using this RI/FS work plan in combination with the Implementation Plan (DOE/RL-98-28) to satisfy the requirements for both an RI/FS work plan and an RFI/CMS work plan. General facility background information, potential applicable or relevant and appropriate requirements, preliminary remedial action objectives, and preliminary remedial technologies developed in the Implementation Plan are incorporated by reference into this work plan. This work plan also provides the following RCRA TSD unit closure plan information: facility description and location (Section 2.1), process information (Section 2.2), waste characteristics (Chapter 3.0), and groundwater monitoring (Chapter 3.0). Following the completion of the work plan, an RI will be performed that will satisfy the requirements for an RFI and will provide the data needed to support the selection of a closure strategy for RCRA TSD units. The RI will be limited to the concurrent investigation of representative waste sites and RCRA TSD units undergoing closure. A report summarizing the results of the RI will be prepared to satisfy the requirements for an RFI report. The report also will contain the characterization information required in a RCRA TSD units closure plan.

The majority of radionuclide and nonradiological inventories discharged from operations associated with the 200-IS-1 and 200-ST-1 OUs waste sites were not documented in historical records; however, rough-order-of-magnitude estimates for some of the waste sites are documented in the Implementation Plan (DOE/RL-98-28) and WIDS, based on waste stream analyses for the waste sites. The following general conclusions can be drawn regarding the conceptual contaminant distribution models for the RCRA TSD units and representative sites.

- The major radionuclide contaminants of concern include cesium-137; plutonium-238, plutonium-239, and plutonium-240; strontium-90; and uranium-234, uranium-235, and uranium-238.

- Few of the OU waste sites received enough effluent to contaminate the groundwater.

- Contaminants migrated vertically beneath the waste sites after release. Lateral spreading of liquids and contaminants may have occurred at the bottom of the waste site, at the sand-dominated sequence of the Hanford formation, at the Cold Creek unit and/or at the upper Ringold Formation, if present.

- Contaminants such as cesium-137 and the plutonium isotopes normally adsorb strongly onto shallow-zone Hanford Site sediments, and, therefore, have high distribution coefficients (K_d). These less mobile contaminants should be detected near points of release in the vadose zone. Contaminants with low K_d values (e.g., nitrate and tritium) are not readily adsorbed on soil particles and migrate to greater depth within the vadose zone. For example, cesium-137 ($K_d > 2{,}000$ mL/g) is likely to concentrate near the point of release; strontium-90 ($K_d = 0.4$ to 50 mL/g) and uranium ($K_d = 1$ mL/g) would be expected at greater depths. Tritium, with a K_d value equal to 0, will migrate vertically with the wetting moisture front.

Waste sites in the 200-IS-1 OU no longer receive effluent and most sites have been stabilized and covered with clean soil. With the cessation of artificial recharge, the downward flux of moisture through the vadose zone has decreased. Residual moisture should continue to decrease in the vadose zone over time and should equilibrate with the natural recharge rate, thus reducing the potential for future impacts to groundwater. Some 200-ST-1 OU septic tank and drain field sites, such as 2607-W-5, continue to receive effluent.

Potential receptors (i.e., human and ecological) may be exposed to the affected media through several exposure pathways, including the following:

- Ingestion of contaminated soils (including dust inhalation), sediments, or biota
- Inhalation of contaminant dusts, vapors, or gases
- Dermal contact with contaminated soils or sediments
- Direct exposure to external gamma radiation in site soils and sediments.

Potential human receptors include Site workers (current and future) and Site visitors (occasional users). Under a restricted future land-use scenario, Site worker and visitor exposure pathways would primarily involve incidental soil/sediment ingestion, inhalation of contaminants, dermal contact with contaminated soils/sediments, and external gamma radiation. Potential ecological receptors include terrestrial plants and animals inhabiting the waste sites. Site biota exposures

would primarily result from incidental soil/sediment ingestion, plant uptake, ingestion of contaminated plant or animals (e.g., grazing or predation), dermal contact with contaminated soils/sediments, and external gamma radiation.

Potential contaminant exposures and health impacts to humans depend largely on allowable land uses. The land use inside the 200 Areas exclusive-use boundary, or core zone, selected by DOE through the process outlined in the *National Environmental Policy Act of 1969*[7] in DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*[8] and documented in a Record of Decision (64 Federal Register 61615, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement, Hanford Site, Richland, Washington; Record of Decision")[9] is industrial (exclusive). Outside the core zone, the selected land use is conservation (mining). The 200-IS-1 and 200-ST-1 waste sites all are located within the core zone. Therefore, based on the land-use decision for the 200 Areas, potential impacts from the waste site contaminants within the 200 Area would be to current and future Site workers and to terrestrial biota inhabiting the waste sites.

A screening-level ecological risk assessment has been prepared for the Central Plateau (DOE/RL-2001-54, *Central Plateau Ecological Evaluation Report)*[10]. This report presents the common species present in the Central Plateau and also discusses sensitive habitat and species. DOE/RL-2001-54 serves as a foundational document to further ecological evaluation on the Central Plateau, including OU or waste-site specific data collection. A data quality objectives process is planned for fiscal year 2003 to identify ecological data needs for the 200 Areas OUs. Data needs for the 200-IS-1 and 200-ST-1 OUs will be identified through the data quality objectives process and implemented through an ecological evaluation sampling and analysis plan.

Representative site characterization activities described in Appendix B, Sampling and Analysis Plan (SAP), are based on implementing the data quality objectives process documented in CP-13196, *Remedial Investigation Data Quality Objectives Summary Report for the 200-IS-1 and 200-ST-1 Operable Units.*[11] The sampling and analysis activities will provide data to refine the conceptual contaminant distribution models, support an assessment of risk, and evaluate a range of remedial alternatives for waste sites in these OUs.

---

[7] *National Environmental Policy Act of 1969*, 42 U.S.C. 4321, et seq.

[8] DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

[9] 64 FR 61615, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement, Hanford Site, Richland, Washington; Record of Decision," *Federal Register*, Vol. 64, No. 218, pp. 61615, November 12, 1999.

[10] DOE/RL-2001-54, Draft B, *Central Plateau Ecological Evaluation Report*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

[11] CP-13196, 2002, *Remedial Investigation Data Quality Objectives Summary Report – 200-IS-1 and 200-ST-1 Operable Units*, Internal Draft, Fluor Hanford, Inc., Richland, Washington.

The sample collection methods described in the SAP include driven soil probes, borehole drilling, geophysical logging, and soil gas and soil sampling. These samples will be analyzed to assess the integrity of the tanks at the CX Tank System and the 276-S Hexone Storage and Treatment Facility and to determine the nature and extent of contamination at the 200-E-111 Pipeline, 241-C-151-U1 Single-Shell Tank System Transfer Line, 2607-W-3 Septic Tank, and the 200-W-59 Diversion Box. Based on the results of an initial investigation, additional soil borings or test pits may be made to collect soil samples to be analyzed for radiological and nonradiological contaminants of concern and selected physical properties. Sampling for waste designation is addressed through a waste designation data quality objectives process before the field characterization activities are initiated. Table ES-1 summarizes the sample collection requirements for the representative waste sites to be investigated.

Table ES-1. Summary of Projected Sample Collection Requirements.

Sample Type	200-W-59 Diversion Box	200-E-111 Unplanned Release	2607-W3 Septic Tank	276-S-141/ 142 Hexone Tanks	CX Tank System
Driven Probes for Geophysical Logging	4	12	NA	NA	8
Boreholes for Geophysical Logging	1[a]	1	1	1[a]	2[a]
Samples for Radiological and/or Chemical COCs					
Soil gas samples	NA	NA	NA	6	NA
Internal sludge samples	NA	NA	1	NA	NA
Shallow soil samples	NA	1	NA	NA	3
Driven core soil samples	1	NA	NA	1	2
Borehole/test pit soil samples	5[a]	5	7	2[a]	10[a]
Samples for Physical Properties					
Bulk density, moisture content, particle size[a]	2[a]	2	3	1[a]	5[a]
QC samples					
Duplicates	1[a]	1	1	1[a]	3[a]
Splits	1[a]	1	1	1[a]	3[a]
Equipment blanks	1[a]	1	1	1[a]	2[a]
Trip blanks	1[a]	1	1	1[a]	3[a]
Total number of QC samples	4[a]	4	4	4[a]	11[a]

[a] Samples collected and geophysical logging (boreholes only) conducted only if borehole or test pit is required based on screening sample results.

COC = contaminant of concern.

QC = quality control.

This page intentionally left blank.

CONTENTS

1.0 INTRODUCTION 1-1
- 1.1 200 AREAS IMPLEMENTATION PLAN 1-3
- 1.2 SCOPE AND OBJECTIVES 1-3
- 1.3 CHANGE CONTROL 1-4

2.0 BACKGROUND AND SETTING 2-1
- 2.1 PHYSICAL SETTING 2-1
  - 2.1.1 Topography 2-2
  - 2.1.2 Geology 2-2
  - 2.1.3 Vadose Zone 2-4
  - 2.1.4 Groundwater 2-4
  - 2.1.5 Summary of Hydrogeologic Conditions at RCRA TSD Units and Representative Sites 2-5
- 2.2 WASTE SITE DESCRIPTION AND HISTORY 2-7
  - 2.2.1 200 Area Plant History 2-8
  - 2.2.2 Process Information 2-13
  - 2.2.3 RCRA TSD Units and Representative Sites 2-20

3.0 INITIAL EVALUATION OF TREATMENT, STORAGE, AND DISPOSAL AND REPRESENTATIVE SITES 3-1
- 3.1 KNOWN AND SUSPECTED CONTAMINATION 3-1
- 3.2 ENVIRONMENTAL MONITORING 3-1
- 3.3 NATURE AND EXTENT OF CONTAMINATION 3-3
  - 3.3.1 241-CX-70 Tank 3-3
  - 3.3.2 241-CX-71 Tank 3-4
  - 3.3.3 241-CX-72 Tank 3-5
  - 3.3.4 Hexone Storage and Treatment Facility. 3-7
  - 3.3.5 200-E-111 Tank Farm Process Piping 3-11
  - 3.3.6 200-W-59 Diversion Box 3-13
  - 3.3.7 2607-W3 Septic Tank 3-15
  - 3.3.8 Conceptual Contaminant Distribution Models 3-16
  - 3.3.9 Environmental Information 3-18
- 3.4 RCRA TREATMENT, STORAGE, AND DISPOSAL INTERIM STATUS GROUNDWATER MONITORING 3-21
- 3.5 POTENTIAL IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT 3-21
  - 3.5.1 Contaminant Sources and Release Mechanisms 3-21
  - 3.5.2 Potential Receptors 3-21
  - 3.5.3 Potential Impacts 3-22
- 3.6 DEVELOPMENT OF CONTAMINANTS OF CONCERN 3-22

4.0 WORK PLAN APPROACH AND RATIONALE 4-1
- 4.1 SUMMARY OF DATA QUALITY OBJECTIVE PROCESS 4-1
  - 4.1.1 Representative Site Selection Process 4-1

4.1.2 Data Uses 4-4
4.1.3 Data Needs 4-5
4.1.4 Data Quality 4-5
4.1.5 Data Quantity 4-6
4.2 CHARACTERIZATION APPROACH 4-6
4.2.1 Ground-Penetrating Radar and Electromagnetic Induction 4-7
4.2.2 Drilling and Sampling 4-7
4.2.3 Test Pit Excavation and Sampling 4-9
4.2.4 Field Screening 4-9
4.2.5 Analysis of Soil 4-9
4.3 GEOPHYSICAL LOGGING 4-9
4.3.1 Borehole Geophysics 4-10
4.3.2 Geophysical Logging Through Driven Soil Probes 4-11
4.3.3 Soil Gas Surveys Through Driven Soil Probes 4-11
5.0 remedial investigation/feasibility study process 5-1
5.1 REGULATORY PROCESS 5-1
5.2 ECOLOGICAL EVALUATION PROCESS 5-3
5.2.1 Planning 5-4
5.2.2 Field Investigation 5-4
5.2.3 Management of Investigation-Derived Waste 5-5
5.2.4 Laboratory Analysis and Data Validation 5-5
5.2.5 Remedial Investigation Report 5-5
5.3 REMEDIAL INVESTIGATION ACTIVITIES 5-14
5.4 FEASIBILITY STUDY AND RCRA TREATMENT, STORAGE, AND DISPOSAL UNIT CLOSURE PLAN 5-16
5.4.1 High Risk Waste Sites Identified for Early Action 5-16
5.4.2 Regional Site Closure 5-17
5.4.3 Waste Site Grouping by Characteristics or Hazards 5-17
5.5 POST-RECORD OF DECISION ACTIVITIES 5-18
6.0 PROJECT SCHEDULE 6-1
7.0 REFERENCES 7-1

APPENDICES

A PART A PERMITS ..... A-i

B SAMPLING AND ANALYSIS PLAN ..... B-i

C 200-IS-1 AND 200-ST-1 OPERABLE UNITS SITES REVIEW PROCESS ..... C-i

FIGURES

Figure 1-1. Integrated Regulatory Process for CERCLA, RCRA Past-Practice, and RCRA TSD Unit Closure (modified from Figure 2-2, DOE-RL 1999). 1-5

Figure 2-1. Location of 200-IS-1 and 200-ST-1 Operable Units on the Hanford Site.Figure 2-2. Generalized Stratigraphic Column for the 200 Areas. 2-26

Figure 2-2. Generalized Stratigraphic Column for the 200 Areas. 2-27

Figure 2-3. Groundwater Table Around the 200 East and 200 West Areas, April 2001..... 2-28

Figure 2-4. Semiworks Plan View. 2-29

Figure 2-5. Stratigraphy Near the 241-CX-70, 241-CX-71 and 241-CX-72 Storage Tanks. 2-30

Figure 2-6a. 200-IS-1 and 200-ST-1 Waste Sites in 200 East. 2-31

Figure 2-6b. 200-IS-1 and 200-ST-1 Waste Sites in 200 West. 2-32

Figure 2-7. Stratigraphy Near the 276-S-141 and 276-S-142 Storage Tanks. 2-33

Figure 2-8. Stratigraphy Near the 200-E-111 Waste Site. 2-34

Figure 2-9. Stratigraphy Near the 200-W-59 Diversion Box. 2-35

Figure 2-10. Stratigraphy Near the 2607-W3 Septic Tank. 2-36

Figure 2-11. 241-CX-70 Storage Tank Construction Diagram. 2-37

Figure 2-12. 241-CX-71 Storage Tank Construction Diagram. 2-38

Figure 2-13. 241-CX-72 Storage Tank Construction Diagram. 2-39

Figure 2-14. 276-S-141 and 276-S-142 Storage Tank Construction Diagram. 2-40

Figure 2-15. 200-E-111 Tank Farm Process Piping Construction Diagram. 2-41

Figure 2-16. 200-W-59 Diversion Box Construction Diagram. 2-42

Figure 2-17. 2607-W3 Septic Tank Construction Diagram. 2-43

Figure 3-1. Major Radiological Groundwater Plumes in the Vicinity of the 200 East Area. 3-24

Figure 3-2. Major Nonradiological Groundwater Plumes in the Vicinity of the 200 East Area. 3-25

Figure 3-3. Major Radiological Groundwater Plumes in the Vicinity of the 200 West Area. 3-26

Figure 3-4. Major Nonradiological Groundwater Plumes in the Vicinity of the 200 West Area. 3-27

Figure 3-5. 241-CX-70 Storage Tank Conceptual Contaminant Distribution Model. 3-28

Figure 3-6. 241-CX-71 Storage Tank Conceptual Contaminant Distribution Model. 3-29

Figure 3-7. 241-CX-72 Storage Tank Conceptual Contaminant Distribution Model. 3-30

Figure 3-8. 276-S-141 and 276-S-142 Storage Tanks Conceptual Contaminant Distribution Model. 3-31

Figure 3-9. 200-E-111 Tank Farm Process Piping Conceptual Contaminant Distribution Model. 3-32

Figure 3-10. 200-W-59 Diversion Box Conceptual Contaminant Distribution Model. 3-33

Figure 3-11. 2607-W3 Septic Tank Conceptual Contaminant Distribution Model. 3-34

Figure 3-12. Conceptual Exposure Pathway Model 3-35

Figure 4-1. Location of Planned and Existing Boreholes at the 241-CX Tank System. 4-12

Figure 4-2. Location of Planned and Existing Boreholes at the Hexone Storage and Treatment Facility. 4-13

Figure 4-3. Location of Planned Drive Casings and Existing Boreholes at the 200-E-111 Pipeline Farm Process Piping. 4-14

Figure 4-4. Location of Planned Drive Casings and Existing Boreholes at the 200-W-59 Diversion Box. 4-15

Figure 4-5. Location of Planned and Existing Boreholes at the 2607-W3 Septic Tank. 4-16

Figure 5-1. Operable Unit RI/FS and Ecological Evaluation Integration. 5-19

Figure 6-1. Project Schedule for the 200-IS-1 and 200-ST-1 Operable Units. 6-2

TABLES

Table 3-1. Soil and Vegetation Concentrations of Radionuclides for the D021/V021 Monitoring Site Near the 200-W-59 Diversion Box. 3-36

Table 3-2. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List 3-37

TERMS

AMCP	Assistant Manager for the Central Plateau
ANN	aluminum nitrate nonahydrate
ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CMS	corrective measures study
COC	contaminant of concern
COPC	contaminant of potential concern
CPP	CERCLA past-practice
D&D	decontamination and decommissioning
DBBP	di-butylbutyl phosphate
DBP	dibutyl phosphate
DOE	U.S. Department of Energy
dpm	disintegrations per minute
DQA	data quality assessment
DQO	data quality objective
EMI	electromagnetic induction
EM	electromagnetic
EPA	U.S. Environmental Protection Agency
ERD	Environmental Restoration Division
FS	feasibility study
GG	gross gamma
GPR	ground-penetrating radar
GRA	general response action
HASP	health and safety plan
HEIS	*Hanford Environmental Information System*
HF	hydrogen fluoride
HPGe	high-purity germanium
HSTF	Hexone Storage and Treatment Facility
HVAC	heating, ventilation, and air conditioning
IAEA	International Atomic Energy Agency
IDW	investigation-derived waste
K_d	distribution coefficient
LLWMA	low-level waste management area
MIBK	methyl iso butyl ketone (hexone)
NAVD88	North American Vertical Datum of 1988
NPH	normal paraffin hydrocarbon
NPL	"National Priority List," 40 CFR 300, Appendix B
ORP	U.S. Department of Energy, Office of River Protection
OU	operable unit
PFP	Plutonium Finishing Plant
PIF	Plutonium Isolation Facility

PN	passive neutron
PNNL	Pacific Northwest National Laboratory
PRF	Plutonium Reclamation Facility
PRG	preliminary remediation goal
PUREX	Plutonium/Uranium Extraction (Plant or process)
QRA	qualitative risk assessment
RAO	remedial action objective
RAWP	remedial action work plan
RCRA	*Resource Conservation and Recovery Act of 1976*
RDR	remedial design report
RECUPLEX	recovery of uranium and plutonium by extraction (process)
REDOX	Reduction-Oxidation (Plant or process)
RFI	RCRA facility investigation
RI	remedial investigation
RL	U.S. Department of Energy, Richland Operations Office
RMA	Remote Mechanical Line A
RMC	Remote Mechanical Line C
ROD	record of decision
RPP	RCRA past-practice
SAP	sampling and analysis plan
SCA	surface contamination area
SGL	spectral gamma-ray logging
SST	single-shell tank
TBP	tributyl phosphate
TEDF	Treated Effluent Disposal Facility
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSD	treatment, storage, and disposal
UNH	uranyl nitrate hexahydrate
URM	underground radiation material (area)
URP	uranium recovery process
VCP	vitrified clay pipe
WIDS	*Waste Information Data System*

METRIC CONVERSION CHART

Into Metric Units			Out of Metric Units		
If You Know	*Multiply By*	*To Get*	*If You Know*	*Multiply By*	*To Get*
Length			**Length**		
inches	25.4	millimeters	Millimeters	0.039	inches
inches	2.54	centimeters	Centimeters	0.394	inches
feet	0.305	meters	Meters	3.281	feet
yards	0.914	meters	Meters	1.094	yards
miles	1.609	kilometers	Kilometers	0.621	miles
Area			**Area**		
sq. inches	6.452	sq. centimeters	sq. centimeters	0.155	sq. inches
sq. feet	0.093	sq. meters	sq. meters	10.76	sq. feet
sq. yards	0.836	sq. meters	sq. meters	1.196	sq. yards
sq. miles	2.6	sq. kilometers	sq. kilometers	0.4	sq. miles
acres	0.405	hectares	Hectares	2.47	acres
Mass (weight)			**Mass (weight)**		
ounces	28.35	grams	Grams	0.035	ounces
pounds	0.454	kilograms	Kilograms	2.205	pounds
ton	0.907	metric ton	metric ton	1.102	ton
Volume			**Volume**		
teaspoons	5	milliliters	Milliliters	0.033	fluid ounces
tablespoons	15	milliliters	Liters	2.1	pints
fluid ounces	30	milliliters	Liters	1.057	quarts
cups	0.24	liters	Liters	0.264	gallons
pints	0.47	liters	cubic meters	35.315	cubic feet
quarts	0.95	liters	cubic meters	1.308	cubic yards
gallons	3.8	liters			
cubic feet	0.028	cubic meters			
cubic yards	0.765	cubic meters			
Temperature			**Temperature**		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius	Celsius	multiply by 9/5, then add 32	Fahrenheit
Radioactivity			**Radioactivity**		
picocuries	37	millibecquerel	millibecquerels	0.027	picocuries

This page intentionally left blank

1.0 INTRODUCTION

This work plan supports the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) remedial investigation/feasibility study (RI/FS) activities for the 200-IS-1 Tanks/Lines/Pits/Boxes Waste Group Operable Unit (OU) and the 200-ST-1 Septic Tanks and Drain Fields Group OU. This work plan also integrates the *Resource Conservation and Recovery Act of 1976* (RCRA) facility investigation/corrective measures study (RFI/CMS) requirements for these OUs and supports the framework established in DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*, the implementation plan for integrating the RCRA treatment, storage, and disposal (TSD) unit closure process with the OU RI/FS process. RCRA TSD units included in this work plan that require investigation to comply with RCRA Closure/Post Closure requirements are the CX Tank System (Tanks 241-CX-70, 241-CX-71, and 241-CX-72) and the Hexone Storage and Treatment Facility (HSTF) (276-S-141 and 276-S-142). The RCRA Closure Plan for the CX Tank System and the revision to DOE/RL-92-40, Rev. 0, *Hexone Storage and Treatment Facility Closure Plan*, will be submitted in conjunction with the feasibility study (FS) to be prepared for the 200-IS-1 and 200-ST-1 OUs. The 241-Z Treatment and Storage Tanks RCRA TSD unit is in service supporting the Plutonium Finishing Plant (PFP) Nuclear Materials Stabilization Project and subsequent facility decontamination and decommissioning (D&D) until 2011 (DOE/RL-96-82, *Hanford Facility Dangerous Waste Closure Plan, 241-Z Treatment and Storage Tanks)* and is, therefore, not included. The process outlined in the work plan follows the CERCLA format with modifications to concurrently satisfy the RCRA requirements.

The 200-IS-1 OU is described in DOE/RL-96-81, Rev. 0, *Waste Site Grouping Report for 200 Areas Soil Investigations*. The OU is an extensive network of pipelines, diversion boxes, catch tanks, valve pits, and related infrastructure not assigned to other waste sites. The infrastructure was used to transport process waste from the separations facilities to the single- and double-shell tanks and to control or divert flow between parallel waste sites receiving the same low-level waste streams. The 200-ST-1 Septic Tanks and Drain Fields Waste Group OU, consists of active and inactive septic systems designed to receive shower water, kitchen wastewater, janitorial sink wastewater, human sewage, and similar liquid waste. Each site typically consists of a large-capacity holding tank that overflows to a gravel-filled drain field. Occupied buildings have a dedicated septic tank/drain field or share a system with adjacent structures. The volume and inventory of waste discharged to these sites were not tracked.

The U.S. Department of Energy (DOE), Washington State Department of Ecology (Ecology), and U.S. Environmental Protection Agency (EPA) have agreed on an implementation approach for the RI/FS process in the Hanford Site's 200 Areas. DOE/RL-98-28, Rev. 0, addressed more than 800 waste sites in 9 major waste categories (e.g., process waste, landfills, cooling water) that were grouped into 23 process-based OUs. This categorization facilitates the use of an analogous-sites approach, which involves combining waste sites with similar process histories, structures, and contaminants into groups, then choosing at least one representative waste site for comprehensive field investigations. Findings from the field investigations of the representative waste sites are used to make remedial decisions for all of the waste sites in the waste group.

Modifications to the M-013 series of *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) milestones for non-Tank Farm past-practice waste site investigations approved in June 2002 (Tri-Party Agreement Change Number M-13-02-01) included an approach to investigate similar OUs in a single RI/FS process. This reduces the number of non-Tank Farm work plans, RI reports, and FSs. The revised approach allows for collection of the data necessary to adequately characterize the waste sites in more than one OU to support the evaluation of effective remedial alternatives. The scope of this work plan, therefore, addresses waste sites in both the 200-IS-1 and 200-ST-1 OUs.

The original set of waste sites assigned to these OUs in the Implementation Plan (DOE/RL-98-28) has been revised by adding new waste sites and reclassifying accepted waste sites in accordance with RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)."

This work plan contains the sampling and analysis plan (SAP) for characterization of the RCRA TSD units identified earlier and for the selected representative waste sites. The RCRA TSD units are identified as interim-status units under *Washington Administrative Code* (WAC) 173-303. The current Part A Permit applications for these units are contained in Appendix A. The remaining waste sites are RCRA past-practice (RPP) sites. The logic for selecting representative waste sites to be characterized from these OUs is explained in Chapter 4.0.

The characterization and remediation of waste sites at the Hanford Site are addressed in the Tri-Party Agreement. The schedule of work at the Hanford Site is governed by Tri-Party Agreement milestones. The major milestones applicable for preparing the 200-IS-1 and 200-ST-1 OU RI/FS work plan are as follows:

- **M-013-00M**. "Submit one 200 RI/FS (RFI/CMS) Work Plan for the 200-IS-1, Tanks/Lines/Pits Diversion Boxes OU (Includes waste sites in the 200-ST-1, Septic Tank and Drain Fields OU) by December 31, 2002."

- **M-020-00B**. "Submit Closure/Post-Closure Plans for 216-A-10, 216-A-36B, 216-A-37-1, 207-A South Retention Basin, 216-S-10 Pond, 216-S-10 Ditch, 241-CX-70, 241-CX-71, and 241-CX-72 by December 31, 2008."

- **M-20-54**. "Submit 241-CX-70 Storage Tank, 241-CX-71 Neutralization Tank, 241-CX-72 Storage Tank Closure/Post Closure Plan to Ecology in coordination with the 200-IS-1 Tanks/Lines/Pits/Boxes and 200-ST-1 Septic Tank Operable Units Work Plan Feasibility Study scheduled under M-13-00M by December 31, 2008."

- **M-15-00C**. "Complete all 200 Area nontank farm OUs pre-ROD site investigations under approved work plan schedules by December 31, 2008."

The data generated through investigation activities associated with this OU will support activities in other core projects in the DOE, Richland Operations Office's (RL) Groundwater Protection Program. Integration of the data collection activities with other projects on the Hanford Site results in more efficient and consistent remediation processes.

1.1 200 AREAS IMPLEMENTATION PLAN

The Implementation Plan (DOE/RL-98-28) outlines a strategy that is intended to streamline the characterization and remediation of waste sites in the 200 Areas, including CERCLA past-practice (CPP) sites, RPP sites, and certain RCRA TSD units. The plan outlines the framework for implementing assessment activities and evaluating remedial alternatives in the 200 Areas to ensure consistency in documentation, level of characterization, and decision making. A regulatory framework is established in DOE/RL-98-28 to integrate the requirements of RCRA and CERCLA into one standard approach for cleanup activities in the 200 Areas. This approach is illustrated in Figure 1-1. The 200-IS-1 OU includes TSDs and RPP waste sites and the 200-ST-1 has only RPP waste sites. Ecology is the lead regulatory agency for both OUs. For this document, the CERCLA terminology will be used to be consistent with the Implementation Plan.

DOE/RL-98-28 consolidates much of the information normally found in the specific work plans for the two OUs to avoid duplicating this information for each of the 23 OUs in the 200 Areas. The Implementation Plan also lists potential applicable or relevant and appropriate requirements (ARAR) and preliminary remedial action objectives (RAO), and addresses potentially feasible remedial technologies that may be employed in the 200 Areas. This work plan references the Implementation Plan for further details on several topics, such as general information on the physical setting and the operational history of 200 Area facilities, ARARs, RAOs, and post-work plan activities.

A record of decision (ROD) for the OUs specifying remediation requirements will be obtained using data collected during the RI. The analogous sites will be addressed during post-ROD confirmatory sampling to ensure that the remedial action decision specified in the ROD is appropriate and to provide required engineering design data for implementing the remedial action.

1.2 SCOPE AND OBJECTIVES

This work plan provides details for characterizing chemical, radiological, and physical conditions in the soil at the RCRA TSD sites and representative waste sites in the 200-IS-1 and 200-ST-1 OUs. This work plan presents background information, existing data regarding contamination, and the approach that will be used to investigate the sites. The preliminary remedial action alternatives that are likely to be considered for remediation of the OU waste sites also are identified. A discussion of the remedial investigation planning and execution process is included, along with a schedule for the characterization work. Details on sampling and analysis are provided in Appendix B to guide work in the field. Waste management will be conducted under a waste control plan to be prepared before field activities begin.

A data quality objective (DQO) process was conducted for the OUs to define the radiological and nonradiological constituents to be characterized and to specify the number, type, and location of samples to be collected at the RCRA TSD units and representative waste sites within the OUs. The results of the DQO process form the basis for the work plan and associated SAP included in Appendix B. The SAP includes a quality assurance project plan and a field sampling

plan for implementing the characterization activities in the field for the 200-IS-1 and 200-ST-1 OUs.

After characterization data have been collected, the results will be presented in a group-specific RI report that includes the RCRA TSD unit characterization. The RI report will support the evaluation of remedial alternatives and closure options that will be included in the FS and RCRA TSD unit closure plan. Data collected and remedial decisions made under the 200-IS-1 and 200-ST-1 OUs RI/FS process will be applied to all of the other analogous waste sites in these waste categories. Confirmatory sampling of waste sites in the 200-IS-1 and 200-ST-1 OUs after remedy selection may be required to demonstrate that analogous conditions exist and to support the remedial design process. The assessment process is described in Chapter 5.0; the schedule for assessment activities at the 200-IS-1 and 200-ST-1 OUs is presented in Chapter 6.0.

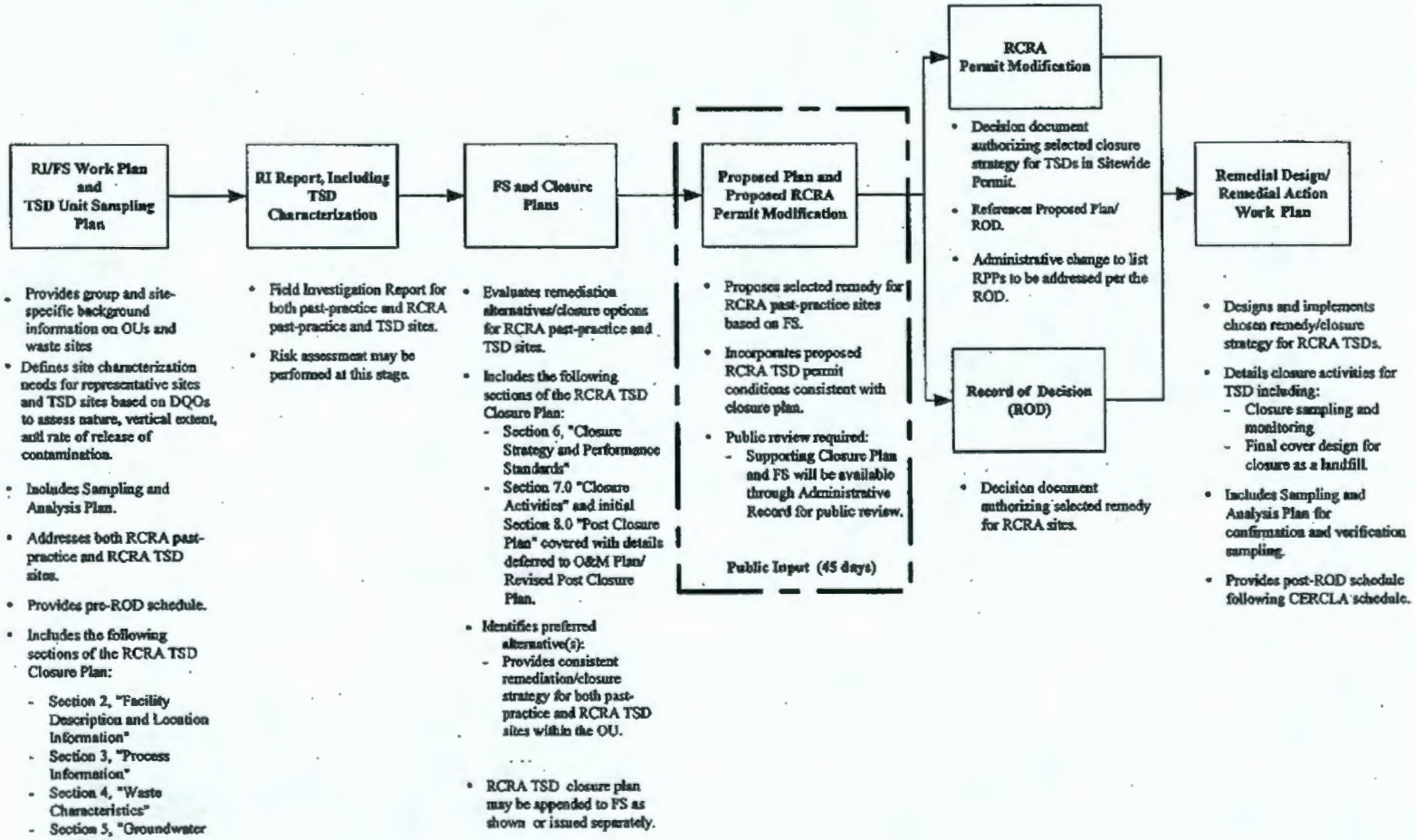
1.3 CHANGE CONTROL

Following approval of the work plan, the major elements (RI/FS steps) of the work plan are requirements that are not expected to change; therefore, the work plan should not change. Specific work-scope elements might require change or refinement as the work progresses. Changes that do not affect the overall intent of the approved work plan or schedule can be made using a change notice. Alternatively, and if agreed to by RL and the lead regulatory agency, unit managers' meeting or predecessor primary documents requiring RL and lead regulatory agency approval also can be used to document changes (e.g., the RI report can be used to document refinements to or focus the FS). Changes to the project schedule that affect assigned M-15 interim milestones will require approval through the Tri-Party Agreement change control process.

Changes to the remedial investigation scope detailed in the SAP could be required because of unexpected field conditions, new information, health and safety concerns, or other unexpected conditions. Minor changes that have no adverse effect on achieving the DQOs for the job or schedule may be made in the field with the approval by the project manager or assigned task lead and documented in the field logbook and/or field summary reports. Changes that affect DQOs will require concurrence by RL and the lead regulatory agency and may be documented through unit managers' meetings. Alternatively, if substantial changes are required, the SAP may be revised and issued as a separate document requiring RL and regulator approval.

Additional discussion on work control can be found in Section 7.2.2 of the Implementation Plan (DOE/RL-98-28).

Figure 1-1. Integrated Regulatory Process for CERCLA, RCRA Past-Practice, and RCRA Treatment, Storage, and Disposal Unit Closure (modified from Figure 2-2, DOE/RL98-28).



This page intentionally left blank

2.0 BACKGROUND AND SETTING

This chapter describes the waste site information and the hydrogeologic conditions framework associated with the 200-IS-1 and 200-ST-1 OUs. The information presented in this section addresses the physical setting, waste site description, history, and waste-generating processes for the RCRA TSD units and representative sites. Section 2.2.3 covers the RCRA TSD units and representative sites. Summary information is provided in Appendix C for all other waste sites that will not be immediately characterized, but are addressed in future planning efforts. Information in this section has been compiled from a number of sources, the most significant of which are as follows:

- CP-13196, *Remedial Investigation Data Quality Objectives Summary Report for the 200-IS-1 and 200-ST-1 Operable Units*
- DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*
- DOE/RL-92-04, *PUREX Plant Source Aggregate Area Management Study Report*
- DOE/RL-91-60, Rev. 0, *S Plant Source Aggregate Area Management Study Report*
- DOE/RL-92-18, Rev. 0, *Semiworks Source Aggregate Area Management Study Report*
- DOE/RL-91-61, Rev. 0, *T Plant Source Aggregate Area Management Study Report*
- DOE/RL-91-52, *U Plant Source Aggregate Area Management Study Report*
- DOE/RL-91-58, Rev. 0, *Z Plant Source Aggregate Area Management Study Report*
- PNNL-13788, *Hanford Site Groundwater Monitoring for Fiscal Year 2001*
- WIDS.

Certain sections of this chapter contain information that will be used for portions of the FS and closure plan. Closure Plan Chapters 2.0, "Facility Description and Location Information," and 3.0, "Process Information," are covered in Sections 2.1 and 2.2, respectively. Closure Plan Chapters 4.0, "Waste Characteristics," and 5.0, "Groundwater Monitoring," correspond to information found in Sections 2.2.3 and 3.4, respectively.

2.1 PHYSICAL SETTING

The following sections summarize the geology and hydrology associated with the 200 Areas, including the 200-IS-1 and 200-ST-1 OUs. More detail on the physical setting of the 200 Areas and vicinity is provided in Appendix F of the Implementation Plan (DOE/RL-98-28).

2.1.1 Topography

The 200-IS-1 and 200-ST-1 OUs include waste sites located in both the 200 East and 200 West Areas on the 200 Area Plateau. The 200 Area Plateau (Figure 2-1) is the common reference used to describe the broad, flat area that constitutes a local topographic high around the 200 Areas of the Hanford Site. The plateau was formed approximately 13,000 years ago during the cataclysmic Missoula floods. The northern boundary is defined by an erosional channel that runs east-southeast before turning south just east of the 200 East Area. This erosional channel formed during the waning stages of flooding as the floodwaters drained from the basin. The northern half of the 200 East Area lies within this ancient flood channel. A secondary flood channel running southward off the main channel bisects the 200 West Area. The buried former river and flood channels could provide preferential pathways for groundwater and contaminant movement.

Waste sites in the 200 West Area are situated in a relatively flat area in a secondary flood channel. Surface elevations range from approximately 205 m (673 ft) to 217 m (712 ft) (the datum is the *North American Vertical Datum of 1988* [NAVD88]), and the surface slopes gently to the west. Waste site surface elevations in the 200 East Area and vicinity range from approximately 189 m (620 ft) NAVD88 in the northern portion of the 200 East Area to 230 m (755 ft) at waste sites just south of the 200 East Area. The surface inside the 200 East Area slopes gently to the northeast.

2.1.2 Geology

The 200-IS-1 and 200-ST-1 OUs are underlain by basalt of the Columbia River Basalt Group and a sequence of suprabasalt sediments. From oldest to youngest, major geologic units of interest are the Elephant Mountain Basalt Member, the Ringold Formation, the Cold Creek unit, the Hanford formation/Cold Creek unit, and the Hanford formation. The fluvial-lacustrine Ringold Formation is informally divided into several informal units (from oldest to youngest): unit A, lower mud, unit E, and upper unit. The Ringold Formation is overlain by a Plio-Pleistocene-aged unit in the 200 West Area consisting of a locally derived subunit that is interpreted to be a weathered surface that developed on the top of the Ringold Formation (WHC-SD-EN-TI-290, Rev. 0,*Geologic Setting of the Low-Level Burial Grounds*; PNL-7336, *Geohydrology of the 218-W-5 Burial Ground, 200-West Area, Hanford Site*) and an eolian facies (Slate 1996). The eolian facies originally was described as a separate unit called the early "Palouse soil." A recently identified unit of questionable origin, referred to as the Hanford formation/Cold Creek unit, is reported in the northeast corner of the 200 East Area. This unit could be equivalent or partially equivalent to the Cold Creek unit or it may represent the earliest ice age flood deposits overlain by a locally thick sequence of fine-grained nonflood deposits (HNF-5507 Rev. 0A, *Subsurface Condition Report for the B-BX-BY Waste Management Area*). Glaciofluvial cataclysmic flood deposits of the Hanford formation are present in both the 200 East and 200 West Areas. Hanford formation deposits consist of gravel-dominated and sand-dominated sequences. A generalized stratigraphic column for the 200 East and 200 West Areas is shown in Figure 2-2.

The Elephant Mountain Basalt Member is a medium- to fine-grained tholeiitic basalt with abundant microphenocrysts of plagioclase (DOE/RW-0164-F, *Consultation Draft, Site*

Characterization Plan, Reference Repository Location, Hanford Site, Washington). Basalt is overlain by the Ringold Formation over most of the 200 East Area and all of the 200 West Area. This formation consists of an interstratified sequence of unconsolidated clay, silt, sand, and granule to cobble gravel deposited by the ancestral Columbia River. These alluvial sediments consist of four major units (from oldest to youngest): the fluvial gravel and sand of unit A, the buried soil horizons and lake deposits of the lower mud sequence, the fluvial sand and gravel of unit E, and the lacustrine mud of the upper Ringold.

Overlying the Ringold Formation in the 200 West Area is the locally derived subunit of the Cold Creek unit, which consists of poorly sorted, locally derived, interbedded reworked loess, silt, sand, and basaltic gravel (WHC-SD-EN-TI-290). The subunit consists of a lower carbonate-rich paleosol (caliche) and an upper eolian facies. The carbonate-rich section consists of interbedded carbonate-poor and carbonate-rich strata. The upper silty eolian facies had been interpreted to be early Pleistocene loess and had been referred to as the early Palouse soil (PNL-7336). Generally, it is well-sorted quartz-rich/basalt-poor silty sand to sandy silt (BHI-00270, Rev. 1, *Pre-Operational Baseline and Site Characterization Report for the Environmental Restoration Disposal Facility*).

Where the Ringold Formation and Cold Creek unit are not present, the Hanford formation/Cold Creek unit and Hanford formation sediments overlie the basalt. The Hanford formation/Cold Creek unit is made up of two facies and has been identified only in the 200 East Area near the B, BX, and BY Tank Farms. The lower facies overlies basalt and is described in HNF-5507 as loose, unconsolidated sandy gravel to gravelly sand. These gravels contain 50 to 70 percent basalt and are similar to and often indistinguishable from Hanford formation flood gravels in the absence of the second facies. The second facies consists of an olive brown to olive gray, well-sorted calcareous eolian/overbank silt with laminations, as well as pedogenic structures. However, the second facies also has been observed to be massive and void of any sedimentary or pedogenic structures. The Hanford formation consists of unconsolidated gravel, sand, and silts deposited by cataclysmic floodwaters. These deposits consist of gravel-dominated and sand-dominated facies. The gravel-dominated facies consist of cross-stratified, coarse-grained sands and granule to boulder gravel. The gravel is uncemented and matrix poor. The sand facies consists of well-stratified fine- to coarse-grained sand and granule gravel. Silt in these facies is variable and might be interbedded with the sand. Where the silt content is low, an open-framework texture is common. An upper and lower gravel unit and a middle sand facies are present in the study area.

Holocene-aged deposits overlie the Hanford formation and are dominated by eolian sheets of sand that form a thin veneer across the site; except in localized areas where the deposits are absent. Surficial deposits consist of very fine- to medium-grained sand to occasionally silty sand. Silty deposits less than 1 m (approximately 3 ft) thick also have been documented at waste sites where fine-grained windblown material has settled out through standing water over many years.

2.1.3 Vadose Zone

The vadose zone is approximately 104 m (340 ft) thick in the southern section of the 200 East Area and thins to as little as 0.3 m (1 ft) near West Lake to the north. Sediments in the vadose zone are dominated by the Ringold Formation and the Hanford formation. The Hanford formation/Cold Creek unit contact might be present in a small area immediately above the basalt beneath the B, BX, and BY Tank Farms. Because erosion during cataclysmic flooding removed much of the Ringold Formation north of the central part of the 200 East Area, the vadose zone is predominantly composed of Hanford formation sediments between the northern part of the 200 Areas and Gable Mountain. Areas of basalt also project above the water table north of the 200 East Area.

In the 200 West Area, the vadose zone thickness ranges from 79 m (261 ft) in the southeast corner to 102 m (337 ft) in the northwest corner. Sediments in the vadose zone are the Ringold Formation, the Cold Creek unit, and the Hanford formation. Erosion during cataclysmic flooding removed some of the Ringold Formation and Cold Creek unit.

Perched water historically has been documented above the Cold Creek unit at locations in the 200 West Area. While the liquid waste disposal facilities were operating, many localized areas of saturation or near saturation were created in the soil column. With the reduction of artificial recharge in the 200 Areas, the downward flux of liquid in the vadose zone beneath these waste sites has been decreasing. As unsaturated conditions are reached, the liquid flux at these disposal sites becomes increasingly less significant as a source of recharge and contaminant movement to groundwater. However, the moisture in the vadose zone is expected to remain elevated over preoperational levels for some time. In the absence of artificial recharge, recharge from natural precipitation becomes the dominant driving force for moving contaminants remaining in the vadose zone to groundwater.

2.1.4 Groundwater

The unconfined aquifer in the 200 Areas occurs within the Hanford formation/Cold Creek unit, the Hanford formation, or the Ringold Formation, depending on the location. Groundwater in the unconfined aquifer flows from recharge areas where the water table is high (west of the Hanford Site) to areas where it is low (e.g., near the Columbia River) (PNNL-13316, *Hanford Site Groundwater Monitoring for Fiscal Year 1999*). In the northern half of the 200 East Area, the water table is present within the Hanford formation, except in areas where basalt extends above the water table. Near the B-BX-BY waste management area, the water table occurs within the Hanford formation/Cold Creek unit. In the central and southern sections of the 200 East Area, the water table is located near the contact of the Ringold Formation and Hanford formation.

Depth to the water table in the 200 East Area and vicinity ranges from about 54 m (177 ft) near B Pond to over 104 m (340 ft) near the southern section. The water table across the 200 East Area is very flat (Figure 2-3), making it difficult to determine groundwater flow direction based on water level measurements from monitoring wells. Contaminant-plume geometry, however, indicates that groundwater flows to the northwest in the northern half of the 200 East Area and to the east/southeast in the southern half of the 200 East Area. Identifying the specific location of

the groundwater divide between the northern and southern sections is hampered by the flat water table. Highly transmissive Hanford formation sediments cause the flat water table in the 200 East Area (PNNL-13788). Since surface liquid discharges were terminated in the 200 East Area, the water table has been declining at a rate of about 0.14 m/yr (0.45 ft/yr) based on measurements collected between March and April of 2001 and March 2002 (PNNL-13788).

Groundwater beneath the 200 West Area occurs primarily in the Ringold Formation. Depth to water varies from about 50 m (164 ft) to greater than 100 m (328 ft). Groundwater flow is predominately to the east (Figure 2-3). The surface elevation of the water table beneath the 200 West Area is dropping at a rate of 0.35 m/yr (1.1 ft/yr) (PNNL-13788).

Recharge to the unconfined aquifer within the 200 Areas is from artificial and, possibly, natural sources. Any natural recharge originates from precipitation. Estimates of recharge from precipitation range from 0 to 10 cm/yr (0 to 4 in./yr) (PNNL 2002) and depend largely on soil texture and the type and density of vegetation. Artificial recharge occurred when effluent such as cooling water was disposed of to the ground. PNL-5506, *Hanford Site Water Changes --1950 through 1980, Data Observation and Evaluation* reports that between 1943 and 1980, 6.33×10^{11} L (1.67×10^{11} gal) of liquid waste were discharged to the soil column. Most sources of artificial recharge have been halted. A small potential exists for intermittent discharges from broken raw water lines before they were discovered and repaired. The artificial recharge that does continue is largely limited to liquid discharges from sanitary sewers, 2 state-approved land disposal structures, and 140 small-volume, uncontaminated, miscellaneous streams.

2.1.5 Summary of Hydrogeologic Conditions at RCRA TSD Units and Representative Sites

This section presents lithology, stratigraphy, and general location information about each of RCRA TSD unit and representative waste site.

2.1.5.1 CX Tank System

The CX Tank System consists of the Tanks 241-CX-70, 241-CX-71, and 241-CX-72 (Figures 2-4 and 2-6a), all in the central portion of the 200 East Area.

2.1.5.1.1 Tank 241-CX-70. Tank 241-CX-70 is located in the central portion of the 200 East Area south of 7th Street within the Hot Semiworks stabilized area (200-E-41) at coordinates N136298.7 and E574610.6 (Figure 2-4). The surface elevation at this site is 208.05 m (682.58 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, Ringold Formation (unit A), and the Hanford formation sand-dominated sequence. The Hanford formation and part of the Ringold Formation unit A occur within the vadose zone. The stratigraphy at Tank 241-CX-70 is based on data from wells 299-E27-5 and 299-E24-8 (Figure 2-5). Groundwater beneath Tank 241-CX-70 occurs within the Ringold Formation unit A, about 86.6 m (284 ft) below ground surface (bgs).

2.1.5.1.2 Tank 241-CX-71. Tank 241-CX-71 is located in the central portion of the 200 East Area south of 7th Street, within the Hot Semiworks stabilized area (200-E-41) at coordinates N136316.9 and E574592.25 (Figure 2-4). The surface elevation at this site is 208.08 m

(682.67 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, Ringold Formation (unit A), and the Hanford formation sand-dominated sequence. The Hanford formation and part of the Ringold Formation unit A occur within the vadose zone. The stratigraphy at Tank 241-CX-71 is based on data from wells 299-E27-5 and 299-E24-8 (Figure 2-5). Groundwater beneath Tank 241-CX-71 occurs within the Ringold Formation unit A, about 86.6 m (284 ft) bgs.

2.1.5.1.3 Tank 241-CX-72. Tank 241-CX-72 is located in the central portion of the 200 East Area south of 7th Street, within the Hot Semiworks stabilized area (200-E-41) at coordinates N136300.25 and E574631.0 (Figure 2-4). The surface elevation at this site is 208.08 m (682.67 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, Ringold Formation (unit A), and the Hanford formation sand-dominated sequence. The Hanford formation and part of the Ringold Formation unit A occur within the vadose zone. The stratigraphy at Tank 241-CX-72 is based on data from wells 299-E27-5 and 299-E24-8 (Figure 2-5). Groundwater beneath Tank 241-CX-72 occurs within the Ringold Formation unit A, about 86.6 m (284 ft) bgs.

2.1.5.2 Hexone Storage and Treatment Facility

The HSTF, located in the southeast corner of the 200 West Area, consists of two 24,000-gal tanks (Appendix A).

2.1.5.2.1 Tank 276-S-141. Tank 276-S-141 is located in the southern portion of the 200 West Area northwest of the Reduction-Oxidation (REDOX) canyon and service facility (S Plant) at coordinates N 134037.6 and E 567284.5 (Figure 2-6b). The surface elevation at this site is approximately 205.4 m (674 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member; the Ringold Formation unit A, lower mud unit, and unit E; the undifferentiated Cold Creek unit, and the Hanford formation sand-dominated sequence. Of these units, the Ringold E, the undifferentiated Cold Creek unit, and the Hanford formation are within the vadose zone and are the principal units of interest in this site. The stratigraphy at Tank 276-S-141 is shown in Figure 2-7 and is based on the geology at well 299-W22-14. Groundwater beneath Tank 276-S-141 occurs within the Ringold Formation unit E about 70.9 m (232.6 ft) bgs.

2.1.5.2.2 Tank 276-S-142. Tank 276-S-142 is located in the southern portion of the 200 West Area northwest of the REDOX canyon and service facility at the coordinates N134032.3 and E567284.5 (Figures 2-6b). The surface elevation at this site is approximately 205.4 m (674 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, the Ringold Formation unit A, lower mud unit, and unit E, the undifferentiated Cold Creek unit, and the Hanford formation sand-dominated sequence. Of these units, the Ringold Formation unit E, the undifferentiated Cold Creek unit, and the Hanford formation are within the vadose zone and are the principal units of interest in this site. The stratigraphy at Tank 276-S-142 is shown in Figure 2-7 and is based on the geology at well 299-W22-14. Groundwater beneath the 276-S-142 Tank occurs within the Ringold Formation unit E about 70.9 m (232.6 ft) bgs.

2.1.5.3 200-E-111 Tank Farm Process Piping

The 200-E-111 Tank Farm Process Piping is located in the central portion of the 200 East Area (Figure 2-6a). The surface elevation at this site is 203 m (666 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, Ringold Formation unit A, and the Hanford formation sand- and gravel-dominated sequences (RPP-7123, Rev. 0, *Subsurface Conditions Description of the T-TX-TY Waste Management Area*). Of these units, the Ringold unit E, the upper Ringold, and the Hanford formation are within the vadose zone and are the principal units of interest in this site. The stratigraphy at the 200-E-111 Tank Farm Process Piping is shown in Figure 2-8 and occurs within the Ringold Formation unit E about 80.1 m (263 ft) bgs.

2.1.5.4 200-W-59 Diversion Box

The 200-W-59 Diversion Box is located in the central portion of the 200 West Area, southwest of the Plutonium/Uranium Extraction Plant (PUREX) at the coordinates N135493.1 and E566364.6 (Figure 2-6b). The surface elevation at this site is approximately 207.3 m (680 ft) NAVD88. Stratigraphic units at this site (in ascending order) consist of basalt of the Elephant Mountain Member, the Ringold Formation unit A, lower mud unit, and unit E), the undifferentiated Cold Creek unit, and the Hanford formation gravel-dominated sequence. Of these units, the Ringold Formation unit E, the undifferentiated Cold Creek unit, and the Hanford formation are within the vadose zone and are the principal units of interest in this site. The stratigraphy at the 200-W-59 Diversion Box is shown in Figure 2-9 and is based on the geology at well 299-W18-1. Groundwater beneath the 200-W-59 Diversion Box occurs within the Ringold Formation unit E about 68.7 m (225 ft) bgs.

2.1.5.5 2607-W3 Septic Tank

The 2607-W3 Septic Tank is located in the northeast portion of the 200 West Area (Figure 2-6b). The surface elevation at this site is 217.1 m (712 ft) NAVD88. Stratigraphic units at this site consist of, in ascending order, basalt of the Elephant Mountain Member, the Ringold Formation unit E and the upper Ringold unit, the undifferentiated Cold Creek unit, and the Hanford formation sand- and gravel-dominated sequences. Of these units, the Ringold unit E, the undifferentiated Cold Creek unit, and the Hanford formation are within the vadose zone and are the principal units of interest in this site. The stratigraphy at the 2607-W3 Septic Tank is shown in Figure 2-10, and is based on the geology at well 299-W27-13 and 299-W11-19. Groundwater beneath the 2607-W3 Septic Tank occurs within the Ringold Formation unit E about 75.3 m (247 ft) bgs.

2.2 WASTE SITE DESCRIPTION AND HISTORY

The actual waste sites assigned to these OUs in DOE/RL-98-28 have been revised by adding new waste sites and reclassifying accepted waste sites in accordance with TPA-MP-14 (RL-TPA-90-0001). Section 4.1 describes the method used during the DQO process to determine the waste sites that this work plan considers.

The following are source waste streams for the 200-IS-1 and 200-ST-1 OU waste sites:

- 221-B Building and bismuth phosphate process operations (B Plant)
- T Plant
- U and UO_3 Plants
- REDOX Plant (S Plant)
- PUREX Plant (A Plant)
- Z Plant complex
- Hot Semiworks Plant (C Plant).

All the 200-IS-1 and 200-ST-1 waste sites are located within the 200 Area industrial (exclusive) land-use boundary as identified in DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Environmental Impact Statement*, and documented in a ROD (65 FR 61615).

Summary information on the 200-IS-1 and 200-ST-1 RCRA TSD Units and representative waste sites is presented in Section 2.2.3. Appendix C contains summary information on the waste sites covered by this work plan.

2.2.1 200 Area Plant History

The following discussion summarizes historical process operations at 200 Area facilities that were associated with the 200-IS-1 and 200-ST-1 OU waste sites addressed in this work plan.

B Plant. The B Plant was constructed in 1944. From 1945 to 1952, B Plant operations consisted of a batchwise, inorganic chemical separation of weapons-grade plutonium from irradiated uranium. This was known as the bismuth phosphate/lanthanum fluoride process. From 1952 to 1965, B Plant was used for waste treatment operations. In 1963, the 221-B Building Waste Fractionalization Project began recovering strontium, cerium, and rare earth metals as part of the Phase I processing. Phase I processing ended in June 1966 to accommodate Phase II construction and Phase III waste fractionalization processing began in 1968. This process separated the long-lived radionuclides strontium-90 and cesium-137 from high-level PUREX and REDOX waste, and stored a concentrated solution of strontium-90 and cesium-137 at the 221-B Building. In 1968, B Plant underwent renovations and the Waste Encapsulation and Storage Facility (WESF) was added to concentrate, encapsulate, and store radioactive waste. Waste fractionalization and encapsulation efforts continued until 1986 (DOE/RL-92-05, Rev. 0, *B Plant Source Aggregate Area Management Study Report*). The 222-B Laboratory supported operations at the 221-B Building complex and other 200 Area facilities from 1945 to 1952.

T Plant. The T Plant was constructed in 1944. From 1945 to 1956, T Plant operations consisted of the bismuth phosphate/lanthanum fluoride process. In 1957, the 221-T Building was converted to a decontamination and equipment refurbishment facility. The facility provided services in radioactive decontamination, reclamation, and decommissioning of process equipment. It currently serves the Hanford Site in this capacity. A series of testing programs by Pacific Northwest National Laboratory and the Westinghouse Hanford Company also occurred intermittently from 1964 to 1990 (DOE/RL-91-61, Rev. 0, DOE/RL-92-05, Rev. 0, *B Plant Source Aggregate Area Management Study Report*, DOE/RL-92-18, Rev. 0, *Semiworks Source Aggregate Area Management Study Report*). The 222-T Laboratory supported operations at the

221-T Building from 1945 to 1956. After 1956, all laboratory analyses of T Plant operations were sent to the 222-S Laboratory.

U Plant. The U Plant was constructed in 1944 and included the 221-U Canyon Building and the 224-U Building. U Plant was based on the design of the T and B Plants and initially was used to train personnel for the bismuth/phosphate plutonium separation and purification operations. During the training phase, only water was used in the plant systems, and no waste streams were generated. However, in 1951, U Plant was modified for the uranium recovery process (URP). From 1952 to 1958, U Plant was used to recover uranium from bismuth/phosphate waste stored in the single-shell tanks for reuse in the reactor plants. A later operation conducted at U Plant was the "scavenging" or precipitation of long-lived fission products during the liquid waste settling process before discharge to the soil column. U Plant also performed equipment decontamination operations similar to those conducted at T Plant.

The final operation of U Plant involved converting uranyl nitrate hexahydrate (UNH) to uranium trioxide (UO_3). This operation was accomplished by calcining the UNH in a batch process within the 224-U Building. In 1957, the batch conversion of UNH to UO_3 was renovated. The operation was updated to a continuous flow and the 224-U Building became known as the UO_3 Plant (DOE/RL-91-52). The UO_3 Plant operated from 1958 until 1972 when PUREX was put in "stand-down" mode. During that time, the UO_3 Plant converted UNH from the PUREX and REDOX Plants to UO_3 powder. The UO_3 Plant resumed operations in 1984 to process UNH from the PUREX Plant. Because the feed lines from the REDOX Facility and 221-U no longer were used, they were disconnected and capped in the UO_3 Plant. UO_3 Plant operations ceased in 1988 (DOE/RL-91-52,, DOE/RL-2001-01, *200-PW-1 Plutonium-Rich/Organic-Rich Process Waste Group Operable Unit RI/FS Work Plan,* ,and DOE/RL-2000-60, Rev. 0, *200-PW-1 Uranium Rich Process Waste Group Operable Unit RI/FS Work Plan and Process Waste RCRA TSD Unit Sampling Plan*).

REDOX Plant. The REDOX Plant (S Plant) was home to the first continuous uranium and plutonium separation operation at the Hanford Site. The REDOX process was a solvent extraction process that used hexone and aluminum nitrate nanohydrate (ANN) in nitric acid to complete these separations. Plant operations began in 1952 and continued until 1967 (DOE/RL-91-60, Rev. 0). The 222-S Laboratory is one of the primary waste generators in the S Plant Aggregate Area. It was constructed during 1950 and 1951 and is located immediately south of the 202-S Building. The laboratory provides high-level and low-level radiological and nonradiological analytical services for operations in the 200 Areas. It continues to support Hanford Site operations with emphasis on waste management, offsite shipment certification, chemical processing, and environmental monitoring programs throughout the 200 West and 200 East Areas including B Plant, U Plant, the tank farms, the 242-A and 242-S Evaporators, WESF, the PUREX Plant, and the Z Plant complex (DOE/RL-2001-01).

PUREX Plant. The separation process used at the PUREX Plant (A Plant) replaced the REDOX process. The PUREX process used a recoverable salting agent (nitric acid) that proved economically more feasible, generated less waste, and operated more safely than the REDOX process. The construction of the PUREX Plant was completed in late 1955. The PUREX Plant operated continuously from November 1955 until 1972, separating plutonium and uranium products from irradiated fuel. The PUREX Plant was put on standby from 1972 until 1983. The

PUREX Plant was restarted in 1983 and continued operations until 1988 when it was deactivated. The 202-A Laboratory supported PUREX operations at the 202-A Building from 1955 to 1972, and again from 1983 to 1988. However, other samples from the PUREX Plant were sent to the 222-S Laboratory for analysis (DOE/RL-92-18, DOE/RL-2001-01).

The Z Plant Complex. The Z Plant complex was used to isolate and purify plutonium solutions, produce metallic plutonium and plutonium oxides, and recover plutonium and americium from plutonium scrap materials. Throughout its life, the Z Plant complex (PFP) received processed (i.e., uranium and fission products removed) plutonium solutions from each of the 200 Area separations facilities. Currently, the Z Plant complex is used to stabilize plutonium-containing solids, solutions, and incinerator ashes. The buildings associated with the 200-IS-1 and 200-ST-1 OU waste sites are discussed in the following paragraphs.

The 231-Z Building was constructed in 1944 and served to further decontaminate plutonium product from both T and B Plants before being shipped off Site. At the start of Hanford Site operations, plutonium was refined and converted to a nitrate paste in the 231 Z Building before being shipped off Site. In 1949, after the 234-5 Z Building was constructed and operating, plutonium nitrate pastes no longer were produced. The 231-Z Building then was converted into a plutonium metallurgy laboratory and it operated in this capacity from the 1950's through the 1970's. The research included tensile strength testing, stress testing, and testing coatings and other material science properties of plutonium and plutonium alloys. Beginning in the 1960's, the Atomic Energy Commission's Division of Military Application began design, development, and fabrication of other experimental weapons to support the weapons testing program at the Nevada Test Site. As of 1975, the experimental work performed by the Division of Military Application was phased out. Major cleanouts of glove boxes, hoods, and other plutonium-containing equipment were performed from 1978 until 1982. Much of this waste was placed in 20-year transuranic retrievable storage and in transuranic burial grounds within the 200 West Area. In the mid-1980's, the 231 Z offices were used by the Special Isotope Separations Design Group. Currently the 231 Z Building is in a post-operations surveillance and maintenance mode and is scheduled for deactivation after 2010.

In 1948, the 234-5 Z Building and ancillary facilities (i.e., PFP) were constructed to replace the processes within the 231 Z Building. A number of process lines in the 234-5 Z Building were used between 1949 and 1989. Initially, batch inorganic chemical steps were used to refine and convert plutonium to the desired form; elaborate mechanical extraction processes were developed later. The Rubber Glove (RG) line was used to reduce plutonium nitrate to metal and/or oxide forms beginning in 1949. The Remote Mechanical A (RMA) line operations replaced the RG operations in 1953 and continued until 1979. The Remote Mechanical C (RMC) line became operational in 1960 and continued until 1989. The RMA and RMC operated the same chemical process as the RG line. However, the RMA and RMC operations were conducted by the operators using remote mechanical devices, rather than using rubber gloves within glove boxes and hoods. The 234-5 Z (PFP) Building also housed the Recovery of Uranium and Plutonium by Extraction (RECUPLEX) operation that was used to reprocess scrap plutonium slag from the RMA and RMC processes using solvent extraction techniques with tributyl phosphate (TBP) diluted by carbon tetrachloride. The RECUPLEX process operated from 1953 until a criticality ended operations in 1962. The PFP also was used to fabricate plutonium metal into weapons shapes from the metal buttons produced in the RMA line

operations from 1953 to the 1970s and RMC line operations from 1962 to the early 1990's. In addition to the plutonium processing lines, the 234-5 Z Building houses office space, analytical and development laboratories, workshops, storerooms, and locker rooms. Currently, the PFP is being used for stabilizing various plutonium materials.

The Plutonium Reclamation Facility (PRF), located in the 236 Z Building, replaced the RECUPLEX operations in 1964 and operated until 1987. This operation recovered plutonium from scrap solutions and materials within the PFP and other DOE facilities. The 236 Z Building housed process and support facilities used for plutonium reclamation operations. The plutonium recovery facilities currently are being considered for decontamination and deactivation.

The 242 Z Building housed the americium recovery process line. The building was used from 1964 to 1976 to recover americium from the PFP process line. Currently, no routine process effluent contributors discharge from this building; however, it contains unstabilized and stabilized plutonium materials. The 242-Z Building will be considered for decontamination and deactivation activities on completion of the stabilization effort.

The 241 Z Building is located south of the 234-5 Z Building. The 241-Z Building houses equipment used to temporarily store and treat process effluents from the PFP. The facility includes five 15,900 L (4,200-gal) below-grade tanks set in concrete sumps and two above-grade tanks. One of the below-grade tanks, the 241-Z Treatment Tank, also called Tank D-5 or TK 5, is an active RCRA TSD unit. Other tanks listed on the RCRA Part A permit include D-4, D-7, D-8, and an overflow tank in the D-7 vault. Another below-grade tank, Tank D-6, was declared unfit for use and was filled with cement in 1980. The two above-grade tanks, D-10 (208 L [55 gal]) and D-11 (15,899 L [4,200 gal]), were used to mix chemical additives for the D-5 Tank until 1988. The 241-Z Building structure also is referred to as a storage tank pit. The 241-Z Building is a subsurface structure with a concrete floor, side walls, and internal walls separating each tank compartment. The structure has a ground-level concrete cover and above-ground sheet metal housing for utility piping and electrical components. The 241-Z Treatment Tank is the easternmost tank in the building. Tanks D-8 and D-5 currently support plutonium scrap stabilization efforts.

The 291 Z Building contains the ventilation exhaust fans, instrument air compressors, and vacuum pumps for all ventilation exhaust from the 234-5 Z, 236-Z, and 242-Z Buildings and the former 232-Z Building. Routine effluents from the 291 Z Building include noncontact cooling and condensate wastewater from heating, ventilation, and air conditioning (HVAC) equipment, cooling water for the compressors, and vacuum-pump seal water. Currently, all effluents are collected and routed to the Treated Effluent Disposal Facility (TEDF).

201-C Facility. The 201-C Facility (also known as the Hot Semiworks and Strontium Semiworks) was the main processing facility for the Hot Semiworks Plant.

During its history, the 201-C Process Building went through three distinct operational modes. The 201-C Process Building was constructed in 1949 as a pilot plant for reprocessing reactor fuel using the REDOX (S Plant) chemical process until 1954 when it began using the PUREX chemical process. In 1961, it was converted to recover strontium from fission product waste. Cerium, technetium, and promethium, as well as minor amounts of americium and curium in the

final production run, also were extracted. This facility operated until 1967. The facility remained in safe storage mode until it was decommissioned.

The 201-C Building consisted of three integrated cells (A, B, and C), seven process galleries, a gallery exhaust system, a hot shop, and an air-treatment room. In addition, two cells (D and E) were connected to the east side of the building. Overall dimensions were 32 by 61 m (104 by 200 ft) with 872 m^2 (9,375 ft^2) of work area.

The process equipment in the 201-C Building consisted of approximately 38 stainless steel tanks, 19 columns of assorted types, 13 centrifugal pumps, and a large amount of primarily stainless steel process and service piping.

Decommissioning of the 201-C Building began in 1983 and was completed in 1987. According to the WHC-SD-EN-ES-019, *Semiworks Aggregate Area Management Study, Technical Baseline Report*, the following efforts were completed:

- In A, C, D, and E cells the tanks were grouted and the cells were filled with grout to ground surface.
- Equipment in B cell was removed down to 1 ft above grade and the cell and any tanks were filled with concrete to 0.6 m (2 ft) above grade. The upper cell then was decontaminated and filled with concrete to 1.5 m (5 ft) above grade.
- The air treatment system and the hot shop were dismantled.
- The C cell sample gallery and the C cell pipe gallery were filled with grout to 3 m (10 ft) above grade.
- The B cell sample gallery was and dismantled down to 3 m (10 ft) above grade and filled with grout
- The C cell valve room, sample gallery, and pipe gallery were dismantled down to 3 m (10 ft) above grade and filled with grout.
- The A cell valve room, sample gallery, and pipe gallery were dismantled down to 3 m (10 ft) above grade and filled with grout.

Contaminated portions of the structure were disposed of in the 218-C-9 Burial Grounds located north of 7th Street across from the Hot Semiworks Plant, while uncontaminated portions were taken to the Central Landfill south of the 200 East Area (WHC-SD-EN-ES-019). The process cells were partially covered over with 3 m (10 ft) of ash, the initial component of a proposed engineered cover (WHC-SD-EN-ES-019).

The initial base layer of bottom ash was put in place in 1989, then construction was suspended after waste was discovered in the grouted Tank 241-CX-72, which is inside the Hot Semiworks stabilization area (200-E-41).

2.2.2 Process Information

The 200-IS-1 and 200-ST-1 OU waste sites received waste from several 200 Area processes, including the following:

- Bismuth phosphate and lanthanum fluoride (B and T Plants)
- Uranium recovery and scavenging operations (U Plant)
- REDOX
- PUREX
- Strontium/cesium separations, recovery, and storage operations (Hot Semiworks)
- Plutonium/americium scrap recovery processes (RECUPLEX, PRF, and americium recovery) along with several experiments including tritium production and uranium, plutonium, and thorium studies (Z Plant).

The processes conducted in the 200 Area facilities (i.e., B and T U and-UO_3, REDOX, PUREX, Hot Semiworks Plants, and the Z Plant complex) that generated the primary waste streams into the 200-IS-1 and 200-ST-1 OUs waste sites included the processes discussed in the following paragraphs.

B and T Plants. The bismuth phosphate process used sodium hydroxide to remove the aluminum cladding and concentrated nitric acid to dissolve the fuel rods. Bismuth phosphate and bismuth oxynitrate were used to support precipitation of plutonium; hydrogen peroxide, sodium dichromate, ferrous hydroxide, and ferrous ammonium sulfates were used to change the plutonium valence during the oxidation reactions. Phosphoric, sulfuric, and nitric acids were added to dissolve the precipitates formed. In the bismuth phosphate process, the bismuth phosphate preferentially attracted plutonium from the solution; the plutonium, as a precipitate, was separated physically by centrifuging.

The lanthanum fluoride process further purified the dilute plutonium solution created in the last step of the bismuth phosphate process. The dilute plutonium nitrate supernatant was oxidized with sodium metabismuthate. Phosphoric acid was added to precipitate impurities and the resulting solution was treated with oxalic and hydrofluoric acids and lanthanum salt. Consequently, lanthanum fluoride and plutonium fluorides were coprecipitated. The lanthanum and plutonium fluoride solids then were converted to hydroxides by the addition of a hot potassium hydroxide solution. The hydroxides were washed with water, dissolved in nitric acid, and heated to form a concentrated plutonium nitrate solution. This solution was sent to the isolation building (231-Z) for further purification treatments and evaporation. A concentrated plutonium nitrate paste was the final product. Every 760 L (200-gal) batch of dilute, unpurified plutonium solution entering the 224-B/T Building yielded an estimated 30 L (8 gal) of purified concentrated weapons-grade plutonium (HW-10475, *Hanford Engineer Works Technical Manual (T/B Plants)*).

Uranium Recovery Process (URP) UO_3 Plant and Scavenging Operations. The URP was implemented at U Plant to recover the spent uranium from the metal waste and first-cycle waste streams generated in T and B Plants for reuse in weapons-grade plutonium production. The URP was performed in three phases. The first phase consisted of removing bismuth phosphate waste (metal waste, first-cycle supernatants, and cell 5 and 6 drainage) from the T, TX, TY, B, BX, and BY Tank Farms and preparing the sludge-slurry solution using nitric acid to dissolve the uranium metal and jet it into U plant. The second phase consisted of using a solvent extraction process to separate the uranium from the remaining plutonium, fission products, and chemicals.. The counter-current solvent extraction process used TBP in a normal paraffin hydrocarbon (NPH) diluant such as AMSCO or kerosene to bond with the uranium. Sulfamic acid and ferrous ammonia sulfate were used to ensure that the correct valence states were obtained.. The separated uranyl nitrate hexahydrate (UNH) then was sent to the 224-U Building or the UO_3 Plant where it was heated to 204 °C (400 °F to drive off nitrate, resulting in UO_3. The UO_3 powder was removed from the vessels, packaged, and shipped to Oak Ridge, Tennessee where it was converted to uranium metal. The uranium metal was sent to the Hanford Site 300 Area to be reincorporated into the uranium fuel rod production process (HW-18700-DEL, *REDOX Technical Manual*).

In 1953, tests to further treat URP aqueous waste streams generated at T, U, and B Plants during the bismuth phosphate campaign proved successful. The scavenging process precipitated the long-lived fission products (including strontium-90 and cesium-137) from the waste solutions. The order of operations was modified often during the scavenging process. After URP processing, TBP column waste usually was sent to a neutralization tank at U Plant where, normally, the pH was adjusted to 9 ± 1. Chemicals used to scavenge fission products included potassium and sodium derivatives of the metal-ferrocyanide complex ion. The metals that were most notable and widely used to assist precipitation were iron, nickel, and cobalt. Calcium nitrate and/or strontium nitrate often were added to enhance the precipitation of strontium-90. Phosphate ions also were added to help the soil retain strontium-90. After the TBP waste had been scavenged, it was returned to the B, BX, BY, T, TX, and TY Tank Farms to allow the solids containing the fission products and scavenging chemicals to settle. The waste liquid was sampled from the tanks at various depths and analyzed before the liquid effluent was sent to cribs and/or trenches, depending on the concentrations of cesium-137 and strontium-90, or was rerouted to other nearby tanks where settling continued. The U-UO_3 and scavenging operations process samples were analyzed at the 222-U and 222-S Laboratories.

REDOX. The REDOX process, used until 1967, was a solvent-extraction process that removed plutonium and uranium from dissolved fuel rods into a methyl isobutyl ketone (or hexone) solvent. The solvent-extraction process was based on the preferential distribution of uranyl nitrate and the nitrates of plutonium between an aqueous phase and an immiscible organic phase (DOE/RL-91-60). The REDOX process included fuel decladding with a boiling sodium hydroxide or sodium nitrate solution or a boiling ammonium fluoride and ammonium nitrate solution. Feed dissolution, using concentrated nitric acid, and plutonium oxidation were completed simultaneously using potassium permanganate and sodium dichromate. The prepared feed entered the packed counter-current solvent extraction column where acidified hexone was fed to the column from the bottom and the aqueous phase (ANN scrub solution or salting agent) was fed to the column from the top. The aqueous solubility of the uranium and plutonium nitrates was reduced by increasing the nitrate concentration in the aqueous phase. The uranium

and plutonium were extracted into the organic phase and routed to the second extraction column while the fission products remained in the aqueous phase. Uranium and plutonium (present in the organic phase) were chemically separated in the second extraction column using ferrous sulfamate solution containing ANN to reduce the plutonium to the +III valence state. Additional purification cycles of uranium and plutonium were conducted during operations using the same chemical constituents. The solvent was recovered and recycled back into the process after undergoing sampling and analysis. Waste generated in the 202-S Building also was treated and routed to cribs after sampling and analysis.

PUREX. The PUREX process used a recyclable salting agent, nitric acid (which greatly lessened the cost and the amount of waste generated), and TBP in an NPH solution as a solvent. The main purpose of the PUREX Facility (202-A) was to extract a compound of plutonium, uranium, and neptunium from irradiated uranium fuel rods discharged from Hanford Site reactors then purify and concentrate the compound into the individual plutonium, uranium, and neptunium elements. Fuel decladding was performed using a boiling sodium hydroxide or sodium nitrate solution or a boiling ammonium fluoride and ammonium nitrate solution. Feed dissolution used concentrated nitric acid and ANN. The prepared feed entered the pulsing, counter-current solvent extraction column where TBP diluted in NPH was fed to the column from the bottom and the aqueous phase (sodium nitrite or nitric acid salting agent solution) was fed to the column from the top. Dilute nitric acid, ferrous sulfamate, and sulfamic acid descended from the top of the second column to remove uranium and neptunium from plutonium. Chemical separation processes were based on conducting multiple purification operations on the resulting aqueous nitrate solution containing each of the separated products. The driving forces for the separations consisted of varying partition coefficients between the aqueous and organic phases, controlled by valence-state changes of the element of interest (DOE/RL-92-04). The solvent and salting agents (e.g., nitric acid) were recovered, treated, and recycled back into the process operations.

201-C Facility. The 201-C Process Building and 209-E Critical Mass Laboratory make up the Hot Semiworks Plant. During its useful life, the 201-C Process Building went through three distinct operational modes: pilot-plant testing for the REDOX process, for the PUREX process, and for the strontium recovery process.

Twelve studies of the REDOX process were conducted at the Hot Semiworks Plant to refine the operating procedures of the REDOX Production Plant. The studies started November 17, 1952, and were completed October 9, 1953. These studies evaluated dissolution and feed preparation, the potassium permanganate head-end procedure, the updraft and downdraft dissolving procedures, permanganate oxidation and manganese dioxide scavenging before solvent extraction, and solvent extraction. During these studies the following chemicals were used:

- ANN
- HNO_3
- NaOH
- Hexone (methyl iso butyl ketone [MIBK])
- Ferrous sulfamate
- Sulfamic acid
- Iron powder
- Sodium nitrate

- Disodium chromate
- Chromium nitrate.

According to HW-31767, *Hot Semiworks REDOX Studies*, Figure 2, "Equipment Flow Sketch Hot Semi-works Plant," steam transfer jets and piping connected the scrubber, oxidizer, dissolver, feed make-up and waste receiver tanks, as well as the centrifuge to the waste concentrator tank, which discharged waste to the 241-CX-70 underground storage tank.

Twenty-two studies of the PUREX process were performed at the Hot Semiworks, scaled to process irradiated slugs produced at the Hanford Site to recover plutonium and decontamination products using a modified PUREX Flowsheet (HW-31373, *PUREX Chemical Flowsheet HW Number 3 Chemical Development Unit Separations Technology Subsection Technical Sec Engineering Department*). The Hot Semiworks building contained equipment for slug dissolution, feed preparation, a two-column co-decontamination cycle, a four-column partition cycle, a two-column second plutonium cycle, a one-column solvent recovery system, and an acid recovery system. However, during the studies, equipment and processes were changed to maximize the recovery of plutonium and reduce the amount of contamination. During the modified PUREX Flowsheet study, several aspects of the process were investigated, including process chemistry, scrubbing efficiency, properties of chemical solvents at different concentrations, solvent recycling, uranium processing rates, the effects of sulfamic acid, column performance, decontamination deficiencies, and backmixing. During these studies the chemicals used included the following (HW-31373):

- Nitric acid
- Tributyl phosphate
- NPH
- Sodium carbonate.

The Hot Semiworks studies for the purification of strontium-90 occurred from 1961 through 1967. The strontium recovery process was performed via solvent extraction using a complexant, di-2-ethyl-hexyl phosphoric acid (D2EHPA), to extract strontium from acid solutions of waste fuels. During the studies, the following essential materials were used in the strontium purification process (HW-72666, *Hot Semi-Works Strontium-90 Recovery Program*):

- Acetic acid
- Citric acid
- Di(2-ethyl-hexyl) phosphoric acid
- DTPA–sodium salt (sodium diethylenetriaminepentaacetate)
- Hydrogen peroxide
- Nitric acid (60% nominal)
- Oxalic acid
- Petroleum diluent
- Potassium bicarbonate
- Sodium acetate
- Sodium hydroxide (caustic soda) 50%
- Sodium hydroxide (reagent grade)
- Sodium sulfate

- Tartaric acid
- Tributyl phosphate.

Z Plant Complex. At the Z Plant complex, the recovered, purified plutonium was refined to one of several forms depending on the era and the available process. Processes at the Z Plant complex that potentially generated waste streams that fed the 200-IS-1 and 200-ST-1 OU waste sites are discussed in the following paragraphs.

The Plutonium Isolation Facility (PIF) process line and operations were located primarily in the 231-Z Building (Concentration Building). The exact dates of PIF operations are unclear, but are thought to be from 1945 to 1949. The PIF process was described as being a production step where concentrated plutonium nitrate solution was further reduced to a paste in batchwise steps. The first step in the PIF process consisted of adding ammonium nitrate to the plutonium nitrate solution (received as the product from T and B Plants), which reduced the plutonium to the +4 valence state. Next, sulfates and peroxide were added to the mixture, causing plutonium to precipitate as plutonium peroxide. Nitric acid was added to this precipitate, forming a purer more concentrated plutonium nitrate solution. Finally, this product was placed in small shipping containers and boiled using hot air to evaporate the liquid to form a wet plutonium nitrate paste.

Until 1949, the plutonium nitrate paste was shipped to Los Alamos, New Mexico, for final processing into plutonium metal. Apparently, after 1949 this concentration step was moved to the 234-5 Z Building. The wet plutonium paste produced in this concentration step then was processed as discussed in Section 2.2.3. PIF waste streams probably included process waste and non-contact wastewater. The process waste can be characterized as acidic and corrosive, high in salts, and low in organic content. The PIF process waste likely contained minor amounts of fission products, plutonium, and other transuranic elements.

The 234-5 Building housed the RG line operations. The RG line operations were performed in batches through a series of glove boxes in which the operators handled the radioactive materials directly with their hands encased in rubber gloves. Several steps were involved with the RG line operations, as follows:

- Wet chemistry operations
- Dry chemistry operations
- Reduction to metal operations and casting
- Machining and review of product.

Plutonium feed, in the form of a concentrated plutonium nitrate solution produced in the T and B Plants (bismuth phosphate process), the 202-S Building (REDOX operations), and later the 202-A Building (PUREX operations), was transferred to the 234-5 Building for the beginning of the wet chemistry operations. The chief impurities in the concentrated plutonium nitrate were lanthanum and americium. The first step in removing these impurities was to perform two peroxide precipitations to adjust the valence of the plutonium from (IV) to (VI) to facilitate impurity removal. Then, aluminum was added to complex the fluoride ions present in solution. After the second-cycle precipitation, the plutonium oxide was redissolved in nitric acid and concentrated by evaporation into a plastic-like, solid plutonium nitrate. The waste solutions then were recycled back to the T and B Plants.

The plastic-like plutonium nitrate solution was dissolved with hydroiodic acid in preparation for an oxalate strike. Dissolving the plutonium nitrate in hydroiodic acid changed the plutonium valence from (IV) to (III). The oxalate was added with nitric acid and dilute peroxide, and a plutonium oxalate solid was formed. This solid was washed with a dilute solution of nitric and oxalic acid. The filtrate was treated with 4% potassium permanganate for 30 minutes at 65 °C.

After the plutonium oxalate solid was washed, the dry chemistry operations began. The solid was dried at 120 °C to drive off the associated water. The temperature then was raised to 300 °C to convert the plutonium oxalate to plutonium oxide by calcination.

To produce the metal, plutonium oxide and any residual plutonium oxalate first were converted to plutonium fluoride by reactions with hydrogen fluoride (HF). The HF was added at high temperatures over time (refluxing), which allowed the reaction to proceed to 100 percent completion (production of plutonium fluoride). The plutonium fluoride then was placed in a container, which was placed in a magnesium oxide crucible with calcium. A reducing charge was added to the crucible to convert the plutonium fluoride to plutonium metal at approximately 1600 °C. Gallium was used to alloy the plutonium metal to stabilize the delta phase during metal and oxide formation.

The liquid process waste was characterized as acidic and corrosive (pH 2), high in salts, and low in organic content (except for the plutonium milling waste). The waste contained only minor amounts of fission products and low concentrations of plutonium and other transuranic elements (WHC-EP-0342, Addendum 8, *Plutonium Finishing Plant Wastewater Stream-Specific Report*). The waste was high in nitrates in the form of nitric acid, aluminum nitrate, magnesium nitrate, ferric nitrate, and calcium nitrate. Other components were aluminum fluoride, potassium hydroxide, potassium fluoride, chromium, lead, and trace metal ions.

Process waste, including process condensates, was discharged through the 241-Z Treatment Tank (Tank D 5) where sodium hydroxide, ferric nitrate, and sodium nitrite were added for solubilization and neutralization. Corrosion inhibitors such as sodium nitrite and aluminum compounds for solubilization also were added in this tank. Before 1973, the waste was discharged via cribs to the soil column. Beginning in 1973, the treated waste was stored in underground single-shell tanks (SST) and later in double-shell tanks (DST).

The RMA and RMC line operations replaced the RG line operation. The process remained the same chemically so the waste also remained the same. Remotely operated mechanical equipment was installed in the 234-5Z Building to increase operation efficiency and reduce employee doses. The operators no longer directly handled the plutonium materials. The plutonium metal was reduced in the shape of a disk or "button." The buttons were inspected and tested. From the early 1950's to late 1970's, the buttons were remelted and cast into a finished shape. Cast forms were coated with nickel and polished so they could be handled without spreading plutonium contamination. A mixture of lard oil and carbon tetrachloride was used for milling the plutonium metal. Other cutting solvents and hydraulic fluids (including polychlorinated biphenyls) also were used in the plutonium machine shop. The liquid process waste from the milling operations was characterized as high in organic content and contained only minor amounts of fission products and low concentrations of plutonium and other transuranic elements. Milling process waste, including process condensates, was discharged

through the 241-Z Treatment Tank (Tank D 5) where it mixed with other 234-5Z liquid process waste and had sodium hydroxide, ferric nitrate, and sodium nitrite added for solubilization and neutralization. Corrosion inhibitors such as sodium nitrite and aluminum compounds for solubilization also were added in this tank. Before 1973, the waste was discharged via cribs to the soil column. Beginning in 1973, this treated waste was stored in SSTs (later DSTs) tanks and/or packaged in absorbent inside 207 L (55-gal) drums and routed to burial grounds in low-level waste management areas (LLWMA) in the 200 West Area.

The RECUPLEX Facility was used to purify plutonium scrap and solutions from 1955 to 1962. The process used batchwise solvent extraction technology to remove plutonium from the PFP waste streams. The RECUPLEX Facility was housed in the 234-5Z Building. The RECUPLEX solvent extraction technology was based on the formation of an organic plutonium complex that was preferentially soluble in an organic solvent. This process used nitric acid and hydrofluoric acid to convert plutonium solids to plutonium nitrate and a TBP carbon tetrachloride solvent to recover plutonium from the purified plutonium nitrate solutions. An 85:15 ratio by volume of carbon tetrachloride to TBP was used. Other ratios were tested during the pilot plant treatability tests, but the 85:15 ratio gave the most satisfactory results for recovering plutonium. Silica gel was used as a settling agent on the dissolved feed for the RECUPLEX process. A silica gel waste-settling tank (Settling Tank 241-Z-8) was used to hold the backflush solution from the filters. Overflow from the silica gel settling tank was routed to the 216-Z-8 French Drain.

The RECUPLEX process produced three primary waste streams: spent aqueous extractant, spent organic solvents, and waste silica gel. Secondary RECUPLEX process waste streams included fabrication oil from the machine shop and noncontact wastewater from the building sinks and equipment wash areas. The aqueous process waste was characterized as acidic, high-salt, low-level radioactive liquid waste containing low levels of plutonium and other transuranic elements. Major components of the waste were nitric acid, fluoride, and phosphate. Carbon tetrachloride was used in combination with di-butylbutyl phosphate (DBBP) to remove residual plutonium from the aqueous solution before it was discharged. The organic process waste was characterized as slightly acidic, low-salt, high-organic, radioactive liquid waste with intermediate levels of plutonium and other transuranic elements. Major components of the waste are carbon tetrachloride-TBP and DBBP. With continued use, the carbon tetrachloride-TBP extraction solvent gradually degraded into carbon tetrachloride-dibutyl phosphate (DBP) and lost its capacity as an extractant. The mixture periodically was replaced with fresh solvent and the degraded solvent was discharged to the 216-Z-9 Trench. This trench was the only waste site used for solvent disposal during RECUPLEX operation. The disposal history of the settled solids in the 216-Z-8 Settling Tank is not known. Available information suggests that the tank has never been pumped out. A reported 1.6 kg (3.5 lb) of plutonium were present in the tank as of 1974 (WHC-MR-0227, *Tank Wastes Discharged Directly to Soil at the Hanford Site*). Historically, liquid overflow from the 216-Z-8 Settling Tank was discharged to the 216-Z-8 French Drain. Both units have been idle since the RECUPLEX operation was shut down in 1962.

The PRF replaced the RECUPLEX process line after a criticality accident forced the closure of the RECUPLEX unit in April 1962. The PRF operated from 1964 to 1979 and again from 1984 to 1987 in the 236 Z Building. This facility is being considered for decontamination and decommissioning. The PRF was designed to reclaim plutonium from solutions and solids from

PFP waste streams. The recoverable material was treated to produce soluble plutonium as plutonium nitrate. The PRF had essentially the same mission as the RECUPLEX process line and used a similar solvent extraction column technology. The extraction solvent used was carbon tetrachloride-TBP in a 80:20 ratio by volume, whereas the ratio in the RECUPLEX process was 85:15. Spent aqueous and organic wastes from the PRF were disposed of to the soil column through a series of cribs until 1973.

The recovery of americium from PRF waste streams began in 1964 in the 242 Z Building. This facility was shut down in 1976 after a chemical explosion occurred in an ion-exchange column. The explosion reportedly could have released up to 1 mCi of alpha activity to the atmosphere through the Z Plant stack. The americium recovery process used an ion-exchange technique to recover americium from the waste streams. Elution and regeneration of the ion-exchange resin was done with nitric acid. Americium also was recovered in the PRF using a DBBP extractant in a carbon tetrachloride diluent. The DBBP was replaced in the process with TBP. Information on waste generated from the americium recovery process was limited. Presumably, these waste streams would have included spent ion-exchange resins; organic solvent waste; and unrecovered americium, plutonium, uranium, and small amounts of fission products.

Currently, the Z Plant analytical and development laboratories are housed in the 234-5Z Building. Analytical and development laboratories are reported to have been housed in the 231-Z Building as well. The laboratory provided analytical services and supported research and development activities for the plutonium finishing operations at the PFP. This support was provided in the following ways:

- Quality assurance and quality control for the plutonium processing lines
- Liquid scintillation counting
- Preparation work for solvent extraction tests.

The 231 Z and 234-5 Z laboratory process waste was characterized as slightly acidic, low-salt radioactive waste. This waste was routed through the 241-Z-361 Settling Tank to various cribs. The pH of the waste was adjusted to between 8 and 10 in the 241-Z Treatment Tank before disposal (DOE/RL-2001-01, *200-PW-1 Plutonium-Rich/Organic-Rich Process Waste Group Operable Unit RI/FS Work Plan*).

2.2.3 RCRA TSD Units and Representative Sites

The concept of using analogous sites to reduce the amount of site characterization and evaluation required to support remedial-action decision making is discussed in DOE/RL-98-28, Rev. 0, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan–Environmental Restoration Program* (Implementation Plan). This approach relies on grouping sites with similar waste histories and contaminants, then choosing one or more representative sites and RCRA TSD units for comprehensive field investigations, including sampling. Findings from site investigations at representative waste sites are applied to the analogous sites in the waste group that were not characterized.

Data from representative sites and RCRA TSD units are used to evaluate remedial alternatives and to select one or more to apply to the entire waste group. Confirmatory sampling at the

analogous sites is built into the remedial design planning to ensure that the remedy is appropriate for the analogous sites. Although a degree of uncertainty exists in employing the analogous site concept, substantial benefit is realized in the early selection of a remedy that allows early cleanup actions to be performed. The Implementation Plan (DOE/RL-98-28) did not identify representative sites for either the 200-IS-1 or the 200-ST-1 OU. The following RCRA TSD units and representative sites were selected for this work plan during the DQO process: the CX Tank System, the HSTF, the 200-E-111 Tank Farm Process Piping, the 200-W-59 Diversion Box, and the 2607-W-3 Septic Tank. The following sections describe the representative sites in detail. The information presented was obtained from the WIDS database and WIDS historical files unless otherwise noted.

2.2.3.1 CX Tank System

The CX Tank System is located east of B Plant in the 200 East Area within the Hot Semiworks stabilized area. The 241-CX Tank System consists of three tanks: 241-CX-70, 241-CX-71, and 241-CX-72. Although the Dangerous Waste Permit Application, Form 3, calls it the "241-CX Tank system" (Appendix A), these three tanks operated independently and served separate functions. The one thing that they have in common is that they were decommissioned as part of the Hot Semiworks decommissioning project. Processes that were associated with these three tanks are as follows.

Tank 241-CX-70 was used for approximately 1 year in the early 1950's to store high-level process waste from the REDOX pilot studies (Figure 2-11). Waste removal activities for Tank 241-CX-70 were initiated in the summer of 1987 with the construction of a sluicing-pumping system. The sluicing-pumping system involved using large volumes of water to sluice the solid waste mixed from Tank 241-CX-70 and pump it to the DST System. Approximately 529,950 L (140,000 gal) of water were used to reduce the original waste volume of 38,986 L (10,300 gal) to 2,839 L (750 gal). This volume remained in Tank 241-CX-70 until December 20, 1991, at which time the waste was placed in approved containers and transferred to the 224-T Transuranic Waste Storage and Assay facility. The design capacity of Tank 241-CX-70 is 113,550 L (30,000 gal).

Tank 241-CX-71 was used from 1952 thorough 1957 for neutralizing the 201-C process condensate and coil and condenser cooling water (Figure 2-12). Tank 241-CX-71 received process condensate from the REDOX and plutonium operations. The mixed waste remaining in Tank 241-CX-71 contains liquid process effluents that were passed through the tank to be neutralized by contact with a bed of limestone aggregate placed in the tank for this purpose. After the June 1957 decontamination flushes, Tank 241-CX-71 was placed out of service. The design capacity of Tank 241-CX-71 is 3,785 L (1,000 gal).

Tank 241-CX-72 was used for approximately 1 year in 1956 when 8,725 L (2,305 gal) of Hot Semiworks complex mixed waste was transferred into the tank for storage (Figure 2-13). Tank 241-CX-72 also was used to study the concentration of waste generated from the Hot Semiworks complex pilot studies. Decontamination flushes from the Hot Semiworks complex also might have been sent to Tank 241-CX-72. The waste in the tank was then heated until it was nearly dry. Tank 241-CX-72 remained idle from 1960 until it was taken out of service in 1967. In

1986, Tank 241-CX-72 was filled with 7.3 m (24 ft) of grout over a 3.4 m (11-ft) heel of non-liquid mixed waste. The design capacity of Tank 241-CX-72 is 8,860 L (2,340 gal).

The RCRA Part A Permit Application (Form 3) was revised in 1994 and submitted to Ecology as Revision 3. The tanks are classified as dangerous waste tank TSD units with the following waste codes:

- 241-CX-70. D002 (Corrosive) because of sodium hydroxide, and D007 and WT-02 (Dangerous Toxic) because of chromium.
- 241-CX-71. WT-02 (Dangerous Toxic – state only) because of cyanides and nitrates.
- 241-CX-72. D002 (Corrosive), D004 (Arsenic), D005 (Barium), D006 (Cadmium), D007 (Chromium), D008 (Lead), D009 (Mercury), D010 (Selenium), D011 (Silver), WC02, WT01 (Extremely Hazardous Toxic), and WT-02 (Dangerous Toxic–state only) because of cyanides and nitrates.

The CX Tank System no longer receives waste and will be closed under interim status.

2.2.3.2 Hexone Storage and Treatment Facility

The HSTF is located in the southeast corner of the 200 West Area of the Hanford Site. The HSTF consisted of two 91,000 L (24,000-gal) below-grade carbon steel tanks: Tanks 276-S-141 and 276-S-142, a distillation system, and railroad tank cars (Figure 2-14). The HSTF received liquid mixed waste from the REDOX Plant and possibly the Hot Semiworks Plant. The HSTF was used from 1951 through 1967 to store reagent-grade methyl isobutyl ketone (hexone) as a source of make-up solvent for the REDOX Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the REDOX Plant. Tank 276-S-142 also contained NPH and TBP from a one-time campaign to separate americium, curium, and promethium from Shippingport reactor blanket fuel in 1966. Approximately 760 L (200 gal) of water were added to Tank 276-S-141 in 1988. Tank 276-S-142 received approximately 5000 L (1,300 gal) of water in 1967, 1,900 L (500 gal) in the mid-1970's, and 760 L (200 gal) in the mid-1980's. The combined storage design capacity of Tanks 276-S-141 and 276-S-142 is 182,000 L (48,000 gal). The treatment design capacity of the distillation system was 11,400 L (3,000 gal) of waste per day. The storage design capacity of the railroad tank cars was 152,000 L (40,000 gal). The mixed waste was pumped from Tanks 276-S-141 and 276-S-142 through a distillation system to decrease the radioactivity of the waste. The distilled waste was sent to temporary storage in railroad tank cars located within the HSTF until completion of transfers to an offsite incinerator in June of 1992. Three distillation vessels containing process residue have been sampled and are stored at the Hanford Site as mixed waste. Tanks 276-S-141 and 276-S-142 each contain between 19 L to 114 L (5 to 30 gal) of liquid mixed waste containing 93% NPH and 7% hexone and up to 950 L (250 gal) of phosphate tar. The phosphate tar will be stored at the Hanford Site as mixed waste. The railroad tank cars have been emptied, cleaned, and moved to another location. The two 91,000 L (24,000-gal) below-grade carbon steel tanks: Tanks 276-S-141 and 276-S-142 are being closed under interim status.

A RCRA Dangerous Waste Permit Application, Form 3, for the hexone tanks was submitted to Ecology in December 1987 and was revised most recently in 1994 (Appendix A).

DOE/RL-92-40, Rev. 0, *Hexone Storage and Treatment Facility Closure Plan*, a RCRA closure plan for the tanks was submitted in November 1992. The tanks are regulated as dangerous waste tank TSD units with waste codes D001 (ignitability), F003 (listed spent hexone solvent), and WT02 (toxicity criteria).

The hexone tanks had been safeguarded by a nitrogen purge almost continuously since 1992. This inert gas purge mitigate the risks associated with the hazardous vapors in the tanks. The purge prevented the collection of flammable vapor mixtures and eliminated the safety hazard to workers.

In April 2000, Ecology inspected the TSD unit encompassing the tanks. In May 2000, Ecology issued CCN 079387, "Notice of Correction for Stabilization of Hexone Storage and Treatment Facility," about their findings. The letter required that the hexone tanks be stabilized by removing all of the potential safety hazards posed to employees by no later than December 2001. It also required that the stabilization include removal or deactivation of the waste. If the tanks remain in place, provisions must be made for monitoring the tanks for oxygen and organic vapors and for intrusion of liquids.

In May 2001, Ecology issued CCN 089928, "Notice of Correction for Stabilization of the Hexone Storage and Treatment Facility," which revised the deadline for stabilizing the hexone tanks to the end of February 2002.

On December 13, 2001, Ecology approved grouting as the stabilization method for the hexone storage tanks (CCN 095038, "Approval for Stabilization of the Hexone Storage and Treatment Facility"). They stipulated that each tank be grouted in two pours. In March 2002, the tanks were filled with cement grout using the method authorized by Ecology to stabilize them and reduce the flammability concerns associated with hexone vapors. In each tank, the grout from first pour covers the heel of waste with a distinctly colored grout. The first grout layer was allowed to solidify enough to introduce a cold joint between pours. After the first-pour grout solidified, the second layer of grout was poured into the tank. The second grout layer completely filled the tank's void space. The second pour consists of uncolored grout that, in concert with the cold joint created between layers, provides a clear demarcation between the grout layers. The coloring and two-stage grouting processes facilitate closure of the tanks by separating the mixed waste contents (tank bottom containing the heel and colored grout) from nonmixed waste debris (upper tank and uncolored grout). The area is fenced off as a controlled access zone.

Ecology also requested that a revised closure plan for the hexone storage tanks be prepared for inclusion in future modifications to the Hanford Site's RCRA Sitewide permit. Submittal of a revised hexone tank closure plan in conjunction with the 200-IS-1 and 200-ST-1 FS is presently planned.

2.2.3.3 200-E-111 Tank Farm Process Piping

The 200-E-111 Tank Farm Process Piping, also referred to in WIDS as SST System Transfer Line 241-C-151-U1, is an encased liquid waste transfer line that runs eastward from the 241-ER-151 Diversion Box south of 7th Street, and branches off in two directions at a point southeast of the 216-C-10 Crib (Figure 2-15). From the Y, it branches to the C Tank Farm and the 244-AR Vault. The pipeline is an underground encasement containing three 7.5 cm

(3-in.)-diameter stainless steel waste transfer pipelines numbered V108, 8618, and 8653, except between the Y junction and the 244-AR-Vault where the encasement contains two 7.5 cm (3-in.) pipelines numbered 809 and 818. Currently the entire length of the pipeline is marked with steel fence posts and is posted as an "Underground Radioactive Materials" area. The ground surface above the pipeline is bare in spots; other sections are vegetated with crested wheatgrass, tumbleweeds, and native grass species (WIDS).

Although specific operation dates have not been found, the facilities connected by the piping operated from 1945 (ER-151) to 1980 (C Tank Farms). The amount and content of liquid waste transported in the 200-E-111 Pipeline vary based on the source plant and time. In the late 1960's, high-level waste was sluiced from the A and AX Tank Farms and routed to B Plant for cesium and strontium removal through the AR-Vault and 200-E-111 Pipeline (WIDS). Before the tanks were sluiced, the A Tank Farm stored PUREX waste including high-level waste, acid concentrator waste, organic wash waste, carbonate wash, and self-concentrating waste (WHC-SD-WM-ER-308, Rev. 0, *Supporting Document for the Historical Content Estimate for A-Tank Farm*). Before the tanks were sluiced, AX Tank Farm contained PUREX high-level waste, organic wash waste, PUREX acid waste, PUREX sludge supernatant liquid, and B Plant fission product waste (HNF-SD-HTI-TI-001, *AX Tank Farm Waste Inventory Study for the Hanford Tanks Initiative Project*). The C Tank Farm received bismuth phosphate metal waste, PUREX sludge supernate enroute to B Plant, first and second cycle waste and process decontamination waste from B Plant, and process waste generated by U Plant. B Plant and PUREX waste could be transferred by the 200-E-111 Pipeline, via the 200-AR Vault and the 241-ER-151 Diversion Box. Transfers from the 200 West Area were conducted through the cross-site transfer line to the 241-ER-151 Diversion Box and through the 200-E-111 Pipeline(WIDS).

An associated unplanned release (UPR) (UPR-200-E-86) occurred in February 1971 when a leak was discovered near the southwest corner of the C Tank Farm outside the boundary fence. The line was being used to transfer process waste from the 244-AR Vault to the C Tank Farm. The leak was approximately 66,000 L (17,000 gal) containing 25,000 Ci of cesium-137 and contaminating approximately 36 m^3 (1,300 ft^3) of soil. A 1971 study to define the extent of contamination found no contamination below 6 m (20 ft). During the study, eight borings were drilled around the leak to define the release area. The site is marked by concrete AC-540 marker posts at each corner. The surface has been covered with grout and is posted with "Underground Radioactive Material" signs (WIDS).

2.2.3.4 200-W-59 Diversion Box

The 200-W-59 Diversion Box is a liquid waste site located southwest of the 234-5 Z Building between the two fences that make up the double Z Plant exclusion area. It is west of the 241-Z-361 Settling Tank and directly north of the 216-Z-12 Crib. The site consists of a 2.1 m x 2.1 m x 5.2 m (6.9-ft x 6.9-ft x 17.1-ft) concrete box containing equipment used to remotely route liquid process waste from the 241-Z-361 Settling Tank and the 200-W-58 Diversion Box to the 216-Z-12 Crib (Figure 2-16).

The 200-W-59 Diversion Box received process waste and analytical and development waste from the 234-5Z Building (PFP) (WIDS), with minor amounts of waste from the

232-Z Incinerator, PRF, and 242-Z Waste Treatment Facility (RHO-ST-44, *216-Z-12 Transuranic Crib Characterization: Operational History and Distribution of Plutonium and Americium*). The 200-W-59 Diversion Box received this waste from the 241-Z-361 Settling Tank via the 200-W-58 Diversion Box and diverted it to the 216-Z-12 Crib. The 200-W-59 Diversion Box was built as part of the 216-Z-12 Crib and was the sole conduit for waste to the crib. The diversion box was in service until the crib was retired in 1973. Records indicate the 216-Z-12 Crib received waste from January 1959 to May 1973 (RHO-ST-44). During this period, 281,000,000 L (74,200,000 gal) of liquid waste containing 25 kg (55 lbs) of plutonium was sent to the 216-Z-12 Crib via the 200-W-59 Diversion Box (RHO-ST-44). Waste diverted through the 200-W-59 Diversion Box was slightly basic, low-salt, sodium, fluoride, and nitrate solutions containing organic waste (RHO-ST-44). Bulk disposal of organic waste was diverted to the 216-Z-1A Crib. The results of studies conducted in the 1970's indicated plutonium contamination under the diversion box and crib, with the maximum concentration starting at 5 m (16 ft) deep and extending to a depth of between 6 m (20 ft) near the diversion box and 10 m (33 ft) near the crib. Leaks from the crib and diversion box were believed to be the sources of this plume, but subsequent studies showed that leaks from the unsealed joints in the vitrified clay piping connecting the crib and diversion box were the most likely source. Plutonium activity in the well closest to the 200-W-59 Diversion Box, approximately 12 m (40 ft) southeast of the diversion box, reached a maximum of 252,000 pCi/g (±15%) during the study. Currently, the diversion box is buried with its concrete lid slightly above ground level. The Z Plant fenced exclusion area is covered with gravel (WIDS).

2.2.3.5 2607-W3 Septic Tank

The 2607-W3 Septic Tank is a sanitary sewage disposal site consisting of a reinforced concrete tank extending 15 cm (6 in.) above grade (Hanford Site Drawing HW-71192, *Hanford Engineer Works Septic Tanks Plan and Sections*) with a 54,428 L (14,369-gal) capacity, located northeast of the 241-T-361 Settling Tank, approximately 61 m (200 ft) north of 23rd Street and 244 m (800 ft) southwest of the 224-T Building (Figure 2-17). This site also includes a drain field that was expanded in the 1950's to 134 m by 61 m (440 ft by 200 ft). The drain field flow capacity was 18,685 L (4,933 gal) per day (WHC-SD-LL-ES-020, *200 Area Sanitary Waste Management Engineering Study*). The tank received sanitary effluent from the 221-T, 222-T, 224-T, and 271-T Buildings from 1944 until it was pumped, filled with sand, and abandoned in place in August 1996. Before being abandoned, the 2607-W3 Septic System received 14,187 L (3,745 gal) per day of sanitary effluent. A contaminated process sewer line runs parallel to the sanitary sewer line in this area (WIDS).

Figure 2-1. Location of 200-IS-1 and 200-ST-1 Operable Units on the Hanford Site.

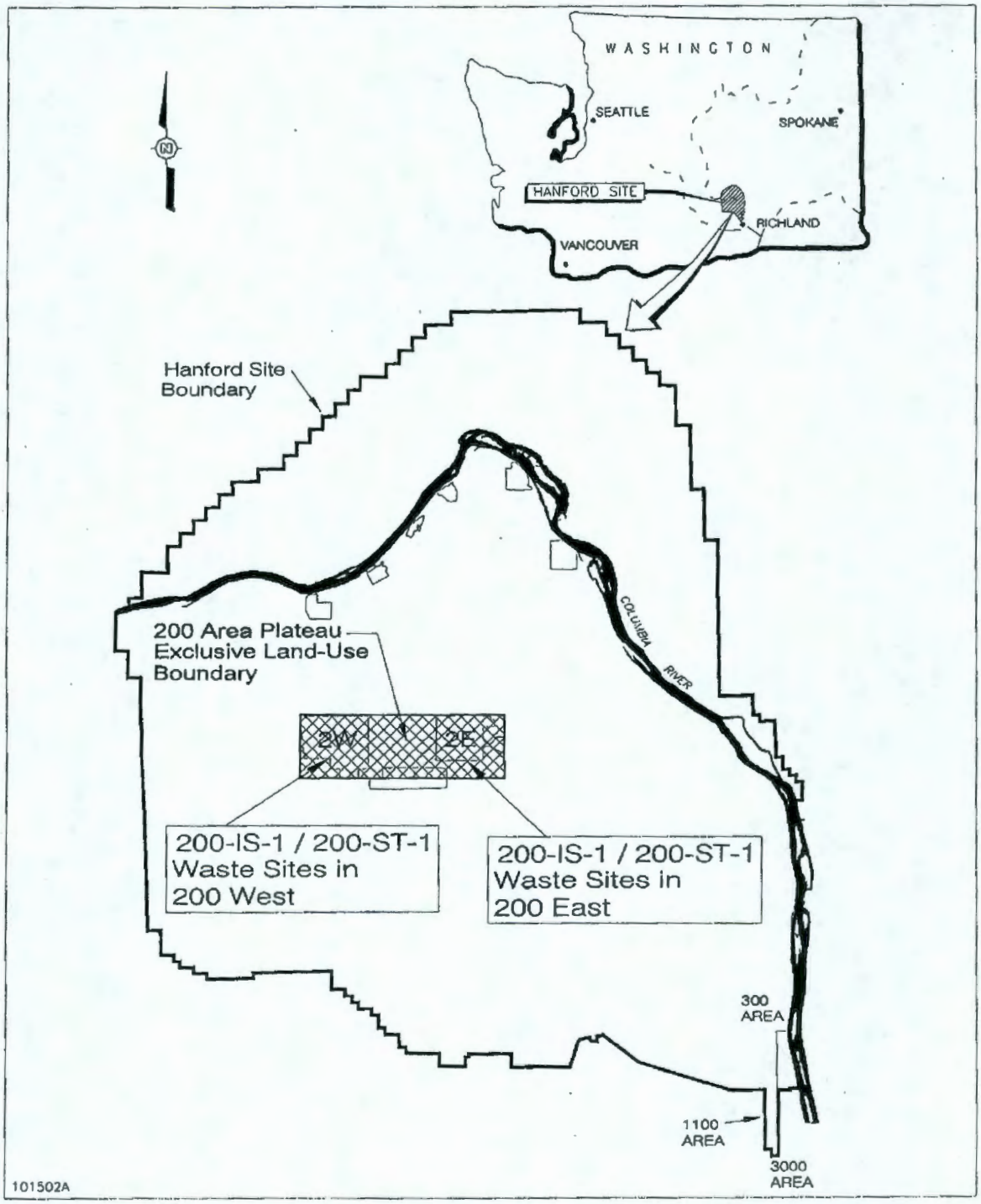
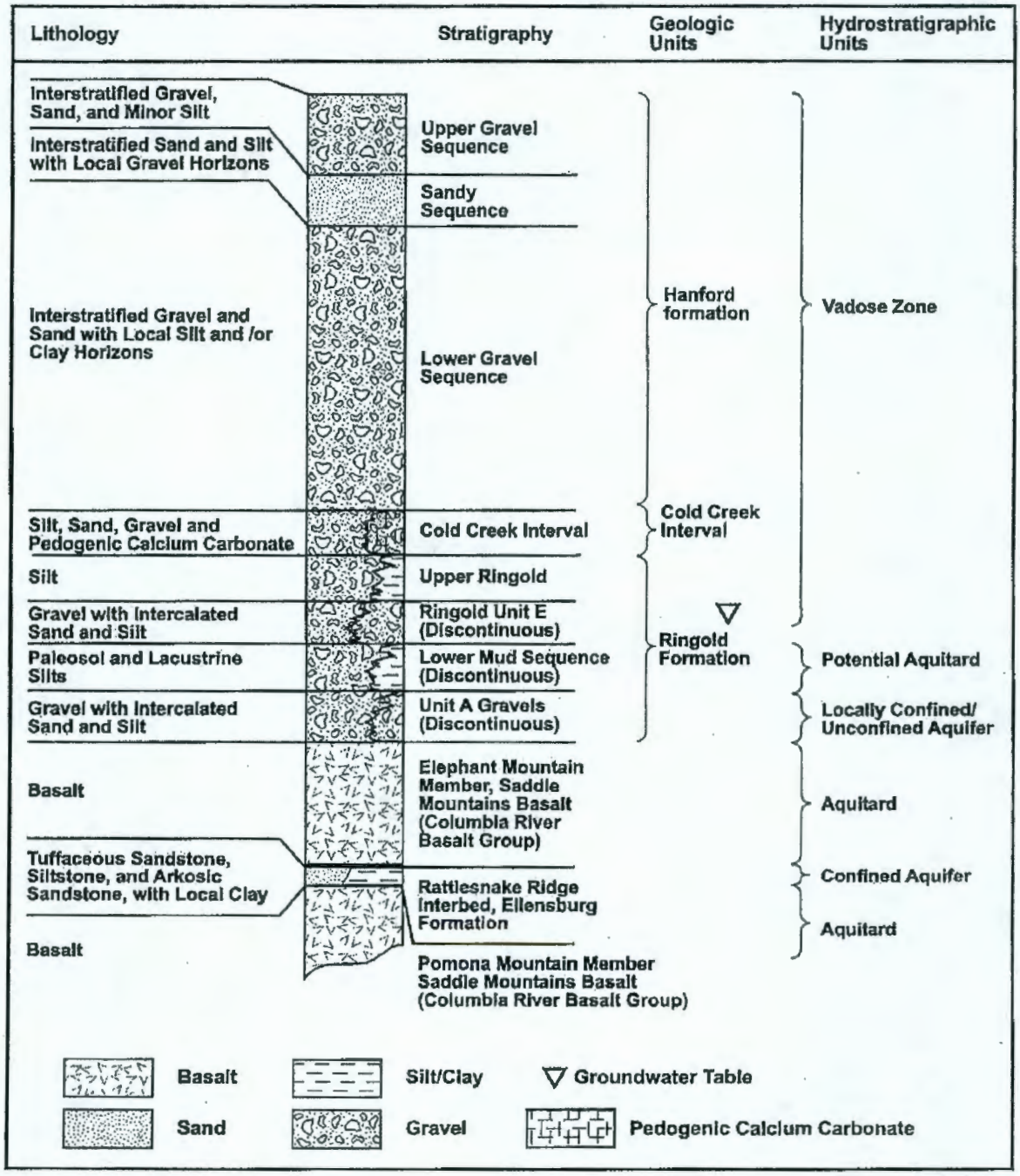


Figure 2-2. Generalized Stratigraphic Column for the 200 Areas.



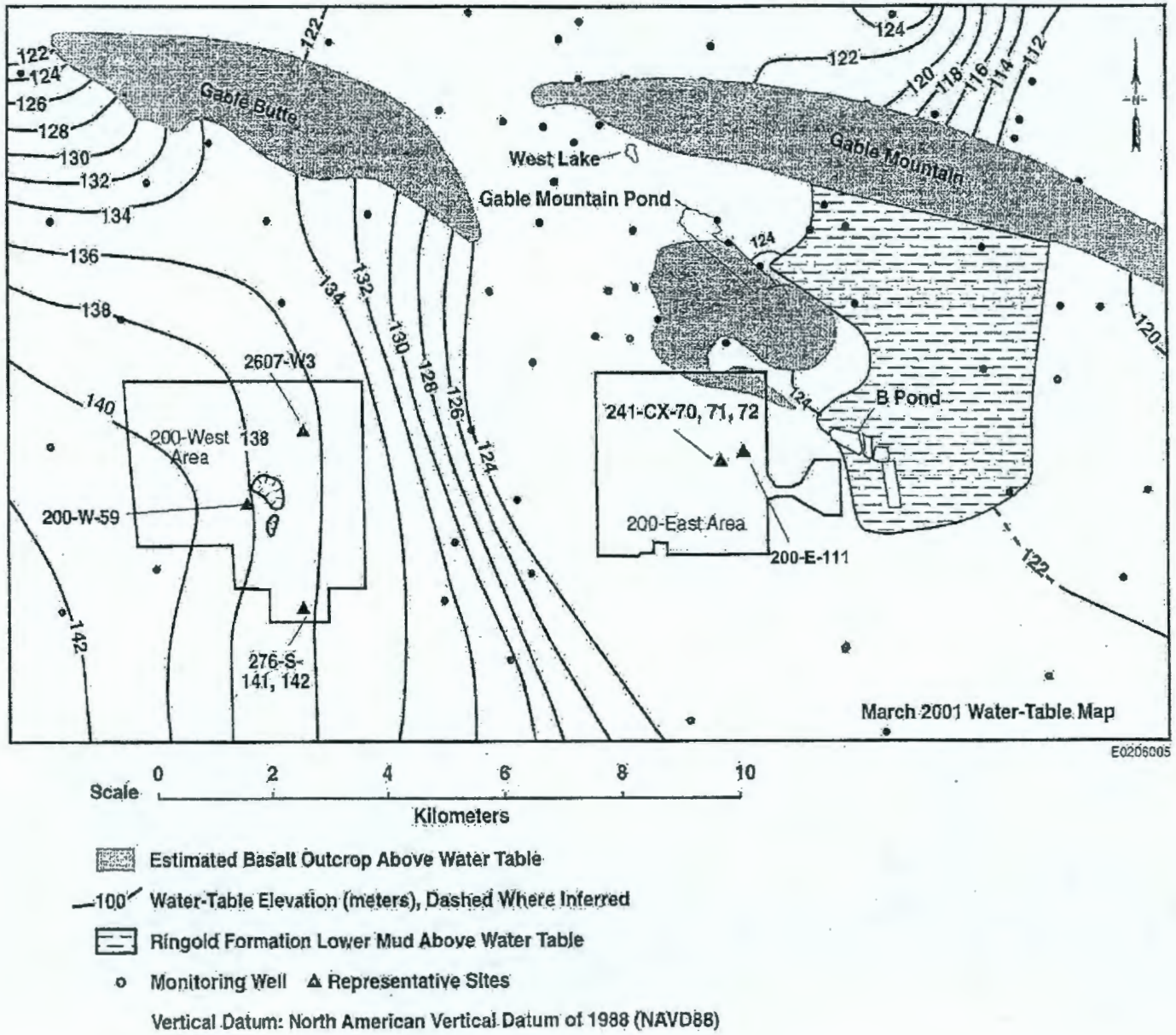


Figure 2-3. Groundwater Table Around the 200 East and 200 West Areas, April 2001.

Figure 2-4. Hot Semiworks Plan View.

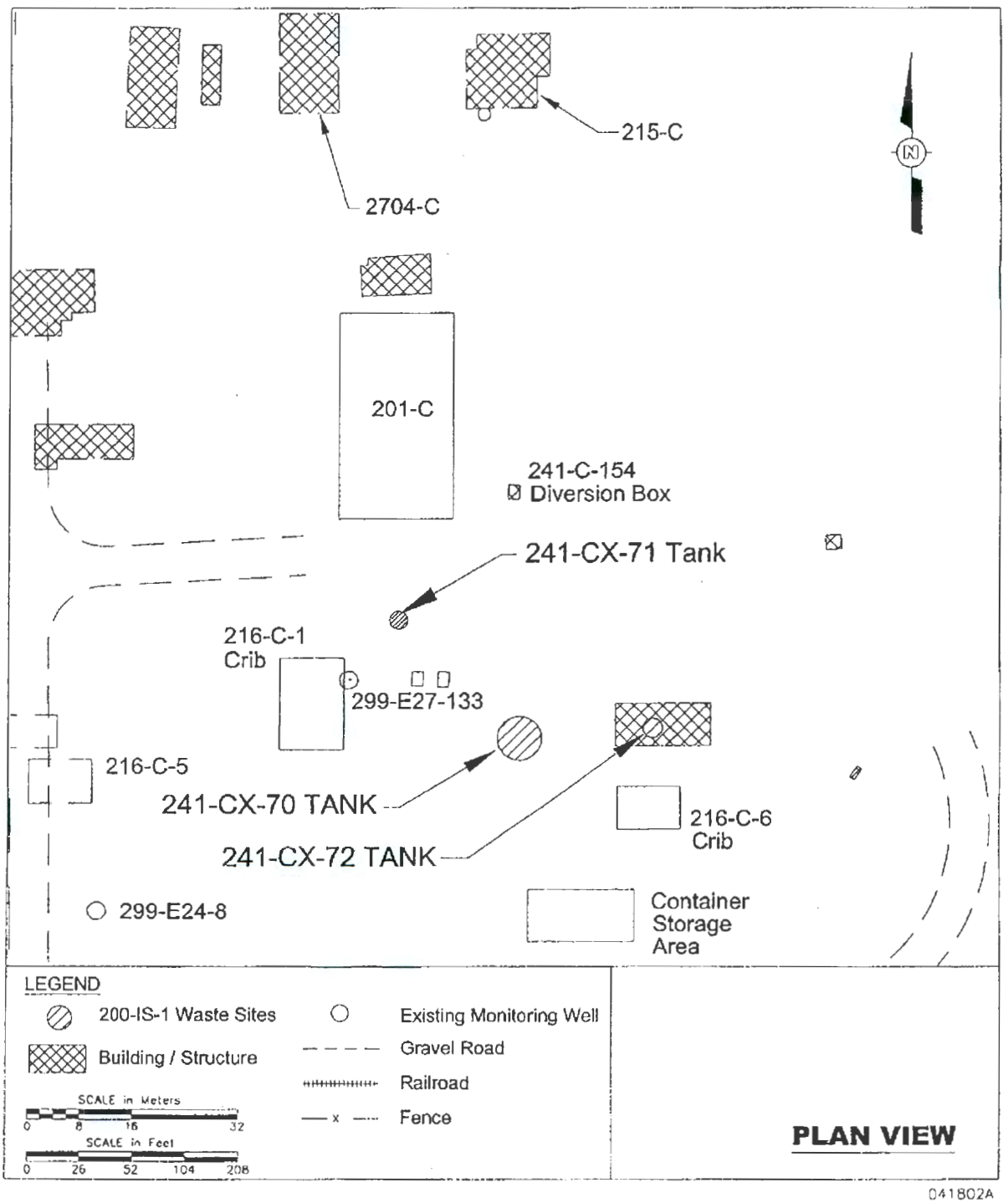


Figure 2-5. Stratigraphy Near the 241-CX-70, 241-CX-71 and 241-CX-72 Storage Tanks.

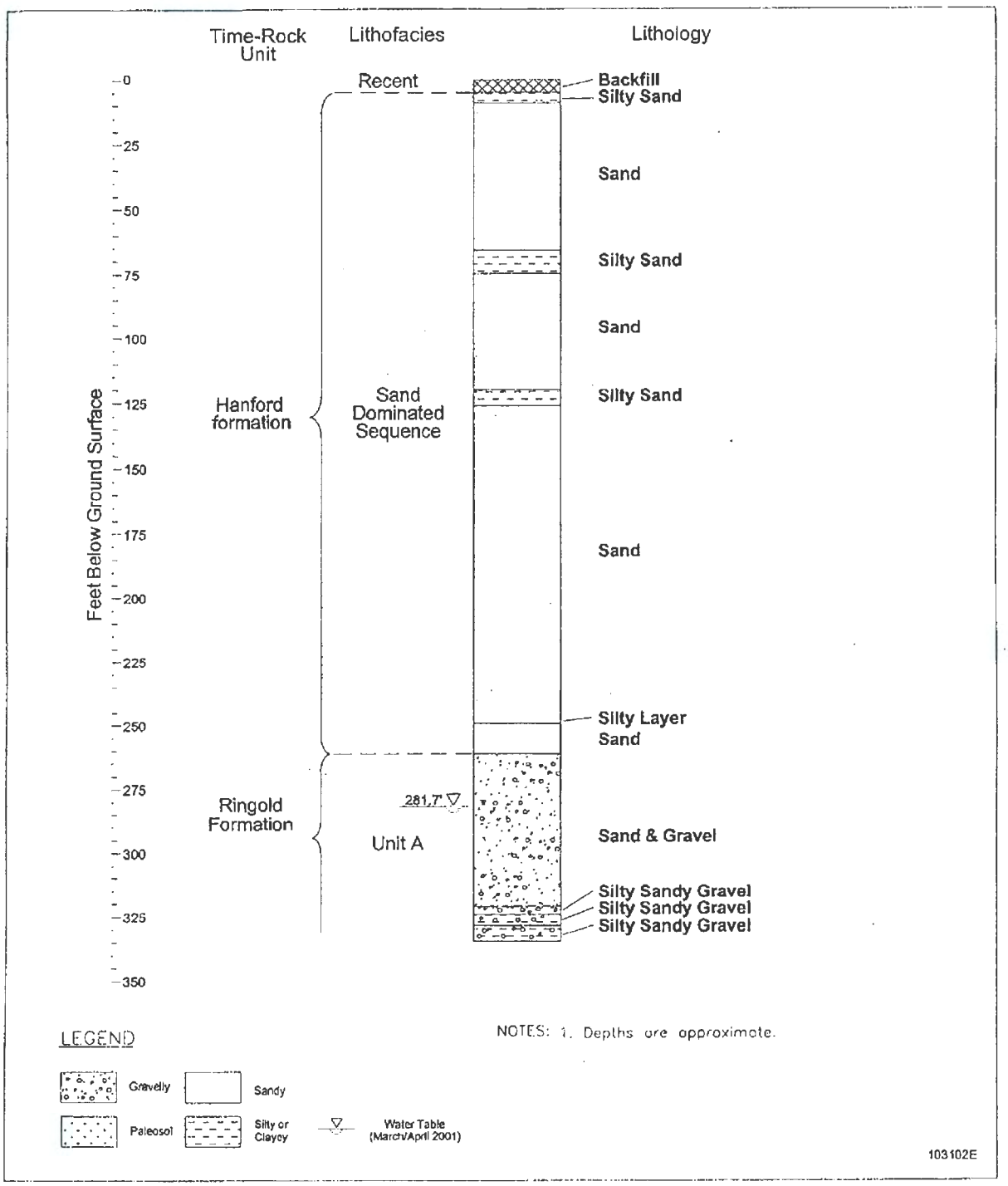


Figure 2-6a. 200-IS-1 and 200-ST-1 Operable Unit Waste Sites in the 200 East Area.

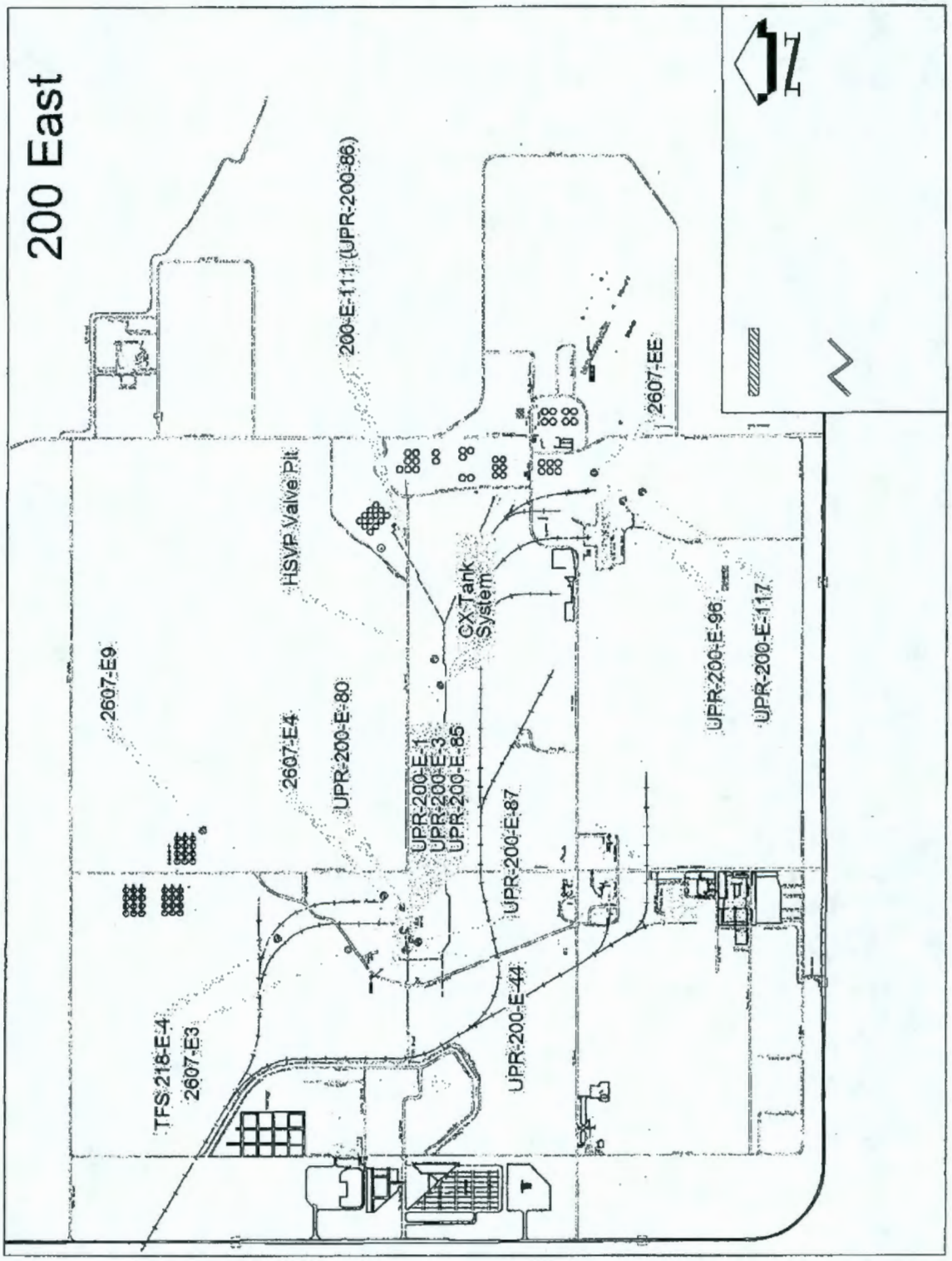


Figure 2-6b. 200-IS-1 and 200-ST-1 Operable Unit Waste Sites in the 200 West Area.

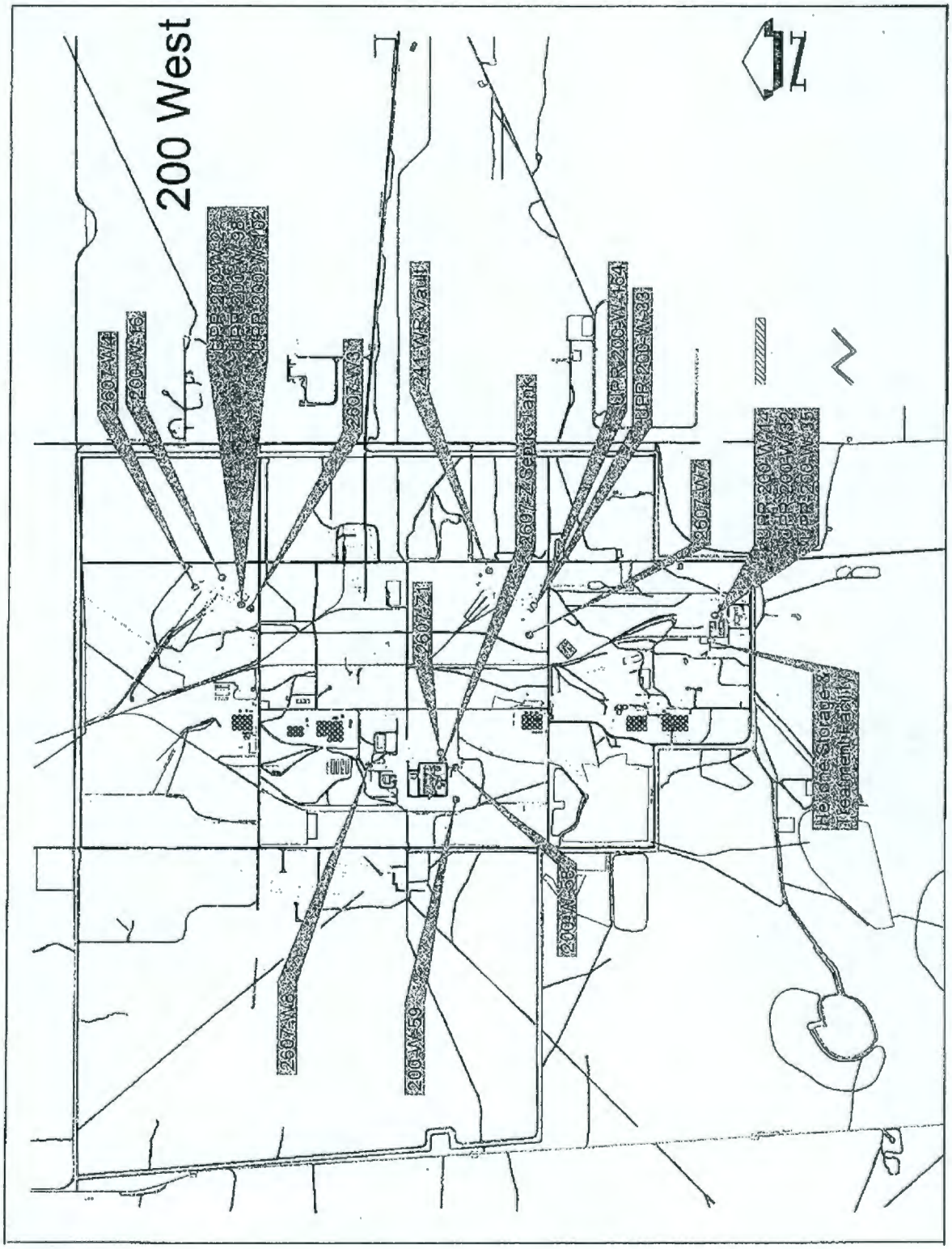


Figure 2-7. Stratigraphy Near the 276-S-141 and 276-S-142 Storage Tanks.

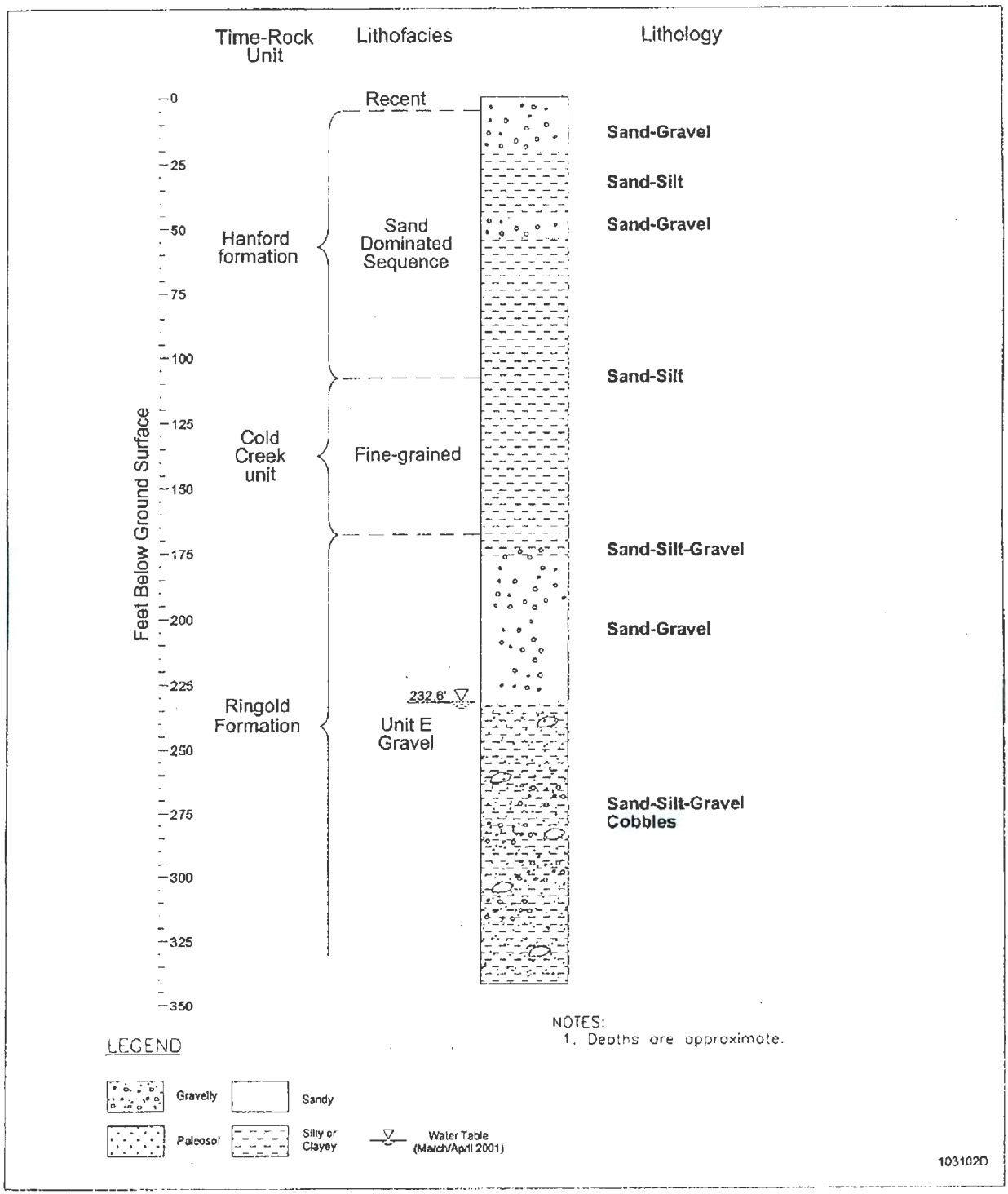


Figure 2-8. Stratigraphy Near the 200-E-111 Waste Site.

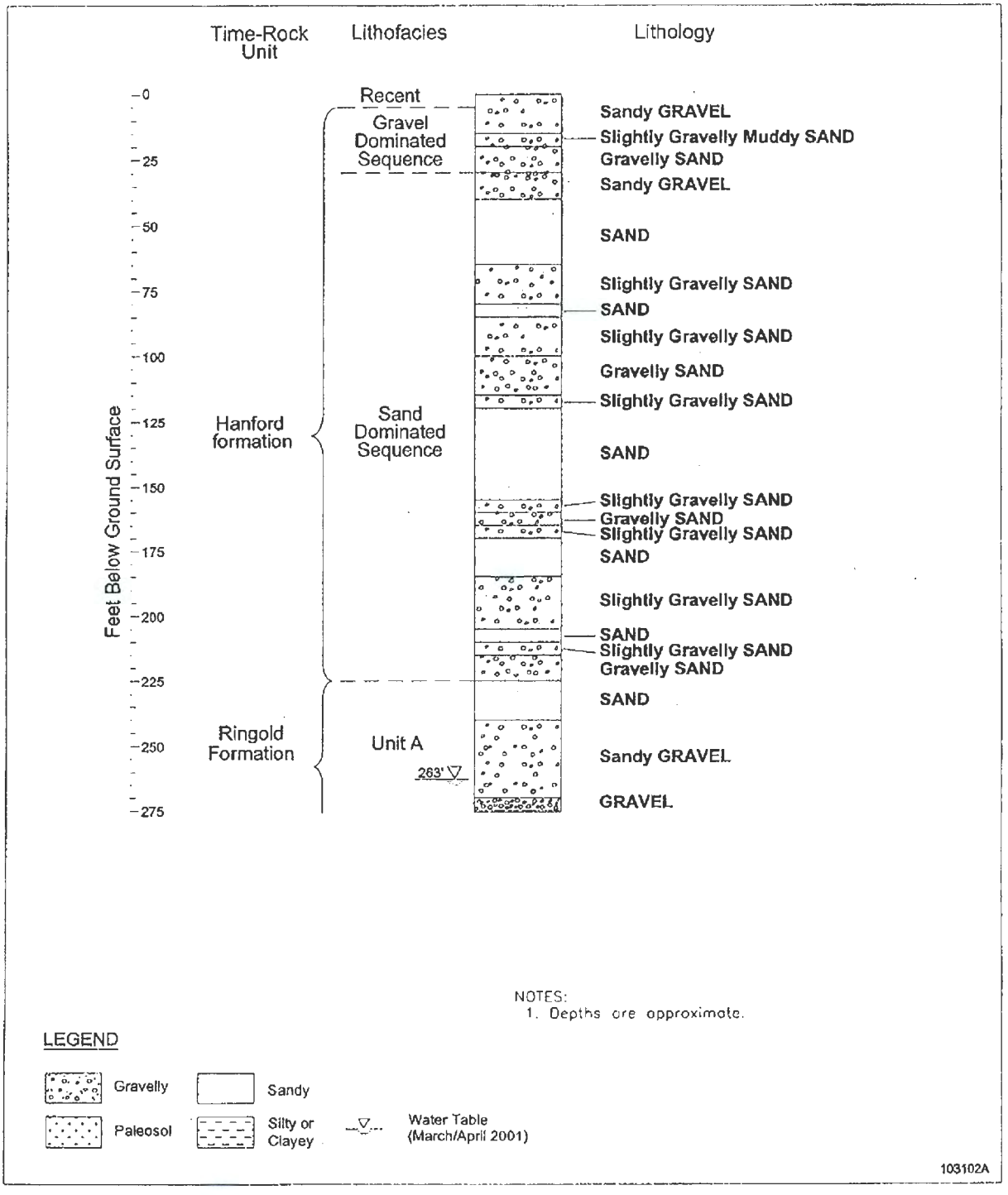


Figure 2-9. Stratigraphy Near the 200-W-59 Diversion Box.

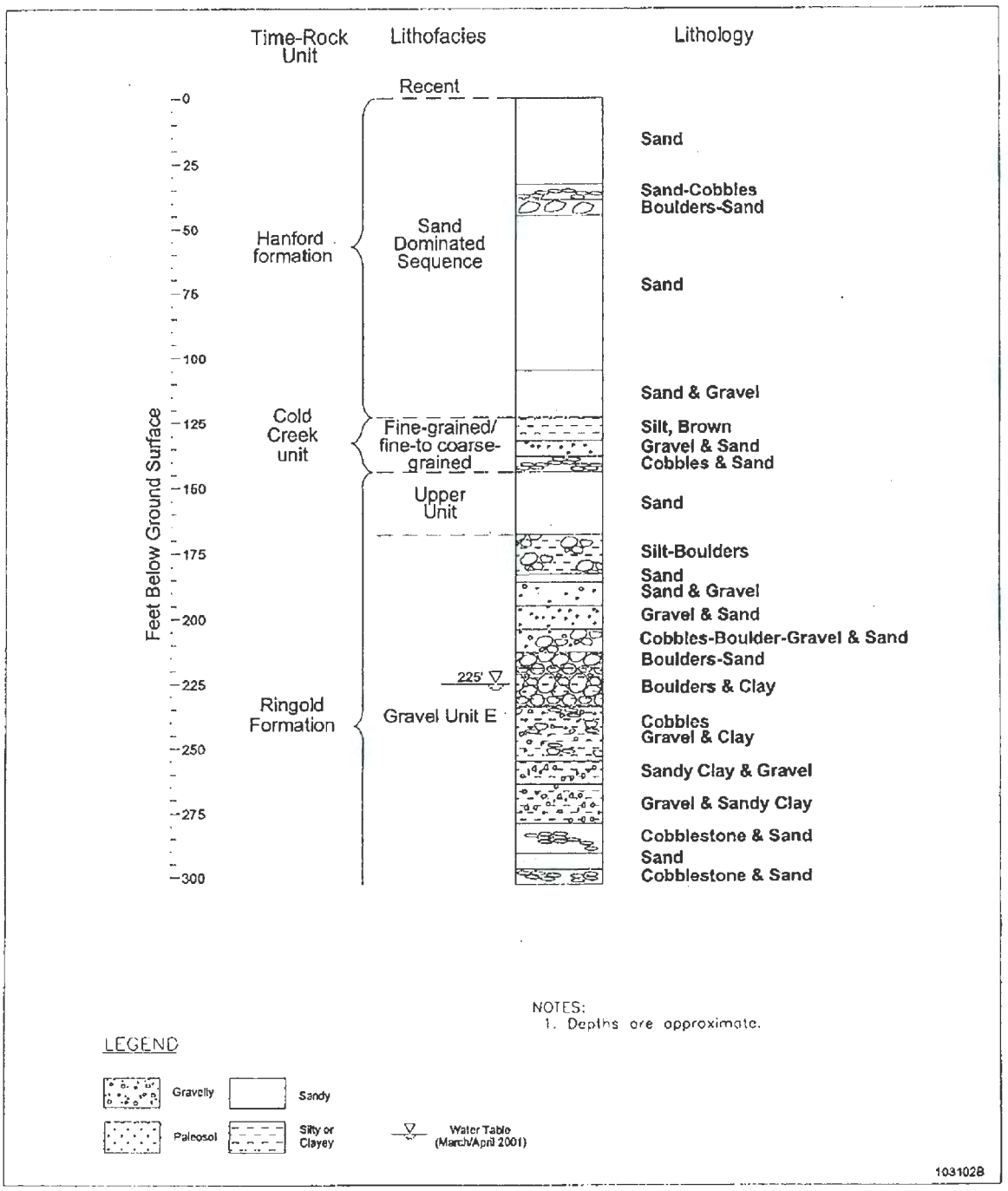


Figure 2-10. Stratigraphy Near the 2607-W3 Septic Tank.

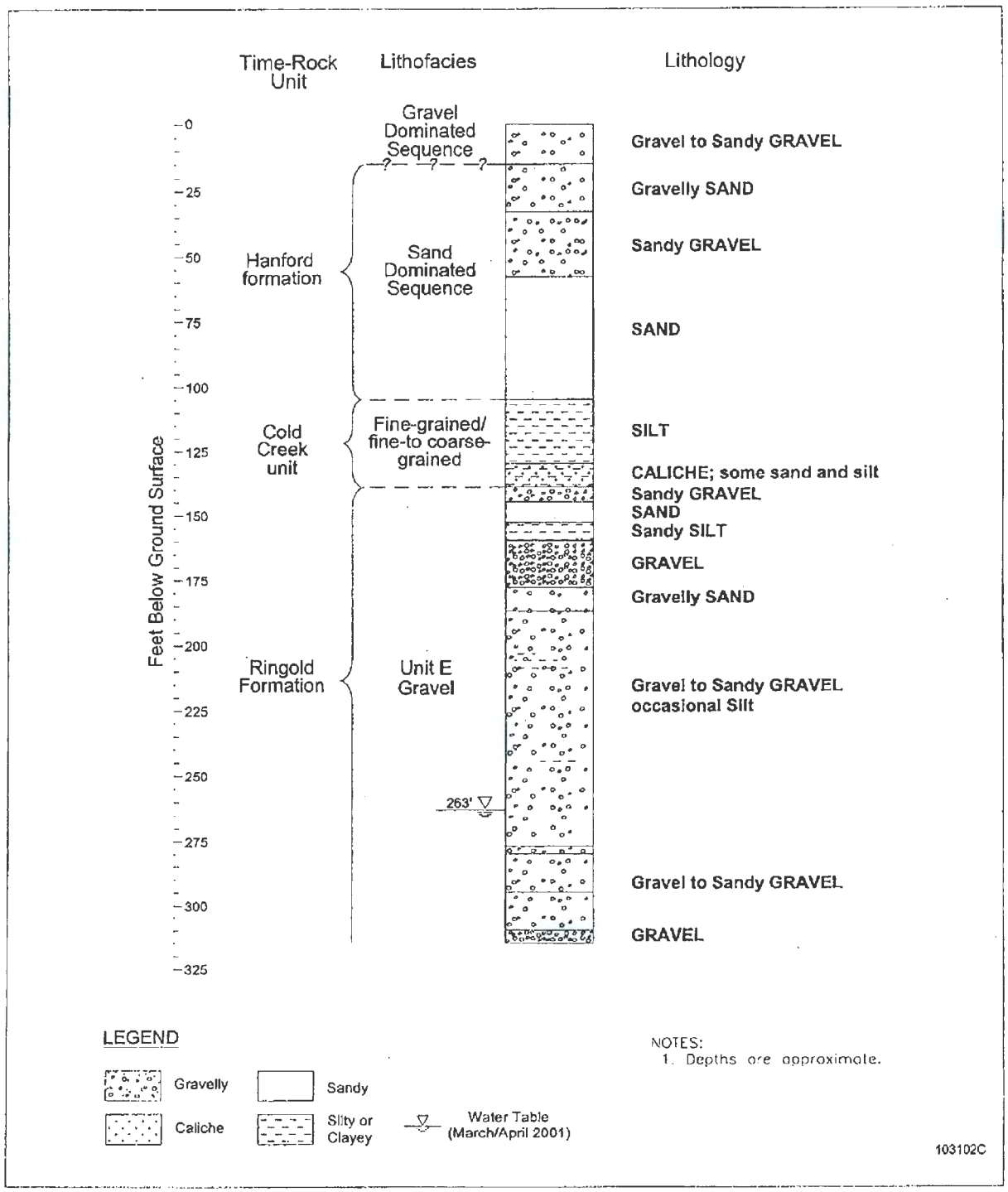


Figure 2-11. 241-CX-70 Storage Tank Construction Diagram.

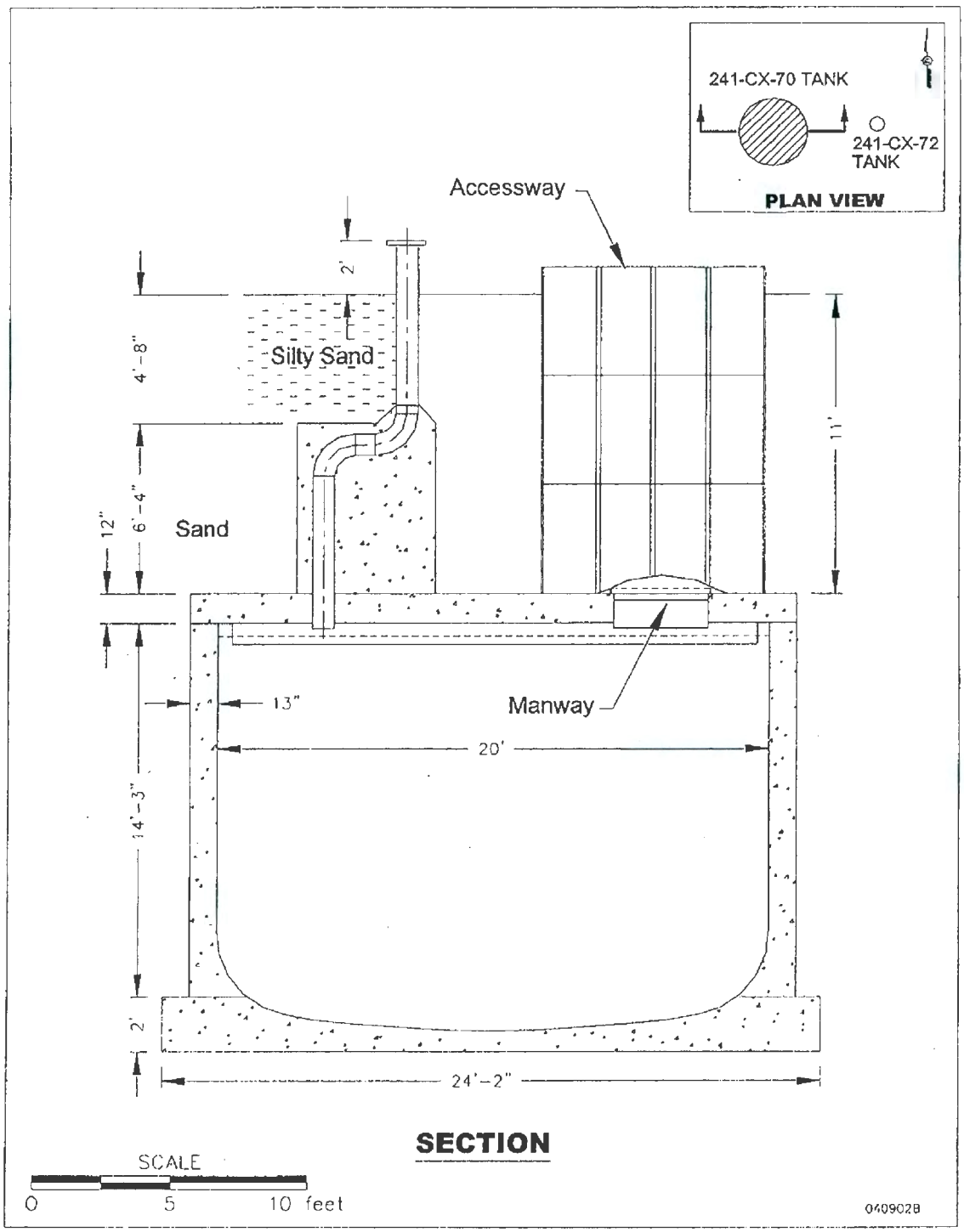


Figure 2-12. 241-CX-71 Storage Tank Construction Diagram.

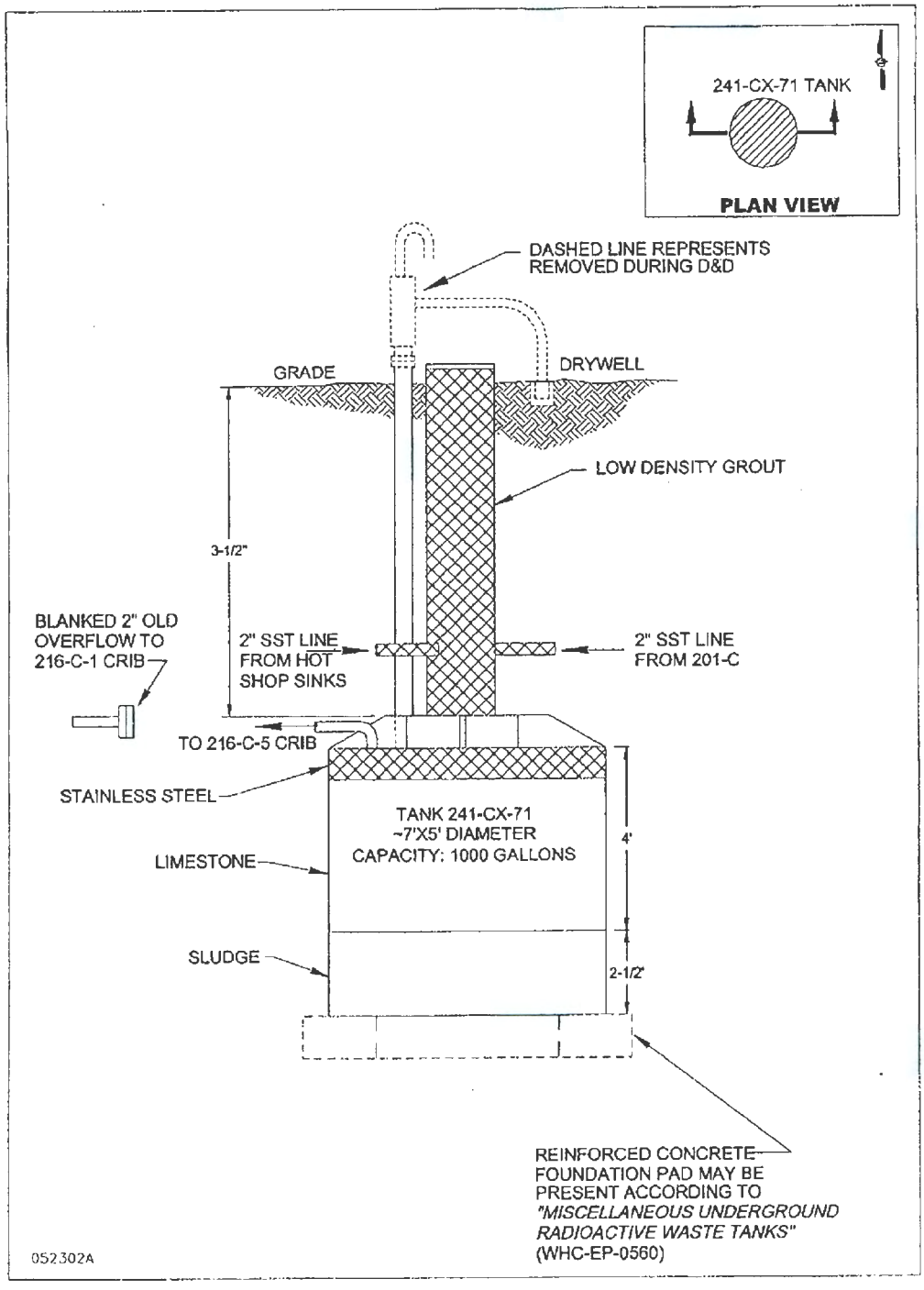


Figure 2-13. 241-CX-72 Storage Tank Construction Diagram.

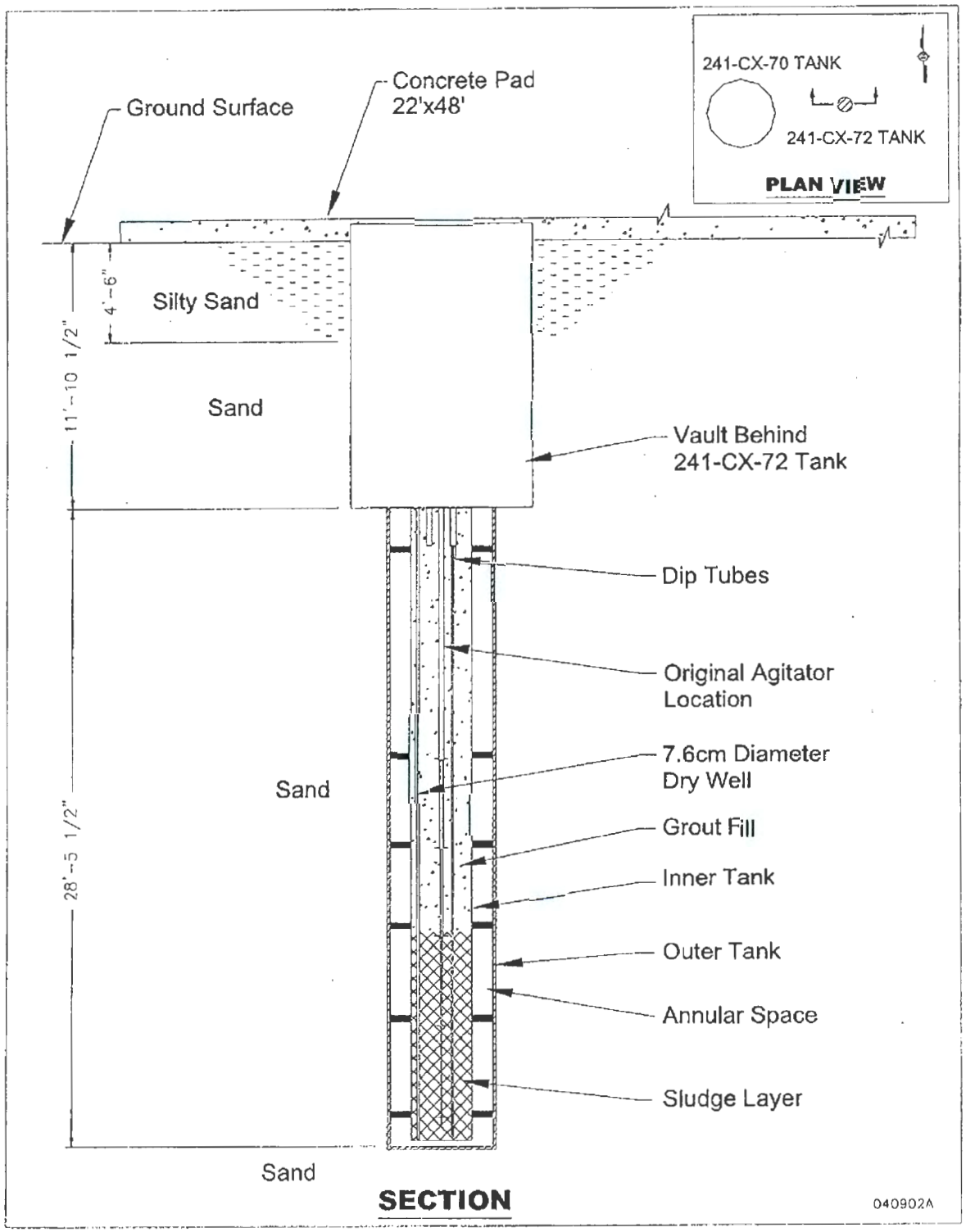


Figure 2-14. 276-S-141 and 276-S-142 Storage Tanks Construction Diagram.

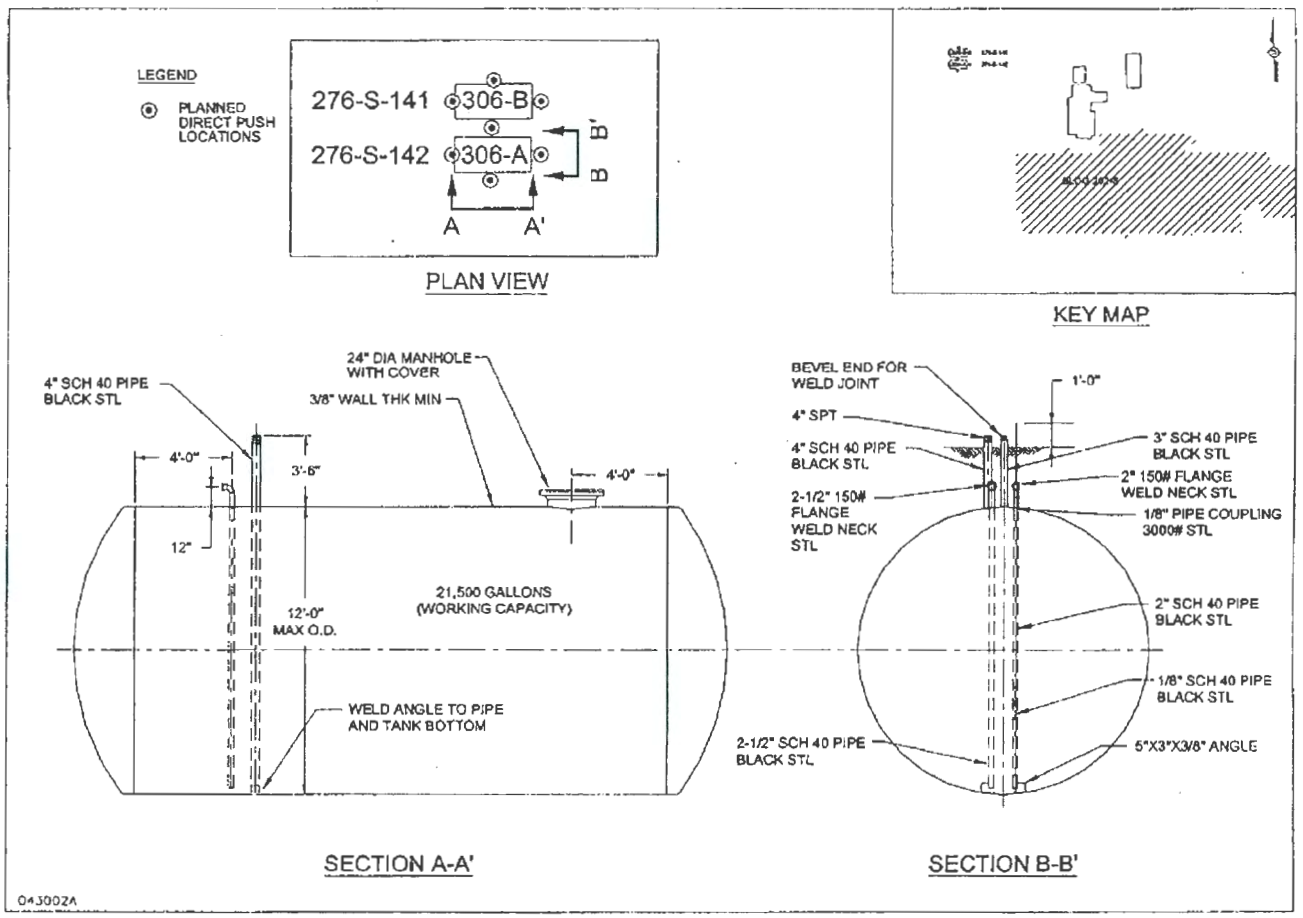


Figure 2-15. 200-E-111 Tank Farm Process Piping Construction Diagram.

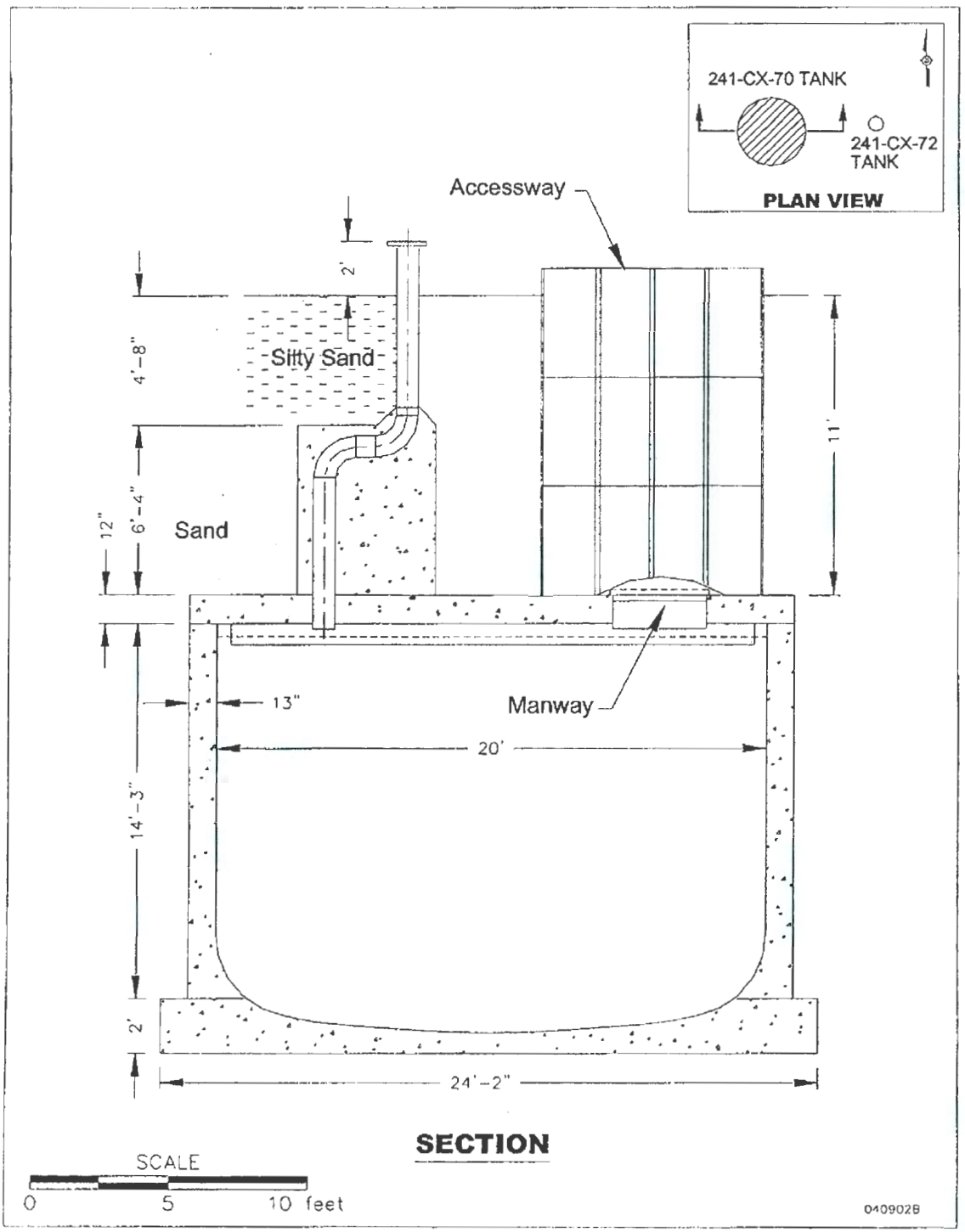
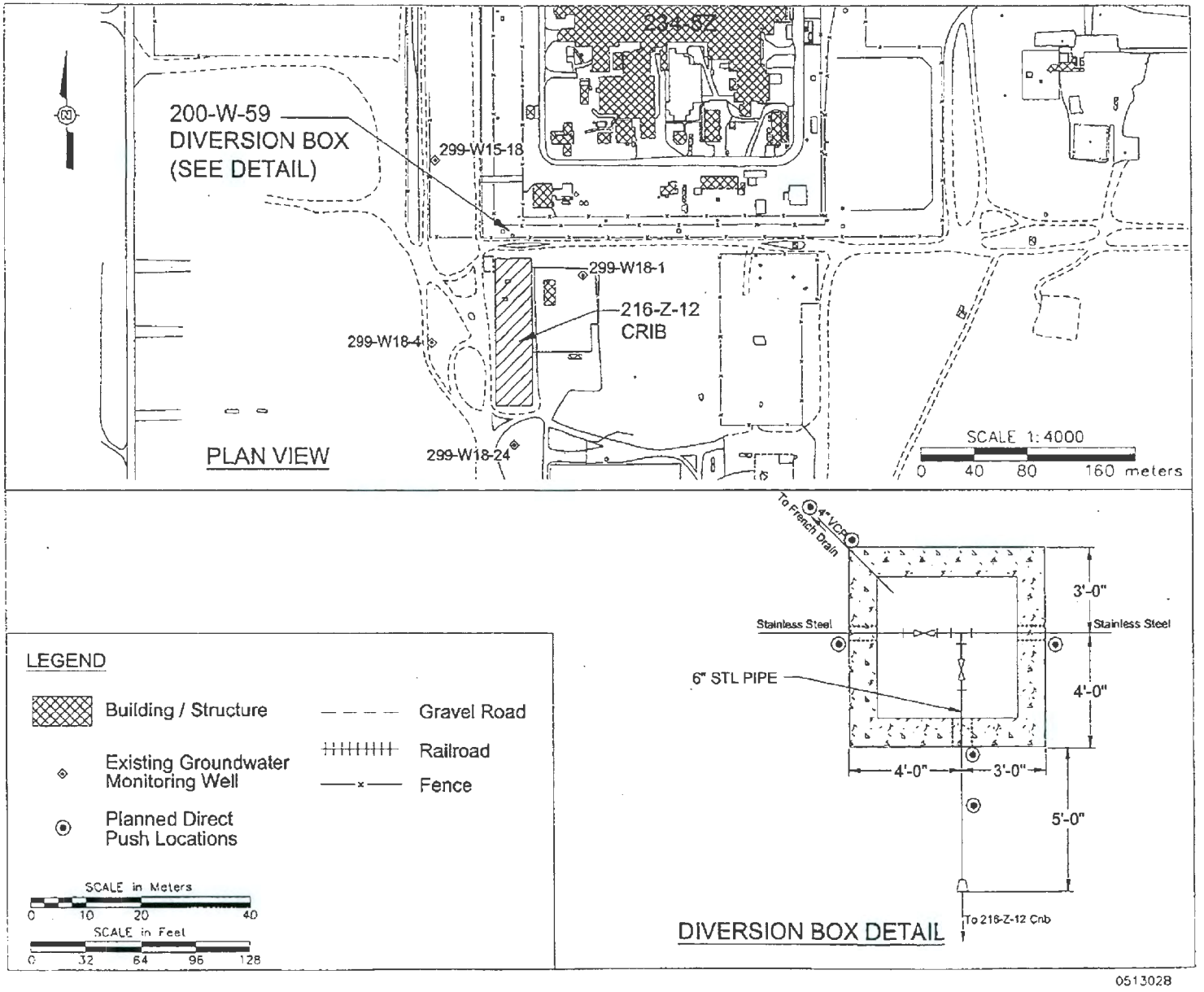


Figure 2-16. 200-W-59 Diversion Box Construction Diagram.



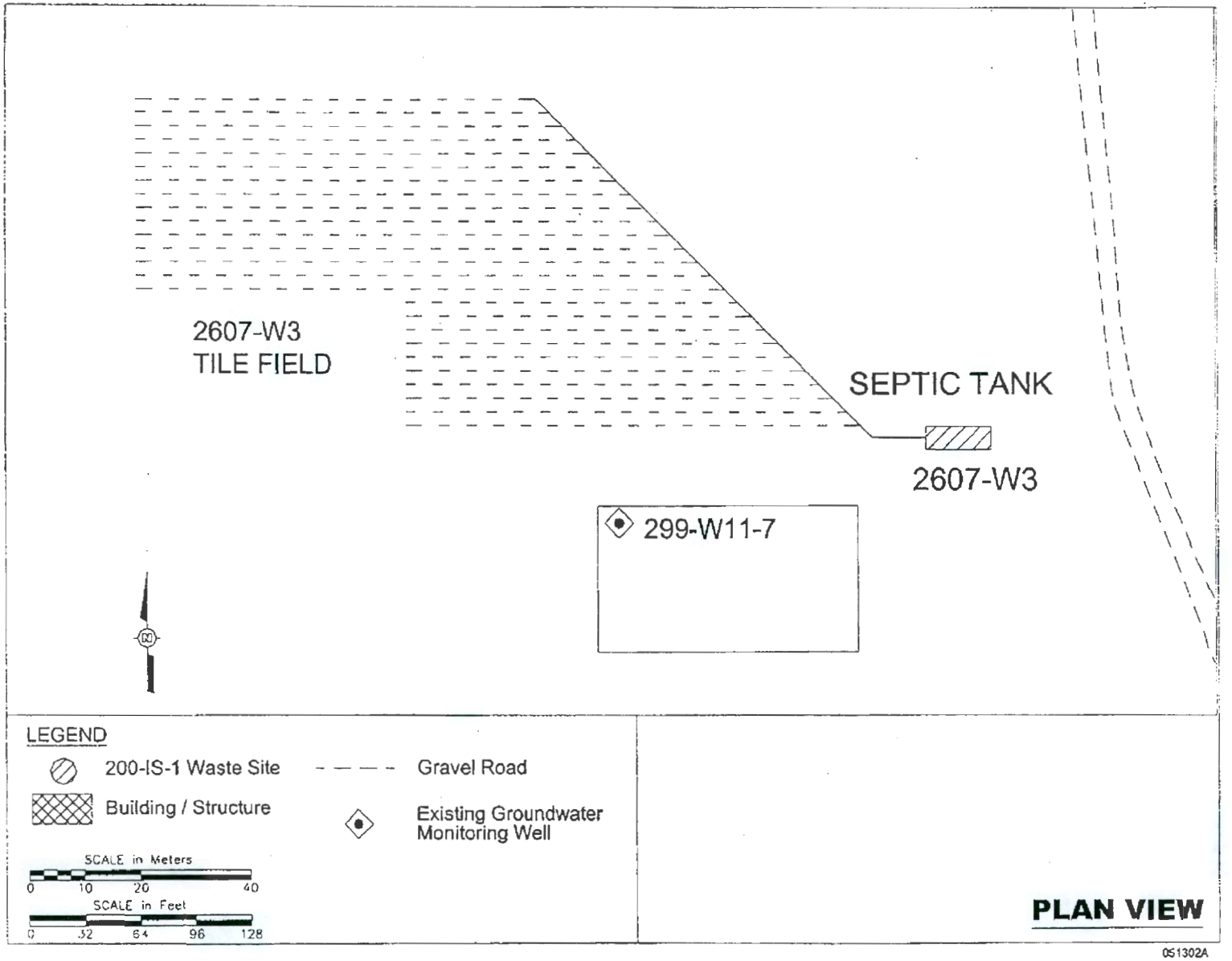


Figure 2-17. 2607-W3 Septic Tank Construction Diagram.

This page intentionally left blank.

3.0 INITIAL EVALUATION OF TREATMENT, STORAGE, AND DISPOSAL UNITS AND REPRESENTATIVE SITES

This chapter presents the results of previous characterization efforts at RCRA TSD units and representative sites in the 200-IS-1 and 200-ST-1 OU waste sites. This chapter also covers the contaminant inventory, effluent volume, available soil and groundwater data, and current understanding of the distribution of contamination for these sites. Sections 3.3 and 3.4 contain information that will be used for portions of the RCRA TSD closure plan. Section 3.3 describes the nature and extent of contamination that corresponds to the closure plan facility description. Section 3.4 presents the current RCRA interim status groundwater monitoring requirements.

3.1 KNOWN AND SUSPECTED CONTAMINATION

The waste generally was associated with tanks, lines, pits, diversion boxes, and septic tanks with associated drain fields. The estimated inventory of the primary radionuclides and nonradiological constituents that potentially were discharged to the vadose zone from the waste sites in the 200-IS-1 and 200-ST-1 OUs was obtained from the following sources:

- WIDS
- The aggregate area management study reports for the 200 Areas (DOE/RL-92-05, *B Plant Source Aggregate Area Management Study Report*, DOE/RL-91-52, *U Plant Source Aggregate Area Management Study Report*, DOE/RL-91-60, *REDOX Plant Source Aggregate Area Management Study Report*, DOE/RL-92-04, *PUREX Plant Source Aggregate Area Management Study Report*, DOE/RL-92-18, 1993, *Semiworks Plant Source Aggregate Area Management Study Report*)
- DOE/RL-98-28, the Implementation Plan
- DOE/RL-96-81, *Waste Site Grouping for 200 Areas Soil Investigations*.

The majority of the radionuclide and nonradiological waste disposed of by operations associated with the 200-IS-1 and 200-ST-1 OU waste sites was not documented in historical records. However, rough-order-of-magnitude estimates for some of the waste sites are documented in DOE/RL-98-28 and WIDS based on waste stream analyses for each waste site. The available inventories are presented in Appendix C, which contains summary information on the waste sites covered by this work plan. The inventories, where present, predominantly consisted of cesium-137, strontium-90, uranium, plutonium, nitrate, and sodium dichromate (DOE/RL-96-81).

3.2 ENVIRONMENTAL MONITORING

Current efforts at the Hanford Site focus on environmental cleanup. Before the recent cleanup efforts began, monitoring was performed across the Hanford Site to measure and evaluate long-term trends in the environmental accumulation of radioactive contamination. Risks associated

with unacceptable levels of contamination typically were addressed by stabilizing the waste sites with soil, concrete, and/or gravel backfill to minimize impact on human health and the environment.

Typically, the accumulation of radioactivity at disposal sites was evaluated through gathering and analyzing soil samples. These samples generally were collected less than 0.3 m (1 ft) directly below the bottom of the receiving sites. Samples were collected annually, however, the number of samples collected was limited and sample locations were not always documented. Therefore, little or no information typically is available to evaluate the lateral and vertical extent of contamination in the vadose zone during active periods of discharge. Nonradioactive constituents usually were not analyzed for. Scintillation logging commonly was performed in boreholes adjacent to waste sites. The logs were used to determine the extent of radiological contamination in the subsurface, however, these logs are not quantitative and only generally indicate the presence of radiological contamination. Groundwater is monitored for some constituents at these sites through RCRA requirements and the Sitewide groundwater-monitoring program.

Currently, environmental monitoring at the Hanford Site consists of effluent monitoring, groundwater and vadose zone monitoring, and environmental surveillance. The environmental surveillance is conducted for the following media:

- Air
- Surface water and sediments
- Drinking water
- Farm and farm products
- Soil and vegetation
- External radiation.

Air, external radiation, soil, and vegetation are evaluated routinely in the 200 Areas as part of the Hanford Site near-facility and environmental monitoring programs. Results of the near-facility and environmental monitoring programs are presented in annual reports. The annual reports, PNNL-13230, *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 1999*, and PNNL-13316, *Hanford Site Environmental Report for Calendar Year 2000*, contain data most applicable to the 200-IS-1 and 200-ST-1 OUs. PNNL-13230 focuses on monitoring activities near facilities that have potential to or have discharged, stored, or disposed of radioactive or hazardous materials, including those facilities within the 200 Areas. PNNL-13316 covers the entire Hanford Site, including those areas not associated with operations (e.g., the 600 Area). This annual report examines the resources associated with the Hanford Site, including the media listed in the previous paragraph and groundwater. Results of monitoring efforts pertinent to the 200-IS-1 and 200-ST-1 OU waste sites are presented in Section 3.3.7. The potential impacts of 200-IS-1 and 200-ST-1 OU waste site contamination on human health and the environment are discussed in Section 3.5.

Groundwater also is routinely monitored Site wide. More than 600 monitoring wells are sampled annually to characterize groundwater flow; groundwater contamination by metals, radionuclides, and nonradiological constituents; and the extent of contamination. Contaminated groundwater, ingestion risk, and dose also are assessed. Results of groundwater monitoring and

remediation are presented in annual reports, the most recent of which is PNNL-13788, *Hanford Site Groundwater Monitoring for Fiscal Year 2001*. The groundwater monitoring reports also summarize vadose zone characterization activities conducted on the Hanford Site as part of other projects.

3.3 NATURE AND EXTENT OF CONTAMINATION

The following sections describe the nature and extent of contamination at the RCRA TSD units and representative waste sites.

3.3.1 Tank 241-CX-70

3.3.1.1 Sources of Waste Contributions

As described in Chapter 2, the 201-C Building, A Cell, was reported as discharging waste to Storage Tank 241-CX-70. According to Figure 2 of HW-31373, *Hot Semiworks REDOX Studies*, and Hanford Site Drawings H-2-4093, *Hot Semiworks Process Piping Plan A Cell*; H-2-4105, *Hot Semiworks Engineering Flow Sketch*; and H-2-4335, *Hot Semiworks Waste Line Bldg 201-C to TK-70;* the following equipment discharged waste from A Cell to Tank 241-CX-70: steam transfer jets and piping that connected the scrubber, oxidizer, dissolver, feed make-up and waste receiver tanks, as well as the centrifuge to the waste concentrator tank.

3.3.1.2 Maximum Inventory of Waste Managed

According to HW-52860, *Standby Status Report for Hot Semiworks Facility*, the total estimated effluent volume received was 95,000 L (25,000 gal) of nonneutralized REDOX waste. However, in May 1974, the material level measurements indicated that 14 ft of liquid and sludge remained in the tank (AR0027). Based on the 1974 material level reported, Tank 241-CX-70 had approximately 11,000 L (2,900 gal) more inventory than it reportedly received in 1957 (HW-52860) for a total of 106,000 L (28,000 gal).

3.3.1.3 Historical Sampling and Analysis

Limited information is available to evaluate the nature and extent of contamination beneath Tank 241-CX-70. Well 299-E27-5, located about 77 m (253 ft) east of Tank 241-CX-70, was drilled in September 1962 to a depth of 102 m (335 ft). No information was available regarding soil samples or radiological surveys in the vadose zone. Groundwater levels for March 2002 were reported at 87 m (284 ft) below ground surface (bgs). Sample data for Well 299-E27-5, last reported in 1987, showed strontium and uranium concentrations ranging from 0.01 pCi/L to 2.04 pCi/L. In 1967, strontium levels ranged from 2.4 pCi/L to 28 pCi/L.

The amount of effluent discharged to the soil column is unknown, but comparing liquid level data from July 1974 to the data from an unknown later date indicated that the tank had not leaked. The tank was designed and constructed specifically for storing high-level process waste in support of the Semi-Works processes. In April 1976, analysis of the remaining sludge in Tank 241-CX-70, reported that fission products totaled about 4,300 Ci of strontium-90, 870 Ci of

cesium-137, and 3.4 Ci of TRU (SD-WM-SAR-003, *The Safety Analysis Report for the Decontamination and Decommissioning of the Strontium Semiworks Complex*).

Sludge removal activities began in the summer of 1987 with the construction of a sluicing-pumping system. Grab samples collected on August 17, 1988, showed alpha readings ranging from 390 nCi/g to 690 nCi/g of filtered solids. The TRU content of the sludge was approximately 50 nCi/g with a pH of 13 in the liquid phase. Halogenated hydrocarbons were recorded at 0.0009 wt %. In addition, as reported in 12712-PCL88-019, *Analysis of Sludge Samples from Hot Semiworks Tank CX-70*, qualitative identification classified the organics as aliphatic amines or possibly aliphatic alcohol. Later the waste was removed; the tank is empty.

Because the tank integrity seems to be intact, an assumption for the conceptual model focused on the potential leaks associated with the pipe connections above the tank. Although leakage has been reported from the pipe connections, the conceptual model conservatively assumes that 0.1 percent of the total waste transferred (i.e., 95 L [25 gal]) to the tank through the associated piping could potentially have leaked. Assuming this potentially released volume is in the soil adjacent to and beneath the tank, the entire volume is capable of being retained by the soil within 9 m (30 ft) of the ground surface. Based on these assumptions, waste water and mobile contaminants most likely have not affected groundwater because the soil column pore volume is greater than the estimated liquid release.

The status of groundwater contamination near Tank 241-CX-70 is described in the Hanford Site groundwater monitoring report (PNNL-13788). Reported groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the waste site. Groundwater plumes in the 200 East Area are shown in Figures 3-1 and 3-2. Groundwater wells in the area are sparse and mainly cross gradient (east or west) of the site and, therefore, do not provide useful analytical information. One downgradient well 299-E27-1 was reviewed for groundwater concentrations of uranium and strontium. The records, compared to the results from Well 299-E27-5, were generally equivalent and ranged from 0.259 pCi/L to 2.04 pCi/L.

3.3.2 Tank 241-CX-71

3.3.2.1 Sources of Waste Contributions

The 201-C Building Hot Shop routed condensate, coil, and condenser cooling waters containing low-level radioactivity waste from the hot sinks to Tank 241-CX-71 before discharging the waste to the 216-C-1 and 216-C-5 Cribs according to WHC-SD-DD-TI-040, *Tank 241-CX-72 Preliminary Waste Characterization*, and Drawings H-2-4010, *Strontium Semiworks & Vicinity Outside Lines Key Map*; H-2-4420, *Plot Plan Hot Semiworks Waste Self Concentrator*; and H-2-4535, *Plot Plan Hot Semiworks Waste Self Concentrator*.

3.3.2.2 Maximum Inventory of Waste Managed

The total estimated effluent volume received was approximately 33 million L (8.8 million gal) of waste (AR00227, "Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72").

3.3.2.2.1 Historical Sampling and Analysis. Limited information is available to evaluate the nature and extent of contamination beneath Tank 241-CX-71. Well 299-E27-5, drilled in September 1962, is located about 314 m (1,000 ft) to the east. The maximum depth of the boring was 102 m (335 ft). No information was available regarding soil samples or radiological surveys in the vadose zone. Groundwater levels for March 2002 were reported at 87 m (284 ft) bgs. Sample data for Well 299-E27-5, last reported in 1987, showed strontium and uranium concentrations ranging from 0.0107 pCi/L to 2.04 pCi/L. In 1967, strontium levels ranged from 2.4 pCi/L to 28 pCi/L.

The effluent volume discharged at this site to the soil column is unknown and depends on the integrity of the stainless steel tank during its year of operation. Tank 241-CX-71 was designed and constructed for the neutralization of acidic low-level radioactive waste. WHC-SD-DD-SAD-001, "Safety Evaluation for Interim Waste Management Activities in Tank 241-CX-70, Tank 241-CX-71, and 241-CX-72" reported that the estimated waste discharged to Tank 241-CX-71 contained 2.46E-08 g/L plutonium, 43,000 nCi/L Sr-89/90 and 1,600 nCi/L Cs-137. The maximum inventory was estimated at 6 Ci TRU and 6,000 Ci of beta.

In October 1990, gas, liquid, and sludge samples were collected from Tank 241-CX-71. Extremely low concentrations of methyl ethyl ketone, xylene, and toluene ranging from 7 to 54 ppb were measured. Cyanide was measured in the sludge at 21 ppm.

The stainless steel tank was in operation for less than 3 years. An assumption for the conceptual model focused on the potential leaks associated with the pipe connections above the tank. Because no leaks from the pipe connections were documented, the conceptual model assumes that 0.1gal/hr (i.e., potentially 8,300 L [2,200 gal]) could have leaked over the time the neutralizing tank and associated piping were in service. Assuming this volume is within the soils adjacent to and beneath the tank, the entire volume is capable of being retained by the soils within 15 m (50 ft) of the ground surface. The soil column pore volume is greater than the estimated liquid release; consequently wastewater and mobile contaminants likely have not affected the groundwater.

The status of groundwater contamination near Tank 241-CX-71 is described in PNNL-13788. The report indicates that groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the site. Groundwater plumes in the 200 East Area are shown in Figures 3-1 and 3-2. Groundwater wells in the area are sparse and mainly cross gradient and, therefore, do not provide useful analytical information. Uranium and strontium records for Well 299-E27-5 indicate concentrations ranging from 0.26 pCi/L to 2.04 pCi/L. This well lies downgradient of Tank 241-CX-71. Based on the review of the operational history, these plumes are not the result of Tank 241-CX-71 operation.

3.3.3 241-CX-72 Tank

3.3.3.1 Sources of Waste Contributions

According to WHC-SD-DD-TI-040and Drawings H-2-4093, H-2-4420 and H-2-4535, only A and C Cells of the 201-C Building discharged waste to storage tank 241-CX-72 .

3.3.3.2 Maximum Inventory of Waste Managed

According to HW-52860, the estimated effluent volume received was 8700 L (2,300 gal) of liquid waste.

3.3.3.3 Historical Sampling and Analysis

Limited information is available to evaluate the nature and extent of contamination beneath Tank 241-CX-72. The nearest groundwater well is 299-E27-5, located about 57.3 m (188 ft) to the east of the tank. The well was drilled in September 1962 to a depth of 102 m (335 ft). No information was available regarding soil samples or radiological surveys in the vadose zone. Groundwater levels for March 2002 were reported at 86.6 m (284 ft) bgs. A search of the Hanford Environmental Information System (HEIS) for strontium and uranium for well 299-E27-5 showed that the constituents were last reported for 1987. Concentrations ranged from 0.0107 pCi/L to 2.04 pCi/L. Strontium levels reported for 1967 ranged from 2.4 pCi/L to 28 pCi/L.

The effluent volume discharged at this site to the soil column is unknown. The probability of contamination spread from this site is estimated to be zero to very low. The tank received only 8,700 L (2,300 gal) of liquid waste (HW-52860). In addition, material level measurements indicated that 74 in. of sludge and 1 in. of liquid were present in the tank in July of 1974 and 76 in. of sludge and 1 in. of liquid were present in November of that year. Tank 241-SX-72 was designed and constructed specifically for the concentration and terminal storage of waste from the pilot PUREX studies. In AR00227, sampling results for a clear, light brown solution with a pH of 9.5 and a trace of solids were reported as follows:

- Total plutonium. 1.13×10^{-8} grams/gal
- Total uranium. 2.43×10^{-3} grams/gal
- Strontium-89/90. 4.33 mCi/g
- Cesium-137. Analyzed for and not detected.

In 1988, nondestructive assays were performed to evaluate the radiological content of Tank 241-CX-72. Three smears were collected from an agitator rod that was inadvertently removed from the tank. WHC-SD-CP-TI-148, *Radiological Evaluation of Hot Semiworks Tank 241-CX-72*, reported alpha activity between 2,000 and 8,000 disintegrations per minute (dpm), gamma activity between 2.64 E 3 3 and 5.81 E 3 3 pCi and a beta-to-gamma ratio of 25:1. The report concluded that the residual waste material contains 150 g to 200 g of plutonium. WHC-SD-DD-TI-051, *An Estimation of the Radionuclide Content of Tank 241-CX-72*, estimated that between 9,000 and 10,000 Ci of cesium-137 would be present on the basis of data presented in WHC-SD-CP-TI-148. The sludge was never removed from the tank.

Because the tank integrity seems to be intact, an assumption for the conceptual model focused on the potential leaks associated with the pipe connections above the tank. Although no information about the volume of leakage from the pipe connections is available, the conceptual model assumes that 1 percent or 87 L (23 gal) of the waste transferred to the tank through the associated piping could have leaked. Assuming that this potential was realized, the released volume is within the soils adjacent to the tank and the entire volume can be retained by the soils within

4.6 m (15 ft) of the ground surface. Thus wastewater and mobile contaminants have most likely not affected groundwater because the soil column pore volume is greater than the estimated liquid release.

The status of groundwater contamination near Tank 241-CX-72 is described in PNNL-13788. The report indicates that groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the site. Groundwater plumes in the 200 East Area are shown in Figures 3-1 and 3-2. Groundwater wells in the area are sparse and mainly cross gradient (east or west) of the site and, therefore, do not provide useful analytical information. Downgradient well 299-E27-1 was reviewed through HEIS for groundwater concentrations of uranium and strontium. The records were generally equivalent to those for well 299-E27-5, and ranged from 0.259 pCi/L to 2.04 pCi/L. These plumes are not expected to be associated with tank operations.

3.3.4 Hexone Storage and Treatment Facility

Located in the southeast corner of the 200 West Area, the HSTF consists of two 91,200 L (24,000 gal) tanks (DOE/RL-88-21, *Dangerous Waste Permit Application*) used to store reagent-grade hexone for use in the REDOX Plant. These tanks received waste during the decontamination of the REDOX Plant.

3.3.4.1 Tank 276-S-141

3.3.4.1.1 Sources of Waste Contribution

Essentially pure hexone waste was transferred to Storage Tank 276-S-141 from the 276 Building located to the south of the tank, as described in Section 2 and shown on Hanford Site Drawing H-2-5304, *276 Organic-Solvent Make-Up Storage Piping.*

3.3.4.1.2 Maximum Inventory of Waste Managed

The estimated volume of hexone received by Tank 276-S-141 was 605,600 L (160,000 gal). This estimate is based on CCN 100786, "276-S-141/142 Hexone Storage Tank Sludge Sampling Results,", which reported that 76,000 L (20,000 gal) of essentially pure hexone was discharged to Tank 276-S-141annually.

3.3.4.1.3 Historical Sampling and Analysis

Limited information is available to evaluate the nature and extent of contamination beneath the Tank 276-S-141. Well 299-W22-14, drilled in March 1956, is located approximately 38 m (125 ft) northwest of the hexone tanks and is 104 m (342 ft) deep. Information about soil samples or radiological surveys in the vadose zone was not available. The groundwater level in Well 299-W22-20 for March 2002 was reported as 134.62 m (441.37 ft). Strontium levels were monitored in this well from January 1956 through February 1961 with concentrations ranging from 55 pCi/L to 7000 pCi/L; uranium was monitored from August 1956 to December 1957 with concentrations ranging from 1.5 pCi/L to 24 pCi/L.

The probability of contamination spread from a tank leak is estimated to be zero to very low. In April 1976, ARH-CD-639, *Integrity of Tank 276-S-141 and 276-S-142,* reported the integrity of the tank as good. The tank's average wall thickness was 0.83 cm to 0.92 cm (0.327 to 0.363 in.); the tank was constructed specifically to store clean hexone.

The tank was sampled twice and the results were reported in and ARH-CD-685, *Characterization of the Contents of Organic Waste Storage Tanks 276-S-141 and 276-S-142*, and WHC-SP-0350, *Hexone Remediation Demonstration Plan for Tanks 276-S-141 and 276-S-142.* The 1976 analytical work (ARH-CD-685) characterized the material in both tanks and included preliminary distillation tests. The 1988 (WHC-SP-0350) work obtained fully representative concentrations with the goal of determining a practical means for treating and disposing of the waste. These results are consistent with the operator-based knowledge of process information. The analytical results and historical knowledge are summarized from DOE/RL-92-40).

Tank 276-S-141 has a capacity of 76,000 L (20,000-gal)) and contained the following:

- Hexone 98.4%
- Water 1.6%
- Total Alpha <31 pCi/L
- Total Beta 4,910 pCi/L
- Iodine-129 5,460 pCi/L
- Tritium 7,470,000 pCi/L (estimate).

Pumpable liquids were removed from the tank in 1991 after which it contained approximately 950 L (250 gal) of residual tar-like sludge. The sludge was collected and analyzed in March 2001. The principle chemical components of the sludge were normal petroleum hydrocarbons, tributyl phosphate, iron oxide, and hexone. The principle radionuclides were americium-141, plutonium isotopes, strontium-90, and cesium-137 (CCN 100786, "276-S-141/142 Hexone Storage Tank Sludge Sampling Results").

Because the tank integrity seems to be intact, an assumption for the conceptual model focused on the potential leaks associated with the pipe connections above the tank. Although no information about leak volumes from the pipe connections is available, the conceptual model assumes that 0.05 gal/hr or 4,800 L (1,300 gal) could have leaked over the time the tank and associated piping were in service. Assuming this potentially released volume is within the soils adjacent to and beneath the tank, the entire volume can be retained by the soils within 6.7 m (22 ft) of the ground surface. Thus, wastewater and mobile contaminants most likely have not affected the groundwater.

The status of groundwater contamination in the vicinity of Tank 276-S-141 is described in PNNL-13788. The report indicates that groundwater concentrations of carbon tetrachloride, iodine-129, and uranium exceed groundwater protection standards beneath the waste site. Groundwater plumes in the 200 West Area are shown in Figures 3-3 and 3-4. However, based on process history, these plumes are not presumed to be associated with these tanks. Few groundwater wells are in the area and are located west, southeast, and east-northeast of the tank. However, because of their distance from the tank and the other surrounding waste sites they do not provide useful information about this site.

3.3.4.2 Tank 276-S-142

3.3.4.2.1 Sources of Waste Contributions

According to Drawing H-2-5304, Storage Tank 276-S-142 originally was used to store reagent-grade hexone from the 276 Building, located to the south of the tank,. Later it was used to store NPH and TBP during a one-time separations activity involving fuel from the Shippingport reactor.

3.3.4.2.2 Maximum Inventory of Waste Managed

The total estimated effluent volume received by 276-S-142 was 980,000 L (256,000 gal) of mainly reagent-grade hexone as described above. This volume is based on the information in DOE/RL-96-82, which reported that 61,000 L (16,000 gal) of hexone waste was discharged to Tank 276-S-142 annually.

3.3.4.2.3 Historical Sampling and Analysis

Limited information is available to evaluate the nature and extent of contamination beneath Tank 276-S-142. Well 299-W22-14, drilled in March 1956, is located approximately 44 m (145 ft) to the northwest and is 104 m (342 ft) deep. No information was available about soil samples or radiological surveys in the vadose zone. The groundwater elevation in Well 299-W22-14 is approximately 134.6 m (441.3 ft). Strontium was monitored from January 1956 through February 1961 with concentrations ranging from 55 pCi/L to 7,000 pCi/L. Uranium was monitored from August 1956 to December 1957 with concentrations ranging from 1.5 pCi/L to 24 pCi/L.

The probability of contamination spread from a tank leak is estimated to be zero to very low. ARH-CD-639 stated that the integrity of the tank is good. The tank's average wall thickness was 0.89 cm to 0.91 cm (0.350 to 0.357 in.); the tank was designed and constructed specifically to store clean hexone. The tank contents were sampled twice. The 1976 analytical work (ARH-CD-685) characterized the material in both tanks and included preliminary distillation tests. The 1988 work (WHC-SP-0350) obtained fully representative concentrations with the goal of determining a practical means for treating and disposing of the waste. The results are consistent with the operator knowledge of process information. The analytical results and historical knowledge are summarized from DOE/RL-92-40. Tank 276-S-142 has a capacity of 76,000 L (20,000-gal) and contained the following:

- 7600 L (2,000 gal) of water
- 53,000 L (14,000 gal) of the following mixture:
  - 60% hexone
  - 25.2% normal paraffin hydrocarbon
  - 12.6% tributyl phosphate, and 1.7% water
  - 380 L (100 gal) tarry sludge resting on the base of the tank.

The radionuclide inventory is as follows:

- Total alpha 2,070,000 pCi/L
- Total Beta 871,000 pCi/L

- Iodine-129 34,500 pCi/L
- Tritium 3,162,000 pCi/L (estimated).

After the pumpable liquids were removed from the tank in 1991, it contained approximately 950 L (250 gal) of residual tar-like sludge. The sludge was collected and analyzed in March 2001. The principle chemical components of the sludge were normal petroleum hydrocarbons, tributyl phosphate, iron oxide, and hexone. The principle radionuclides were americium-141, plutonium isotopes, strontium-90, and cesium-137 (CCN 100786).

Because the tank integrity seems to be intact, an assumption for the conceptual model focused on the potential leaks associated with the pipe connections above the tank. Although no information about leak volumes from the pipe connections is available, the conceptual model assumes that 0.05 gal/hr or 4800 L (1,300 gal) could have leaked over the time the tank and associated piping were in service. Assuming this potentially released volume is within the soils adjacent to and beneath the tank, the entire volume can be retained by the soils within 6.7 m (22 ft) of the ground surface. Thus, wastewater and mobile contaminants most likely have not affected the groundwater.

The status of groundwater contamination in the vicinity of Tank 276-S-141 is described in PNNL-13788. The report indicates that groundwater concentrations of carbon tetrachloride, iodine-129, and uranium exceed groundwater protection standards beneath the site. Based on tank operation, these plumes are not associated with the tanks. Groundwater plumes in the 200 West Area are shown in Figures 3-3 and 3-4. Groundwater wells in the area of the waste site are sparse and distant. Groundwater monitoring wells are located west, southeast, and east-northeast of the tank site. Because of their distance from the tank and the other surrounding waste sites, they do not provide useful analytical information for the tank.

3.3.4.3 Combined Hexone Tank Sampling

In March 2001, Tanks 276-S-141 and -142 were sampled and the samples were analyzed. in accordance with DOE/RL-2000-73, Rev. 0, *Sampling and Analysis Plan for the 276-S-141/142 Hexone Tank Stabilization/Characterization Project*. The sampling event included deploying a video camera into the tanks through the 0.61 m (2-ft)-diameter riser to visually survey the inside of the tank and to guide the survey efforts. Samples were collected through the 0.61 m (2-ft)-diameter riser and the 10 cm (4-in.)-diameter risers of each tank.

The video survey showed that the volume of residual material in both tanks was approximately 494 L (130 gal). No free liquid was observed in either tank. The sludge appeared to be a uniform tar-like layer extending the length of the tank across the bottom with a dried, cracked crust. The sludge depth appeared to be approximately equal to the 8.25 cm (3.25-in.) diameter of the sample tool (beaker).

The video survey showed both tanks to be structurally sound. The tanks' internal surfaces appeared rusted, but had no apparent pits or voids. No evidence was present to suggest that either tank was leaking; however, no soil samples were taken from around the tanks. More details are provided in CCN 088368.

Analytical results for the sludge samples from Tanks 276-S-141 and -142 are presented in CCN 100786. CCN 100786, Table 2, contains results for sludge collected from Tank 276-S-141; Table 3 contains results for sludge collected from Tank 276-S-142; Table 4 summarizes the TRU analytical results for both tanks.

The sludge collected from Tanks 276-S-141 and 276-S-142 can be characterized as a dark-colored, mildly acidic, phosphate tar. Sludge collected on the tanks' west ends was less viscous, with densities of 0.97 g/mL and 0.91 g/mL for Tanks 276-S-141 and -142, respectively. Sludge collected from the tanks' east ends was more granular in texture, with densities of 1.21 g/mL and 1.20 g/mL for Tanks 276-S-141 and -142, respectively. The pH of the sludge samples ranged from 3.2 to 4.8 (standard units). The principle chemical components of the sludge are normal petroleum hydrocarbons, tributyl phosphate, iron oxide, and hexone. The principle radionuclides detected in the sludge samples are americium-141, plutonium isotopes, strontium-90, and cesium-137. The sludge in Tank 246-S-142 contains approximately four times the amount of radioactive material as the sludge in Tank 246-S-141.

3.3.5 200-E-111 Tank Farm Process Piping

3.3.5.1 Sources of Waste Contributions

The amount and content of liquid waste transported in the 200-E-111 Pipeline varied based on the source plant and the time of operations. In the late 1960's, high-level waste was sluiced from the A and AX Tank Farms and routed to B Plant for cesium and strontium removal through the AR-Vault and 200-E-111 Pipeline (WIDS). Before sluicing, the A Tank Farm stored PUREX waste, including high-level waste, acid-concentrator waste, organic wash waste, carbonate wash, and self-concentrating waste (WHC-SD-WM-ER-308). Before sluicing, the AX Tank Farm contained PUREX high-level waste, organic wash waste, PUREX acid waste, PUREX sludge supernatant liquid, and B Plant fission product waste (HNF-SD-HTI-TI-001). The C Tank Farm received bismuth phosphate metal waste, PUREX sludge supernatant liquid enroute to B Plant, cycle waste and process decontamination waste from B Plant, and process waste from U Plant.

3.3.5.2 Maximum Inventory of Waste Managed

The amount of effluent transferred by the 200-E-111 pipeline is unknown. However, the estimated amount of effluent released by the 200-E-111 pipeline in February 1971 to the UPR-200-E-86 site was 66,000 L (17,000 gal) of mainly cesium-137 liquid waste (RHO-CD-673, *Handbook 200 Areas Waste Sites*).

3.3.5.3 Historical Sampling and Analysis

In 1971 and 1972, 14 shallow wells were drilled to assess the soils adjacent to and beneath the 200-E-111 and UPR-200-E-86 pipelines near the southwest corner of the C Tank Farm. The pipeline also is known as V108 and 812 at the unplanned release UPR-200-E-86 location. Contamination was reported for three of these wells according to a November 9, 1972, letter entitled, "PSS Line Leak (Line No. 812)" (METZ 1972) and RHO-CD-673. Elevated readings for cesium in the soil were reported from 0.3 m to 5.5 m (1 to 18 ft) bgs. One of the wells was

terminated at 1.8 m (6 ft) because the driller encountered radiation. The release was assumed to be associated with a joint in the pipeline.

According toRPP-7494, *Historical Vadose Zone Contamination from A, AX, and C Tank Farm Operations*, the contaminated area was 36 m^2 (387 ft^2). The depth of the contamination, 9 m (30 ft) bgs, was calculated from the volume of material spilled and soil column pore space. Extrapolating from this information, wastewater and mobile contaminants have not reached groundwater because the soil column pore volume is greater than the estimated liquid release.

The status of groundwater contamination near the 200-E-111/UPR-200-E-86 Pipeline is described in PNNL-13788. While the report indicates that groundwater concentrations of iodine-129, nitrate, tritium, technetium-99, and uranium exceed groundwater protection standards beneath the site, the concentrations are not attributed to the UPR. Groundwater plumes in the 200 East Area are shown in Figures 3-1 and 3-2. Groundwater wells are located south, east, and northeast of the site. However, because of their distance from the pipeline and other surrounding waste sites, the wells do not provide useful analytical information for the pipeline. The nearest Hanford Site Groundwater Monitoring Program well is 299-E27-13, drilled in October 1989, is located approximately 46 m (150 ft) to the south. No information was available regarding soil samples or radiological surveys in the vadose zone. Technetium was monitored from July 1991 through March 2002 with concentrations ranging from 11 pCi/L to 492 pCi/L. Cesium was monitored from February 1990 to March 2002 with concentrations ranging from 0 pCi/L to 11.9 pCi/L. Well 299-E27-12, part of the Hanford Site Groundwater Monitoring Program, was sampled for groundwater concentrations of technetium and cesium. Technetium was monitored from July 1991 through March 2002 with concentrations ranging from 1.04 pCi/L to 93.4 pCi/L. Cesium was monitored from February 1990 to March 2002 with concentrations ranging from 0:118 pCi/L to 4.75 pCi/L. The concentrations generally were lower than those found in Well 299-E27-12.

Analogous information on pipelines leaks is contained in BHI-00033, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit*, which documents a 1994 field investigation of the 200-UP-2 OU. The field investigation was conducted in conjunction with the 200-UP-2 limited field investigation (LFI) (DOE/RL-95-13, Rev. 0, *Limited Field Investigation for the 200-UP-2 Operable Unit*) and examined surface soil contamination and uptake of radionuclides and metals by vegetation at the 216-U-8 Crib. The LFI also covered the 216-U-8 Vitrified Clay Pipeline (216-U-8 VCP, officially known in WIDS as waste site 200-W-42), the 216-U-1 and -2 Cribs, and the 216-U-10 Pond. As part of the LFI at the 216-U-8 Crib, an integrity investigation also was conducted on the pipeline that discharged to the crib. The investigation was undertaken to determine the potential of this vitrified clay pipeline to leak and cause soil contamination. The investigation consisted of surveying sections of pipeline with an in-line video camera and collecting 23 surface and near-surface soil samples to depths of 2 to 4 m (7 to 12 ft). The samples were collected in the area of the pipeline between Beloit Avenue and the 216-U-8 Crib. These depths represent the approximate location of the top of the pipeline in the subsurface. Activities and results are described in greater detail in BHI-00033 and DOE/RL-95-13.

The pipeline integrity investigation yielded a number of observations. In the vitrified clay section of the pipeline, many of the joints were dislodged, allowing silty sandy material to enter

the pipeline. The degree of dislodgment varied from minor to very serious. The stainless steel section of the pipe was in excellent condition and the joints were sound.

Surface-soil samples collected during the pipeline investigation typically showed background levels of activity for analyzed-for constituents. The highest levels of contamination were detected in the subsurface near the vitrified clay pipe. However, many constituents were distributed throughout the 4 m (12-ft) depth being investigated. The data also suggested that minor lateral spreading (no more than 1 to 2 m [3 to 5 ft]) occurred. The maximum concentrations of americium-241, cesium-137, plutonium-239/240, and strontium-90 detected during the pipeline investigation were 426 pCi/g, 49,100 pCi/g, 70.6 pCi/g, and 1380 pCi/g, respectively. The highest strontium activity was detected in a vegetation sample. Soil sampling results for constituents are presented graphically in BHI-00033 and are discussed in DOE/RL-2000-60, Rev. 0, *200-PW-1 Uranium Rich Process Waste Group Operable Unit RI/FS Work Plan and Process Waste RCRA TSD Unit Sampling Plan*).

The 200-W-42 Diversion Box is included in DOE/RL-2000-60 as part of the 216-U-8 Crib representative site, but no further investigation is planned.

3.3.6 200-W-59 Diversion Box

3.3.6.1 Sources of Waste Contributions

Several operations within the Z Plant complex discharged waste to the 216-Z-12 Crib via the 200-W-59 Diversion Box (WIDS).

3.3.6.2 Maximum Inventory of Waste Managed

RHO-ST-21, *Report on Plutonium Mining Activities at 216-Z-9 Enclosed Trench*, estimated the effluent volume that was routed through the 200-W-59 Diversion Box as 281,000,000 L (74,240,000 gal) of mainly slightly basic, low-salt (sodium, calcium, magnesium, aluminum, manganese, fluoride, and nitrate) solutions containing small amounts of organic (tributyl/phosphate and dibutyl butyl phosphate) and radioactive (plutonium, americium, neptunium, and curium) elements).

3.3.6.3 Historical Sampling and Analysis

Four shallow wells, Wells 299-W-18-151, -154, -155, and -156, were drilled in 1976 between the 216-Z-12 Crib and the 200-W-59 Diversion Box to evaluate the near-surface soils. All of the wells showed plutonium contamination activity at approximately 5 m. The source of the contamination is thought to be unsealed joints of vitrified clay pipe that extend from the south side of the diversion box to the crib. RHO-ST-21 stated that engineering drawings did not specify seals to be used for the butted vitrified clay pipe connections between the diversion box and the crib. The report also indicated that the vitrified clay pipe sections were 3 m (10 ft) long. The log for Well 299-W18-156 reported contamination at 5.3 m to 5.5 m (17.5 to 18 ft) bgs. This well is approximately 3.7 m (12 ft) to the west of the 200-W-59 Diversion Box and is the closest of the four wells drilled. Other activity measurements in wells adjacent to and beneath the 216-Z-12 Crib reported that the bulk of the plutonium was sorbed onto sediments within 3 m

(10 ft) of the crib bottom and decreased rapidly with depth. Plutonium activity at 12 m (39 ft) beneath the crib was reported at less than 1 pCi/g. However, low-level plutonium and americium activity was detected from 30 m to 36 m (98 to 118 ft) beneath the crib (36 m (118 ft) was the maximum depth sampled).

Contamination from diversion box leaks is expected to be zero to very low because the diversion box drawings indicate that watertight seals were placed between pipe conduits and the concrete diversion box walls. According to Drawings H-2-20986, *Crib + Test Wells for 2345 Bldg Wastes,* and H-2-44511 sheet 87, *Area Map 200 West Z Plant Facilities*, the pipe entering the diversion box from the east and the pipe exiting from the west are 15 cm (6-in.) schedule 10 stainless steel. The floor drain and associated French drain system are shown in 200-W-59 Diversion Box drawings H-2-20987, *Crib 216-Z-12 Plan Sections + Details* and H-2-20988, *Crib 216-Z-12 Plan Sections + Details.* Drawing H-2-20988 shows a 1.5 m (5-ft) section of 4-in. vitrified clay pipe extending from the diversion box to the northwest. The 10 cm (4-in.) pipe connects into a 12-in unsealed vitrified clay pipe that extends an additional 6 m (20 ft) to the northwest. This section completes the French drain system. The conceptual model assumes that any leaks associated with the pipe connections inside the diversion box would be transferred through the French drain to the soil column. Although no actual information was available, the conceptual model assumes that 0.4 L/hr (0.1 gal/hr) or 40,000 L (12,000 gal) of liquid passed through the French drain while the diversion box and associated piping were in service. Assuming this potentially released volume is held in the soils adjacent to and beneath the French drain system, the entire volume can being retained by the soils within 12 m (40 ft) of ground surface. Thus, wastewater and mobile contaminants likely have not impacted groundwater.

The status of groundwater contamination near the 200-W-59 Diversion Box is described in PNNL-13788. While the report indicates that groundwater concentrations of carbon tetrachloride and nitrate exceed groundwater protection standards beneath the site, the contamination is not attributed to this site. Groundwater plumes in the 200 West Area are shown in Figures 3-3 and 3-4. Groundwater wells are located west, east, and northeast of the site, but they are few and distant. Because of the distance from the diversion box to the surrounding waste sites, the wells do not provide useful information for the diversion box. The nearest Hanford Site Groundwater Monitoring Program well, Well 299-W18-1, drilled in January 1959, is located approximately 64 m (210 ft) to the east. No information was available regarding soil samples or radiological surveys in the vadose zone. Carbon tetrachloride was monitored from April 1993 through January 2002 with concentrations ranging from 5 μg/L to 4100 μg/L. Well 299-W15-38, part of the Hanford Site Groundwater Monitoring Program, was reviewed for groundwater concentrations of carbon tetrachloride. Carbon tetrachloride was monitored from July 1996 through January 2002 with concentrations ranging from 510 μg/L to 4000 μg/L. The records show that the concentrations were generally equivalent to those found in samples taken from Well 299-W18-1.

3.3.7 2607-W3 Septic Tank

3.3.7.1 Sources of Waste Contributions

The 2607-W3 Septic Tank received sanitary effluent from the 221-T, 222-T, 224-T, and 271-T Buildings. The tank operated from 1944 until it was filled with sand and abandoned in place in August 1996. Before being abandoned, the 2607-W3 septic system received 14,187 L (3,745 gal) of waste daily. A contaminated process sewer line runs parallel to the sanitary sewer line in this area.

3.3.7.2 Maximum Inventory of Waste Managed

The total effluent volume discharged to this site is estimated to be 270,000 m^3. This estimate is calculated from the 14,200 L/day (3,750 gal/day) rate reported in WIDS, which, in turn, is an average of the current and planned rates reported in WHC-SD-LL-ES-020.

3.3.7.3 Historical Sampling and Analysis

Limited information is available to evaluate the nature and extent of contamination beneath the 2607-W3 Septic Tank. Well 299-W11-7, drilled in September 1951, is located approximately 21 m (64 ft) to the southwest. No information was available regarding soil samples or radiological surveys in the vadose zone. Cesium was monitored from 1998 to 2001 with concentrations ranging from 0.182 pCi/L to 1.36 pCi/L. Strontium was not monitored and carbon tetrachloride was monitored from 1988 to 2001, with concentrations ranging from 230 μg/L to 2,500 μg/L.

The estimated effluent volume discharged to the soil column at this site is estimated to be 250,000,000 L (66,000,000 gal), which is greater than the estimate of the soil pore volume. (The soil pore volume was estimated following the approach in DOE/RL-96-81.)

Although little information is available regarding the nature of contamination within the vadose zone at the subject site, a similar 200 West Area septic tank and drain field system has been studied. In September 1993 as part of the 200-UP-2 RCRA facility investigation and corrective measures study documented in DOE/RL-91-19, Rev. 0, *200-UP-2 RCRA Facility Investigation/Corrective Measures Study*, Borehole 299-19-97 was drilled to determine the possible northern extent of contamination from the 216-U-1 and -2 Cribs. The borehole was located approximately 20 m southwest of the drain field corner. The presence of perched water was investigated from the active 2607-W-5 Septic Tank and Drain Field. Perched water was not encountered in the borehole; however, a damp-to-moist interval was encountered at a depth of 55 ft in a silt lens. Contamination from cesium-137 and strontium-90 was detected at 4 ft bgs at concentrations of 22 pCi/g and 3.3 pCi/g, respectively. The underground radioactive material is the result of an overflow to the ground from Tank 241-U-361 and the 216-U-1 and -2 Crib vents (UPR-200-W-19). The overflow occurred in the spring of 1953 and decontamination was started that same year. The area was backfilled, delineated by a wooden fence, and posted with "Radiation Zone" signs. In 1992, contaminated soil in the vicinity of the 216-U-1 and -2 Cribs was scraped and consolidated near Tank 241-U-361. The surface surrounding the tank was surface-stabilized with grout. The area was down-posted from a surface contamination area (SCA) to an underground radiation material (URM) area (WIDS). The cesium-137 and

strontium-90 analytical results reported in Borehole 299-19-97 at 55 ft bgs are consistent with reports at 167 ft bgs beneath the 216-U-1 and -2 Cribs. The borehole sampling summary is in BHI 00034, Rev. 1, *Borehole Summary Report for the 200-UP-2 Operable Unit, 200 West Area*, and the radionuclide and chemical sample results are available from the HEIS database. The 2607-W-5 Septic Tank Drain Field that serves the 221-U Canyon Building and the 271-U Office Building are still active. The septic tank and associated diversion box are inside a URM area, but the tile field is outside the URM boundary.

The status of groundwater contamination near the 2607-W3 Septic Tank is described in PNNL-13404, *Hanford Site Groundwater Monitoring for Fiscal Year 2000*. The report indicates that the carbon tetrachloride concentration in the groundwater exceeds the groundwater protection standards and guidelines near the crib. Based on process knowledge, this contaminant is not associated with waste disposal practices at this site. Major groundwater plumes in the vicinity of the 200 West Area and the 2607-W3 Septic Tank are shown in Figures 3-3 and 3-4.

3.3.8 Conceptual Contaminant Distribution Models

Preliminary conceptual contaminant distribution models were developed for the 200-IS-1 and 200-ST-1 OUs in DOE/RL-96-81. These preliminary models were updated as part of the DQO with conceptual contaminant distribution models of representative sites; these models are presented in this section. The revised conceptual contaminant distribution models are based on data collected at the RCRA TSD units and representative sites, and knowledge gained by evaluating other 200 Area waste sites. Because limited data were available to evaluate the nature and extent of contamination beneath the 241-CX Tank System, HSTF, 200-E-111 Tank Farm Process Piping, 200-W-59 Diversion Box, and 2607-W3 Septic Tank, conceptual contaminant distribution models were developed based on a general understanding of contaminant transport and fate.

Information pertaining to contaminant sources, release mechanisms, and transport media have been incorporated into this discussion of the conceptual contaminant distribution models. This information will support an evaluation of the potential risk to human health and the environment. The conceptual exposure pathway model that discusses exposure routes and receptors is included in Section 3.5.

The majority of radionuclide and nonradiological inventories disposed of from operations associated with the 200-IS-1 and 200-ST-1 OUs waste sites were not documented in historical records; however, rough-order-of-magnitude estimates for some of the waste sites are documented in DOE/RL-98-28 and WIDS based on waste stream analyses for the waste sites.

The following general conclusions can be drawn regarding the conceptual contaminant distribution models for the RCRA TSD units and representative sites:

- The major radionuclide COCs are cesium-137; plutonium-238, plutonium-239, and plutonium-240; strontium-90; and uranium-234, uranium-235, and uranium-238.
- Few of the OU waste sites received enough effluent to affect groundwater.

- Contamination migrated vertically beneath the waste sites after release. Lateral spreading of liquids and contaminants may have occurred at the bottom of the waste site at the sand-dominated sequence of the Hanford formation, at the Cold Creek unit, and/or at the upper Ringold Formation, if present.

- Contaminants such as cesium-137 and the plutonium isotopes normally adsorb strongly onto shallow-zone Hanford Site sediments, and therefore have high distribution coefficients (K_d). These less mobile contaminants should be detected near points of release in the vadose zone. Contaminants with low K_d values (e.g., nitrate and tritium) are not readily adsorbed on soil particles and migrate to greater depth within the vadose zone. For example, cesium-137 ($K_d > 2{,}000$ mL/g) is likely to concentrate near the point of release; strontium-90 ($K_d = 0.4$ to 50 mL/g) and uranium ($K_d = 1$ mL/g) would be expected at greater depths. Tritium with a K_d value equal to 0 will migrate vertically with the wetting moisture front (DOE/RL-2000-38, Rev. 0, *200-TW-1 Scavenged Waste Group Operable Unit and 200-TW-2 Tank Waste Group Operable Unit RI/FS Work Plan*).

- Waste sites in the 200-IS-1 OUs no longer receive effluent. Most sites in this OU have been stabilized and covered with clean soil. With the cessation of artificial recharge, the downward flux of moisture through the vadose zone has decreased. Residual moisture should continue to decrease in the vadose zone over time and equilibrate with the natural recharge rate, thus reducing the potential for future impacts to groundwater. Some septic tank and drain field sites, such as 2607-W-5, continue to receive effluent at the present time.

The 241-CX Tank System, HSTF, 200-E-111 Tank Farm Process Piping, 200-W-59 Diversion Box, and 2607-W-3 Septic Tank conceptual contaminant distribution models are presented in the following figures:

- Figure 3-5, 241-CX-70 Storage Tank
- Figure 3-6, 241-CX-71 Storage Tank
- Figure 3-7, 241-CX-72 Storage Tank
- Figure 3-8, 276-S-141 and 276-S-142 Storage Tanks
- Figure 3-9; 200-E-111 Tank Farm Process Piping
- Figure 3-10, 200-W-59 Diversion Box
- Figure 3-11, 2607-W3 Septic Tank.

Potential receptors (human and ecological) may be exposed to the affected media through several exposure pathways, including inhalation, ingestion, and direct exposure to external gamma radiation. Potential human receptors include current and future Site workers and visitors (occasional users). Potential ecological receptors include terrestrial plants and animals, which are discussed in Section 3.3.9. The conceptual exposure model for the 200-IS-1 and 200-ST-1 OUs is shown in Figure 3-12.

Future impacts to humans largely depend on prominent exposure pathways indicated by future land uses. A restricted-land-use scenario has been identified for the core zone. All the sites in the 200-IS-1 and 200-ST-1 OUs are located in core zone.

3.3.9 Environmental Information

The section introduces the *Central Plateau Ecological Evaluation Report* (DOE/RL-2001-54), which serves as the basis for ecological evaluation activities in the Central Plateau. The Central Plateau includes the 200 East, 200 West, and 200 North industrial areas and portions of the largely undisturbed 600 Area. This section also summarizes existing OU-specific environmental information.

3.3.9.1 *Central Plateau Ecological Evaluation Report*

The *Central Plateau Ecological Evaluation Report* (DOE/RL-2001-54) has been prepared to support ecological evaluations under the RI/FS process for Central Plateau waste sites. DOE/RL-2001-54 completes a screening level ecological risk assessment for the Central Plateau in accordance with the eight-step EPA ecological risk assessment process presented in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA/540/R-97/006). The first two steps of the process, the screening level assessment, are presented in the document (see Figure 1-1 in DOE/RL-2001-54).

The document contains a compilation and evaluation of ecological sampling data that have been collected over many years from undisturbed and disturbed habitats in the Central Plateau. The ecological evaluation document helps answer questions about the ecological resources in the Central Plateau that are important to preserve and protect. The document also identifies ecological data needs that can be addressed in future ecological sampling activities on the Central Plateau.

The document includes descriptions of the habitats in the Central Plateau, including sensitive habitats, and the plants and animals that inhabit them. The document identifies potential species of concern, including threatened and endangered species and new-to-science species. A detailed survey of the Central Plateau was conducted in 2000 and 2001; the results are incorporated into the ecological evaluation document. The information from the survey provides a detailed description of the ecological setting of the Central Plateau and augments the ecological information presented in this work plan.

3.3.9.2 200-IS-1 and 200-ST-1 Operable Unit-Specific Environmental Information

A summary of ecological resources for the 200 Areas is provided in Appendix F, Sections 8.0 and 9.0 of the Implementation Plan (DOE/RL-98-28). Available information pertaining to sampling of vegetation and biota within the 200-IS-1 and 200-ST-1 OU waste sites is presented in this section to summarize existing ecological data and as input to Section 3.5 on potential impacts to human health and the environment. Several other sources of information, while not pertinent to a specific representative site, provide useful data in the vicinity of the sites.

In recent years, the frequency and breadth of biological (wildlife) sampling has significantly diminished. Several radionuclides that were monitored in the past have not been detected in recent samples because they no longer were present in the environment in sufficient

concentrations to accumulate in wildlife or did not accumulate in the wildlife tissues of interest (PNNL-13230). In recent years, sampling in the 200 Areas has been limited to terrestrial biota such as elk and rabbits (PNNL-13230). Analytes sampled under the radionuclide monitoring program include gamma-emitting radionuclides, strontium isotopes, uranium isotopes, and plutonium isotopes. Media sampled include soil, vegetation, nests (bird, wasp, ant), mammal feces (rabbit, coyote), mammals (mice, bats), and insects (fruit flies). Results of investigative sampling are reported in the annual Hanford Site Environmental Monitoring Report (e.g., PNNL-13230, PNNL-13316). A large volume of radionuclide data exists as a result of the annual monitoring program; however, nonradiological constituents have not been analyzed under this program.

Wildlife species most commonly associated with uptake of radioactive contamination in the 200 Areas historically have been house mice and deer mice, but other animals such as birds (including waterfowl), coyotes, cottontail rabbits, mule deer, and elk have been sampled (WHC-MR-0418, PNNL-12088, *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 1998*). In 1999, the Pacific Northwest National Laboratory sampled elk, geese, and rabbits for gamma emitters and strontium-90. Samples of elk muscle, bone, liver, heart, kidney, intestine, and feces were collected from animals struck on Hanford Site roadways and on the 200 Area Plateau. Cesium-137 was undetected in all elk samples. PNL-10174 reported a consistent decline in cesium-137 concentration in elk since 1983. Geese were sampled from the Hanford Reach near the Vernita Bridge. Only one of the eight geese sampled showed a cesium-137 concentration above analytical detection. Eight rabbit samples, consisting of jackrabbit and cottontail muscle and bone, were taken from the 200 Areas in 1999. One of the eight rabbit muscle samples showed a cesium-137 concentration above analytical detection. Strontium-90 was detected in bones of all eight samples; however, according to PNNL-13230, the results from animals sampled near the 200 Areas did not suggest significant exposure attributable to Hanford Site operations.

Plant species potentially could be exposed to contaminated soils present in the 200 Area vadose zone because they live in direct contact with the soil and can take up contaminants through physical and biological processes. The extent of exposure is a function of the plant species, root depth, physical nature of the contamination, and the contaminant concentrations and distributions in the soil. Plants themselves generally are tolerant of ionizing radiation (IAEA-TECDOC-332, *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*), but present a potential contaminant pathway to wildlife through the consumption of contaminated seeds, leaves, roots, or stalks. Radionuclide uptake by plants within the 200 Areas was demonstrated by Johnson et al. and reported in WHC-MR-0418.

Eighty-five environmental monitoring records for wildlife and vegetation in the 200 East and 200 West Areas collected since 1965 were reviewed and summarized in WHC-MR-0418. About 4,500 individual cases of monitoring for radionuclide uptake or transport in biota in the 200 Area environs were included in the documents reviewed for WHC-MR-0418. Approximately 1,900 (42 percent) of this biota had radionuclide concentrations in excess of 10 pCi/g. These radionuclide transport or uptake cases were distributed among 45 species of animals (mostly small mammals and feces) and 30 species of vegetation.

Wildlife species historically associated with uptake of radioactive contamination in the 200 Areas have been house mice and deer mice. The vegetative species most commonly associated with the contamination was Russian thistle. The largest numbers and levels of radionuclide uptake or transport occurred at several sites unrelated to the 200-IS-1 and 200-ST-1 OUs, including the 216-Z Ditches, 216-B-3 Ditches, 216-BC Cribs, B Tank Farm, and BX and BY Tank Farms. Much of the sampling data were collected before stabilization activities began at the individual waste sites. Noticeable improvements in reducing uptake and transport of radionuclide contaminants by biota were observed in areas where interim stabilization activities have taken place (WHC-MR-0418).

Only one location near the 200-IS-1 and 200-ST-1 OU waste sites was field surveyed or analytically sampled between 1965 and 1993 (WHC-MR-0418). Samples of vegetation (cheatgrass and terrestrial composite samples) and rabbit and coyote feces were collected from 1978 to 1988 and analyzed for cesium-137, strontium-90, and plutonium-239. These samples were collected outside of the 221-U Facility, which is located near the 216-U-7 and UPR-200-W-138 sites within the 200-IS-1 OUs. All but two samples contained radionuclide concentrations of less than 1.0 pCi/g. The two exceptions were terrestrial vegetation and rabbit feces samples collected in 1982 that contained 1.2 pCi/g and 8.0 pCi/g of cesium-137, respectively (PNL-4657, *Environmental Surveillance at Hanford for CY-1982*).

In a 1999 sampling effort described in the Hanford Site Environmental Report (PNNL-13230), 55 soil samples and 48 vegetation samples were collected in the 200 and 600 Areas. Vegetation and soil samples were collected from one 200-IS-1 waste site, the 200-W-59 Diversion Box, under the Hanford Site Near-Facility Monitoring Program (e.g., PNNL-13316). Soil and vegetation samples were collected from station D021/V021 located inside the 200-W-59 Diversion Box boundary. Soil and vegetation concentrations of radionuclides for the D021/V021 monitoring site are listed in Table 3-1. All soil and vegetation samples contained radionuclide concentrations of less than 1.0 pCi/g.

Biological transport of contamination by ants also is a concern on the Hanford Site. Harvester ants, which are present on the disturbed soils associated with waste sites, have shown extreme resistance to radioactive sources (Gano 1980). In a contamination area, ants can bring radioactive materials to the surface, where they could be susceptible to other means of transport by wind, plant uptake, birds, or mammals. The biological transport of contamination by harvester ants was documented during an annual radiological survey at the UPR-200-E-64 site in 1985. The source of contamination was assumed to be a small-diameter pipe visible on the west side of the 216-B-64 Retention Basin, near Tank 270-E-1 in the 200-SC-1 OU. In 1985, the pipe had a dose rate of 30 mrad/hr. Surrounding contamination was transported to the surface by harvester ants, and further spread by wind. The size of the area of contamination in 1995 was approximately 8100 m^2 (2 acres), and currently is posted as a soil contamination area. Additional contaminated soil and anthills were identified both north and south of 7th Street and around the 241-ER-151 Diversion Box (part of the 200-IS-1 OU) in September 1998.

3.4 RCRA TREATMENT, STORAGE, AND DISPOSAL INTERIM STATUS GROUNDWATER MONITORING

Neither the 241-CX Tank System nor the HSTF is involved in interim-status groundwater monitoring.

3.5 POTENTIAL IMPACTS TO HUMAN HEALTH AND THE ENVIRONMENT

This section presents the conceptual exposure model developed to identify potential impacts to human health and the environment from waste sites in the 200-IS-1 and 200-ST-1 OUs. Information pertaining to contaminant sources, release mechanisms, transport media, exposure routes, and receptors is discussed to develop a conceptual understanding of potential risks and exposure pathways. This information will be used to support an evaluation of potential human health and environmental risk in the RI Report and FS to be prepared for the 200-IS-1 and 200-ST-1 OUs following the RI.

3.5.1 Contaminant Sources and Release Mechanisms

As discussed in Chapter 2.0, the primary sources of contamination at waste sites in the 200-IS-1 and 200-ST-1 OUs were effluents from tanks, lines, pits, diversion boxes, and septic tanks with their associated drain fields. The waste generally was released to the vadose zone through unplanned releases from tanks, lines, etc., or through direct discharge, as with septic tank drain fields where the wastewater infiltrated into the soil. Releases to the environment from the primary contaminant sources have produced contaminated surface soils, subsurface soils, and groundwater beneath waste sites. These are secondary sources that can spread contaminants through the environment by infiltration, resuspension of contaminated soil, volatilization, biotic uptake, leaching, and external radiation. During the periods when waste sites received effluent, the dominant mechanism of contaminant transport was infiltration. After effluent disposal ceased, the liquids continued to move through the soil column for an undetermined period. Currently, the dominant mechanism of contaminant transport through the vadose zone is assumed to be from residual effluent moisture and natural recharge.

3.5.2 Potential Receptors

Potential receptors (i.e., human and ecological) can be exposed to the affected media through several exposure pathways, including the following:

- Ingestion of contaminated soils (including dust inhalation), sediments, or biota
- Inhalation of contaminant dusts, vapors, or gases
- Dermal contact with contaminated soils or sediments
- Direct exposure to external gamma radiation in Site soils and sediments.

Potential human receptors include current and future Site workers and Site visitors (i.e., occasional users). Under a restricted future land-use scenario, site worker and visitor exposure pathways primarily would involve incidental soil and sediment ingestion; inhalation of

contaminants, dermal contact with contaminated soils and sediments, and external gamma radiation. Potential ecological receptors include terrestrial plants and animals inhabiting the sites. Site biota exposures would primarily result from incidental soil and sediment ingestion, plant uptake, ingestion of contaminated plant or animals (e.g., grazing or predation), dermal contact with contaminated soils and sediments, and external gamma radiation.

3.5.3 Potential Impacts

Potential contaminant exposures and health impacts to humans depend largely on allowable land uses. The land use inside the core zone selected by DOE is industrial (exclusive). Outside the core zone, the selected land use is conservation (mining). The DOE determined these land use designations through the *National Environmental Policy Act 1969* process; the designations are identified in the DOE/EIS-0222-F and documented in 64 FR 61615. The 200-IS-1 and 200-ST-1 sites are all located within the core zone. Therefore, based on the land-use decision for the 200 Areas, potential impacts from the waste site contaminants within the core zone would be to current and future Site workers and to terrestrial biota inhabiting the sites.

Ecological receptors have been identified and potential impacts to those receptors have been evaluated at waste sites within the 200 Areas (PNNL-13404, Appendix 2, *Hanford Site Near-Facility Environmental Monitoring Data report for Calendar Year 1999*; PNL-2253, *Ecology of the 200 Area Plateau Waste Management Environs: A Status Report*; WHC-SD-EN-TI-216, *Vegetation Communities Associated with the 100 Area and the 200 Area Facilities on the Hanford Site*). The vegetation cover on the 200 Area Plateau is predominantly a rabbitbrush-cheatgrass and sagebrush-cheatgrass association with incidence of herbaceous and annual species. Many areas are disturbed and nonvegetated or sparsely vegetated with annuals and weedy species such as Russian thistle. Potential ecological contaminant exposures at the waste sites are minimized because of past site stabilization activities.

DOE/RL-2001-54 presents a more recent evaluation of habitats on the Central Plateau and provides a screening-level risk assessment, including an evaluation of threatened and endangered and new-to-science species that may be associated with the Central Plateau.

Existing characterization data and proposed sampling at representative waste sites are expected to be sufficient to address potential impacts to human health and the environment.

3.6 DEVELOPMENT OF CONTAMINANTS OF CONCERN

The development of the list of contaminants of potential concern (COPC) and the final list of COCs for these OUs was a principal objective of the DQO process. The list of COPCs for the 200-IS-1 and 200-ST-1 OUs originated with the set of all contaminants potentially discharged to these waste groups. The final COC list was determined by evaluating the COPCs against a set of exclusion criteria and past sampling and characterization activities. Chemical characteristics such as toxicity, persistence, and chemical behavior in the environment were considered. The criteria for exclusion of constituents are as follows:

- Short-lived radionuclides with half-lives of less than 3 years
- Radionuclides that constitute less than 1% of the fission product (evaluated against Sr-90/Cs-137 activities and represent the major contributors to total fission product inventory). This is based on the reactor physics principles and relationships model (ORIGEN2) of Hanford Site nuclear reactor production profiles (ORNL-5621, *ORIGENZ-A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code*)
- Naturally occurring isotopes that were not increased above background levels as a result of Hanford Site operations
- Constituents with atomic mass numbers greater than 242 that represent less than 1 percent of the actinide activities-based on the reactor physics principles and relationships (ORNL-5621) modeling of Hanford Site nuclear reactor production profiles
- Progeny radionuclides whose in-growth activity remains insignificant after 50 years and/or for which parent-progeny relationships exist that permit progeny estimation-based on the reactor physics principles and relationships ORIGEN2 modeling of Hanford Site nuclear reactor production profiles (ORNL-5621)
- Constituents that would be neutralized and/or decomposed by facility processes
- Chemicals in a gaseous state that cannot accumulate in soil media
- Based on evaluation of the source documents listed in the DQO summary report, chemicals used in minute quantities relative to the bulk-production chemicals consumed in the normal processes; these chemicals have no suspected introduction to waste streams except in incidental quantities
- Chemicals that are not persistent in the environment because of biological degradation or other natural rapid degradation pathways
- Materials not found on "regulated lists" including Publication No. 94-145, *Cleanup Levels and Risk Calculations Under the Model Toxics Control Act Cleanup Regulation Version 3.1* and Title 40 *Code of Federal Regulations* (CFR) Part 268, "Land Disposal Restrictions."

The exclusion process resulted in final lists of COCs for each of the RCRA TSD units and representative sites in these waste groups (Table 3-2).

Figure 3-1. Major Radiological Groundwater Plumes in the Vicinity of the 200 East Area.

(Modified from PNNL-13788, March 2002.)

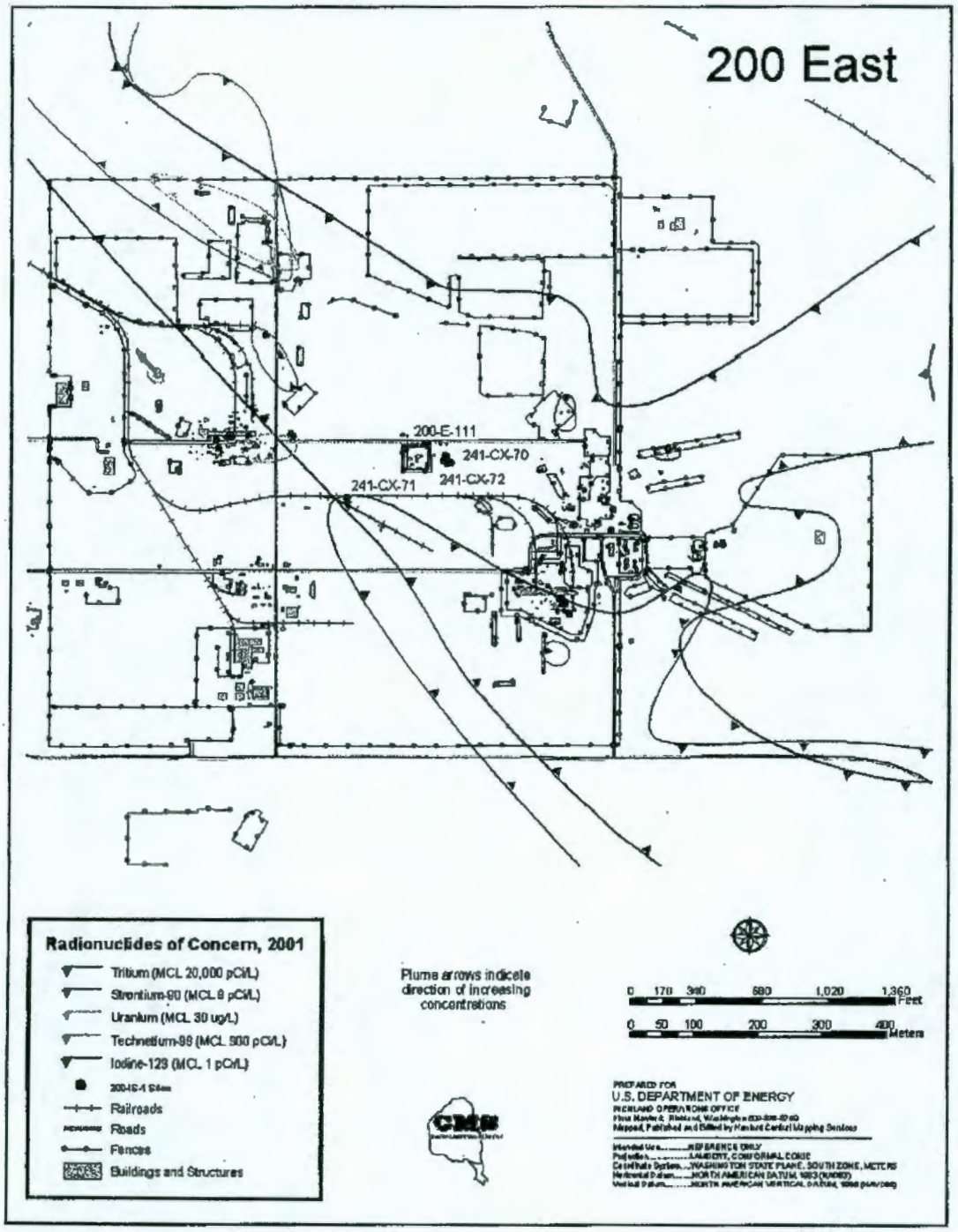


Figure 3-2. Major Nonradiological Groundwater Plumes in the Vicinity of the 200 East Area.

(Modified from PNNL-13788, March 2002.)

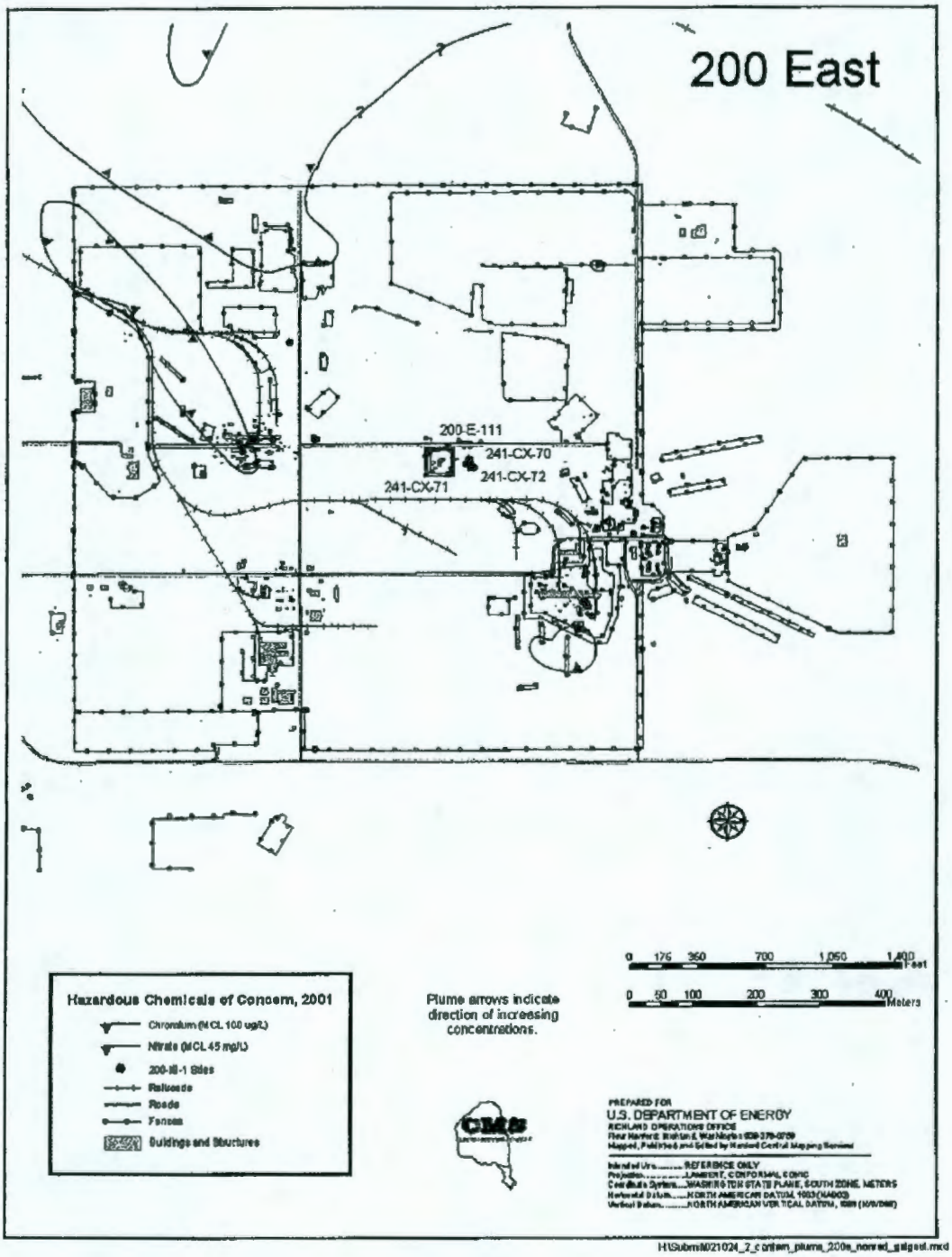


Figure 3-3. Major Radiological Groundwater Plumes in the Vicinity of the 200 West Area.

(Modified from PNNL-13788, March 2002.)

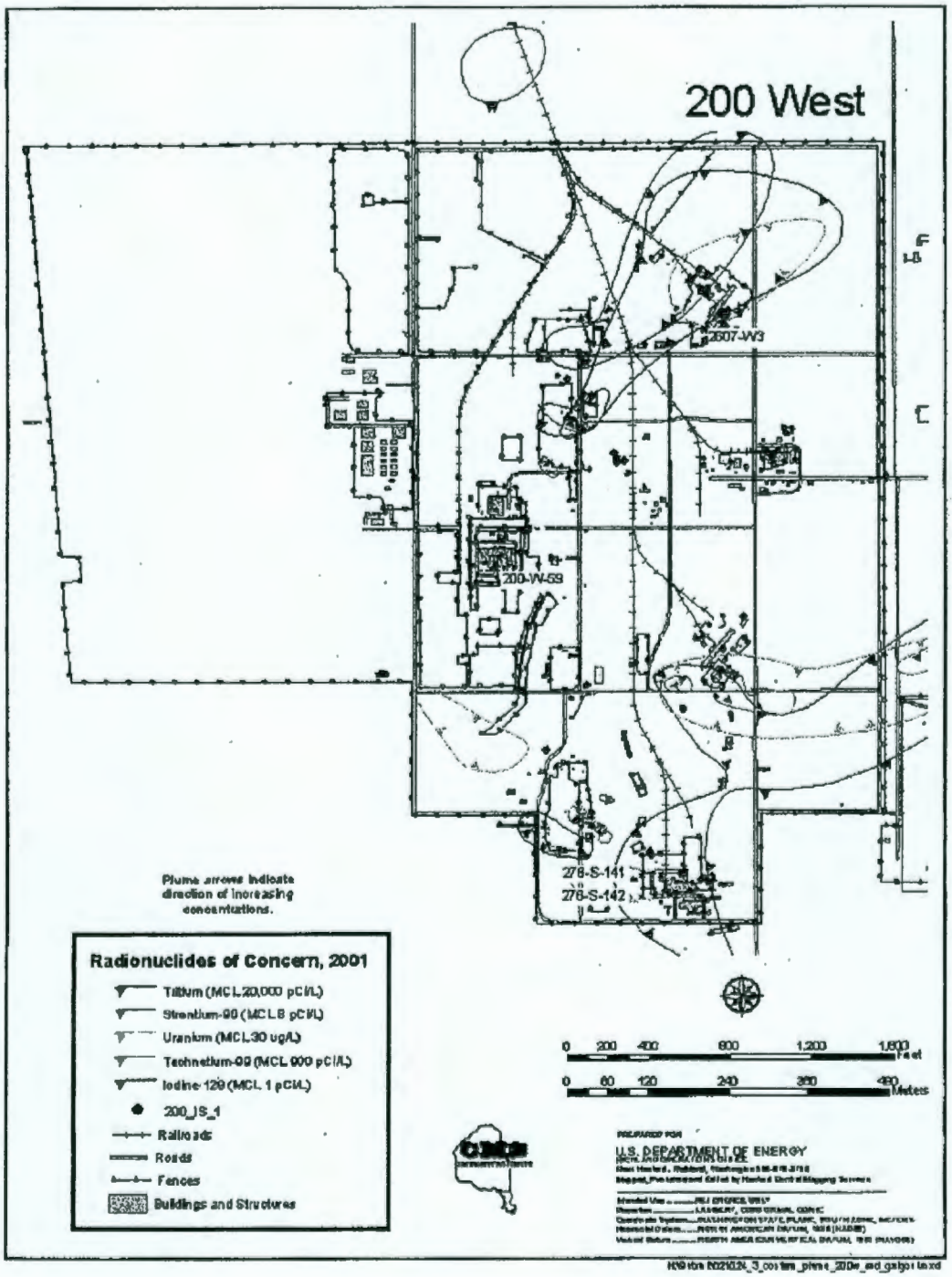


Figure 3-4. Major Nonradiological Groundwater Plumes in the Vicinity of the 200 West Area.

(Modified from PNNL-13788, March 2002.)

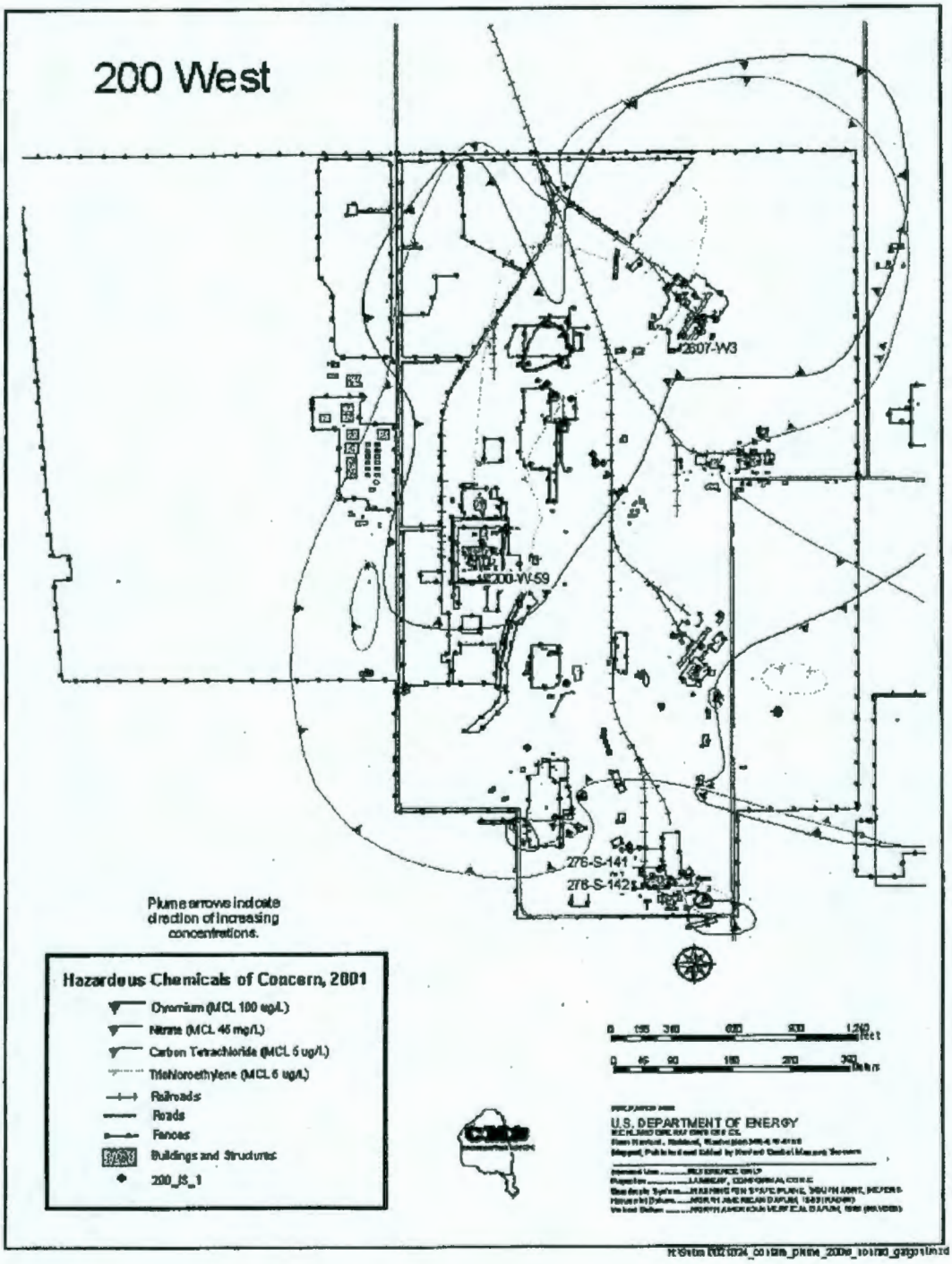
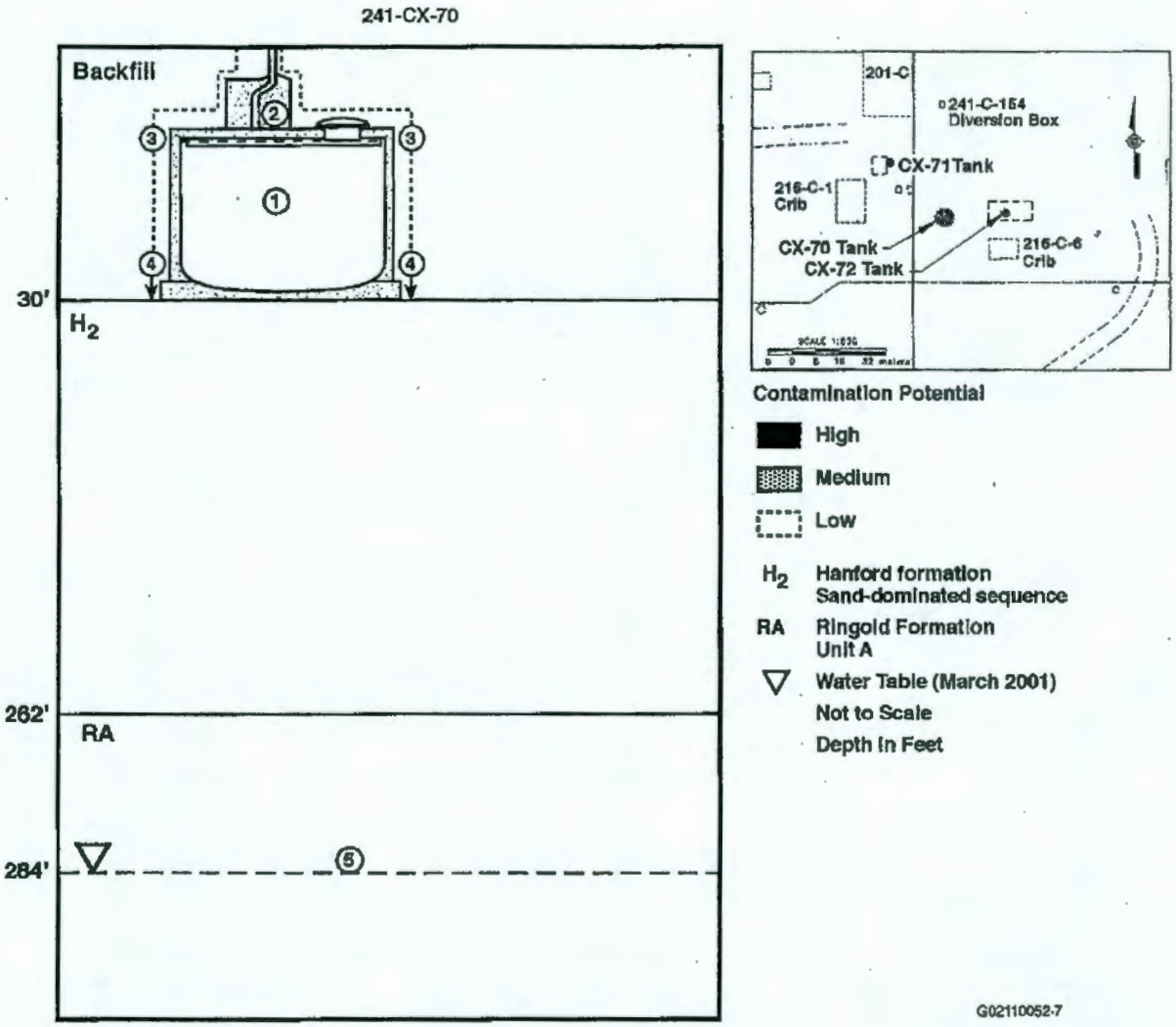
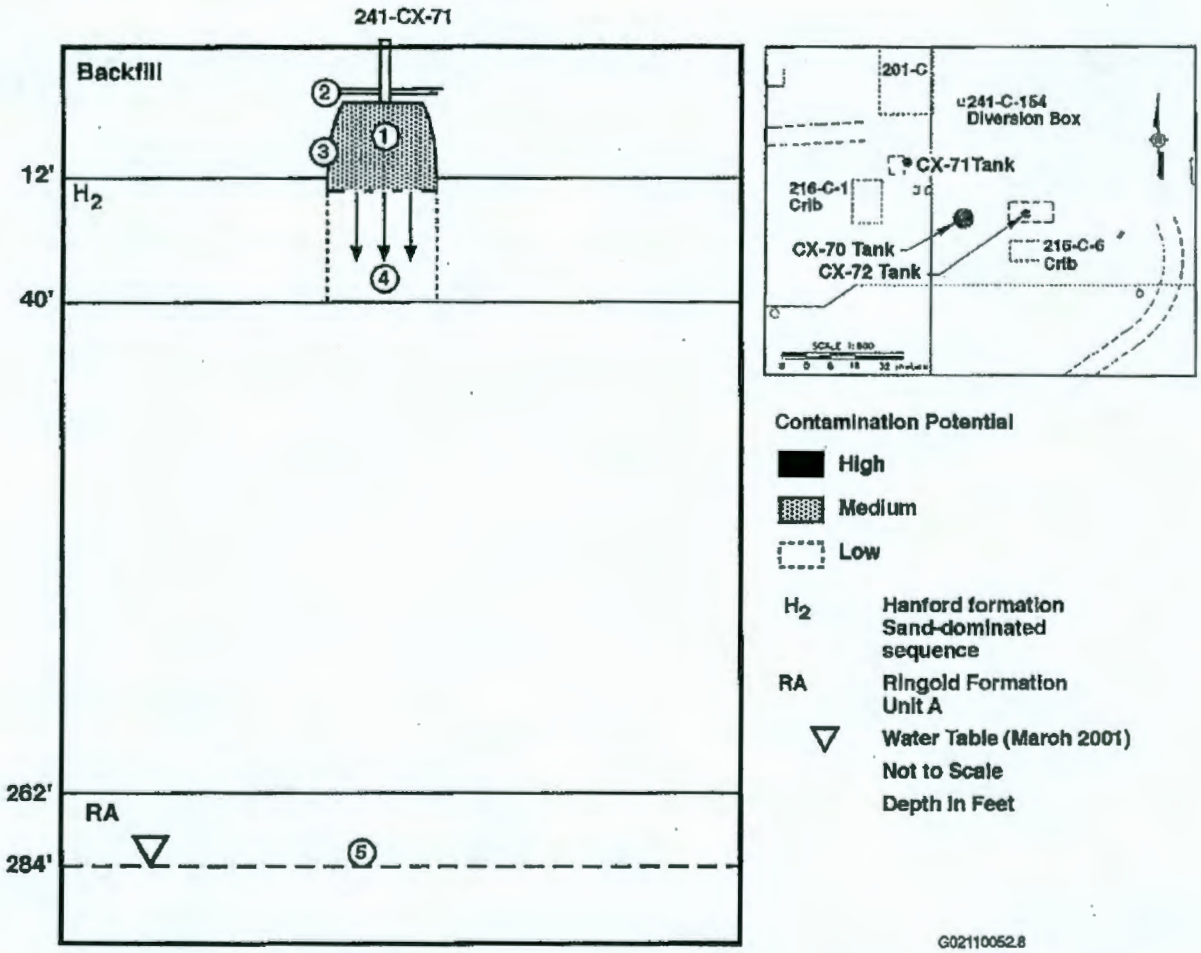


Figure 3-5. 241-CX-70 Storage Tank Conceptual Contaminant Distribution Model.



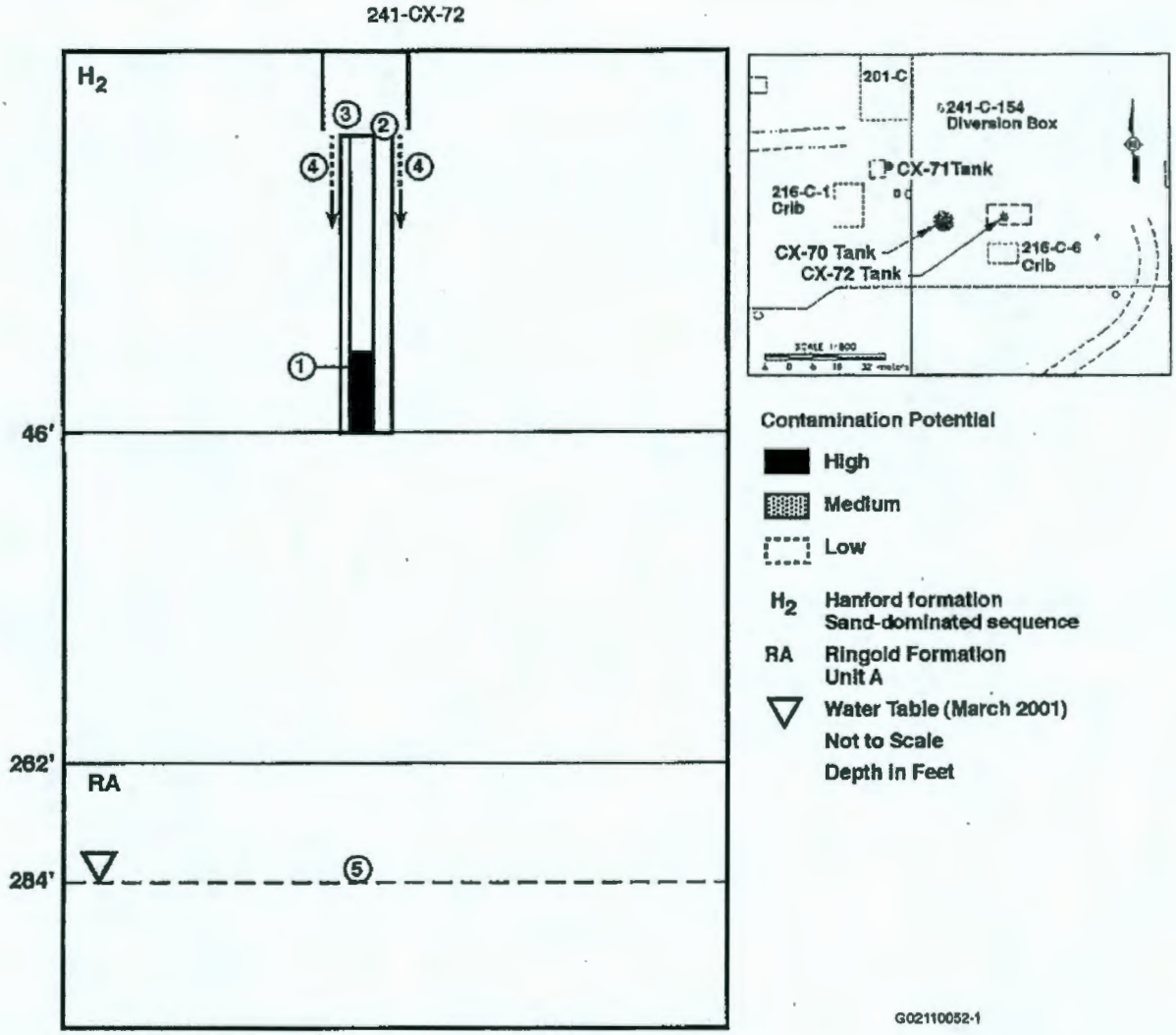
1. High-level process waste containing plutonium-239/240, cesium-137, strontium-90, sodium nitrate, sodium nitrite, sodium fluoride, aluminum sulfate, and sodium chromate were received by the tank from late 1952 to late 1953. The tank capacity was 113,550 liters (30,000 gallons). The tank received a total volume of 94,951 liters (25,086 gallons) of liquid waste. In 1979, 1987, and 1992 liquid waste and sludge were sluiced/pumped from the tank. In 1992, the tank was dried and considered empty. Very little data are available to evaluate contaminant distribution at this site.
2. Potential leaks from this tank seem unlikely because of liquid level measurements, volume of liquid waste received, and construction of tank. Therefore, if a leak had occurred, it would be more likely from process piping connecting to the tank, rather than the tank. To fulfill the conceptual contaminant distribution model, a leak of 0.1% or 95 liters (25 gallons) is assumed to have been released from the process piping connecting to the tank. Based on this assumption, little or no lateral spreading is thought to have occurred because of the nature of soils under the site and the minimal amount of liquid released. Assuming that the spilled liquid was released within the soil adjacent to the tank, the entire assumed released amount would be retained by the soil within a 9 m (30-ft) radius of the tank.
3. Immobile contaminants, such as plutonium-239/240, normally sorb near the point of release. Contaminant concentrations decrease with depth.
4. Mobile contaminants, like nitrate, migrate with the moisture front along and beneath the tank.
5. Waste water and mobile contaminants likely have not impacted and are not likely to impact groundwater because the potential leak volume is significantly less than the soil column pore volume. While groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the tank, this contamination is not attributed to this site.

Figure 3-6. 241-CX-71 Storage Tank Conceptual Contaminant Distribution Model.



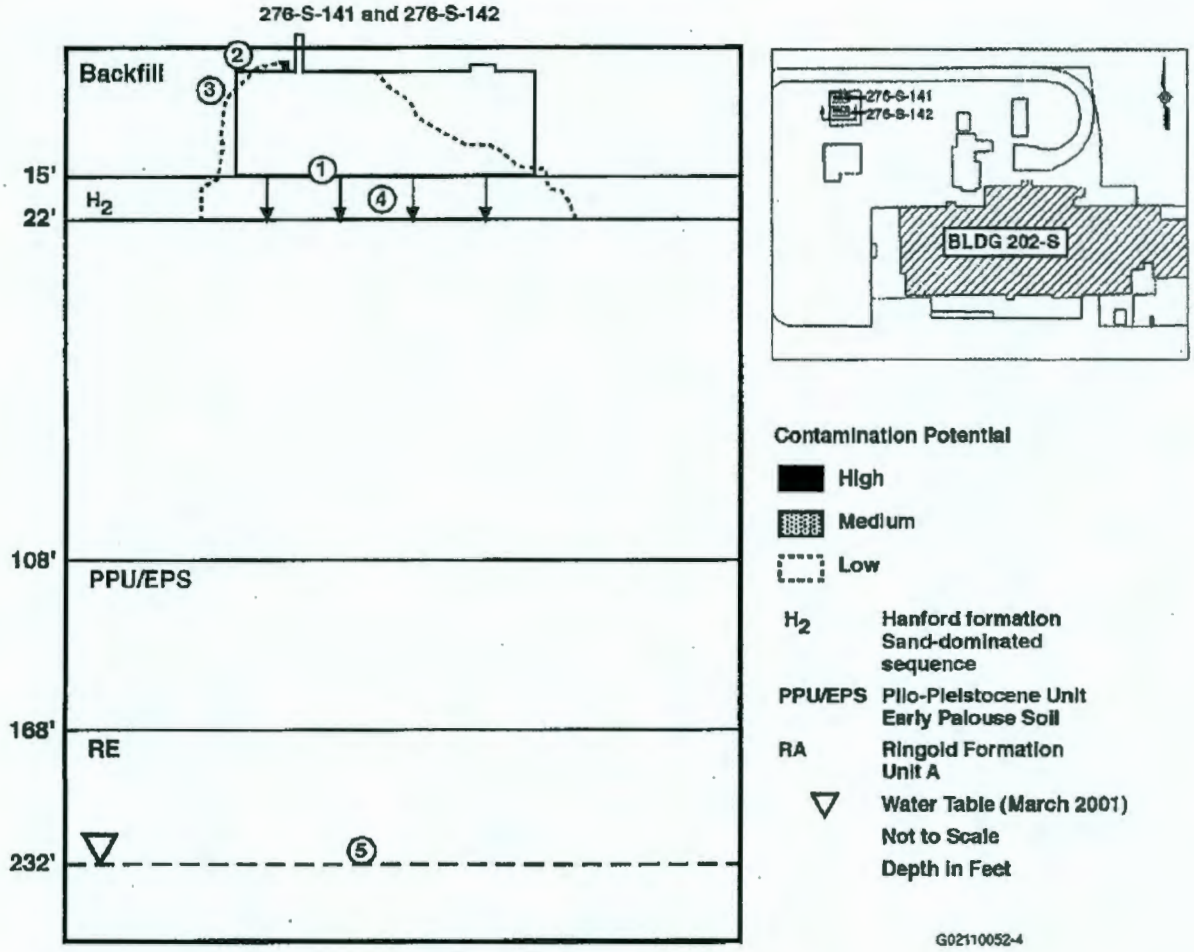
1. Process condensate waste containing plutonium-239/240, uranium, cesium-137, strontium-90, tributyl phospate, caustic-tartrate, oxalic acid, hydrogen peroxide, sodium nitrate, sodium nitrite, sodium fluoride, aluminum sulfate, and sodium chromate were discharged to the tank from late 1952 until mid 1957. The tank's capacity was 3,807 liters (1,000 gallons). The tank transferred a total volume of 33,308,000 liters (8.8 million gallons) of liquid waste to C-1 and C-5 cribs. In 1974, visual inspection indicated that the tank contained very little liquid and limestone. Very little data are available to evaluate contaminant distribution at this site.
2. Potential leaks from this tank are likely because of the volume of liquid waste received and similar leaks reported in other equipment in the Hot Semiworks building. For the purposes of this conceptual contaminant distribution model, a leak of 0.1 gallon per hour is assumed over the time the tank was in service. Based on this assumption, a potential release of 8,300 liters (2,200 gallons) may have been released to the soil column. Based on this assumption and the nature of the soils near the waste site, little lateral spreading is expected to have occurred. Assuming that the spilled liquid was released within the soil adjacent to and beneath the tank, the entire assumed released amount would be retained by the soil within a 15 m (50-ft) radius of the tank.
3. Immobile contaminants, such as plutonium, normally sorb near the point of release. Contaminant concentrations decrease with depth.
4. Mobile contaminants, like nitrate, migrate with the moisture front to depth.
5. Waste water and mobile contaminants are not likely to have impacted groundwater because the potential leak volume is less than the soil column pore volume. While groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the tank, the contaminant is not attributed to this site.

Figure 3-7. 241-CX-72 Storage Tank Conceptual Contaminant Distribution Model.



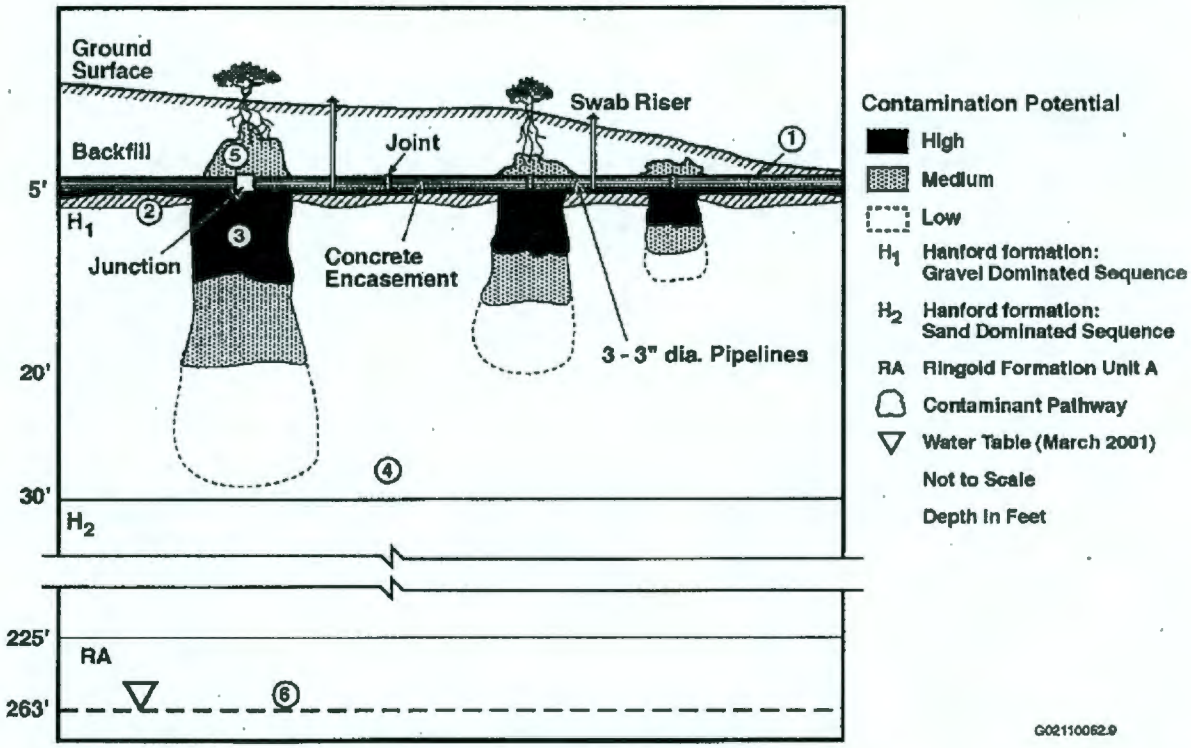
1. High-level process waste containing plutonium-239/240, uranium-total, tributyl phosphate, strontium-89/90 caustic-tartrate, oxalic acid, hydrogen peroxide, nitric ferrous ammonium sulfate, nitric dichromate, sodium nitrate, sodium nitrite, aluminum sulfate, sodium fluoride, and sodium chromate were received by the tank in 1956. The tank's capacity was 8,725 liters (2,300 gallons). The tank received 8,724 liters (2,300 gallons) of liquid waste. In 1974, the tank was reported as having approximately 1.9 meters (74.5 inches) of waste. Very few data are available to evaluate contaminant distribution at this site.
2. Potential leaks from this tank seem unlikely because of liquid level measurements, the volume of liquid waste received, and the construction of tank. Therefore, leaks, if any, would probably be from process piping connecting to the tank. For purposes of this conceptual contaminant distribution model, a leak of 1% or 87 liters (23 gallons) is assumed to have been released from the process piping connecting to the tank. Based on this assumption, little or no lateral spreading is expected to have occurred based on the nature of soils associated with the waste site and minimal volume of liquid potentially released. Assuming this volume of liquid was released to soils adjacent the tank, it would be retained by soils within 1.3 m (4 ft) of the top of the tank.
3. Immobile contaminants such as plutonium normally sorb near the point of release. Contaminant concentrations decrease with depth.
4. Mobile contaminants like nitrate migrate with the moisture front to depth.
5. Waste water and mobile contaminants have not likely impacted and are not likely to impact groundwater, because the potential leak volume is less than the soil column pore volume. While groundwater concentrations of iodine-129 exceeds groundwater protection standards beneath the tank, this contaminant is not attributed to this site.

Figure 3-8. 276-S-141 and 276-S-142 Storage Tanks Conceptual Contaminant Distribution Model.



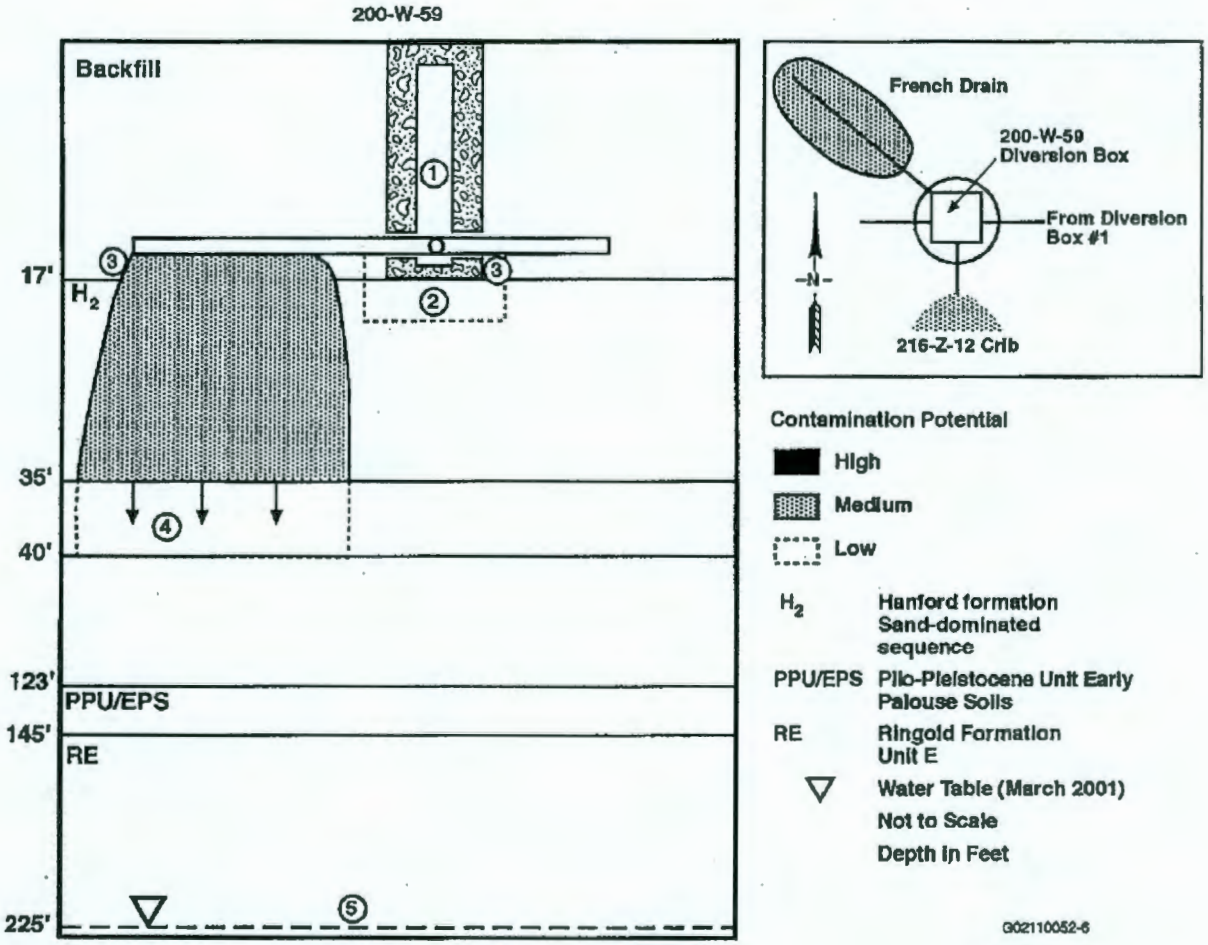
1. Essentially 100% hexone waste, containing minor amounts of uranium-238, strontium 89/90, cobalt 60, and cesium 137, were received by the tank. The tank's capacity was 89,000 liters (23,575 gallons). The tank received an estimated volume of 605,600 liters (160,000 gallons) of liquid waste. In 1991, pumpable liquids were removed from the tank leaving approximately 946 liters (250 gallons) of sludge. Very few data are available to evaluate contaminant distribution at this site.
6. Potential leaks from this tank are unlikely based on a tank integrity test. Therefore, if a leak had occurred, it would probably be from process piping connecting to the tank. For purposes of this conceptual contaminant distribution model, a leak of 0.05 gal/hr or 4,800 liters (1,300 gallons) is assumed to have been potentially released from the process piping connecting the tank. Based on this assumption, little lateral spreading is expected to have occurred based on the nature of soils near the waste site. Assuming this volume of liquid was released to soils adjacent the tank, it would be retained by soils within 6.7 m (22 feet) beneath the tank.
2. Immobile contaminants such as cesium-137 normally sorb near the point of release. Contaminant concentrations decrease with depth.
3. Mobile contaminants like hexone migrate with the moisture to depth.
4. Waste water and mobile contaminants likely have not impacted and are not likely to impact groundwater because the potential leak volume is less than the soil column pore volume. While groundwater concentrations of iodine-129 exceed groundwater protection standards beneath the tank, this contamination is not associated with the site.

Figure 3-9. 200-E-111 Tank Farm Process Piping Conceptual Contaminant Distribution Model.



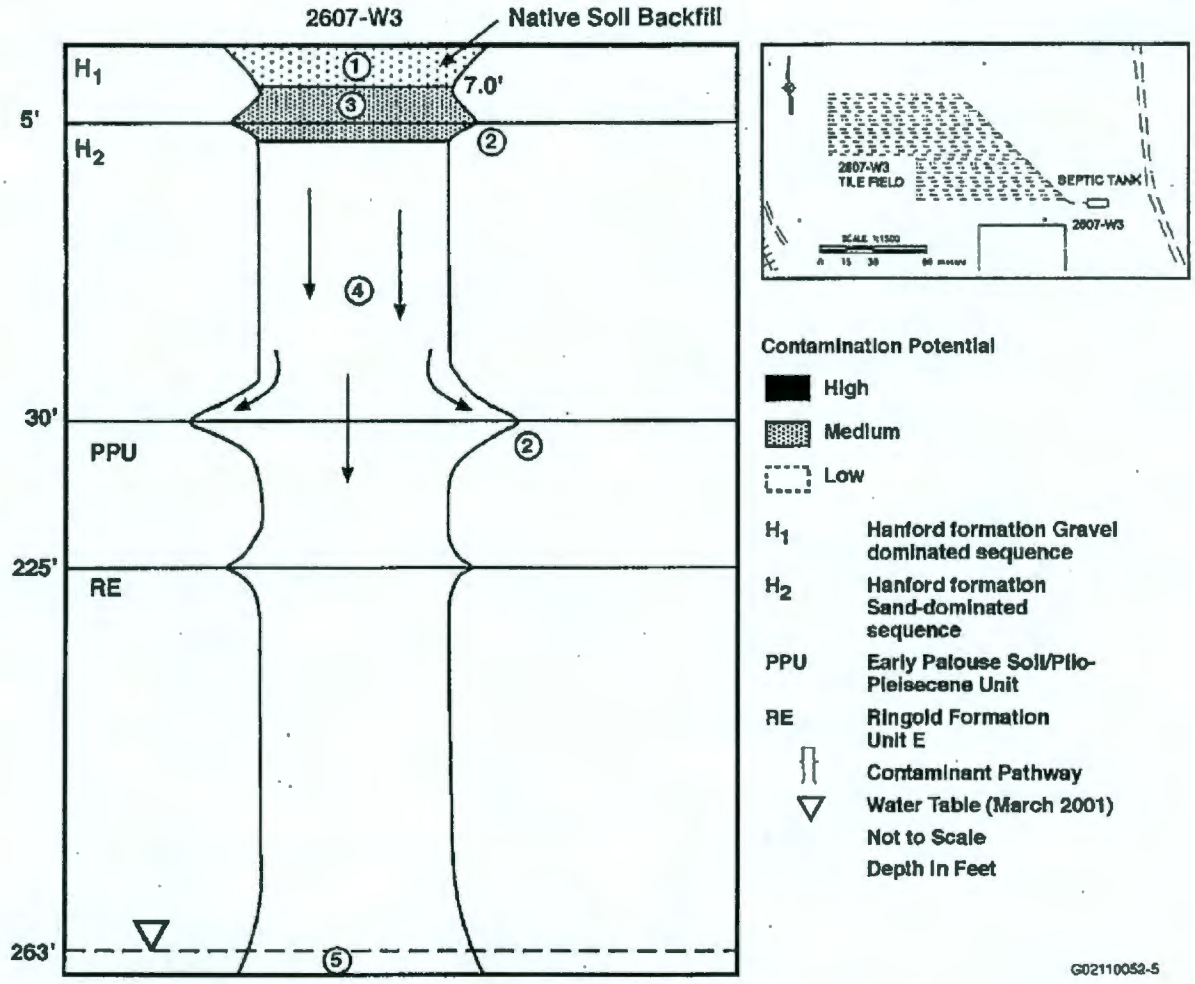
1. The 200-E-111 Tank Farm Process Piping is an encasement that contains three 3-inch diameter stainless steel waste transfer pipelines. The pipelines were used to transport bismuth phosphate and uranium recovery waste (uranium and fission rich process wastes) from 1946 to 1957, waste fractionation fission product waste from 1961 to 1978, and interim stabilization and isolation waste from 1975 to 2001. The pipelines transferred waste to the C Tank Farm and the 244-AR Vault from the 241-ER-151 Diversion Box.
2. Effluent and contaminants were released to the subsurface from the encasement approximately 5 to 8 feet below the ground surface within H1. The releases are characterized as low volume leaks and are most likely attributed to faulty or degraded seals, joints, or fittings.
3. The effluent and contaminants move vertically down beneath the encasement at various points of release. Low mobility contaminants such as cesium and plutonium sorb near points of release, and concentrations decrease with depth.
4. Mobile contaminants such as nitrate and tritium migrate with the moisture front to a maximum depth of 20 to 30 ft.
5. Contamination extends above the pipeline in some places because of transport by vegetation (i.e., tumbleweed).
6. Waste water and contaminants do not impact groundwater, because the suspected volume of releases is small.

Figure 3-10. 200-W-59 Diversion Box Conceptual Contaminant Distribution Model.



1. Slightly basic, low salt, sodium fluoride and nitrate solutions containing small amounts of organics were received by the diverson box from January 1959 to May 1973. The diversion box consists of 6-inch schedule 10 stainless steal piping that runs east, west, south, and northeast. To the south, an undetermined distance from the diversion box, the stainless steel pipe ties into an unsealed vitrified clay tile pipe that has been previously assessed and shown as leaking. Therefore, this is not shown in the conceptual model. To the northwest, the stainless steel pipe ties into perforated pipe approximately 1.5 m (5 ft) from the diversion box. This French drain system is documented in drawing H-2-20987 and shown on the left in the plan view and cross section model. The H-2-90987 drawing also states that the pipe inlets were caulked for a watertight seal. The diversion box transferred 281,000,000 liters (74,240,500 gallons) of liquid waste.
2. Potential leaks from the diversion box piping connections are likely, because this site is associated with an unplanned release. However, the leaks within the diversion box appear to have been routed to the French drain, with little if any liquid having leaked from the diversion box itself. For purposes of this conceptual contaminant distribution model, a leak of 0.1 gallons per hour is assumed over the time the diversion box and associated piping were in service. This amount totals a potential of 40,000 liters (12,000 gallons). Based on this assumption and the nature of soils near the site, little lateral spreading is expected to have occurred. Assuming this volume of liquid was released to soils adjacent the tank, it would be contained by soils within 12 m (40 ft) bgs. The model also indicates that a release from the diversion box, though unlikely, would be contained within a two-foot radius of the diversion box base.
3. Immobile contaminants such as plutonium normally sorb near the point of release. Contaminant concentrations decrease with depth.
4. Mobile contaminants like nitrate migrate with the moisture front to depth.
5. Waste water and mobile contaminants likely have not impacted and are not expected to impact groundwater because the potential leak volume is less than the soil column pore volume. While groundwater concentrations of carbon tetrachloride and nitrate exceed groundwater protection standards beneath the 200-W-59 diversion box, this contamination is not attributed to this site.

Figure 3-11. 2607-W3 Septic Tank Conceptual Contaminant Distribution Model.



1. Sanitary sewage containing cleaning products, soaps, boric acid, oxalic acid, EDTA, phosphoric acid, and ammonium hydroxide were discharged to the septic tank and drain field from 1944 to 1996. A potential for slight contamination exists if radionuclides were discharged to the septic tank through a sink or toilet from contaminated clothing or personnel. Likely isotopes would include $Pu^{239/24}$, Am^{241}, Cs^{137}, Sr^{90}, and Co^{60}. The septic system is estimated to have received a total of 250,000,000 liters (66,000,000 gallons) of waste water. Very few data are available to evaluate contaminant distribution at this site.
2. Once discharged, wastewater and contaminants migrate vertically downward beneath the drain field within H1. Lateral spreading probably occurs, however this is not supported by borehole data. The nearest well is 299-W11-7 located about 21 m (70 ft) to the southwest. Waste water and contaminants may be associated with this unit. Effluent and more mobile contaminants intersect the PPU at approximately 32 m (105 ft) bgs. Minor spreading of contaminants may occur associated with this unit. Effluent and more mobile contaminants intersect the Ringold Unit E at approximately 42.7 m (40 ft) bgs. Lateral spreading of contaminants may occur with this unit.
3. Immobile contaminants such as cesium-137 normally sorb near the point of release. Contaminant concentrations decrease with depth.
4. Mobile contaminants such as nitrate migrate with moisture front beneath the drain field and may be detected in low concentration to the water table.
5. Waste water and contaminates may affect groundwater since the effluent discharge to the soil column is greater than the soil column pore volume. While groundwater concentrations of tritium, iodine-129, trichloroethylene, carbon tetrachloride, and nitrate exceed groundwater protection standards beneath the drain field, only nitrate may have been associated with waste disposal practices at this septic system.

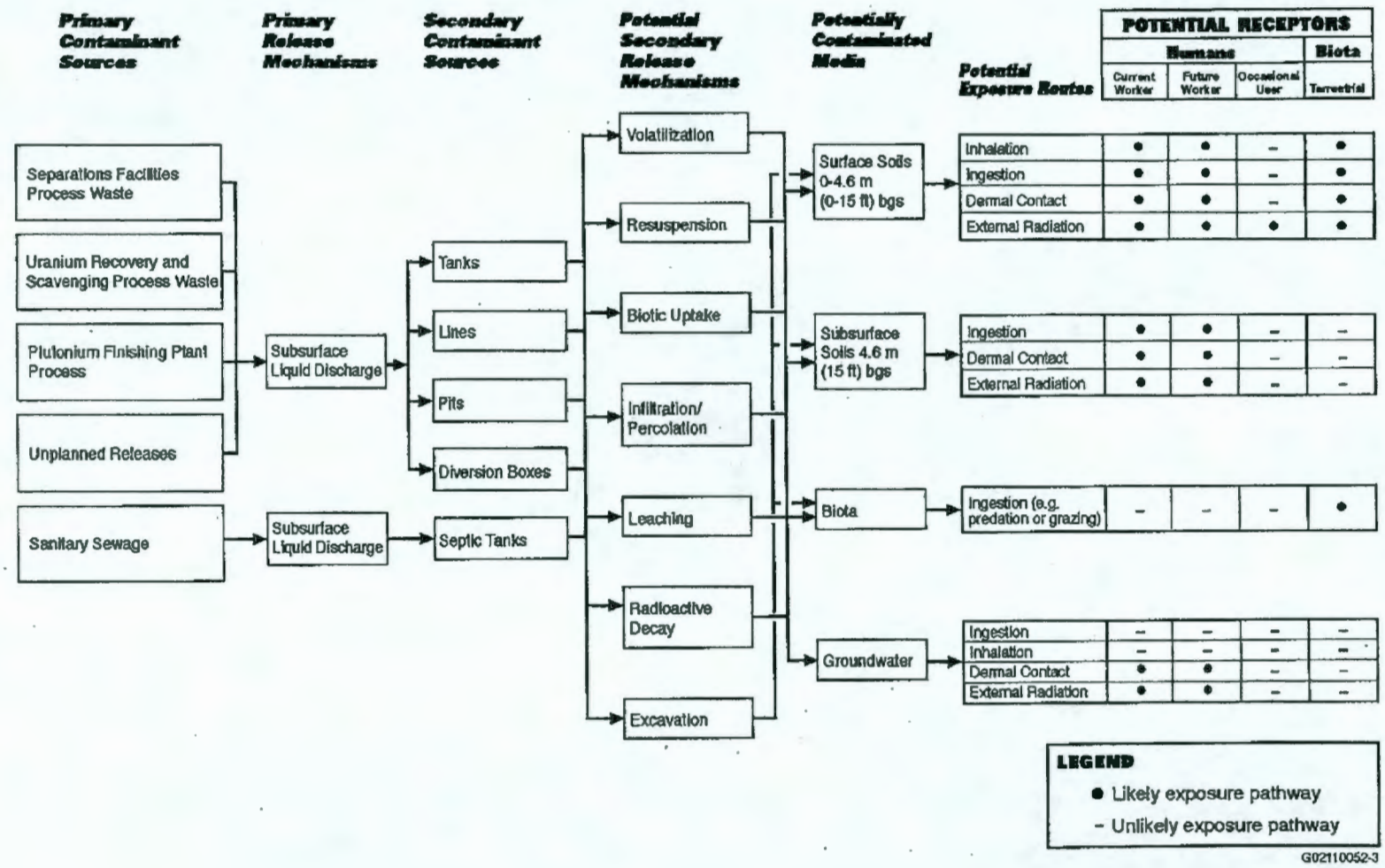


Figure 3-12. Conceptual Exposure Pathway Model.

Table 3-1. Soil and Vegetation Concentrations of Radionuclides for the D021/V021 Monitoring Site Near the 200-W-59 Diversion Box.

Isotope	D021/V021 Monitoring Site	
	Soil (D021)	Vegetation (V021)
Antimony-125	2.9E-03	1.5E-02
Cerium-144	-4.3E-03	5.9E-02
Cobalt-60	5.3E-03	1.8E-02
Cesium-134	2.5 E-02	-1.3E-02
Cesium-137	2.1E-01	9.2E-03
Europium-152	-2.6E-02	3.7E-02
Europium-154	6.8E-03	-1.7E-02
Europium-155	5.0E-02	7.1E-03
Plutonium-238	-9.6E-02	6.4E-03
Plutonium-239/240	2.0E-02	3.7E-03
Ruthenium-103	-7.6E-03	1.9E-02
Ruthenium-106	5.2E-02	4.2E-03
Strontium-90	1.9E-01	4.7E-01
Tin-113	-9.5E-03	-5.3E-02
Uranium-234	1.9E-01	2.0E-02
Uranium-235	3.5E-02	3.8E-03
Uranium-238	1.7E-01	1.3E-02
Zinc-65	-5.2E-03	7.0E-02

Source: PNNL-13230, 2000, *Hanford Site Near Facility Environmental Monitoring Data Report for Calendar Year 1999*, Pacific Northwest National Laboratory, Richland, Washington..

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
200-W-59 Diversion Box – Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239	14119-33-6	Plutonium-240
200-W-59 Diversion Box – Inorganics			
7664-41-7	Ammonium	14280-30-9	Hydroxide
7440-38-2	Arsenic	7439-92-1	Lead
7440-39-3	Barium	7440-02-0	Nickel
7440-41-7	Beryllium	14797-55-8	Nitrate
7440-69-9	Bismuth	14797-65-0	Nitrite
24959-67-9	Bromide	14265-44-2	Phosphate
16887-00-6	Chloride	7440-22-4	Silver
7440-47-3	Chromium	14808-79-8	Sulfate
18540-29-9	Chromium (VI)	18496-25-8	Sulfides
16984-48-8	Fluoride		
200-W-59 Diversion Box – Organics			
75-34-3	1,1-dichloroethane (DCA)	75-09-2	Dichloromethane (methylene chloride)
107-06-2	1,2-dichloroethane (DCA)	64742-81-0	Kerosene (Normal Paraffin Hydrocarbon)
51-28-5	2,4-Dinitrophenol	98-95-3	Nitrobenzene
67-64-1	Acetone	87-86-5	Pentachloro-phenol
120-12-7	Anthracene	1336-36-3	Polychlorinated biphenyls
35296-72-1	Butanol	108-88-3	Toluene
56-23-5	Carbon Tetrachloride	156-60-5	Trans-1,2-dichloroethylene
108-90-7	Chlorobenzene	126-73-8	Tributyl Phosphate

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
67-66-3	Chloroform	79-01-6	Trichloroethylene
156-59-2	Cis-1,2-dichloroethylene	1330-20-7	Xylene
10061-01-5	cis-1,3-dichloropropene	75-09-2	Dichloromethane (methylene chloride)
200-E-111 Pipeline – Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
200-E-111 Pipeline – Inorganics			
7664-41-7	Ammonia	14280-30-9	Hydroxide
7440-36-0	Antimony	13709-38-1	Lanthanum Fluoride
7440-39-3	Barium	7439-92-1	Lead
7440-41-7	Beryllium	7439-97-6	Mercury
7440-69-9	Bismuth	7440-02-0	Nickel
24959-67-9	Bromide	14797-55-8	Nitrate
7440-43-9	Cadmium	14797-65-0	Nitrite
16887-00-6	Chloride	14265-44-2	Phosphate
7440-47-3	Chromium	7782-49-2	Selenium
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
57-12-5	Cyanide	18496-25-8	Sulfides
16984-48-8	Fluoride		
200-E-111 Pipeline – Organics			
71-55-6	1,1,1-trichloroethane (TCA)	108-90-7	Chlorobenzene
79-34-5	1,1,2,2-tetrachloroethane	67-66-3	Chloroform
79-00-5	1,1,2-trichloroethane	10061-01-5	cis-1,3-dichloropropene
75-34-3	1,1-dichloroethane (DCA)	53-70-3	Dibenz[a,h]anthracene

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
75-35-4	1,1-dichloroethene	75-09-2	Dichloromethane (methylene chloride)
120-82-1	1,2,4-trichlorobenzene	100-41-4	Ethylbenzene
95-50-1	1,2-dichlorobenzene	118-74-1	Hexachlorobenzene
107-06-2	1,2-dichloroethane (DCA)	87-68-3	Hexachlorobutadiene
540-59-0	1,2-Dichlofoehtene(total)	64742-81-0	Kerosene (Normal Paraffin Hydrocarbon)
78-87-5	1,2-dichloropropane	78-93-3	Methyl Ethyl Ketone
541-73-1	1,3-dichlorobenzene	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
106-46-7	1,4-Dichlorobenzene	91-20-3	Naphthalene
121-14-2	2,4, Dinitrotoluene	98-95-3	Nitrobenzene
95-95-4	2,4,5 Trichlorophenol	8008-20-6	Normal Paraffin Hydrocarbon (Kerosene)
591-78-6	2-hexanone	87-86-5	Pentachloro-phenol
95-48-7	2-Methylphenol (o-cresol)	108-95-2	Phenol
106-44-5	4-Methylphenol (p-cresol)	1336-36-3	Polychlorinated biphenyls
67-64-1	Acetone	100-42-5	Styrene
71-43-2	Benzene	127-18-4	Tetrachloroethylene
207-08-9	Benzo(k)fluoranthene	108-88-3	Toluene
50-32-8	Benzo(a)pyrene	TOC	Total Organic Carbon
191-24-2	Benzo(ghi)perylene	10061-02-6	Trans-1,3-dichloropropene
207-08-9	Benzo(k)fluoranthene	126-73-8	Tributyl Phosphate
35296-72-1	Butanol	79-01-6	Trichloroethylene
56-23-5	Carbon Tetrachloride	1330-20-7	Xylene
2607-W-3 Septic Tank – Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
15117-48-3	Plutonium-239		
2607-W-3 Septic Tank – Inorganics			
7664-41-7	Ammonia	14280-30-9	Hydroxide
7440-36-0	Antimony	13709-38-1	Lanthanum Fluoride
7440-39-3	Barium	14797-55-8	Nitrate
7440-41-7	Beryllium	14797-65-0	Nitrite
16887-00-6	Chloride	14265-44-2	Phosphate
7440-47-3	Chromium	7782-49-2	Selenium
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
16984-48-8	Fluoride		
2607-W-3 Septic Tank – Organics			
67-64-1	Acetone	78-93-3	Methyl Ethyl Ketone
71-43-2	Benzene	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
35296-72-1	Butanol	91-20-3	Naphthalene
75-09-2	Dichloromethane (methylene chloride)	108-88-3	Toluene
64742-81-0	Kerosene (Normal Paraffin Hydrocarbon)		
241-CX Tank System – Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
241-CX Tank System – Inorganics			
7664-41-7	Ammonia	57-12-5	Cyanide
7440-36-0	Antimony	16984-48-8	Fluoride

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
7440-39-3	Barium	14280-30-9	Hydroxide
7440-41-7	Beryllium	7439-92-1	Lead
7440-69-9	Bismuth	7439-97-6	Mercury
24959-67-9	Bromide	7440-02-0	Nickel
7440-43-9	Cadmium	14797-55-8	Nitrate
16887-00-6	Chloride	14797-65-0	Nitrite
7440-47-3	Chromium	14265-44-2	Phosphate
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
CX Tank System – Organics			
71-55-6	1,1,1-trichloroethane (TCA)	35296-72-1	Butanol
120-82-1	1,2,4-trichlorobenzene	67-66-3	Chloroform
95-48-7	2-Methylphenol (o-cresol)	78-93-3	Methyl Ethyl Ketone
67-64-1	Acetone	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
71-43-2	Benzene	8008-20-6	Normal Paraffin Hydrocarbon (Kerosene)
207-08-9	Benzo(k)fluoranthene	108-95-2	Phenol
50-32-8	Benzo(a)pyrene	127-18-4	Tetrachloroethylene
191-24-2	Benzo(ghi)perylene	126-73-8	Tributyl Phosphate
207-08-9	Benzo(k)fluoranthene	1330-20-7	Xylene
276-S Hexone Storage and Treatment Facility – Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
276-S Hexone Storage and Treatment Facility – Inorganics			
7664-41-7	Ammonia	16984-48-8	Fluoride

Table 3-2. 200-IS-1 and 200-ST-1 Operable Unit Representative Sites Contaminants of Concern List. (6 sheets)

CAS Number	Compound Name	CAS Number	Compound Name
7440-36-0	Antimony	14280-30-9	Hydroxide
7440-39-3	Barium	7439-97-6	Mercury
7440-41-7	Beryllium	14797-55-8	Nitrate
7440-69-9	Bismuth	14797-65-0	Nitrite
7440-47-3	Chromium	14265-44-2	Phosphate
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
57-12-5	Cyanide		
276-S Hexone Storage and Treatment Facility – Organics			
71-43-2	Benzene	8008-20-6	Normal Paraffin Hydrocarbon
207-08-9	Benzo(k)fluoranthene	126-73-8	Tributyl Phosphate
108-10-1	Methyl iso butyl ketone (MIBK, hexone)		

4.0 WORK PLAN APPROACH AND RATIONALE

4.1 SUMMARY OF THE DATA QUALITY OBJECTIVE PROCESS

The RI needs for assessing potential human health impacts from waste sites within the 200-IS-1 and 200-ST-1 OUs were developed in accordance with the DQO process (EPA QA/G-4, 1994, *Guidance for Data Quality Objectives Process*; BHI-EE-01, *Environmental Investigations Procedures*, Procedure 1.2). The DQO process is a seven-step planning approach used to develop data collection strategies consistent with data uses and needs. The DQO goals for the 200-IS-1 and 200-ST-1 OUs were to provide the data needed to refine the preliminary conceptual contaminant distribution model and to support remedial decisions. The need for additional data to support the assessment of potential ecological impacts will be evaluated through a separate Central Plateau DQO process to be conducted in 2003.

The DQO process was implemented by a team of subject matter experts and key decision makers who developed the characterization approach outlined in the DQO summary report. The subject matter experts provided input on regulatory issues, the history and physical condition of the sites, and sampling and analysis methods. The key decision makers were representatives from DOE and Ecology. Both the DQO process and the participants provide a high degree of confidence that the appropriate data are collected to provide the information needed to make good decisions about the 200-IS-1 and 200-ST-1 OUs. Results of the DQO process for characterizing the RCRA TSD units and representative sites in the 200-IS-1 and 200-ST-1 OUs are presented in CP-13196, *Remedial Investigation DQO Summary Report – 200-IS-1 and 200-ST-1OUs*. No representative sites were identified in DOE/RL-98-28. Therefore, the DQO waste site review process identified two representative waste sites for the 200-IS-1 OU and one for the 200-ST-1 OU in addition to the two 200-IS-1 OU RCRA TSD units selected for characterization. Section 4.1.1 outlines the process for selecting the representative sites.

The nature of the waste sites to be investigated in the RI supports the use of focused sampling as identified in *Washington State Department of Ecology Toxics Cleanup Program Guidance on Sampling and Data Analysis Methods* (Ecology 1995). This guidance document defines focused sampling as selective sampling of areas where potential or suspected soil contamination can reliably be expected if a hazardous substance is released. Contaminant distributions are expected to follow relatively predictable patterns based on process knowledge and existing environmental data.

4.1.1 Representative Site Selection Process

The original set of waste sites assigned to these OUs in DOE/RL-98-28 was based on the following rationale:

- **200-IS-1 Tanks/Lines/Pits/Boxes Operable Unit.** This OU was created for structures used to handle the high-level plant waste generated from separations or volume reduction processes conducted outside tank farms and processing facilities. At the same time, the team recognized that remediation of these facilities would ultimately be associated with

tank farms stabilization. They attempted to place diversion boxes, valve pits, sampler pits, pipelines, and other similar structures constructed in support of a soil column disposal waste site within the group in which the soil column disposal waste site has been placed. This complex is a web of concrete encased pipelines that connects facilities inside the 200 East and West Areas and that connects the 200 East and West Areas as well. This complex was only partially identified in WIDS. An activity is under way to identify and map these structures and assign them site names.

- **200-ST-1 Septic Tanks and Drain Fields Operable Unit.** This OU was created for sites that had received or continue to receive largely nonradioactive, nonhazardous, sanitary sewer waste. The concern for the active waste sites was more in their potential to provide a driving force to adjacent soil column disposal sites or unplanned releases than their potential to add significant contamination to the soil column. A remote possibility of radiological contamination did exist for effluent from showers and janitorial sinks at radiological facilities.

In addition, new waste sites were assigned to these OUs in accordance with RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)." Neither the original sites nor those added since DOE/RL-98-28 was published have been screened to determine their appropriateness as the subject of an RI/FS work plan and associated remedial action processes. Therefore, the team had to review all the WIDS sites currently identified with the 200-IS-1 and 200-ST-1 OUs before selecting the representative sites for these OUs. This selection approach was designed to ensure that waste sites added to the 200-IS-1 and 200-ST-1 OUs in the future fit into the subgroups for which representative sites have been selected.

The sites were sorted according to the following criteria:

- WIDS-defined categories (e.g., "Classification Status Rejected Sites," "Classification Status Proposed Rejected Sites," etc.)
- Whether the sites were being used
- Whether the sites were under the jurisdiction of other regulatory authority (such as the septic systems associated with noncontaminated facilities)
- Which was the responsible DOE program (RL or ORP)
- Whether the sites were assigned to an appropriate waste group.

Because of the latest RL reorganization, the WIDS database for the assignment of waste site responsibility is being updated to agree with the newly formed RL organizations. This includes splitting the 200 Areas into several divisions under the Assistant Manager for the Central Plateau (AMCP). The update also considers the waste sites now assigned to the ORP, Operations Program Division.

The results of this review are shown in Appendix C, Tables C-1 through C-6, and are summarized as follows:

- Table C-1 covers all waste sites identified with the 200-IS-1 and 200- ST-1 OUs as of November 27, 2002.

- Table C-2 covers all waste sites identified with the 200-IS-1 and 200- ST-1 OUs that are in the process of or have been removed from consideration in the RPP process. These reclassifications are supported by data packages provided to the Tri-Party Agreement reclassification team and require team approval before being removed.

- Table C-3 covers all waste sites identified with the 200- ST-1 OUs septic systems planned to be moved from the RPP process to the unit category "Septic." The changes are based on whether the system was connected to a contaminated facility. These data are not yet in WIDS, but will be added when the recategorization is approved in accordance with RL-TPA-90-0001. In addition, septic tanks and drain fields still in service were identified as excluded.

- Table C-4 covers all waste sites identified with the 200-IS-1 and 200- ST-1 OUs that are not included in this work plan because they are the responsibility of other programs. For instance, because RL and the ORP have an ongoing discussion regarding the possible change in programmatic responsibility for waste sites associated with waste transfers within the SST and DST systems, waste sites presently assigned to ORP programmatic responsibility were not considered part of this work plan. These sites include waste sites specifically identified in the SST Part A permit application, Form 3, (Appendix A) or associated waste sites. In addition, the 241-Z treatment and storage tanks RCRA TSD unit has an approved closure plan (DOE/RL-96-82, *Hanford Facility Dangerous Waste Closure Plan, 241-Z Treatment and Storage Tanks*) and is supporting the PFP Nuclear Materials Stabilization Project and will support subsequent facility D&D until 2011. Therefore it and its associated UPRs were not considered as part of this work plan.

- Table C-5 covers all waste sites identified with the 200-IS-1 and 200- ST-1 OUs that currently are considered to be included in this work plan as either analogous sites, representative sites, or RCRA TSD sites. This table is meant to be a snap shot of current conditions and is expected to change as the identification of waste sites particularly pipelines and reassignment process continues. This table contains a waste site, the 216-TY-201 Flush Tank, identified to be moved to another OU. Because the 216-TY-201 flush tank received waste from the T and TY Tank Farms and discharged the waste to the 216-T-26, 216-T-27 and 216-T-28 Cribs, it is considered part of the ancillary equipment for these cribs and is recommended to be moved to the 200-TW-1 OU. This move would result in the earliest ROD for remedial action for the site.

The RPP sites and RCRA TSD unit sites identified for this work plan (Table C-5) were reviewed based on their configuration for receiving waste, source of the waste stream, and expected contaminants to identify appropriate subgroups of sites with similar conceptual contaminant distribution models from which representative sites would be selected for characterization.

Waste sites within the 200-IS-1 OU mainly include tanks, lines, pits, and diversion boxes; the waste sites identified in the 200-ST-1 OU are septic tanks and their associated drain fields.

After reviewing the process history for each waste site, the following subgroups were selected for development of conceptual contaminant distribution models. The subgroups were selected primarily based on the site construction and types and amount of waste received:

- Tanks
- Diversion boxes (including valve pits)
- Pipelines
- Septic tanks and drain fields.

The representative sites then were selected and a conceptual contaminant distribution model developed for each subgroup based on the approach outlined in DOE/RL-98-28,. The following representative sites, along with the RCRA TSD units in these OUs, were selected from Appendix C, Table C-5. Sufficient data were not available on the pipeline sites identified in the Appendix C, Table C-5, to select a suitable pipeline representative site. Because a pipeline conceptual contaminant distribution model is expected to be required in the future to select appropriate remedy, Table C-4 was reviewed and the 200-E-111 encased pipeline and its associated unplanned release, UPR-200-E-86, was selected as the pipeline representative site. Selecting 200-E-111 as a representative site does not change the ORP programmatic responsibility for closure of this site. The following representative sites were selected:

- **Tanks:**
  - CX Tank System, which includes the 241-CX-70 Storage Tank, 241-CX-71 Neutralization Tank, and 241-CX-72 Storage Tank
  - The HSTF, which includes the Tanks 276-S-141 and 276-S-142
- **Diversion Boxes Including Valve Pits:** 200-W-59 Diversion Box
- **Pipelines:** 200-E-111 Encased Pipeline
- **Septic Tanks and Drain Fields:** 2607-W3 Septic Tank.

The conceptual contaminant distribution model and associated representative sites, RCRA TSD units, and analogous sites are presented in Appendix C, Table C-6.

4.1.2 Data Uses

Data generated during characterization of the representative sites and RCRA TSD units will consist mainly of soil contamination data. The data will be used to define the nature and vertical extent of radiological and nonradiological contamination, support an initial evaluation of potential human health risks, and assist in evaluating and selecting a remediation alternative. By defining the type and vertical distribution of contamination, the conceptual model for contaminant distribution can be verified or refined. The lateral extent of contamination is assumed to be confined within each site boundary, but could be evaluated further through geophysical logging results or test pits. The lateral extent of contamination might be evaluated further during the confirmatory sampling phase as necessary to support remedial design. Verification of the current conceptual contaminant distribution models will direct the application

of the analogous site concept at the remaining 200-IS-1 and 200-ST-1 waste sites. A limited amount of data will be collected to characterize the physical properties of soils. Those data will be used to support an initial assessment of risk (e.g., RESidual RADioactivity [RESRAD] or other risk modeling) and fate and transport modeling, as required. Contaminant and soil property data will be obtained by collecting and analyzing soil samples.

4.1.3 Data Needs

Chapters 2.0 and 3.0 presented a considerable amount of information about the 200-IS-1 and 200-ST-1 RCRA TSD units and representative waste sites. Some data are available for the representative waste sites; however, these data are insufficient to develop individual conceptual contaminant distribution models for the sites. The most pertinent existing information was used to develop site-specific conceptual contaminant distribution models for the CX Tank System, HSTF, 200-E-111 Tank Farm Process Piping, 200-W-59 Diversion Box, and 2607-W3 Septic Tank, RCRA TSD units and representative sites. Additional information is provided by reference.

For the representative waste sites (and, in general, the other waste sites in the OU), information is available about location, construction design, and major types of waste disposed. However, the data needed to verify and/or refine the site conceptual models and develop conceptual contaminant distribution models are limited. These data are needed to support remedial decision making at these sites and any analogous sites. As defined by the DQO process, the focus of the 200-IS-1 and 200-ST-1 OUs RI is to determine the nature and vertical extent of contamination in the vadose zone within the boundaries of the representative waste sites and RCRA TSD units. Specifically, the type, concentration (particularly the highest concentration), and vertical distribution of radiological and nonradiological contamination in the vadose zone at the representative waste sites and/or TSD units are the major data needs.

Data also are required to determine the physical properties of soils; these data will provide additional inputs to support a risk evaluation through the use of models for fate and transport of contaminants through the vadose zone to groundwater, exposure to radionuclides, and exposure to chemicals.

4.1.4 Data Quality

Data quality was addressed during the DQO process. Data quality and quantity were determined to be insufficient to support the RI/FS process for these OUs; therefore, additional data collection is needed through the RI process. The process of identifying the final list of COCs is summarized in Section 3.5. Analytical performance criteria were established by evaluating potential ARARs and preliminary remediation goals (PRG), which are regulatory thresholds and/or standards or derived risk-based thresholds. These potential ARARs and PRGs represent chemical-, location-, and action-specific requirements that must be met to protect human health and the environment. Regulatory thresholds and/or standards or preliminary action levels provide the basis for establishing cleanup levels and dictate analytical performance levels (i.e., laboratory detection limit requirements). Detection limit requirements and standards for precision and accuracy are used to define data quality.

To provide the necessary quality of data, detection limits should be lower than preliminary action levels. Additional data quality is gained by establishing specific policies and procedures for generating analytical data and field quality assurance and quality control requirements. These requirements are discussed in detail in the SAP (Appendix B). Analytical performance requirements are specified in CP-13196, Table 3-6. The potential ARARs and PRGs for the 200 Area waste sites are discussed in Chapters 4.0 and 5.0 of DOE/RL-98-28.

4.1.5 Data Quantity

Data quantity refers to the number of samples collected. The number of samples needed to refine the site conceptual model and make remedial decisions is based on a biased sampling approach. Biased sampling is the intentional location of a sampling point within a waste site based on process knowledge of the waste stream and expected behavior of the potential COCs. It is the preferred sampling approach as defined in Section 6.2.2 of DOE/RL-98-28 for the RI phase. Using this approach, sampling locations can be selected that increase the chance of encountering the highest contamination in the local soil column.

Sample locations at the representative sites and RCRA TSD units were selected based on the preliminary conceptual models of contaminant distribution presented in the CP-13196. The locations were selected with the goal of intersecting the areas of highest potential for contamination and determining the type and vertical extent of contamination at the representative sites. Except for the pipeline, the representative sites and RCRA TSD units cover only relatively small areas; therefore, knowing the lateral extent of contamination within the site boundaries is not considered necessary for making remediation decisions. Soil along the pipeline will be sampled to determine the spread of contamination at a distance from the pipeline. Extra soil samples could be collected as warranted by observations of such anomalies as changes in lithology, visual indications of contamination, and field screening results. This biased sampling approach was designed to provide the data needed to meet DQOs for this phase of the RI/FS process.

4.2 CHARACTERIZATION APPROACH

This section provides an overview of characterization activities planned to collect the data identified in the DQO process. These activities may include some or all of the following: ground-penetrating radar (GPR) and electromagnetic induction (EMI) surveys, borehole drilling, excavation of test pits, driven soil probe, sampling and geophysical logging using gross gamma, spectral gamma, passive neutron, and neutron moisture tools. An offsite laboratory will conduct sample analysis following a contract-required quality program. The sampling strategy is designed to provide access to potentially contaminated subsurface areas. Sample collection will be guided by field screening conducted during the RI and a sampling scheme that identifies critical sampling depths.

The SAP (Appendix B) presents the characterization approach.

4.2.1 Ground-Penetrating Radar and Electromagnetic Induction

Surface geophysical surveys using the GPR and EMI techniques will be used to determine the location of tanks and other underground features. The survey results also will be used to determine the specific location of each sampling site.

The GPR uses a transducer to transmit FM frequency electromagnetic energy into the ground. Interfaces in the ground, defined by contrasts in dielectric constants, magnetic susceptibility, and, to some extent, electrical conductivity, reflect the transmitted energy. The GPR system measures the travel time between transmitted pulses and arrival of reflected energy. Geologic features (i.e., crossbedding, lateral and vertical changes in soil properties, and rock interfaces) can reflect a portion of the electromagnetic energy. The reflected energy provides the means for mapping the subsurface features of interest, whether constructed or geologic. The display and interpretation of GPR data are similar to those used for seismic reflection data. When numerous adjacent profiles are collected, often in two orthogonal directions, a plan view map showing the location and depth of underground features can be generated.

Electromagnetic induction is a noninvasive method of detecting, locating, and/or mapping shallow subsurface features. It complements GPR because of its response to metallic subsurface anomalies and because it provides reconnaissance-level information over large areas to help focus GPR efforts. The EMI techniques are used to determine the electrical conductivity of the subsurface soil, rock, and groundwater and are generally used for shallow investigations. The method is based on a transmitting coil radiating an electromagnetic (EM) field that induces eddy currents in the earth. A resulting secondary EM field is measured at a receiving coil as a voltage that is linearly related to the subsurface conductivity.

4.2.2 Drilling and Sampling

For waste sites requiring boreholes for characterization, the depth of drilling and associated soil sampling will be based on site-specific conditions. When available information indicates the presence of deep vadose zone contamination or that groundwater has been contaminated by a waste site, soil samples will be gathered to the water table. For waste sites where deep contamination has not been observed or no information exists, sampling to groundwater might not be necessary. In this case, the drilling and sampling depths will be determined using the observational approach. As a minimum, samples will be collected to the deepest significant confining geological unit, such as the Cold Creek unit, if present, and as a maximum, to the water table. The Cold Creek unit is expected to be a zone of higher moisture content than the surrounding soil where contaminants would tend to concentrate. Decisions to collect samples past the Cold Creek unit will be based on field screening procedures screened for radioactive contamination and/or soil gas surveys.

As a result, soil samples will be collected down to and within the Cold Creek unit. The soil samples/drill cutting from the Cold Creek unit will be screened using a hand-held rate meter with a gamma detector. If contamination is three times greater than background, drilling and sampling will be continued, as specified in the SAP (Appendix B), to the next sample interval until contamination is less than three times background. The three-times-greater-than-

background criterion is considered appropriate to minimize the potential for a false positive. If contamination is less than three times background, the borehole will be logged with the spectral gamma-ray logging (SGL) system to confirm that significant contamination is not present before abandoning the borehole. These decisions will be made in the field by the site geologist.

This sample-collection strategy has been designed to thoroughly characterize the vadose zone materials beneath the sites to the Cold Creek unit or to the top of the groundwater table, as appropriate. Sampling generally will begin at the first sign of radiological contamination, as determined through field screening. Significant contamination is expected to begin at the historic bottom of the site (i.e., tank or diversion box bottom), but if contamination is detected in backfill materials above the waste site bottom, the backfill materials also will be sampled. Borehole samples typically will be collected at smaller intervals near the release point (i.e., the bottom of the tank or diversion box), then at larger intervals with depth. Samples that were identified as critical during the DQO process were from 4.6 m (15 ft) bgs and 7.6 m (25 ft) bgs. The SAP also provides that samples can be collected at the discretion of the geologist or sampler based on field screening and geologic information (e.g., changes in lithology). A detailed sample location profile for each borehole is presented in the SAP (Appendix B).

All drilling will be conducted in accordance with approved procedures and will conform to site-specific technical specifications for environmental drilling services. The drill rig generally will require a 23 m (75 ft)-square pad with a 5 m (16 ft)-wide access road. Cleaning and decontamination activities will also be performed according to approved procedures.

Likely drilling methods for this project are cable tool, sonic, and diesel hammer. The drilling method must allow for the use of a 13 cm (5-in.) outside-diameter split-spoon sampler. Use of a split-spoon sampler will necessitate compositing the sample over at least 0.3 m (1 ft) to obtain enough sample material for analysis. The drilling method must not use any system that circulates air or water. Air-based drilling methods could compromise the sample collection and data quality for volatile constituents by introducing air to the soils. In addition, the air circulated in these methods may dry the formation and negatively affect moisture-logging activities.

The presence of water-saturated soil will indicate that the water table has been contacted as determined by the site geologist. Up to three strings of casing could be telescoped to the proposed depth to minimize the transport of contaminants in the vadose zone from the drilling operations. The casings will be of sufficient size to accommodate a split-spoon sampler to the bottom of the borehole. Downsizing of the casing will be commensurate with the expected decrease in contamination levels with decreasing depth. Actual conditions during drilling could warrant changes; the changes may be implemented after consultation with and the approval by the task lead and the subcontract technical representative. All casings will be removed from the boreholes when drilling and sampling are completed. If required to support Hanford Site groundwater monitoring needs, boreholes may be completed as groundwater wells. Otherwise, the borehole will be backfilled and decommissioned in accordance with WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells."

4.2.3 Test Pit Excavation and Sampling

For waste sites requiring test pits for characterization, the depth of excavation and associated soil sampling will be based on site-specific conditions. The test pit locations were chosen to target the accessible areas of maximum potential for contamination within the site. Therefore, the soils collected close to the bottom of the site should reflect maximum contamination levels.

The sample collection strategy has been designed to characterize the vadose zone materials directly beneath the sites (see Figures 3-5 through 3-12). Sampling generally will begin at the first sign of radiological contamination, as determined by field measurements. This contamination is expected to begin at the historic bottom of the site, but if contamination is detected in backfill materials above the waste site bottom, the backfill materials also will be sampled. Samples typically will be collected at smaller intervals near the release point (i.e., the bottom of the tank or diversion box), and at larger intervals with increasing depth. Samples that were identified as critical during the DQO process will be collected at 4.6 m (15 ft) bgs and 7.6 m (25 ft) bgs. Additional samples may be collected at the discretion of the geologist or sampler based on field screening and geologic information (e.g., changes in lithology). If the disposal of mobility-enhancing chemicals creates a potential for significant contamination below the 7.6 m (25-ft) depth of a standard test pit, assessing the contamination at a depth greater than 7.6 m (25 ft) may be required.

All test pits will be conducted in accordance with an approved procedure. The excavator generally will require a 5 m (16-ft)-wide access road. Cleaning and decontamination activities also will be performed according to approved procedures.

4.2.4 Field Screening

All samples and/or cuttings drawn from the boreholes or excavated from test pits will be field screened for evidence of radionuclides. The three-times-greater-than-background criterion is considered appropriate to minimize the potential for a false positive. Except for critical samples, soil radioactivity screening will assist in refining the sampling intervals identified in the SAP.

4.2.5 Analysis of Soil

Soil samples will be collected for analysis of radiological and nonradiological constituents and the determination of select soil properties. The list of analytes for this investigation was developed based on an evaluation of all potential contamination that was discharged to the waste sites. How this list of COCs was developed is explained in Section 3.4. Tables B-7 and B-8 of the SAP list details of the analytical methods, holding times, and quality assurance and quality control procedures for each contaminant. A limited number of samples will be analyzed to determine soil physical properties, such as moisture content and particle size.

4.3 GEOPHYSICAL LOGGING

Geophysical logging is planned for boreholes and driven soil probes.

4.3.1 Borehole Geophysics

All boreholes will be logged using a high-resolution SGL system to provide continuous vertical logs of gamma-emitting radionuclides and a neutron moisture-logging system to identify moisture changes. In addition to the logging performed on the new borings, SGL is proposed in existing boreholes near the representative waste sites. The SGL of existing boreholes near a waste site can be a cost-effective method of providing supplemental data on the vertical and lateral distribution of gamma-emitting radionuclides, provided that the boreholes are located sufficiently close to the waste site and are appropriately constructed (e.g., single borehole casing in contact with the formation).

The SGL system uses standard laboratory high-purity germanium (HPGe) detector instrumentation to identify and quantify gamma-emitting radionuclides in boreholes as a function of depth. The HPGe detector is calibrated to National Institute of Standards and Testing requirements and includes corrections for environmental conditions that deviate from the standard calibration condition. The HPGe detector has been used to locate, identify, and monitor the distribution and movement of contaminants in more than 600 boreholes at the Hanford Site. The precision of this detector is such that movement of mobile constituents in the subsurface can be identified to as little as 0.07 m (0.25 ft) at depths of up to 168 m (550 ft). The detector requires constant cooling with liquid nitrogen and was designed to operate completely submerged in water. The nitrogen gas is vented to the surface using a specially designed logging cable.

The neutron moisture-logging system that measures moisture employs a weak americium-beryllium neutron source and neutron detector to provide a direct reading of hydrogen atom distribution in the soil surrounding the borehole. This detector will be used to measure continuous vertical moisture in the vadose zone.

The SGL logs will be used to supplement the laboratory radionuclide data to determine the vertical distribution of radionuclides in the vadose zone beneath the units and aid in geological interpretation of subsurface stratigraphy. The deep boreholes will be logged through the casing before adding a new casing string and after the borehole has reached total depth. The SGL equipment is calibrated annually, and the data acquired during the calibrations are used to derive factors that convert measured peak area count rate to radionuclide concentrations in picocuries per gram. Corrections are applied to the data to compensate for the gamma-ray attenuation by the casing. A list of boreholes to be logged is identified in the SAP (Appendix B).

All geophysical logging will be conducted in accordance with ES-SSPM-001, *Sampling and Services Procedure Manual*, Section 17, "Geophysical Logging", and Section 18, "Geophysical Logging Analysis," or equivalent. Applicable detection limits, analytical methods, and accuracy and precision requirements are defined in the documents governing borehole logging. The site geologist will record the types of geophysical surveys and the depth intervals of initial and repeat runs on the well construction summary report form.

Logging runs will be made before changing casing sizes and at the total depth of the borehole. The downhole tools and cable will be subject to the same rules as the drill rig and equipment. The downhole tools and cable will be decontaminated and surveyed between boreholes.

4.3.2 Geophysical Logging Through Driven Soil Probes

The radioactive contamination, which also would be an indicator of nonradiological contamination, might need to be assessed at a number of locations perpendicular to pipelines. Based on process knowledge, the radioactive contamination is expected to be represented by gamma emitters (e.g., cesium-137). Driven soil probes will be installed and logged with a gamma-logging tool (gross gamma tool for Geoprobe or cone penetrometer and high-resolution SGL system). The depth of a driven soil probe is limited by the subsurface conditions (i.e., cobbles, gravel). The hole will be pushed as deep as possible, but a maximum depth of approximately 18 m (60 ft) bgs is anticipated for investigation planning. Gross Gamma and Passive Neutron (GG/PN) logging of soil probes also may be used to determine areas of high americium-241 and plutonium-239/240 concentrations in a series of shallowly driven small-diameter soil probes.

The GG/PN system uses bismuth-germanium (BGO) detector instrumentation for gross counting of the gamma-emitting radionuclides in the soil probes as a function of depth. The passive neutron-logging instrument is a helium-3 detector configured to detect the neutron flux present in the below-ground soil probe environment.

4.3.3 Soil Gas Surveys Through Driven Soil Probes

A Geoprobe Model 5400 hydraulic ram system will be used to install soil gas sampling points near Hexone Storage Tanks 276-S-141 and -142. The hydraulic ram will be operated in accordance with the manufacturer's instructions and applicable procedures. The system is equipped with a 4.46 cm (1.75-in)-diameter probe and a detachable steel tip. At the desired depth, a 16.51 cm (6.5-in)-long fine-mesh stainless steel soil gas screen connected to the surface with 0.79 cm (0.31-in) outside-diameter tygon tubing is inserted down the center of the push rod. The push rod assembly is then withdrawn approximately 7.6 cm (3 in.) to release the steel tip and allow the sampling point to extend into the void space below the push rod. Approximately 205 mL of 20/40 mesh silica sand continues to be added while the push rods are extracted; sand is generally built to 30.5 cm (12 in) above the screen. The remaining push rods are then removed and soil is allowed to collapse around the tygon tubing. At approximately 0.9 m (3 ft) bgs, granular bentonite is added through the center of the push rod. The bentonite will not be hydrated.

After allowing each soil gas screen to equilibrate for a minimum of 24 hours, small-volume soil vapor samples (approximately 500 mL) will be collected and analyzed for the volatile COCs specific to the Hexone Storage and Treatment System. The soil gas samples will be collected and analyzed in accordance with applicable approved procedures.

Figure 4-1. Location of Planned and Existing Boreholes at the CX Tank System.

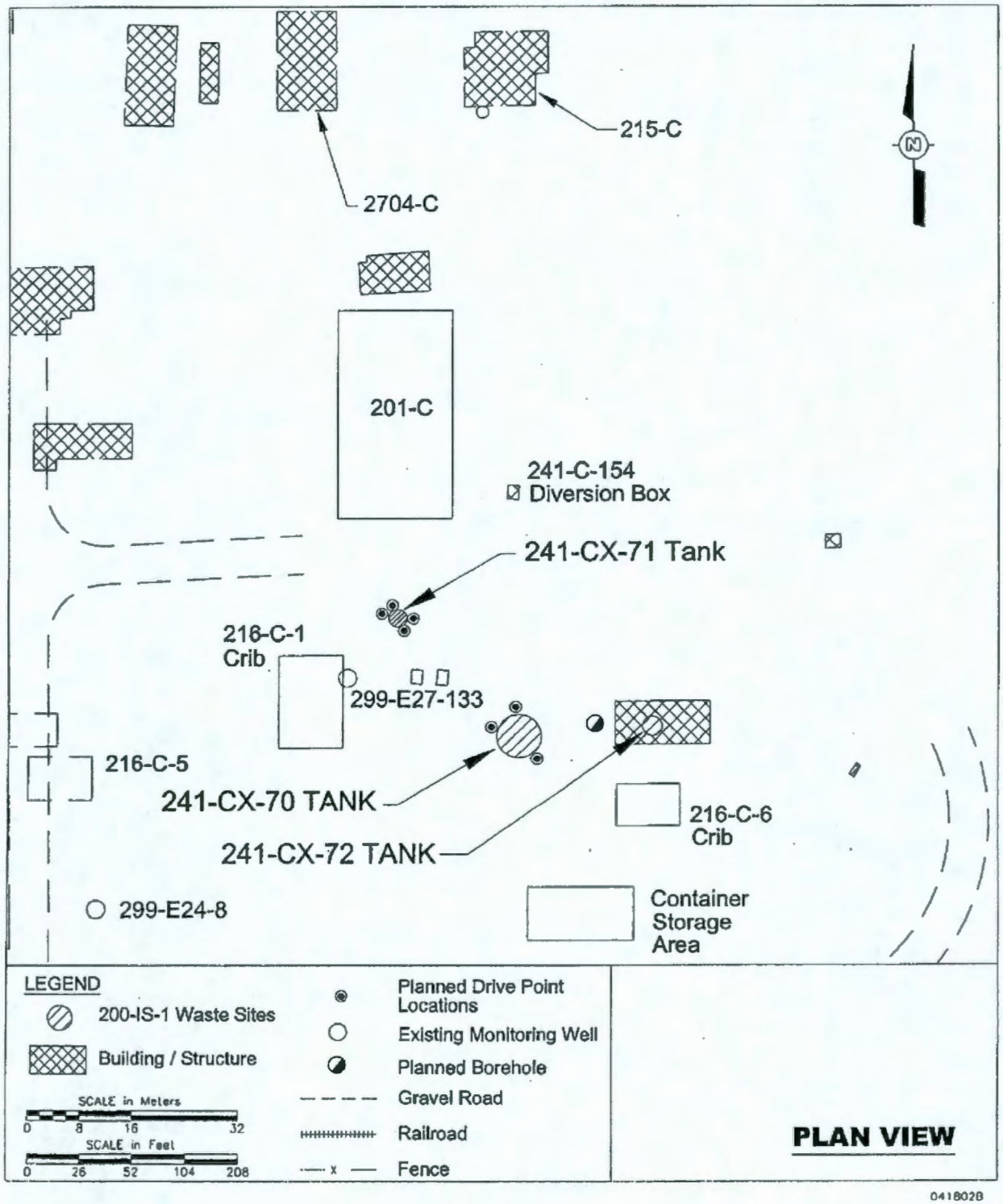


Figure 4-2. Location of Planned and Existing Boreholes at the Hexone Storage and Treatment Facility.

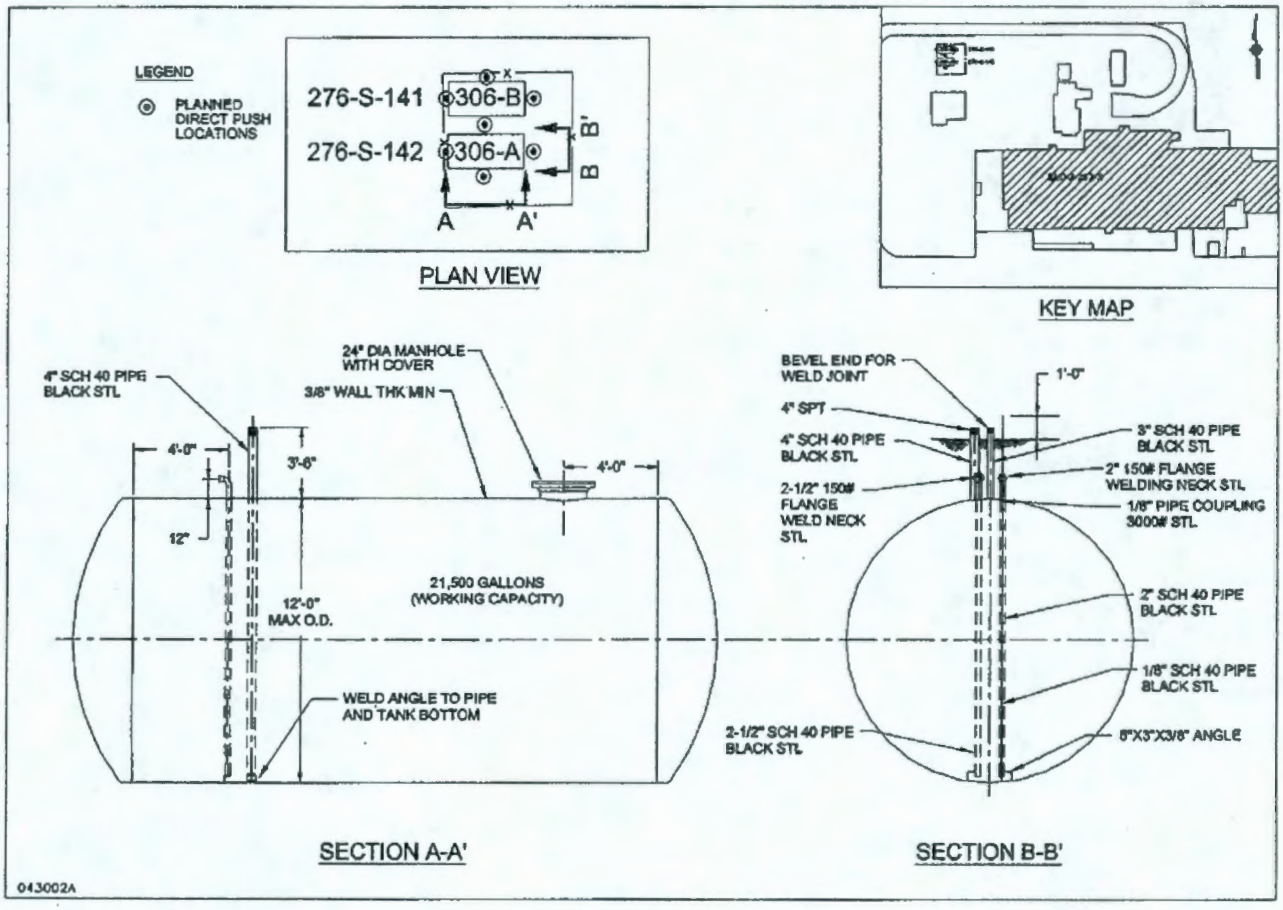


Figure 4-3. Location of Planned Drive Casings and Existing Boreholes at the 200-E-111 Tank Farm Process Piping.

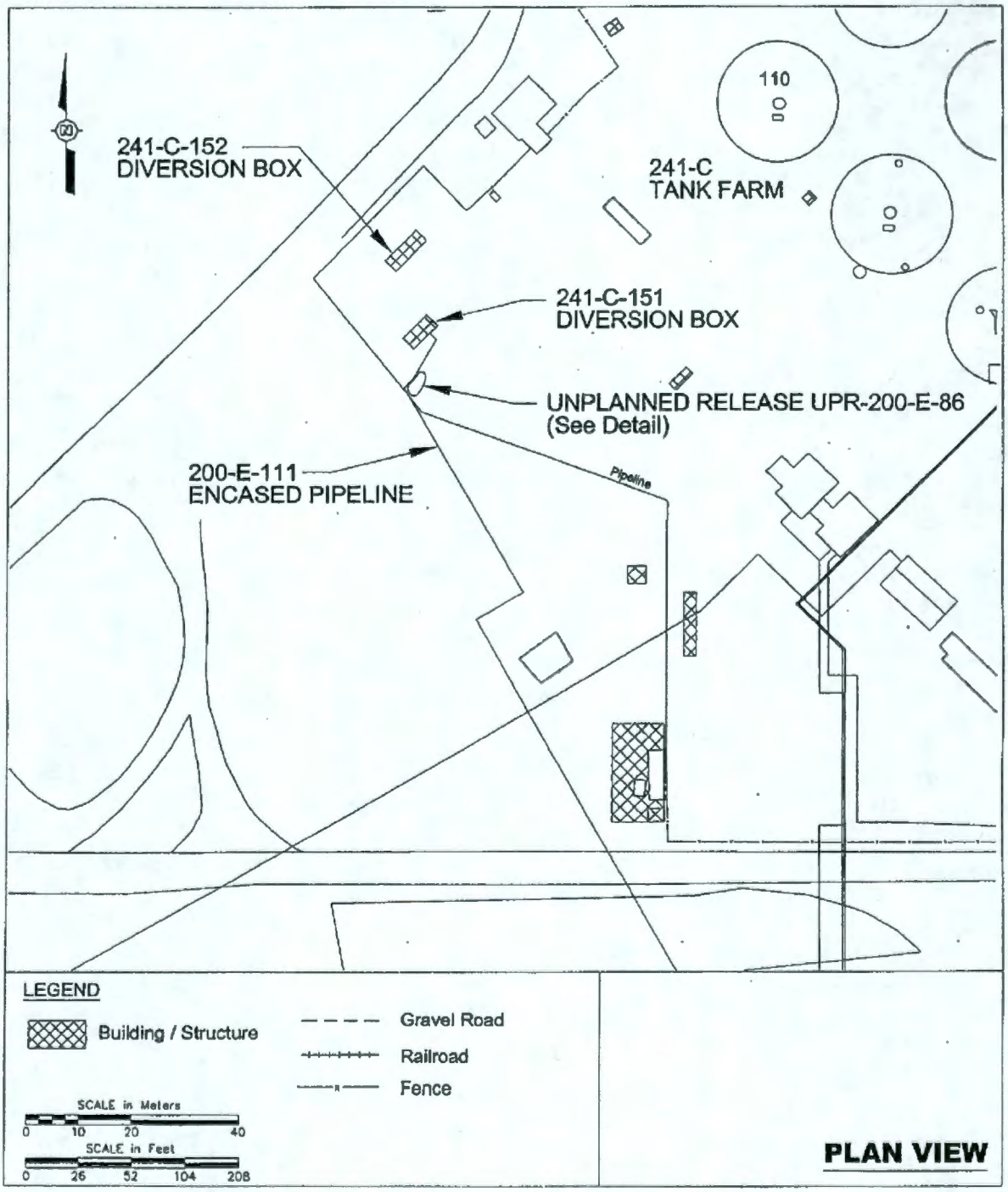


Figure 4-4. Location of Planned Drive Casings and Existing Boreholes at the 200-W-59 Diversion Box.

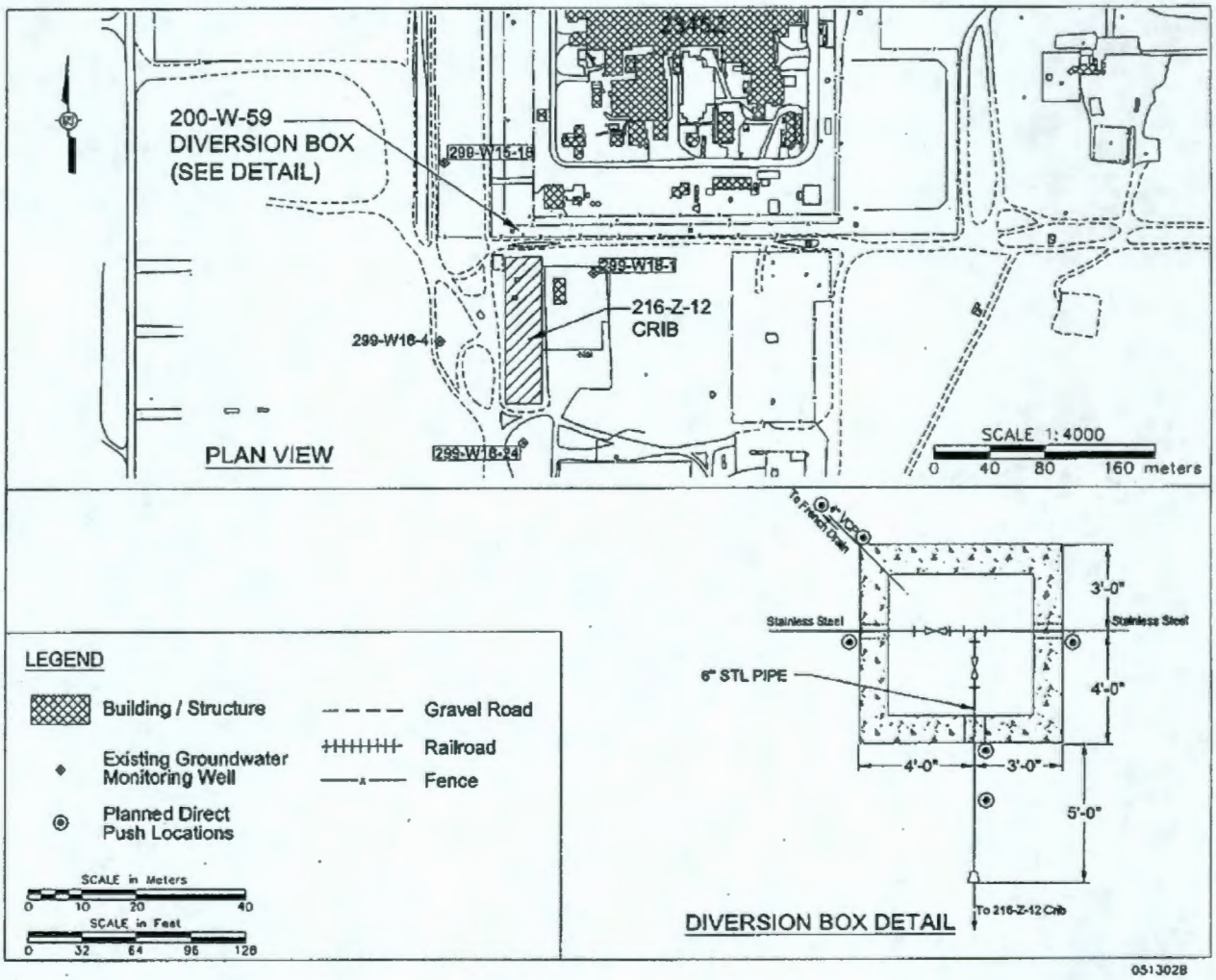
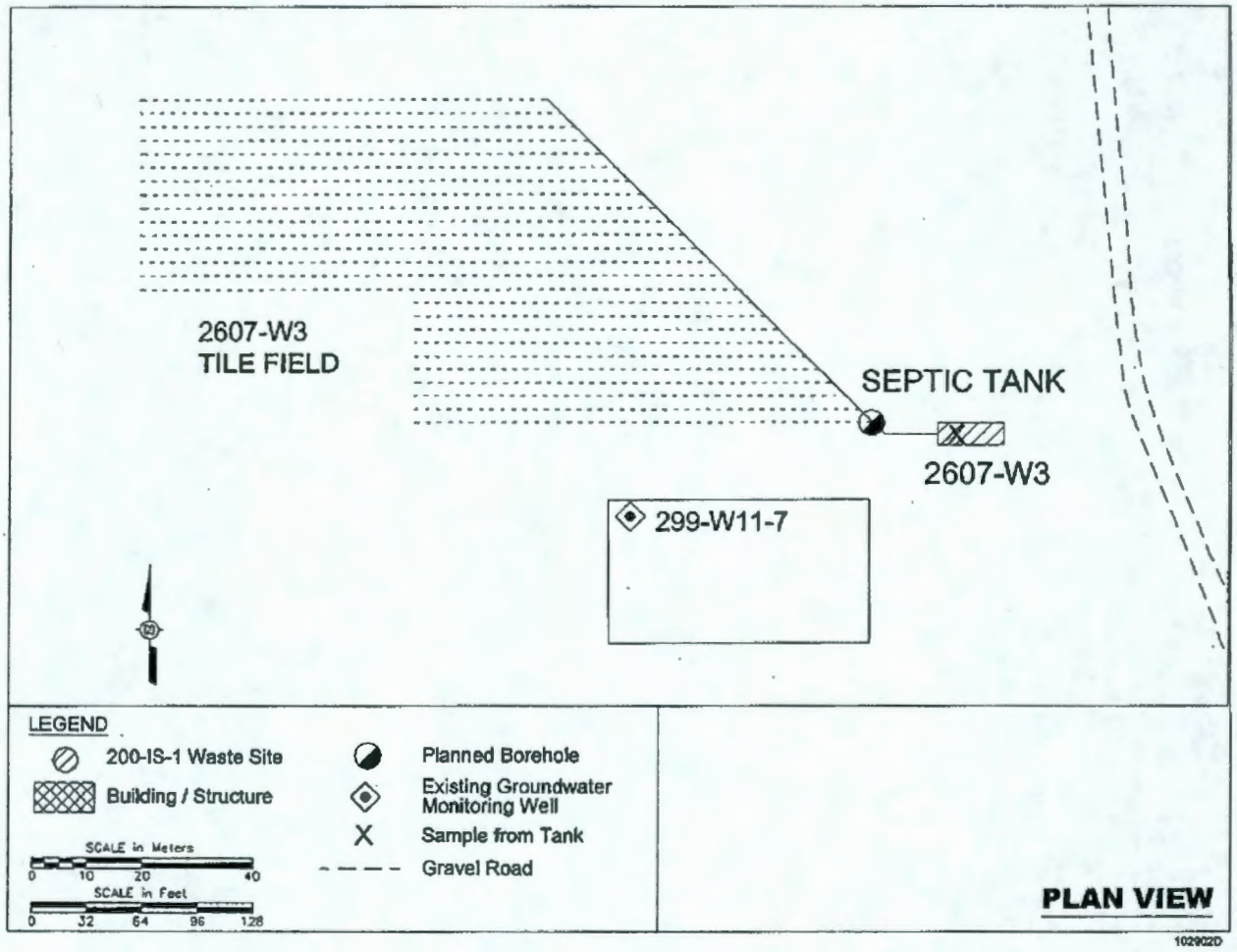


Figure 4-5. Location of Planned and Existing Boreholes at the 2607-W3 Septic Tank.



5.0 REMEDIAL INVESTIGATION/FEASIBILITY STUDY PROCESS

This section describes the RI/FS (assessment) process for the 200-IS-1 and 200-ST-1 OUs. The development of and rationale for this process are provided in DOE/RL-98-28 and are summarized in Figure 1-1. The process follows the CERCLA format with modifications to concurrently satisfy the requirements specific to RPP waste sites and RCRA TSD units undergoing closure. Section 5.1 summarizes the integrated regulatory process. Section 5.2 discusses a strategy to address ecological impacts in the 200 Areas. Section 5.3 outlines the tasks to be completed during the RI phase, including planning and conducting field sampling activities and preparing the RI report. These tasks are designed to effectively manage the work, satisfy the DQOs identified in Chapter 4, document the results of the investigation, and manage waste generated during field activities. Generally, the RI is expected to characterize the nature, the vertical extent, and in some cases the lateral extent of contamination within the confines of the waste site; contaminant concentration; and potential transport of contaminants. The RI also is expected to provide data to determine the need for and type of remediation. The information that will be collected to carry out these tasks is described in the SAP (Appendix B). Tasks to be completed following the RI include an FS with a RCRA TSD units closure plan (Section 5.4) and a proposed plan and proposed RCRA permit modification for RCRA TSD units and RPP sites, followed by an ROD and RCRA permit modification for RCRA TSD units and RPP sites (Section 5.5).

Project management occurs throughout the RI/FS process. Project management is used to direct and document project activities so that objectives of the work plan are met and the project remains within budget and on schedule. The initial project management activity will be to assign individuals according to roles established in Section 7.2 of DOE/RL-98-28. Other project management activities include day-to-day supervision of and communication with project staff and support personnel; meetings; control of cost, schedule, and work; records management; progress and final reports; quality assurance; health and safety; and community relations.

Appendix A of DOE/RL-98-28 provides the overall quality assurance framework that was used to prepare an OU-specific quality assurance project plan for the RI (Appendix A, Section A.2). Appendix B of DOE/RL-98-28 includes a review of data management activities that apply to the investigation activities at this OU and describes the process for the collection/control of data, records, documents, correspondence, and other information associated with OU activities.

5.1 REGULATORY PROCESS

RCRA and CERCLA will be integrated to address closure and environmental requirements at OUs as effectively and efficiently as possible. Integrating RCRA and CERCLA allows additional options for disposal, closure, removal, and/or remedial actions. By allowing flexibility in final disposal options, DOE, Ecology, and the EPA intend to minimize disposal costs as much as possible while remaining fully protective of human health and the environment.

The integrated process for characterization of the 200-IS-1 and 200-ST-1 OUs uses this RI/FS work plan in combination with DOE/RL-98-28 to satisfy the requirements for both an RI/FS

work plan and an RFI/CMS work plan. General facility background information, potential ARARs, preliminary RAOs, and preliminary remedial technologies developed in the Implementation Plan are incorporated by reference into this work plan. This work plan also provides RCRA TSD units closure plan information on facility description, location, and process information (Sections 2.1 and 2.2), waste characteristics (Chapter 3), and groundwater monitoring (Chapter 3). Following completion of the work plan, an RI will be performed that will satisfy the requirements for an RFI and will provide the data needed to support the selection of a closure strategy for RCRA TSD units. The RI will be limited to the concurrent investigation of representative waste sites and RCRA TSD units undergoing closure. Ecological sampling may occur as a result of a separate Central Plateau ecological DQO process. A report summarizing the results of the RI and any supplemental ecological sampling will be prepared that satisfies the requirements for a RFI report. The report also will contain the characterization information required in a RCRA TSD unit's closure plan.

After the RI is complete, remedial alternatives and closure strategies will be developed and evaluated against performance standards and evaluation criteria. The integration process for the evaluation of remedial alternatives includes preparing a CERCLA FS and closure plan and proposed plan that will satisfy the requirements for a CMS report and RCRA TSD units closure plans, including identification and development of corrective measures and remedial alternatives and their evaluation. The recommended alternative, which generally is included in the CMS, is in the proposed plan under CERCLA. The FS also will include a section that provides corrective action recommendations for RPPs.

The RCRA closure options (i.e., landfill, modified, and clean closure as defined in Condition II.K. of the Hanford Facility RCRA Permit) will be integrated with the CERCLA options and based on the alternative selected and the amount of cleanup that can be accomplished by the alternative. Landfill closure under RCRA will include the construction of an engineered barrier over the unit and equates to what is typically termed as a "containment alternative" under CERCLA. A modified closure option includes alternatives that leave contaminants in place above WAC 173-340-740 Method B cleanup standards in soil, debris, or groundwater. A clean closure option requires that all contaminated material and media be removed and decontaminated to levels below WAC 173-340-740 Method B.

The decision-making process for the 200-IS-1 and 200-ST-1 OUs will be based on the use of a proposed plan, ROD, and Hanford Facility RCRA Permit modification. Based on the FS-closure plan, a proposed plan will be prepared that identifies the preferred remedial alternative for waste sites within the OUs. The proposed plan will include a draft permit modification with unit-specific permit conditions for RPP waste sites and each RCRA TSD unit within the OU for incorporation into the Hanford Facility RCRA Permit. The CERCLA ROD will document the RCRA TSD unit closure and RCRA corrective action decisions for these units. The lead regulatory agency (Ecology) will prepare the CERCLA ROD following completion of the public involvement process for the proposed plan, which, after signature by the signatories to the Tri-Party Agreement, will authorize the selected remedial action. The remedy selected under CERCLA will be incorporated into the Hanford Facility RCRA Permit as the RCRA closure-corrective action after the public notice is issued and the comment process completed.

This process fully addresses each technical and procedural element of RCRA and CERCLA. The CERCLA public involvement, including public notice and opportunity to comment, will be enhanced, as necessary, to concurrently satisfy the public involvement requirements for the RCRA closure and RPP processes. The public will be given an opportunity to review and comment on the proposed permit conditions that will be contained in the proposed plan. The proposed plan with a draft permit modification will be issued for a minimum 45-day public review and comment period. Supporting documents, including the FS and closure plan, will be made available to the public for review at the same time. A combined public meeting-public hearing may be held during the comment period to provide information on the proposed action and permit modification and to solicit public comment.

This process is designed to ensure that redundant work is not required at the waste sites but that the CERCLA cleanup activities and RCRA corrective actions are integrated into one action.

5.2 REMEDIAL INVESTIGATION ACTIVITIES

This section summarizes the planned tasks that will be performed during the RI phase for the 200-IS-1 and 200-ST-1 OUs, including the following:

- Planning
- Field investigation
- Management of investigation-derived waste (IDW)
- Laboratory analysis and data verification
- Data evaluation and reporting.

These tasks and subtasks reflect the work structure that will be used to manage the work and develop the project schedule provided in Chapter 6.

5.2.1 Planning

The planning subtask includes activities and documentation that must be completed before field activities can begin. These include the preparation of a site-specific health and safety plan (HASP) in accordance with 29 CFR 1910.120 and a preliminary hazard classification. If required, a final hazard classification and safety analysis will be performed in accordance with approved procedures. Radiological work permits, excavation permits, supporting surveys (e.g., cultural, radiological, wildlife, and utilities), work instructions, personnel training, and the procurement of materials and services (e.g., drilling and geophysical logging services) also will be required. In addition, characterization locations identified in Figures 4-2 through 4-6 will be located using a global positioning satellite system.

DOE/RL-98-28, Appendix B, provides a general HASP that outlines health and safety requirements for RI activities. A site-specific HASP will be prepared for characterization activities, following requirements of the general HASP. Initial surface radiological surveys will be performed to document any radiological surface contamination and background levels in and around the sampling locations. This information will be used to document initial site conditions.

5.2.2 Field Investigation

The field investigation task involves data-gathering activities performed in the field that are required to satisfy the project DQOs. The field characterization approach is summarized in Section 4.2 and detailed in the SAP (Appendix B). The scope includes soil sampling and analysis to characterize the vadose zone at the 200-IS-1 and 200-ST-1 OU representative waste sites and RCRA TSD Units (the 241-CX Tank System, HSTF, 200-E-111 Tank Farm Process Piping, 200-W-59 Diversion Box and 2607-W-3 Septic Tank). Major subtasks associated with the field investigation include the following:

- Driven soil probes, borehole drilling, test pits, soil sampling, and collection of data from geophysical logging
- Preparation of a field report.

5.2.2.1 Driven Soil Probes, Borehole Drilling, and Soil Sampling

This subtask involves driving soil probes or drilling boreholes to perform soil gas monitoring or geophysical logging, or collect soil sample.

Samples will be collected with soil probe or split-spoon samplers and packaged for shipment to an offsite laboratory if radiation levels permit; otherwise, samples will be shipped to an onsite laboratory. At the completion of sampling, the driven soil probes and boreholes will be abandoned and the initial site conditions reestablished. Alternatively, the boreholes could be completed as groundwater monitoring wells if the Hanford Site groundwater monitoring program needs them. Other activities include work zone setup, mobilization and demobilization of equipment, equipment decontamination, and field analyses. Planned field analyses include radiological field screening, soil gas survey, geologic logging, and geophysical logging of soil probes and boreholes.

All samples and drill cuttings will be field screened for radionuclides to provide additional characterization data that will be used to assist in selecting sample intervals (e.g., hot spots) and establishing radiation control measures, and to ensure worker health and safety.

Geophysical logging will be used to gather in situ radiological and physical data from the borehole and from existing wells as specified in the SAP. Gross gamma, high-resolution SGL, or passive neutron monitoring will be performed to assess the distribution of gamma-emitting and neutron radionuclides. Neutron logging also will be performed for moisture content distribution over the borehole or well interval.

5.2.2.2 Preparation of Field Report

At the completion of the field investigation, a field report will be prepared to summarize activities performed and information collected in the field. The report will include survey data for driven soil probe and borehole locations, the number and types of samples collected and associated HEIS numbers, inventory of IDW containers, geological logs, field screening results, and geophysical logging results.

5.2.3 Management of Investigation-Derived Waste

Waste-designation DQOs will be established before beginning the characterization activities to ensure that the information collected during the field effort supports the designation of all project IDW. During the IDW DQO effort, any listed waste issues also will be resolved. Any additional sampling requirements or analytes needed to support designation activities will be identified and the requirements implemented through the waste-designation DQO summary report that will be prepared at that time.

Waste generated during the RI will be managed in accordance with a waste control plan to be prepared for the OU. DOE/RL-98-28, Appendix E, provides general waste management processes and requirements for this IDW and forms the basis for activity-specific waste control plans. The site-specific waste control plan addresses the handling, storage, and disposal of IDW generated during the RI phase. Furthermore, the plan identifies governing procedures and discusses types of waste expected to be generated, the waste designation process, and the final disposal location. The IDW management task begins when IDW is first generated at the start of the field investigation through waste designation and disposal.

5.2.4 Laboratory Analysis and Data Validation

Soil samples collected via boreholes will be analyzed for a suite of radiological and nonradiological constituents identified as COCs during the DQO, and for select physical properties based on established DQOs and as defined in the SAP. The SAP lists the analytes, methods, and associated target detection limits. This task includes the laboratory analysis of samples, the compilation of laboratory results into data packages, and the validation of a representative number of laboratory data packages.

5.2.5 Remedial Investigation Report

This section summarizes data evaluation and interpretation subtasks leading to the production of an RI report. The primary activities include a data quality assessment (DQA); evaluating the nature, extent, and concentration of contaminants based on sampling results; assessing contaminant fate and transport; refining the site conceptual models; and evaluating risks through a risk assessment. These activities will be performed as part of the RI report preparation task.

5.2.5.1 Data Quality Assessment

A DQA will be performed on the analytical data to determine if they are the right type, quality, and quantity for their intended use. The DQA completes the data life cycle of planning, implementation, and assessment that began with the DQO process. In this task, the data will be examined to see if they meet the analytical quality criteria outlined in the DQO and are adequate to evaluate the decision rules in the DQO.

5.2.5.2 Risk Assessment

The Tri-Parties recently undertook the task of developing a risk framework to support risk assessments in the Central Plateau. This included a series of workshops with representatives from DOE, EPA, Ecology, the Hanford Advisory Board (HAB), the Tribal Nations, the State of Oregon, and other interested stakeholders. The workshops focused on the different programs involved in activities in the Central Plateau and the need for a consistent application of risk assessment assumptions and goals. The results of the risk framework are documented in HAB advice #132 (HAB 132), in the Tri-Parties response to the HAB advice (Klein et al. 2002), and in the *Report of the Exposure Scenarios Task Force* (HAB 2002). The following items summarize the risk framework description from the Tri-Parties response to the HAB.

1. The Core Zone (200 Areas including B Pond (main pond) and S Ponds) will have an Industrial Scenario for the foreseeable future.

2. The Core Zone will be remediated and closed allowing for "other uses" consistent with an industrial scenario (environmental industries) that will maintain active human presence in this area, which in turn will enhance the ability to maintain the institutional knowledge of waste left in place for future generations. Exposure scenarios used for this zone should include a reasonable maximum exposure to a worker/day user, to possible Native American users, and to intruders.

3. DOE will follow the required regulatory processes for groundwater remediation (including public participation) to establish the points of compliance and remedial action objectives. It is anticipated that groundwater contamination under the Core Zone will preclude beneficial use for the foreseeable future, which is at least the period of waste management and institutional controls (150 yr). It is assumed that the tritium and iodine-129 plumes beyond the Core Zone boundary will exceed the drinking water standards for the period of the next 150 to 300 yr (less for the tritium plume). It is expected that other groundwater contaminants will remain below, or be restored to, drinking water levels outside the Core Zone.

4. No drilling for water use or otherwise will be allowed in the Core Zone. An intruder scenario will be calculated for in assessing the risk to human health and environment.

5. Waste sites outside the Core Zone but within the Central Plateau (200 North Area, Gable Mountain Pond, B/C Crib Controlled Area) will be remediated and closed based on an evaluation of multiple land-use scenarios to optimize land use, institutional control cost, and long-term stewardship.

6. An industrial land-use scenario will set cleanup levels on the Central Plateau. Other scenarios (e.g., residential, recreational) may be used for comparison purposes to support decision making, especially for:

   - The post-institutional controls period (>150 yr)

   - Sites near the Core Zone perimeter to analyze opportunities to "shrink the site"

- Early (precedent-setting) closure/remediation decisions.

7. This framework does not deal with the tank retrieval decision.

These items form the basis for the OU risk assessments to be conducted in the RI and FS reports.

5.2.5.2.1 Human Health Risk Assessment

For the 200-IS-1 and 200-AT-1 OUs, a quantitative, baseline human health risk assessment for the representative sites will be prepared, as part of the RI report, to evaluate risk to human receptors from potential exposure to contaminants in accessible surface sediments and shallow subsurface soils. The risk assessment also will evaluate the potential for contaminants currently in the vadose zone beneath the waste sites to impact groundwater in the future. Risks from current groundwater contamination will not be evaluated; this evaluation will be conducted as part of the RI/FS process for the groundwater OUs.

The risk assessment in the RI report will focus on the representative sites, because data collected through the RI at these sites are sufficient to allow quantification of risk. The risk assessment will follow the risk guidelines identified through the Risk Framework workshops as documented in the Tri-Parties response to HAB Advice #132 (Klein et al 2002).

The human health risk assessment will be conducted in accordance with appropriate subsections of WAC-173-340 and with the following DOE and U.S. Environmental Protection Agency (EPA) guidance documents:

- *Hanford Site Risk Assessment Methodology* (DOE/RL-91-45)
- *Risk Assessment Guidance for Superfund (RAGS), Volume I – Human Health Evaluation Manual, Part A (Interim Final),* (EPA/540/1-89/002)
- *Risk Assessment Guidance for Superfund, Vol. I Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors, (Interim Final)* (OSWER Directive 9285.6-03)
- *Exposure Factors Handbook* (EPA/600/P-95/002Fa)
- *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim* (EPA/540/R-99/005)
- *Proposed Guidelines for Carcinogen Risk Assessment* (EPA/600/P-92/003C)
- *Supplemental Guidance to RAGS: Calculating the Concentration Term* (OSWER Directive 9285.7-081).

Risks will initially be evaluated by comparison to risk-based standards such as WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties." Contaminants present at concentrations exceeding these risk-based standards will be considered further in the risk assessment process. Risks from nonradiological noncarcinogens will be evaluated by calculating

hazard quotients (HQs) for individual constituents and a hazard index (HI) for cumulative risk. Risks from nonradiological carcinogens and radionuclides will be evaluated by calculating incremental cancer risks for individual constituents and a cumulative cancer risk.

The computer program RESRAD (ANL/EAD-4) will be used to obtain risk and dose estimates from direct-contact exposure to radiological constituents present in the shallow zone of the waste sites. The RESRAD model will also be used to obtain risk and dose estimates for the protection of the groundwater pathway. The results obtained from the RESRAD model for the groundwater protection model are limited to screening purposes only. Additional analysis will be performed using an appropriate fate and transport model (e.g., STOMP [PNNL-11216, *STOMP -- Subsurface Transport Over Multiple Phases: Application Guide*]) to assess impact to the groundwater from chemicals and radionuclides in the vadose zone.

Because waste sites within the 200-IS-1 and 200-ST-1 OUs all are located inside the 200 Areas boundary, risk assessment will be performed for an industrial exposure scenario to establish the baseline risk. As part of the FS, additional risk assessment may be performed to evaluate other scenarios, such as a Native American scenario or an intruder scenario, to evaluate post-remediation residual risks.

Analogous waste sites will be evaluated in the FS following the analogous site approach described in Section 2.5.1 of DOE/RL-98-28. Figure 5-1 shows the process for evaluating the analogous sites against the representative sites for the RI/FS process, carried out through the confirmatory and design sampling processes, and for applying risk assessment results from the representative sites to the analogous sites. Important considerations in determining the appropriate representative site for an analogous waste site include the following:

- Waste site configuration and construction (e.g., pond, trench, surface structure)
- Volume of effluent received in relation to the available pore volume for the waste site
- Types and amounts of contaminants received; contaminant inventory
- Method of discharge and purpose of waste site
- Expected distribution of contamination based on method of discharge and purpose of waste site
- Geological setting
- Neighboring waste sites, structures, or utilities
- Potential for hydrologic and contaminant impacts to groundwater.

The available information from each waste site will be evaluated in the FS against information from the representative sites. In cases where characterization data are available from an analogous waste site, the data will be evaluated for sufficiency to support a site-specific evaluation of risk. If the data are sufficient, a risk estimate for the analogous site will be

calculated and then used to support the evaluation and selection of the appropriate remedial action for that waste site. If the data from a particular waste site are insufficient to support a risk estimate, the available data and information will be used to support the comparison and assignment to an appropriate representative site. In most cases, little or no characterization data are available from the analogous sites. In these instances, existing information from the WIDS database, discharge information, and general process information will be used to make assignments.

The characterization data from representative sites is intended to provide sufficient information to select remedies for the waste group. However, site-specific data may also be needed to verify that the selected remedial alternative is appropriate. Following the decision in the ROD, additional sampling would be conducted as needed to confirm the selected remedy for the analogous waste sites and to collect data to support remedial design. Following remedial action, an additional data collection activity would be conducted as needed to verify achievement of cleanup goals.

The risk analysis and data from the representative sites are used to support the risk evaluation and remedial decisions for those analogous sites without data to support a site-specific risk estimate. The use of the risk assessment from the representative sites presents some risk management decisions for the decision makers. If an analogous site is well represented by the representative site (i.e., the evaluation criteria of waste stream, size and construction, geology, waste inventory, effluent volume received, etc. are similar or equal to the representative site), then the decision to apply the representative site risk and preferred alternative pose minimal risk and minimal consequences of an incorrect decision. Similarly, if the representative site bounds the contamination problem at an analogous site, the application of the representative site risk and remedial action pose minimal consequences from a human health and ecological risk standpoint, but may significantly impact costs through the potential application of an unnecessary remedy. In this situation, no or limited confirmatory sampling may be needed to confirm the nature of the contamination, the risk, and the appropriate remedial action. Design data may be needed depending on the preferred alternative. If an analogous site is not bound by the representative site because contamination may be greater at that analogous site, then application of the representative site risk estimate and preferred alternative poses the greatest decision risk and resulting consequences. In this case, mandatory confirmatory sampling would be conducted to ensure selection of the appropriate alternative based on a better understanding of the nature and risk of the analogous site. This last scenario is unlikely for most sites because the analogous site approach tends to target the worst-case waste sites and the worst contamination locations in those sites in an effort to bound all the contamination circumstances associated with a waste group.

In some cases, the representative site may not appropriately represent a particular analogous site; however, a representative site from another OU may more closely align with the analogous site. In these instances, the representative sites from other OUs may be used to evaluate analogous sites. The analogous sites would be evaluated against the corresponding representative site using the process discussed above.

5.2.5.2.2 Ecological Risk Assessment

The screening-level ecological risk assessment in DOE/RL-2001-54 is meant to be a conservative evaluation of risk to ecological receptors from stressors, in this case, introduction of contaminants and habitat elimination. The screening–level ecological risk assessment identifies pathways for ecological receptors to be exposed to the contamination and evaluates potential risk from those exposures. The following describes the information found in specific sections of DOE/RL-2001-54.

Chapter 2.0 of DOE/RL-2001-54 describes the physical and ecological setting of the Central Plateau and identifies important aspects of the ecology and the condition of the waste sites to consider during the ecological risk assessment. For instance, while most waste sites are in a disturbed habitat with little vegetation to support wildlife, the nearby shrub-steppe offers a more habitable location for wildlife and needs protection in this region due to encroachment and elimination of this habitat in other parts of eastern Washington. Individual species whose populations are limited and are designated as sensitive species must also be protected. Recent surveys of the biological diversity on the Hanford Site have identified a number of new-to-science species and the protection status of these species has not yet been determined. More information is needed to help with this determination. Regarding the waste sites, most of the waste in the waste sites has been stabilized, thereby limiting ecological access. The decisions to stabilize and remediate waste sites must balance the potential disruption to the ecosystem both at and adjacent to the waste sites as well as from a distant location (e.g. borrow source sites).

The conceptual site model in DOE/RL-2001-54, Chapter 3.0, provides an understanding of the ecological resources and the ways that receptors may be exposed. It shows where chemicals and radionuclides from the waste sites are likely to come into contact with receptors in the environment. The exposure pathways that are expected to be complete at most waste sites include:

- Direct contact with, or ingestion of, soil by invertebrates (e.g., beetles, ants) and burrowing mammals.
- Uptake of contaminants in soil by vegetation
- Bioaccumulation through ingestion of food items (e.g., food chain effects) consumed by wildlife that may forage at the waste sites.

Chapter 4.0 of DOE/RL-2001-54 discusses the toxicity values that are available for contaminants believed to be present in the Central Plateau. Contaminants were identified from preliminary sampling data available from a subset of waste sites. These contaminants were then screened, primarily with respect to the likelihood to be present in the environment (i.e. half-life and persistence). A literature search for bird and mammalian toxicity values was performed. Toxicity values are not available for some contaminants. A risk management decision will be needed to determine how contaminants that do not have toxicity values will be handled during the risk assessment for each OU.

Chapter 5.0 of DOE/RL-2001-54 presents the exposure parameters used for estimating the exposure in a quantitative manner. In a screening-level ecological risk assessment most

exposure parameters are set conservatively at 100 percent. The only organism specific factor necessary will be body weight and these data are available in the literature. This section further evaluated the exposure pathways and constructed a food chain exposure model for wildlife specific to the Central Plateau. The wildlife are shown in the food chain and habitat model in DOE/RL-2001-54.

DOE/RL-2001-54, Chapter 6.0, is the screening-level risk calculation for the Central Plateau. The state and DOE provide contaminant-specific numerical values (WAC 173-340-900 and BCGs) to potential risks. These are conservative numbers designed to address all possibilities without leaving potential risks out of consideration. Data are available for a subset of the Central Plateau waste sites. These maximum concentrations of contaminants detected at the waste sites were compared with the state and DOE screening-level values. For chemicals, 12 metals, pentachlorophenol, and 4-dinitrophenol were detected at a maximum concentration above the screening level. The high number of metals presenting a risk requires closer examination. Site-specific bioavailability data would be helpful for understanding whether this is a reflection of the conservative nature of the screening assessment or an actual risk to the ecosystems at the waste sites. For radionuclides, cesium-137, radium-226, radium-228, and strontium-90 were above acceptable limits in the soil samples. It is important to recognize the limitations and uncertainty associated with risks identified by screening-level assessments. The risk calculations are useful for determining relative risks between waste sites, not site-specific risk. The information should be considered carefully along with actual biological evidence from the waste site area to determine if a hazard exists. There are data available for hundreds of wastes sites in the Central Plateau (see Appendix C of DOE/RL-2001-54). These data include soil from the waste site, vegetation, and soil invertebrates. As each OU quantifies their risk using the exposure models available, these data will be useful in verifying the mathematical estimates.

The screening level ecological risk assessment in DOE/RL-2001-54 leads to the problem formulation stage of a baseline ecological risk assessment. During problem formulation, the risk managers and others consider the toxicity evaluation, conceptual model exposure pathways, and assessment endpoints to support cleanup decisions. As a result, they are then able to better define the initial risks and determine direction for the DQO process, if needed. The DQO process will include the following activities:

- Establish the level of effort needed to assess ecological risk at a particular site or OU
- Identify relevant and available data
- Design a conceptual model of the ecological threats at a site and measures to assess those threats
- Select methods and models to be used in the various components of the risk assessment
- Develop assumptions to fill data gaps for toxicity and exposure assessments based on logic and scientific principles
- Interpret the ecological significance of observed or predicted effects.

Ecological risk will be evaluated using the EPA eight-step process as outlined in DOE/RL-2001-54, *Central Plateau Ecological Evaluation Report*. DOE/RL-2001-54 serves as the screening-level assessment for the Central Plateau. For the 200-IS-1 and 200-ST-1 OUs, DOE/RL-2001-54 provides the starting point for OU-specific ecological evaluations that will include a screening-level evaluation based on the data collected during the RI and other existing data as available, which will be compared to screening-level concentrations protective of wildlife. Because the waste sites in these OUs are all within the core zone, only terrestrial wildlife risks will be evaluated. Consistent with this approach, WAC 173-340-7490(3)(b) specifies that for industrial or commercial properties, current or potential for exposure to soil contamination need only be evaluated for terrestrial wildlife protection. Plants and biota need not be considered unless the species is protected under the federal Endangered Species Act. Currently, no Federally-listed threatened or endangered species are known to exist at the waste sites. Surveys prior to field activities will confirm the presence of protected species.

For radionuclides, screening levels have been developed in DOE/STD-1153-2002, *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota*. The international community has been involved for more than 20 years in evaluating the effects of ionizing radiation on plants and animals. The International Atomic Energy Agency (IAEA) issued a study in 1992, IAEA-TECDOC-332, *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*, endorsing the 1977 International Commission on Radiological Protection (ICRP) reports *Recommendations of the International Commission on Radiological Protection* (ICRP Publication 26 and ICRP Publication 60) and stating that chronic radiation dose rates below 0.1 rad/d will not harm plant and animal populations and that radiation standards for human protection will also protect populations of nonhuman biota. The report implies that dose limits of 0.1 rad/d for animals and 1 rad/d for plants will protect populations, but additional evaluation of effects may be needed if sensitive species are present.

Effects of Ionizing Radiation on Terrestrial Plants and Animals: A Workshop Report (ORNL/TM-13141) presents information from a Doe-sponsored workshop held in 1995. The workshop was attended by 12 experts in radioecology and ecological risk assessment. The goal of the workshop was to evaluate the adequacy of current approaches to radiological protection, as exemplified by the IAEA report. The attendees reviewed DOE's perspective and responsibilities, rationales underlying the IAEA conclusions, and a summary of ecological data from the former Soviet Union. The consensus of the workshop participants was that the 0.1-rad/d limit for animals and the 1-rad/d limit for plants recommended by the IAEA are adequately supported by the available scientific information. However, they concluded that guidance on implementing the limits is needed and that the existing data support application of the recommended limits for populations of terrestrial and aquatic organisms to representative rather than maximally exposed individuals.

In response to the workshop findings, DOE produced DOE/STD-1153-2002, which provides a graded approach to ecological risk assessment for radionuclides and screening level BCGs. For radiological constituents, no promulgated screening or cleanup levels are available. The BCGs from DOE/STD-1153-2002 will be used in the ecological evaluation of radiological constituents.

DOE/RL-2001-54 is foundational to the Central Plateau ecological evaluation DQO process to be conducted in fiscal year 2003. This DQO process will further develop data gaps identified in DOE/RL-2001-54 and identify data needs for the Central Plateau to support remedial decision making. An ecological evaluation SAP will be prepared and implemented for the Central Plateau, either on an area-wide basis or by OU, depending on the actual data needs.

Based on the results of the DQO and the screening-level evaluation, additional risk assessment activities, including a baseline ecological risk assessment, may be conducted using the eight-step process. The evaluation will be conducted based on soil data collected during the RI, existing soil and ecological data, and if identified during the Central Plateau ecological evaluation DQO, newly collected ecological data.

5.2.5.3 Data Evaluation and Conceptual Model Refinement

This task will consist of evaluating the information collected during the investigation. The nonradiological and radiological data obtained from the boreholes will be compiled, tabulated, and statistically evaluated to gain as much information as possible to satisfy data needs. Data evaluation tasks may include the following:

- Graphically evaluating the data for vertical distribution of contamination within each driven soil probe, borehole, or test pit as required
- Stratifying the data and computing basic statistical parameters such as mean and standard deviation for individual levels when sufficient data are available. This evaluation can provide an indication of contaminant distribution
- Constructing contour diagrams and variograms to evaluate spatial correlations within each stratum. This evaluation will indicate whether or not contamination is concentrated in a particular area (e.g., near the influent end for trenches)
- Performing statistical tests on the data to evaluate the presence or absence of contamination. This step has many facets including determining the distribution of the data and selecting the appropriate statistical tests. The initial screening for contamination should evaluate the data with respect to background, by using simple comparisons of an upper bound of the data to background concentrations (e.g., "Model Toxics Control Act" tests), or through more complex comparisons, such as nonparametric hypothesis tests (e.g., Wilcoxon Rank Sum Test). These tests also can be used to compare the data to appropriate cleanup levels.

These statistical evaluations will aid in refining the conceptual model for this OU and selecting the remedial alternative. However, because the sites within the 200-IS-1 and 200-ST-1 OUs represent point-source types of releases, statistical analysis might not always be possible. Single boreholes are planned at the representative sites; if the resulting data are not sufficient for statistical analysis, maximum or average concentrations will be used in the data evaluation process.

Data on the soil physical properties will be used to determine the soil type, which will assist in choosing the proper unsaturated hydraulic conductivity-moisture retention curve. Identifying the

soil type and soil moisture will allow the determination of unsaturated hydraulic conductivity, which will be used as needed in modeling flow and transport (see Section 5.3.5.3).

The combined chemical, physical, and geophysical data for the 200-IS-1 and 200-ST-1 OU representative sites will be used for correlating subsurface data, for refining the preliminary conceptual contaminant distribution models, and as inputs to a QRA.

5.3 FEASIBILITY STUDY AND RCRA TREATMENT, STORAGE, AND DISPOSAL UNIT CLOSURE PLAN

After the RI is complete, remediation alternatives and closure strategies will be developed and evaluated against performance standards and evaluation criteria in the FS and appended RCRA TSD unit closure plans. The FS process consists of the following steps:

1. Defining RAO and RCRA closure and RCRA corrective action performance standards
2. Identifying general response actions (GRA) to satisfy RAOs
3. Identifying potential technologies and process options associated with each GRA
4. Screening process options to select a representative process for each type of technology based on its effectiveness, implementability, and cost
5. Assembling viable technologies or process options into alternatives representing a range of treatment and containment plus a no-action alternative.

Evaluating alternatives and presenting information needed to support remedy selection and RCRA closure of the unit as a landfill or under modified or clean closure pursuant to Hanford Facility RCRA Permit Condition II.K (WA 7890008967, *Hanford Facility RCRA Permit*).

Remedial action alternatives considered to apply to the 200-IS-1 and 200-ST-1 OUs are as follows:

- No-action alternative (no institutional controls)
- Engineered multimedia barrier
- Excavation and disposal of waste
- In situ vitrification of soil
- In situ grouting or stabilization
- Monitored natural attenuation (with institutional controls).

During the detailed analysis, each alternative will be evaluated against the following CERCLA criteria (40 CFR 300.430):

- Overall protection of human health and the environment
- Compliance with ARARs
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness

- Implementability
- Cost
- State acceptance.

One additional modifying criterion, community acceptance, will be applied following the FS at the proposed plan and ROD phase.

National Environmental Policy Act of 1969 values also will be evaluated as part of DOE's responsibility under this authority. *National Environmental Policy Act of 1969* values include impacts to natural, cultural, and historical resources; socioeconomic aspects; and irreversible and irretrievable commitments of resources.

The RCRA closure performance standards (WAC 173-303-610[2]) also will be used to evaluate the ability of alternatives to comply with RCRA closure requirements. These standards require the closure of TSD units in a manner that achieves the following:

- Minimizes the need for further maintenance

- Controls, minimizes, or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous waste constituents, leachate, contaminated run-off, or dangerous waste decomposition products to the ground, surface water, groundwater, or the atmosphere

- Returns the land to the appearance and use of surrounding land areas to the degree possible, given the nature of the previous dangerous waste activity.

In addition, RCRA corrective action performance standards (WAC 173-303-646[2]) will be used to evaluate how well the alternatives comply with RCRA corrective action requirements. These standards state that corrective action must achieve the following:

- Protect human health and the environment for all releases of dangerous waste and dangerous constituents, including releases from all solid waste management units at the facility

- Occur regardless of the time at which waste was managed at the facility or placed in such units, and regardless of whether such facilities or unit were intended for the management of solid or dangerous waste

- Be implemented by the owner/operator beyond the facility boundary where necessary to protect human health and the environment.

The FS also will include supporting information needed to complete the detailed analysis and meet regulatory integration needs, including the following:

- Summarize the RI, including the nature and extent of contamination, the contaminant distribution models, and an assessment of the risks to help establish the need for remediation and to estimate the volume of contaminated media

- Refine the conceptual exposure pathway model to identify pathways that might need to be addressed by remedial action
- Provide a detailed evaluation of potential ARARs, beginning with potential ARARs identified in the Implementation Plan (DOE/RL-98-28, Section 4.0)
- Refine potential RAOs and PRGs identified in the Implementation Plan (DOE/RL-98-28, Section 5.0) based on the results of the RI, ARAR evaluation, and current land-use considerations
- Refine the list of remedial alternatives, identified in the Implementation Plan (DOE/RL-98-28, Appendix D) and in this section, based on the RI
- Provide corrective action recommendations for RPPs to fulfill the requirements for a CMS report
- Include as appendices closure plans to address RCRA TSD units in the OU. The closure plans will incorporate, by reference, specific sections of the work plan or RI report containing specific closure plan information. The closure plans will include closure performance standards, a closure strategy, general closure activities including verification sampling, and a general post-closure plan.

Additional RCRA integration guidance for preparing an FS/closure plan is provided in DOE/RL-98-28, Section 2.4.

5.4 PROPOSED PLAN AND PROPOSED RCRA PERMIT MODIFICATION

The decision-making process for the 200-IS-1 and 200-ST-1 OUs will be based on the use of a proposed plan, ROD, and modification to the Hanford Facility RCRA Permit. The proposed plan also will include a draft permit modification with unit-specific permit conditions for RPPs and the RCRA TSD units for incorporation into the Hanford Facility RCRA Permit.

During the RI/FS process, a number of options for development of proposed plans and RODs will be evaluated. Remedial decisions may proceed on an OU by OU basis, but it is also likely that alternative site groupings will be considered for waste sites in the Central Plateau. Several alternatives are currently under consideration, some of which may be utilized for the waste sites addressed in this work plan.

Three alternatives to the OU by OU remediation approach have been identified to provide flexibility in the decision-making process, facilitate early action, and remediate and close specific areas or zones. Examples of these alternatives are presented below.

5.4.1 High Risk Waste Sites Identified for Early Action

This alternative accelerates the start of remedial actions and closure of waste sites that present an ongoing or expected future threat to groundwater. Some Central Plateau high-risk sites have

already been identified for early actions within the B/C Control Area and near U Plant, PUREX, and PFP. These sites will be included in a proposed plans and RODs that promote early action.

5.4.2 Regional Site Closure

Waste site remedial decision-making may be realigned under a regional closure strategy that aligns wastes sites into groups defined by geographical zones. Under this strategy, waste sites in a geographical area may be remediated as a group, even though they may be in different OUs. A strategy to implement this regional closure strategy is being developed.

5.4.3 Waste Site Grouping by Characteristics or Hazards

A third example of remedial decision-making strategies would be based on a specific characteristic or hazard that mandate additional requirements, such as supplemental ARARs, or more robust remedial alternatives. For example there are a number of waste sites in other OUs that are suspected to contain concentrations of transuranic radionuclides in excess of the 100n/Ci per gram concentration limit for designation as TRU waste. Waste sites containing concentrations of TRU radionuclides above 100 nCi/gram may require selective removal actions or more protective barrier designs to prevent intrusion based on this particular hazard. Such alternatives might not be required for other process condensate or process waste sites within 200-IS-1 or 200-ST-1 OUs where only low-levels of radionuclides are expected. Grouping waste sites with other similarly contaminated soil sites in other OUs could streamline the decision-making process and tailor the requirements and alternatives to these specific hazards.

Following the completion of the FS/closure plan, a plan will be prepared that identifies the preferred remedial alternative for the OU. The preferred remedial alternative will include RCRA closure and corrective action requirements. In addition to identifying the preferred alternative, the proposed plan will serve the following purposes:

- Summarize the completed RI/FS
- Provide criteria by which analogous waste sites within the OUs not previously characterized will be evaluated after the ROD to confirm that the contaminant distribution model for the site is consistent with the preferred alternative. Contingencies to move a waste site to a more appropriate waste group also will be developed
- Identify performance standards and ARARs applicable to the OUs.

After the public review process is complete, the lead regulatory agency will make a final decision on the remedial action to be taken. The decision will be documented in a ROD. Ecology then will modify the Hanford Facility RCRA Permit to incorporate the ROD (and subsequent amendments) by reference, authorizing the RCRA actions.

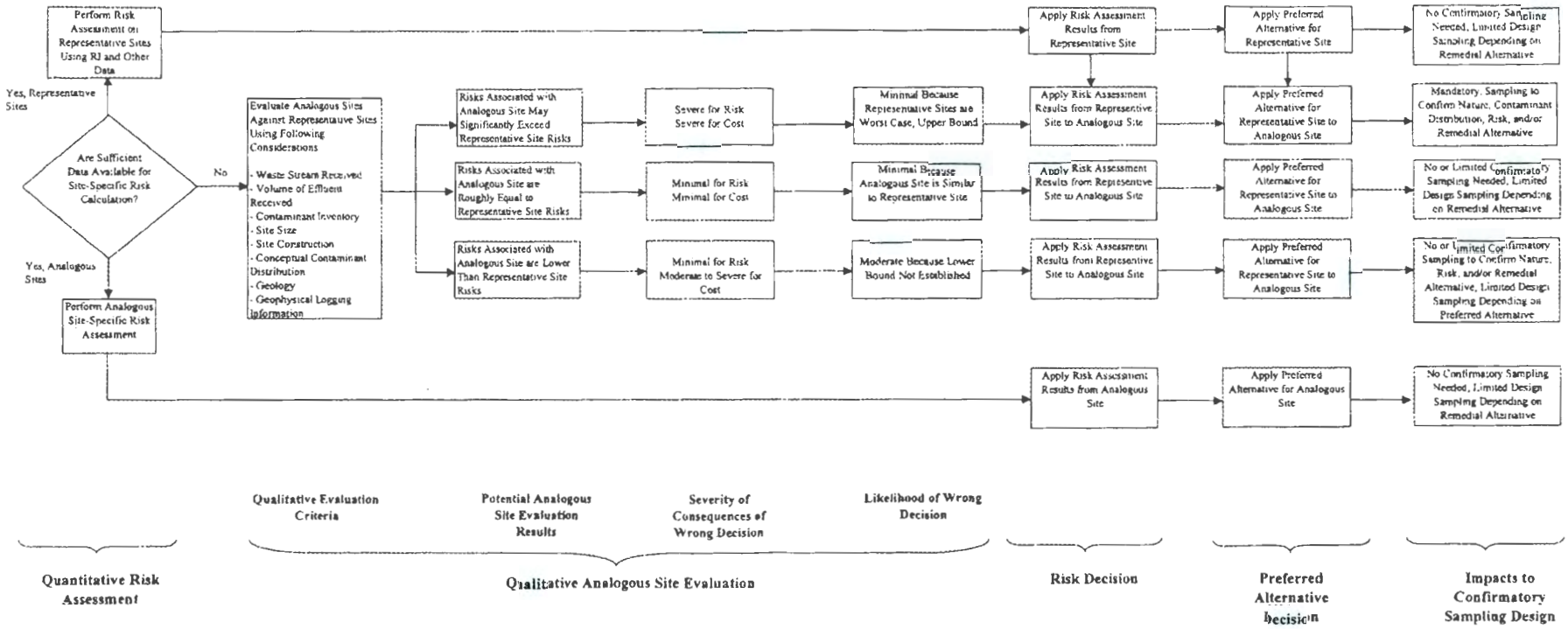
5.5 POST-RECORD OF DECISION ACTIVITIES

After the ROD and Hanford Facility RCRA Permit modification have been issued, a remedial design report (RDR) and remedial action work plan (RAWP) will be prepared to detail the scope of the remedial action, which will include RCRA closure and corrective action requirements. As part of this activity, DQOs will be established and SAPs will be prepared to direct confirmatory and verification sampling and analysis efforts. Before beginning remediation, confirmation sampling will be performed to ensure that sufficient characterization data are available to confirm that the selected remedy is appropriate for all waste sites within the OU, to collect data necessary for the remedial design, and to support future risk assessments, if needed. Verification sampling will be performed after the remedial action is complete to determine if ROD requirements have been met and if the remedy was effective. Additional guidance for confirmatory and verification sampling is provided in DOE/RL-98-28, Section 6.2.

The RDR/RAWP will contain an integrated schedule of remediation activities for the OU, including the schedule for RCRA TSD unit closures, and will satisfy the requirements for an RPP corrective measures implementation work plan and design report. Remediation activities will be designed to ensure integration of CERCLA cleanup activities and RCRA corrective actions and closure. Following the completion of the remediation effort, closeout activities will be performed as specified in the ROD, RDR/RAWP, and the Permit.

The RCRA closure activities and schedules will be defined in the closure plan and will be consistent with those identified in the RDR/RAWP. Enforceable sections of the closure plan will be identified in the Hanford Facility RCRA Permit modification. Certification of closure in accordance with WAC 173-303-610(6) will be performed after cleanup actions are complete. The site will be restored as appropriate for future land use. If clean closure is not attained at a TSD unit, post-closure care requirements will be met. These requirements will include final-status groundwater monitoring, maintenance and monitoring of institutional controls and/or surface barriers, and certification of post-closure at the completion of the post-closure.

Figure 5-1. Application of Analogous Site Approach.



6.0 PROJECT SCHEDULE

The project schedule for activities discussed in this work plan is shown in Figure 6-1. This schedule will serve as the baseline for the work planning process and will be used to measure the progress of implementing this work plan. The schedule for preparing, reviewing, and issuing the RI report and FS/closure plan also is shown in Figure 6-1. The schedule concludes with the preparation of an ROD. The Hanford Facility RCRA Permit will be modified after the ROD is issued, during Ecology's annual modification process.

The portions of the schedule most germane to this work plan and the SAP (Appendix B) are FY 2002. One Tri-Party Agreement milestone that is associated with this work plan is:

> "M-013-00M: Submit one 200 NPL RI/FS (RFI/CMS) Work Plan for the 200-IS-1, Tanks/Lines/Pits Diversion Boxes OU (Includes waste sites in the 200-ST-1, Septic Tank and Drain Fields OU) by December 31, 2002."

The following are proposed project milestone completion dates for key activities:

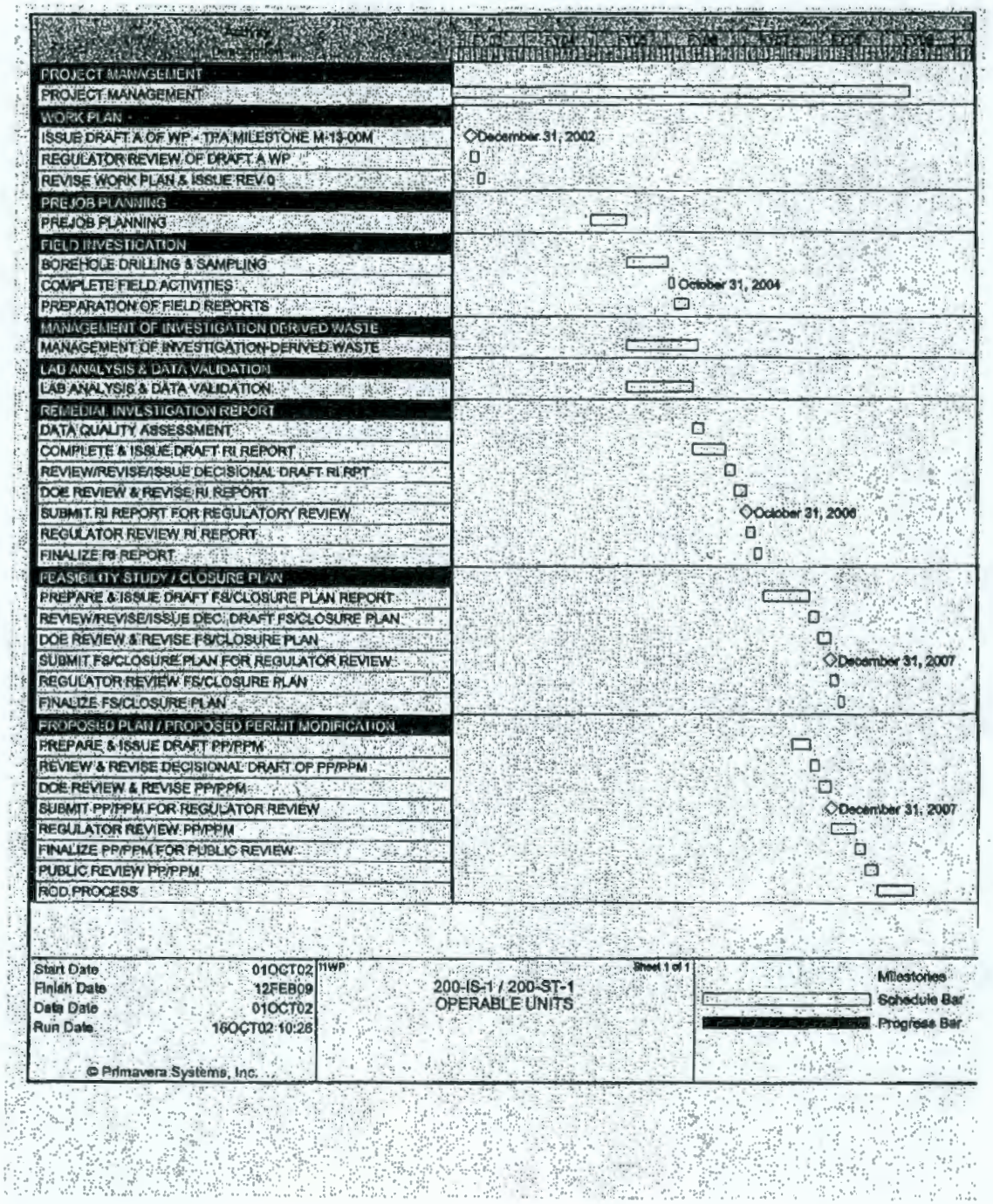
- Submit RI report for regulatory review: October 31, 2006*
- Submit FS/closure plan for regulator review: December 31, 2007*
- Submit proposed plan/permit modification for regulator review: December 31, 2007*.

Interim milestones to be designated under the Tri-Party Agreement will be established through negotiations between DOE, Ecology, and the EPA. A Class II change form will be submitted to Ecology and the EPA to request the addition of any interim milestones.

---

* Target project milestone

Figure 6-1. Project Schedule for the 200-IS-1 and 200-ST-1 Operable Units.



7.0 REFERENCES

10 CFR 830, "Nuclear Safety Management," *Code of Federal Regulations*, as amended.

29 CFR 1910.120, "Hazardous Waste Operations and Emergency Response," *Code of Federal Regulations*, as amended.

40 CRF 268, "Land Disposal Restrictions", *Code of Federal Regulations,* as amended.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," Appendix B, "National Priority List," *Code of Federal Regulations*, as amended.

64 FR 61615, "Hanford Comprehensive Land-Use Plan Environmental Impact Statement (HCP EIS), Hanford Site, Richland, Washington; Record of Decision (ROD)," *Federal Register*, Vol. 64, No. 218, pp. 61615, November 12, 1999.

12712-PCL88-019, 1988, *Analysis of Sludge Samples from Hot Semiworks Tank CX-70,* Westinghouse Hanford Company, Richland, Washington.

AR00227, 1974, "Disposition and Isolation of Tanks 270-E-1, 270-W, 241-CX-70, 241-CX-71, and 241-CX-72," letter from D. G. Harlow to J. A. Teal, dated July 2, 1974, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-1608, 1970, *Radioactive Contamination in Liquid Wastes Discharged to Ground Within the Chemical Separations Area Control Zone*, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-2757, 1973, *Radioactive Liquid Wastes Discharged to the Ground in the 200 Areas During 1972*, Part 3, Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-639, 1976, *Integrity of Tanks 276-S-141 and 276-S-142,* Atlantic Richfield Hanford Company, Richland, Washington.

ARH-CD-685, 1976, *Characterization of the Contents of Organic Waste Storage Tanks 276-S-141 and 276-S-142*, Atlantic Richfield Hanford Company, Richland, Washington.

BHI-00033, 1994, *Surface and Near Surface Field Investigation Data Summary Report for the 200-UP-2 Operable Unit*, Bechtel Hanford, Inc., Richland, Washington.

BHI-00034, 1995, *Borehole Summary Report for the 200-UP-2 Operable Unit, 200 West Area*, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

BHI-00174, 1995, *U Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI-00177, 1995, *T Plant Aggregate Area Management Study Technical Baseline Report*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI-00184, 1995, *Miocene- to Pliocene-Aged Suprabasalt Sediments of the Hanford Site, South-Central Washington*, Rev. 0, Bechtel Hanford, Inc., Richland, Washington.

BHI-00270, 1996, *Pre-Operational Baseline and Site Characterization Report for the Environmental Restoration Disposal Facility*, Vols. 1 and 2, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-01, *Environmental Investigations Procedures*, Bechtel Hanford, Inc., Richland, Washington.

CCN 079387, 2000, "Notice of Correction for Stabilization of Hexone Storage and Treatment Facility," BHI Docket Number 00NWPKM006, dated May 26, 2000, Letter from R. Wilson to K. Klein, U.S. Department of Energy, Richland Operations Office, and M. C. Hughes, Bechtel Hanford, Inc., Washington State Department of Ecology, Olympia, Washington.

CCN 088368, 2001, "Hexone Tanks 276-S-141 and 142, VHS Videotape Notes," Interoffice Memorandum from R. G. Egge to File, dated April 3, 2001, Bechtel Hanford, Inc., Richland, Washington

CCN 089928, 2001 "Notice of Correction for Stabilization of the Hexone Storage and Treatment Facility," Letter from F. Jamison to M. C. Hughes, Bechtel Hanford, Inc., and K. Klein, U.S. Department of Energy, Richland Operations Office, dated May 22, 2001, Washington State Department of Ecology, Olympia, Washington.

CCN 095038, 2001, "Approval for Stabilization of the Hexone Storage and Treatment Facility," Letter from R. Wilson to P. Knollmeyer, U.S. Department of Energy, Richland Operations Office, and M. C. Hughes, Bechtel Hanford, Inc., dated December 13, 2001, Washington State Department of Ecology, Olympia, Washington.

CCN 100786, 2002, "276-S-141/142 Hexone Storage Tank Sludge Sampling Results," Interoffice Memorandum from I. D. Jacques to M. J. Galgoul, dated June 28, 2002, Bechtel Hanford, Inc., Richland, Washington.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 601, et seq.

CP-13196, 2002, *Remedial Investigation Data Quality Objectives Summary Report – 200-IS-1 and 200-ST-1 Operable Units*, CP-13196, Internal Draft, Fluor Hanford, Inc., Richland, Washington.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

DOE/RL-88-21, 1993, *Dangerous Waste Permit Application,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-91-19, 1993, *200-UP-2 RCRA Facility Investigation/Corrective Measures Study,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-91-52, 1992, *U Plant Source Aggregate Area Management Study Report,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-91-58, 1992, *Z Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-91-60, 1992, *S Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-91-61, 1992, *T Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-92-04, 1993, *PUREX Plant Source Aggregate Area Management Study Report,* U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-92-05, 1993, *B Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-92-18, 1993, *SemiWorks Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-92-40, 1992, *Hexone Storage and Treatment Facility Closure Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-95-13, 1995, *Limited Field Investigation for the 200-UP-2 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-96-81, 1997, *Waste Site Grouping for 200 Areas Soil Investigations,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-96-82, 1996, *Hanford Facility Dangerous Waste Closure Plan, 241-Z Treatment and Storage Tanks*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-98-28, 1999, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan–Environmental Restoration Program*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-38, 2001, *200-TW-1 Scavenged Waste Group Operable Unit and 200-TW-2 Tank Waste Group Operable Unit RI/FS Work Plan,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-60, 2001, *200-PW-1 Uranium Rich Process Waste Group Operable Unit RI/FS Work Plan and Process Waste RCRA TSD Unit Sampling Plan*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2000-73, 2000, *Sampling and Analysis Plan for the 276-S-141/142 Hexone Tank Stabilization/Characterization Project,* Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-01, 2001, *200-PW-1 Plutonium-Rich/Organic-Rich Process Waste Group Operable Unit RI/FS Work Plan,* Decisional Draft, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2001-54, 2002, *Central Plateau Ecological Evaluation Report,* Draft B, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RW-0164-F, 1988, *Consultation Draft, Site Characterization Plan, Reference Repository Location, Hanford Site, Washington*, U.S. Department of Energy, Washington, D.C.

Ecology, 1995, *Washington State Department of Ecology Toxics Cleanup Program Guidance on Sampling and Data Analysis Methods,* Washington State Department of Ecology, Olympia, Washington.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA QA/G-4, 1994, *Guidance for Data Quality Objectives Process*, U.S. Environmental Protection Agency, Washington, D.C.

ES-SSPM-001, 1998, *Sampling Services Procedures Manual*, Rev. 0, Waste Management Northwest, Richland, Washington.

Gano, K. A., 1980, "Mortality of the Harvester Ant (Pogonomyrmex owyheei) After Exposure to 137Cs Gamma Radiation," in *Environ. Entomol,* 10:39-44.

Hanford Site Drawings:

- H-2-20986, *Crib + Test Wells for 2345 Bldg Wastes*
- H-2-20987, *Crib 216-Z-12 Plan Sections + Details*
- H-2-20988, *Crib 216-Z-12 Plan Sections + Details*
- H-2-4010, *Strontium Semiworks & Vicinity Outside Lines Key Map*
- H-2-4093, *Hot Semiworks Process Piping Plan A Cell*
- H-2-4105, *Hot Semiworks Engineering Flow Sketch*
- H-2-4335, *Hot Semiworks Waste Line Bldg 201-C to TK-70*
- H-2-4420, *Plot Plan Hot Semiworks Waste Self Concentrator*
- H-2-44511, sheet 87, *Area Map 200 West Z Plant Facilities*
- H-2-4535, *Site Plan + Underground Piping Strontium Facilities*
- H-2-5304, *276 Organic-Solvent Make-Up Storage Piping*

- W-71192, *Hanford Engineer Works Septic Tanks Plan and Sections*

HEIS, *Hanford Environmental Information System*, Hanford Site database.

HNF-5507, 2000, *Subsurface Condition Report for the B-BX-BY Waste Management Area*, Rev. 0A, CH2M Hill Hanford Group Inc., Richland, Washington.

HNF-SD-HTI-TI-001, 1998, *AX Tank Farm Waste Inventory Study for the Hanford Tanks Initiative Project*, Rev. 0A, Numetec Hanford Corporation, Richland, Washington.

HW-10475, 1944, *Hanford Engineer Works Technical Manual (T/B Plants)*, Parts A, B, and C, General Electric Company, Richland, Washington.

HW-19140, 1951, *Uranium Recovery Technical Manual*, General Electric Company, Richland, Washington.

HW-31767, 1954, *Hot Semiworks REDOX Studies*, General Electric Company, Richland, Washington.

HW-31373, 1954, *PUREX Chemical Flowsheet HW Number 3 Chemical Development Unit Separations Technology Subsection Technical Sec Engineering Department*, General Electric Company, Richland, Washington.

HW-52860, 1957, *Standby Status Report Hot Semiworks Facility*, General Electric Company, Richland, Washington.

HW-72666, 1963, *Hot Semi-Works Strontium-90 Recovery Program*, General Electric Company, Richland, Washington.

IAEA-TECDOC-332, 1982, *Effects of Ionizing Radiation on Plants and Animals at Levels Implied by Current Radiation Protection Standards*, International Atomic Energy Agency, Vienna, Austria.

ICRP Publication 26, 1977, *Recommendations of the International Commission on Radiological Protection*, International Commission on Radiological Protection, Pergamon Press, New York.

ICRP Publication 60, 1990, *Recommendations of the International Commission on Radiological Protection*, International Commission on Radiological Protection, Pergamon Press, New York.

Metz, 1972 "PSS Line Leak (Line No. 812)," (letter to G. L. Borshiem from W. P. Metz to G. L. Borshiem), Atlantic Richfield Hanford Company, Richland, Washington, dated November 9.

National Environmental Policy Act of 1969, 42 U.S.C. 4321, et seq.

NAVD88, 1988, *North American Vertical Datum of 1988*, National Geodetic Survey, Federal Geodetic Control Committee, Silver Springs, Maryland.

ORNL-5621, 1980, *ORIGENZ-A Revised and Updated Version of the Oak Ridge Isotope Generation and Depletion Code*, Oak Ridge National Laboratory, Oak Ridge, Tennessee.

94-RPS-005, "Hanford Facility Dangerous Waste Part A Permit Application Form 3, Revision 2, for the 241-CX Tank System (WA7890008967)", (Letter to D. Butler, Washington State Department of Ecology, Olympia, Washington, from J. D. Bauer, U. S. Department, Richland Field Office, and R. E. Lerch, Westinghouse Hanford Company), October 25.

PNL-2253, 1977, *Ecology of the 200 Area Plateau Waste Management Environs: A Status Report*, Pacific Northwest Laboratory, Richland, Washington.

PNL-4657, 1983, *Environmental Surveillance at Hanford for CY-1982*, Pacific Northwest Laboratory, Richland, Washington.

PNL-5506, 1986, *Hanford Site Water Changes--1950 through 1980, Data Observation and Evaluation,* Pacific Northwest Laboratory, Richland, Washington.

PNL-7336, 1990, *Geohydrology of the 218-W-5 Burial Ground, 200-West Area, Hanford Site*, Pacific Northwest Laboratory, Richland, Washington.

PNL-10174, 1994, *A Qualitative Evaluation of Radionuclide Concentrations in Hanford Site Wildlife, 1983 Through 1992,* Pacific Northwest Laboratory, Richland, Washington.

PNNL-12088, 1999, *Hanford Site Near-Facility Environmental Monitoring Data Report for Calendar Year 1998*, Appendix 2, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13230, 2000, *Hanford Environmental Monitoring Report for Calendar Year 1999*, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13316, 2000, *Hanford Site Groundwater Monitoring for Fiscal Year 1999*, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13230, 2000, *Hanford Site Near-Facility Environmental Monitoring Data report for Calendar Year 1999*, Appendix 2, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13404, 2001, *Hanford Site Groundwater Monitoring for Fiscal Year 2000*, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13487, 2001, *Hanford Site Environmental Report for Calendar Year 2000*, Pacific Northwest National Laboratory, Richland, Washington.

PNNL-13788, 2002, *Hanford Site Groundwater Monitoring for Fiscal Year 2001,* Pacific Northwest National Laboratory, Richland, Washington.

Publication No. 94-145, 2001, *Cleanup Levels and Risk Calculations Under the Model Toxics Control Act Cleanup Regulation Version 3.1,* (Updated November 2001), Washington State Department of Ecology, Olympia, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

RHO-CD-673, 1990, *Handbook 200 Areas Waste Sites*, Rockwell Hanford Operations, Richland, Washington.

RHO-ST-21, 1978, *Report on Plutonium Mining Activities at 216-Z-9 Enclosed Trench,* Rockwell Hanford Operations, Richland, Washington.

RHO-ST-44, *216-Z-12 Transuranic Crib Characterization: Operational History and Distribution of Plutonium and Americium*, Rockwell Hanford Operations, Richland, Washington.

RL-TPA-90-0001, 1998, *Tri-Party Agreement Handbook Management Procedures,* Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)," U.S. Department of Energy, Richland Operations Office, Richland, Washington.

RPP-7123, 2001, *Subsurface Conditions Description of the T-TX-TY Waste Management Area,* Rev. 0, CH2M Hill Hanford Group Inc., Richland, Washington.

RPP-7494, 2001, *Historical Vadose Zone Contamination from A, AX, and C Tank Farm Operations*, prepared by Fluor Federal Services for CH2M HILL Hanford Group, Inc., Richland, Washington.

WHC-SD-DD-SAD-001, 1990, *Safety Evaluation for Interim Waste Management Activities in Tank 241-CX-70, Tank 241-CX-71, and 241-CX-72*, prepared by Los Alamos Technical Associates for Westinghouse Hanford Company, Richland, Washington.

SD-WM-SAR-003, 1984, *The Safety Analysis Report for the Decontamination and Decommissioning of the Strontium Semiworks Complex,* Rockwell Hanford Operations, Richland, Washington.

Slate, J. L., 1996, "Buried Carbonate Paleosols Developed in Pliocene-Pleistocene Deposits of the Pasco Basin, South-Central Washington, U.S.A.," *Quaternary International,* Vol. 34-36, p. 191-196.

WA 7890007967, 1994, *Hanford Facility RCRA Permit*, Washington State Department of Ecology, Olympia, Washington.

WAC 173-160, "Minimum Standards for Construction and Maintenance of Wells," *Washington Administrative Code*, as amended.

WAC 173-303, 1990, "Dangerous Waste Regulations," *Washington Administrative Code*, as amended.

WHC-EP-0342, Addendum 8, 1990, *Plutonium Finishing Plant Wastewater Stream-Specific Report,* Westinghouse Hanford Company, Richland, Washington.

WHC-EP-0560, 1992, *Miscellaneous Underground Radioactive Waste Tanks*, Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0227, 1991, *Tank Wastes Discharged Directly to Soil at the Hanford Site,* Westinghouse Hanford Company, Richland, Washington.

WHC-MR-0418, 1994, *Historical Records of Radioactive Contamination in Biota at the 200 Areas of the Hanford Site*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-CP-TI-148, 1989, *Radiological Evaluation of Hot Semiworks Tank 241-CX-72,* Westinghouse Hanford Company, Richland, Washington.

WHC-SD-DD-TI-051, 1990, *An Estimation of the Radionuclide Content of Tank 241-CX-72,* Westinghouse Hanford Company, Richland, Washington.

WHC-SD-DD-TI-040, 1989, *Tank 241-CX-72 Preliminary Waste Characterization,* Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-ES-019, 1992, *Semiworks Aggregate Area Management Study, Technical Baseline Report*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-TI-216, 1993, *Vegetation Communities Associated with the 100 Area and the 200 Area Facilities on the Hanford Site*, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-LL-ES-020, 1993, *200 Area Sanitary Waste Management Engineering Study*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-EN-TI-290, 1994, *Geologic Setting of the Low-Level Burial Grounds*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-308, 1996, *Supporting Document for the Historical Content Estimate for A-Tank Farm*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SP-0350, 1992, *Hexone Remediation Demonstration Plan for Tanks 276-S-141 and 276-S-142,* Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WIDS, *Waste Information Data System Report*, Hanford Site database.

APPENDIX A

PART A PERMITS

This page intentionally left blank.

FORM 3	DANGEROUS WASTE PERMIT APPLICATION	I. EPA/State I.D. No. W A 7 8 9 0 0 0 8 9 6 7

FOR OFFICIAL USE ONLY

Application Approved	Date Received (month/ day / year)	Comments

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or If this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

A. First Application (place an "X" below and provide the appropriate date)

☐ 1. Existing Facility (See instructions for definition of "existing" facility. Complete item below.)

MO	DAY	YEAR
03	22	1943

*For existing facilities, provide the date (mo/day/yr) operation began or the date construction commenced. (use the boxes to the left)

*The date construction of the Hanford Facility commenced

☐ 2. New Facility (Complete item below.)

MO	DAY	YEAR

For new facilities, provide the date (mo/day/yr) operation began or is expected to begin

B. Revised Application (Place an "X" below and complete Section I above)

☒ 1. Facility has an Interim Status Permit

☒ 2. Facility has a Final Permit

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. Process Code – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process (including its design capacity) in the space provided on the (Section III-C).

B. Process Design Capacity – For each code entered in column A enter the capacity of the process.

1. Amount – Enter the amount.

2. Unit of Measure – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
STORAGE:		
Container (barrel, drum, etc.)	S01	Gallons or liters
Tank	S02	Gallons or liters
Waste pile	S03	Cubic yards or cubic meters
Surface impoundment	S04	Gallons or liters
	S06	Cubic yards or cubic meters*
DISPOSAL:		
Injection well	D80	Gallons or liters
Landfill	D81	Acre-feet (the volume that would cover one acre to a Depth of one foot) or hectare-meter
Land application	D82	Acres or hectares
Ocean disposal	D83	Gallons per day or liters per day
Surface impoundment	D84	Gallons or liters
TREATMENT:		
Tank	T01	Gallons per day or liters per day
Surface impoundment	T02	Gallons per day or liters per day
Incinerator	T03	Tons per hour or metric tons per hour; gallons per hour or liters per hour
Other (use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Section III-C.)	T04	Gallons per day or liters per day

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	G	Liters Per Day	V	Acre-Feet	A
Liters	L	Tons Per Hour	D	Hectare-Meter	F
Cubic Yards	Y	Metric Tons Per Hour	W	Acres	B
Cubic Meters	C	Gallons Per Hour	E	Hectares	Q
Gallons Per Day	U	Liters Per Hour	H		

ECY 030-31 Form 3 (Rev. 7/97)
*Add per request of Washington State Department of Ecology (01/2001)

III. PROCESS – CODES AND DESIGN CAPACITIES (continued)

Example for Completing Section III (shown in line numbers X-1 and X-2 below): A facility has two storage tanks; one tank can hold 200 gallons and the other can hold 400 gallons. The facility also has an incinerator that can burn up to 20 gallons per hour.

Line No.	A. Process Code (from list above)			B. Process Design Capacity 1. Amount (Specify)	2. Unit of Measure (enter code)			For Official Use Only			
X-1	S	0	2	800		G					
X-2	T	0	3	20		E					
1	S	0	2	33,340		G					
2											
3											
4											
5											
6											
7											
8											
9											
10											

C. Space for additional process codes or for describing other process (code "T04"). For each process entered here include design capacity.

S02

The 241-CX Tank System is located east of B Plant Complex in the 200 East Area of the Hanford Facility. The 241-CX Tank System consists of three tanks–241-CX-70 (CX-70), 241-CX-71 (CX-71), and 241-CX-72 (CX-72). Processes that were associated with these three tanks are as follows.

Tank CX-70 was used for approximately 1 year in the early 1950's to store high-level process waste from the reduction/oxidation (REDOX) pilot studies. The term REDOX was used for the reduction/oxidation chemical process separating plutonium and uranium from irradiated reactor fuels. Waste removal activities for tank CX-70 were initiated in the summer of 1987 with the construction of a sluicing/pumping system. The sluicing/pumping system involved using large volumes of water to sluice/pump the solid mixed waste from tank CX-70 to the Double-Shell Tank System. Approximately 140,000 gallons (529,950 liters) of water were used to sluice the original waste volume of 10,300 gallons (38,986 liters) down to 750 gallons (2,839 liters). This volume remained in tank CX-70 until December 20, 1991, at which time the waste was placed in approved containers and transferred to the 224-T Transuranic Waste Storage and Assay Facility. The design capacity of tank CX-70 is 30,000 gallons (113,550 liters).

Tank CX-71 was used from 1952 through 1957 for neutralizing the 201-C process condensate and the coil and condenser cooling water. Tank CX-71 received process condensate from REDOX and plutonium-uranium extraction (PUREX) operations, and decontamination flushes following the completion of PUREX operations. The mixed waste remaining in tank CX-71 contains liquid process effluents that were passed through the tank for the purpose of neutralization by contact with a bed of limestone aggregate placed in the tank for this purpose. After the June 1957 decontamination flushes, tank CX-71 was placed out of service. The design capacity of tank CX-71 is 1,000 gallons (3,785 liters).

Tank CX-72 was used for approximately 1 year in 1956 when 2,305 gallons (8,725 liters) of Strontium Semiworks Complex mixed waste was transferred into the tank for storage. Tank CX-72 also was used to study the concentration of waste generated from the Strontium Semiworks Complex pilot studies. Decontamination flushes from the Strontium Semiworks Complex also might have been sent to tank CX-72. The waste in the tank was heated until nearly dry. From 1960 through 1967, tank CX-72 remained idle until taken out of service in 1967. In 1986, tank CX-72 was filled with 24 feet (7.3 meters) of grout over an 11-foot (3.4-meter) deep heel of non-liquid mixed waste. The design capacity of tank CX-72 is 2,340 gallons (8,860 liters).

The 241-CX Tank System no longer receives waste and will be closed under interim status.

ECY 030-31 Form 3 (Rev. 7/97)

IV. DESCRIPTION OF DANGEROUS WASTES

A. **Dangerous Waste Number** – Enter the digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four-digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.

B. **Estimated Annual Quantity** - For each listed waste entered in column A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. **Unit of Measure** - For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate odes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
Pounds	P	Kilograms	K
Tons	T	Metric Tons	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. **Processes**

1. Process Codes:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. Process Description: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER - Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "Included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

Example for completing Section IV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste.

Line No.	A. Dangerous Waste No. *(enter code)*				B. Estimated Annual Quantity of Waste	C. Unit of Measure *(enter code)*	D. Processes				
							1. Process Codes *(enter)*				2. Process Description *(If a code is not entered in D(1))*
X-1	D	0	0	2	900	P	T03	D80			
X-2	D	0	0	2	400	P	T03	D80			
X-3	D	0	0	2	100	P	T03	D80			
X-4	D	0	0	2			T03	D80			Included with above

ECY 030-31 Form 3 (Rev. 7/97)

IV. DESCRIPTION OF DANGEROUS WASTE (continued)

E. Use this space to list additional process codes from Section D(1) on page 3.

Tank CX-70 was used to store high-level process mixed waste from the REDOX pilot studies. The mixed waste was considered corrosive (D002) because of the presence of sodium hydroxide. The mixed waste contained the toxicity characteristic waste chromium (D007) and was considered a toxic state-only (WT02). The estimated annual quantity of waste that was treated and stored in tank CX-70 is approximately 19,000 pounds (8,630 kilograms).

Tank CX-71 was used to store a mixture of materials that remained after large volumes of liquid process effluents were passed through the tank for the purpose of neutralization by contact with a bed of limestone aggregate placed in the tank for this purpose. The waste was considered toxic state-only waste (WT02) because of the presence of cyanides and nitrates. The estimated annual quantity of waste that was treated and stored in tank CX-71 is approximately 33,400 pounds (15,171 kilograms).

Tank CX-72 was used as an experimental tank to study the concentration of waste through the application of heat. This waste was generated from the pilot studies conducted at the Strontium Semiworks Complex. Decontamination flushes from the Strontium Semiworks Complex also might have been sent to tank CX-72. Based on a conservative designation, the mixed waste could consist of toxic constituents (D002, and D004 through D011), and state-only (WC02, WT01, and WT02). The estimated annual quantity of waste that was treated and stored in tank CX-72 is approximately 19,530 pounds (8,870 kilograms).

V. FACILITY DRAWING Refer to attached drawing(s).

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS Refer to attached photograph(s).

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION This information is provided on the attached drawings and photos.

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information," place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. Name of Facility's Legal Owner	2. Phone Number *(area code & no.)*

3. Street or P.O. Box	4. City or Town	5. St.	6. Zip Code

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(print or type)*	Signature	Date Signed
Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office		7/1/02

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(Print Or Type)*	Signature	Date Signed
See attachment		

ECY 030-31 Form 3 (Rev. 7/97)

IV. DESCRIPTION OF DANGEROUS WASTE (continued)

E. Use this space to list additional process codes from Section D(1) on page 3.

Tank CX-70 was used to store high-level process mixed waste from the REDOX pilot studies. The mixed waste was considered corrosive (D002) because of the presence of sodium hydroxide. The mixed waste contained the toxicity characteristic waste chromium (D007) and was considered a toxic state-only (WT02). The estimated annual quantity of waste that was treated and stored in tank CX-70 is approximately 19,000 pounds (8,630 kilograms).

Tank CX-71 was used to store a mixture of materials that remained after large volumes of liquid process effluents were passed through the tank for the purpose of neutralization by contact with a bed of limestone aggregate placed in the tank for this purpose. The waste was considered toxic state-only waste (WT02) because of the presence of cyanides and nitrates. The estimated annual quantity of waste that was treated and stored in tank CX-71 is approximately 33,400 pounds (15,171 kilograms).

Tank CX-72 was used as an experimental tank to study the concentration of waste through the application of heat. This waste was generated from the pilot studies conducted at the Strontium Semiworks Complex. Decontamination flushes from the Strontium Semiworks Complex also might have been sent to tank CX-72. Based on a conservative designation, the mixed waste could consist of toxic constituents (D002, and D004 through D011), and state-only (WC02, WT01, and WT02). The estimated annual quantity of waste that was treated and stored in tank CX-72 is approximately 19,530 pounds (8,870 kilograms).

V. FACILITY DRAWING Refer to attached drawing(s).

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS Refer to attached photograph(s).

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION This information is provided on the attached drawings and photos.

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information," place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. Name of Facility's Legal Owner	2. Phone Number *(area code & no.)*

3. Street or P.O. Box	4. City or Town	5. St.	6. Zip Code

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(print or type)*	Signature	Date Signed
Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office		7/1/02

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(Print Or Type)*	Signature	Date Signed
See attachment		

ECY 030-31 Form 3 (Rev. 7/97)

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Owner/Operator
Keith A. Klein, Manager
U.S. Department of Energy
Richland Operations Office

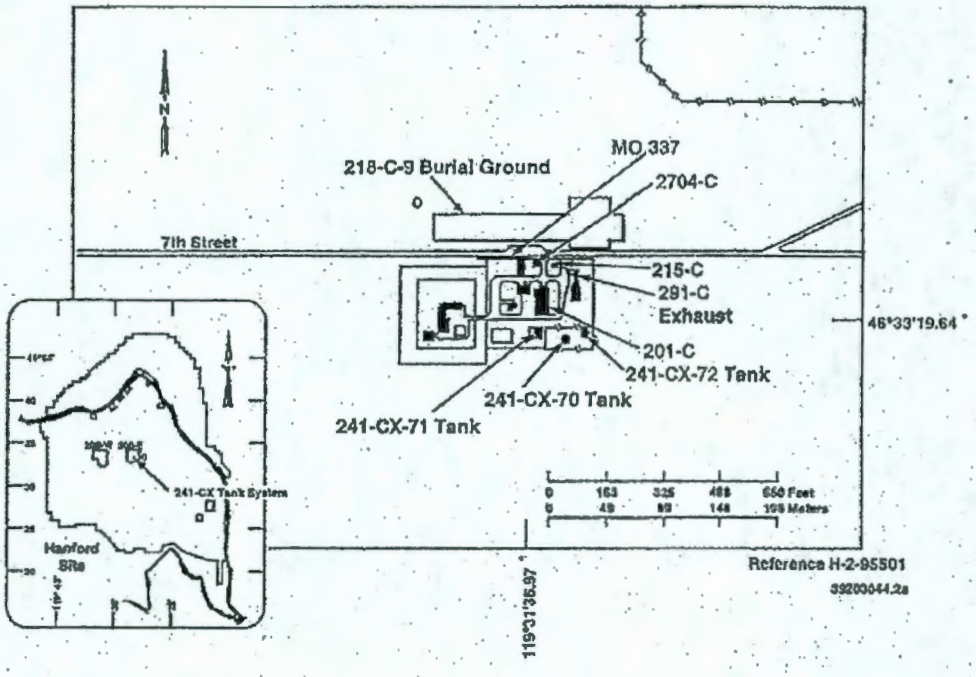
7/1/02
Date

Co-operator
E. Keith Thomson
President and Chief Executive Officer
Fluor Hanford

5/30/02
Date

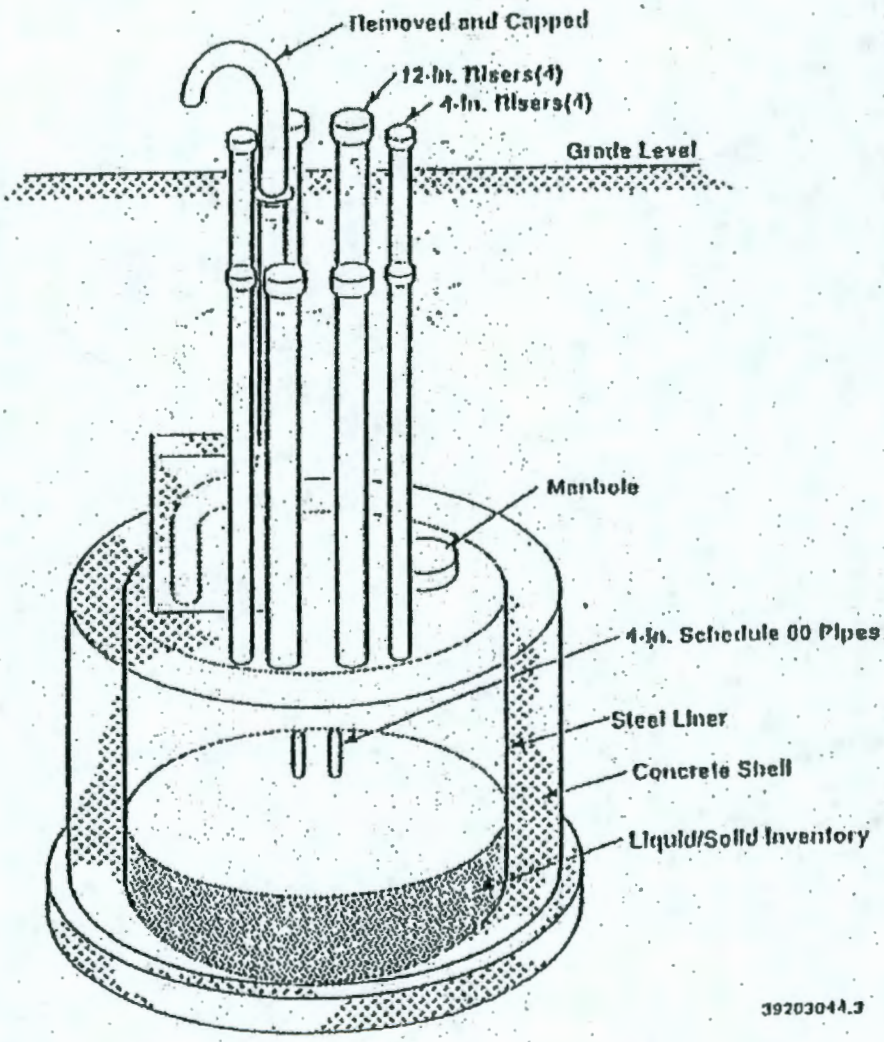
ECY 030-31 Form 3 (Rev. 7/97)

241-CX TANK SYSTEM SITE PLAN



ECY 030-31 Form 3 (Rev. 7/97)

TANK 241-CX-70

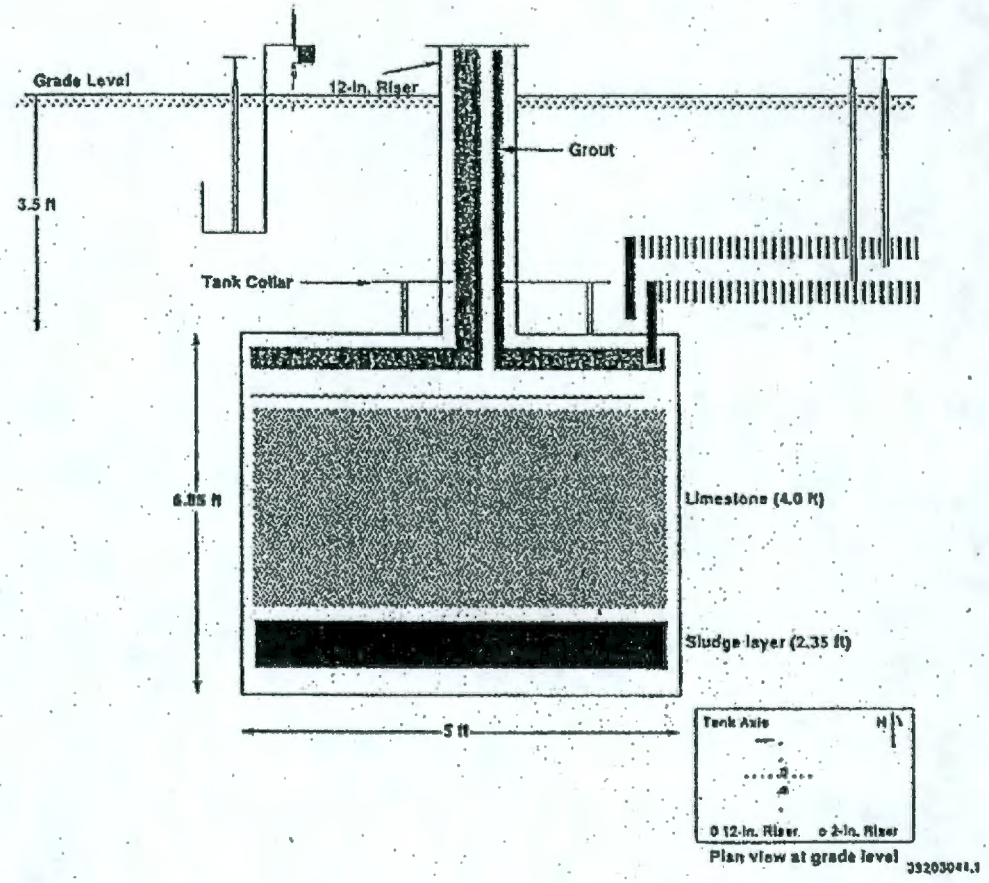


For conversions, apply the following:

Liters to gallons - divide liters by 3.785.
Meters to feet - divide meters by 0.3048.
Centimeters to inches - divide centimeters by 2.54.

ECY 030-31 Form 3 (Rev. 7/97)

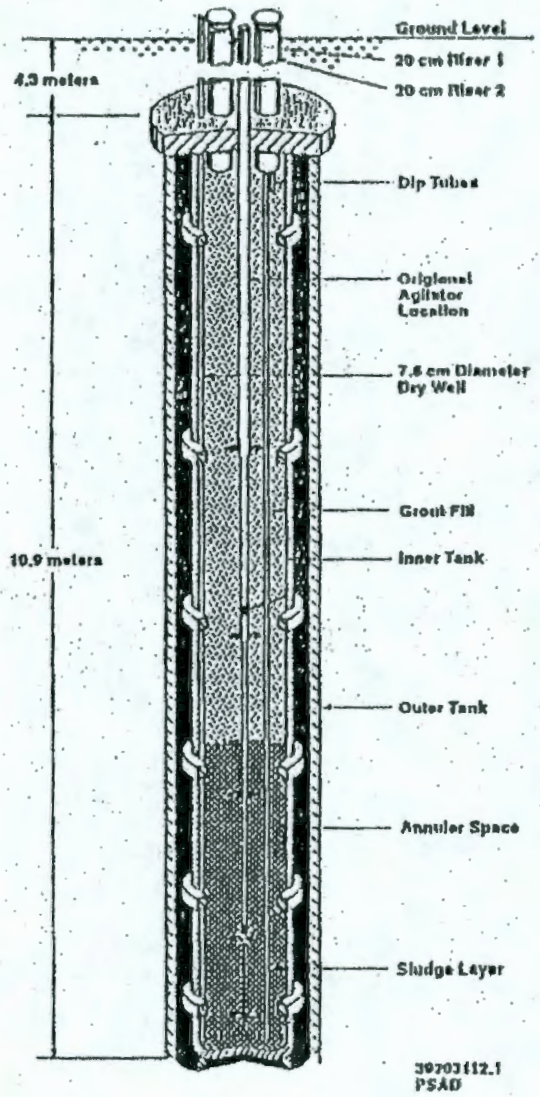
TANK 241-CX-71
CROSS-SECTIONAL VIEW



For conversions, apply the following:

Liters to gallons - divide liters by 3.785.
Meters to feet - divide meters by 0.3048.
Centimeters to inches - divide centimeters by 2.54.

TANK 241-CX-72
CUTAWAY DRAWING



For conversions, apply the following:

Liters to gallons - divide liters by 3.785.
Meters to feet - divide meters by 0.3048.
Centimeters to inches - divide centimeters by 2.54.

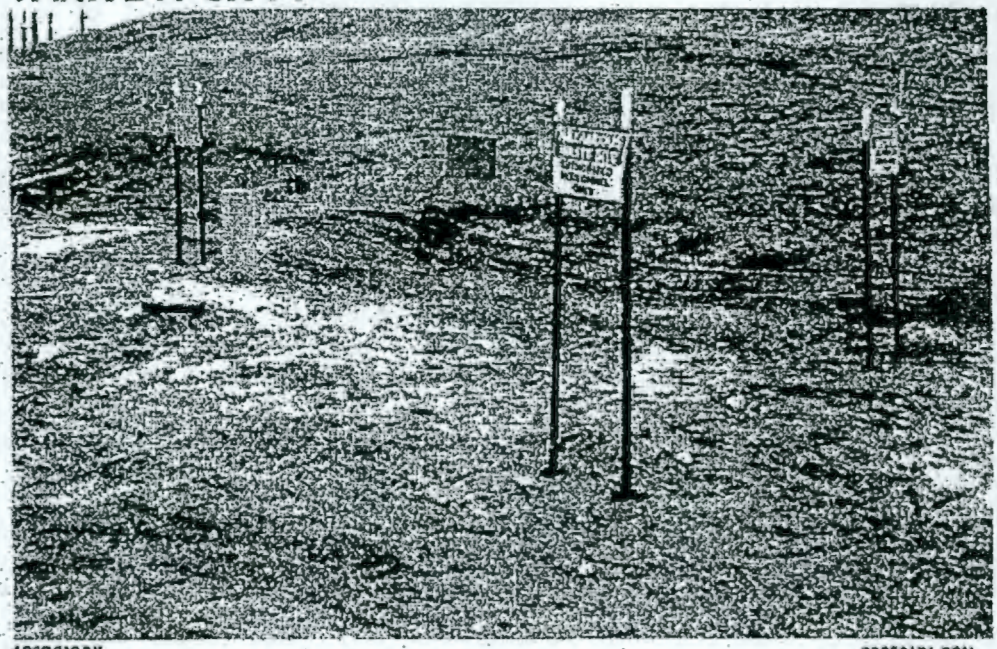
ECY 030-31 Form 3 (Rev. 7/97)

241-CX TANK SYSTEM
TANK 241-CX-70

46°33'20"
119°31'37"

93060151-3CN
(PHOTO TAKEN 1993)

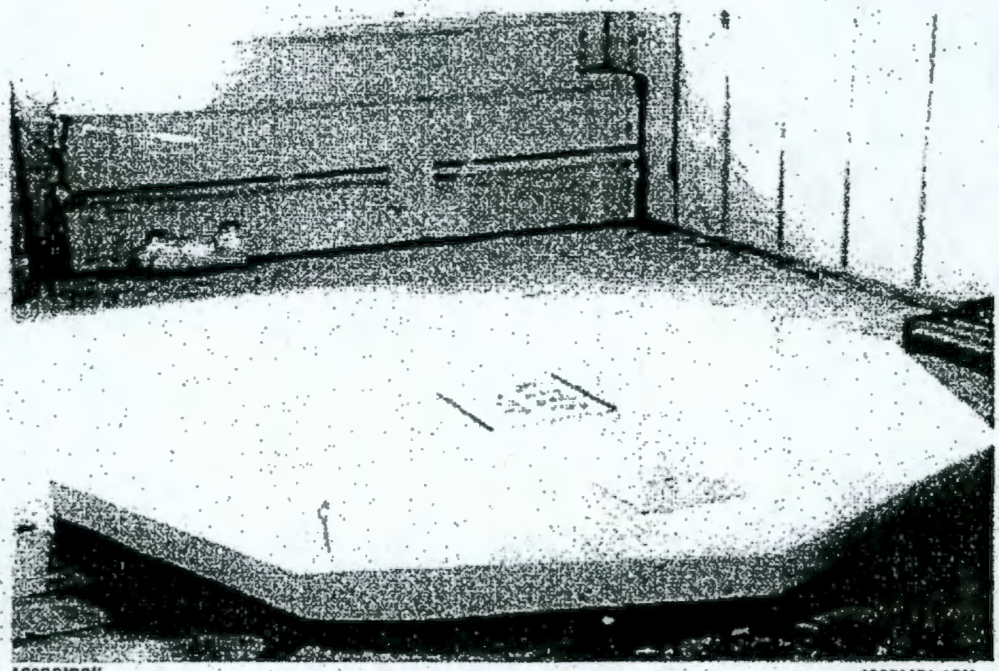
241-CX TANK SYSTEM
TANK 241-CX-71



46°33'20"
119°31'37"

93060151-5CN
(PHOTO TAKEN 1993)

241-CX TANK SYSTEM
TANK 241-CX-72



46°33'20"
119°31'37"

93060151-1CN
(PHOTO TAKEN 1993)

FORM 3	DANGEROUS WASTE PERMIT APPLICATION	I. EPA/State I.D. No. W A 7 8 9 0 0 0 8 9 8 7

FOR OFFICIAL USE ONLY

Application Approved	Date Received (month/ day / year)	Comments

II. FIRST OR REVISED APPLICATION

Place an "X" in the appropriate box in A or B below (mark one box only) to indicate whether this is the first application you are submitting for your facility or a revised application. If this is your first application and you already know your facility's EPA/STATE I.D. Number, or if this is a revised application, enter your facility's EPA/STATE I.D. Number in Section I above.

A. First Application (place an "X" below and provide the appropriate date)

☐ **1. Existing Facility** (See instructions for definition of "existing" facility. Complete item below.)

MO	DAY	YEAR
03	22	1943

*For existing facilities, provide the date (mo/day/yr) operation began or the date construction commenced. (use the boxes to the left)

*The date construction of the Hanford Facility commenced

☐ **2. New Facility** (Complete item below.)

MO	DAY	YEAR

For new facilities, provide the date (mo/day/yr) operation began or is expected to begin

B. Revised Application (Place an "X" below and complete Section I above)

☒ **1. Facility has an Interim Status Permit**

☒ **2. Facility has a Final Permit**

III. PROCESSES – CODES AND DESIGN CAPACITIES

A. Process Code – Enter the code from the list of process codes below that best describes each process to be used at the facility. Ten lines are provided for entering codes. If more lines are needed, enter the code(s) in the space provided. If a process will be used that is not included in the list of codes below, then describe the process (including its design capacity) in the space provided on the (Section III-C).

B. Process Design Capacity – For each code entered in column A enter the capacity of the process.

1. Amount – Enter the amount.
2. Unit of Measure – For each amount entered in column B(1), enter the code from the list of unit measure codes below that describes the unit of measure used. Only the units of measure that are listed below should be used.

PROCESS	PROCESS CODE	APPROPRIATE UNITS OF MEASURE FOR PROCESS DESIGN CAPACITY
STORAGE:		
Container (barrel, drum, etc.)	S01	Gallons or liters
Tank	S02	Gallons or liters
Waste pile	S03	Cubic yards or cubic meters
Surface impoundment	S04	Gallons or liters
	S06	Cubic yards or cubic meters*
DISPOSAL:		
Injection well	D80	Gallons or liters
Landfill	D81	Acre-feet (the volume that would cover one acre to a Depth of one foot) or hecture-meter
Land application	D82	Acres or hectares
Ocean disposal	D83	Gallons per day or liters per day
Surface impoundment	D84	Gallons or liters
TREATMENT:		
Tank	T01	Gallons per day or liters per day
Surface impoundment	T02	Gallons per day or liters per day
Incinerator	T03	Tons per hour or metric tons per hour; gallons per hour or liters per hour
Other (use for physical, chemical, thermal or biological treatment processes not occurring in tanks, surface impoundments or incinerators. Describe the processes in the space provided; Section III-C.)	T04	Gallons per day or liters per day

Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code	Unit of Measure	Unit of Measure Code
Gallons	G	Liters Per Day	V	Acre-Feet	A
Liters	L	Tons Per Hour	D	Hecture-Meter	F
Cubic Yards	Y	Metric Tons Per Hour	W	Acres	B
Cubic Meters	C	Gallons Per Hour	E	Hectares	Q
Gallons Per Day	U	Liters Per Hour	H		

ECY 030-31 Form 3 (Rev. 7/97)
*Add per request of Washington State Department of Ecology (01/2001)

IV. DESCRIPTION OF DANGEROUS WASTES

A. Dangerous Waste Number – Enter the digit number from Chapter 173-303 WAC for each listed dangerous waste you will handle. If you handle dangerous wastes which are not listed in Chapter 173-303 WAC, enter the four-digit number(s) that describes the characteristics and/or the toxic contaminants of those dangerous wastes.

B. Estimated Annual Quantity - For each listed waste entered in column A, estimate the quantity of that waste that will be handled on an annual basis. For each characteristic or toxic contaminant entered in column A, estimate the total annual quantity of all the non-listed waste(s) that will be handled which possess that characteristic or contaminant.

C. Unit of Measure - For each quantity entered in column B enter the unit of measure code. Units of measure which must be used and the appropriate odes are:

ENGLISH UNIT OF MEASURE	CODE	METRIC UNIT OF MEASURE	CODE
Pounds	P	Kilograms	K
Tons	T	Metric Tons	M

If facility records use any other unit of measure for quantity, the units of measure must be converted into one of the required units of measure taking into account the appropriate density or specific gravity of the waste.

D. Processes

1. Process Codes:

For listed dangerous waste: For each listed dangerous waste entered in column A select the code(s) from the list of process codes contained in Section III to indicate how the waste will be stored, treated, and/or disposed of at the facility.

For non-listed dangerous wastes: For each characteristic or toxic contaminant entered in Column A, select the code(s) from the list of process codes contained in Section III to indicate all the processes that will be used to store, treat, and/or dispose of all the non-listed dangerous wastes that possess that characteristic or toxic contaminant.

Note: Four spaces are provided for entering process codes. If more are needed: (1) Enter the first three as described above; (2) Enter "000" in the extreme right box of item IV-D(1); and (3) Enter in the space provided on page 4, the line number and the additional code(s).

2. Process Description: If a code is not listed for a process that will be used, describe the process in the space provided on the form.

NOTE: DANGEROUS WASTES DESCRIBED BY MORE THAN ONE DANGEROUS WASTE NUMBER - Dangerous wastes that can be described by more than one Waste Number shall be described on the form as follows:

1. Select one of the Dangerous Waste Numbers and enter it in column A. On the same line complete columns B, C, and D by estimating the total annual quantity of the waste and describing all the processes to be used to treat, store, and/or dispose of the waste.
2. In column A of the next line enter the other Dangerous Waste Number that can be used to describe the waste. In column D(2) on that line enter "Included with above" and make no other entries on that line.
3. Repeat step 2 for each other Dangerous Waste Number that can be used to describe the dangerous waste.

Example for completing Section IV (shown in line numbers X-1, X-2, X-3, and X-4 below) - A facility will treat and dispose of an estimated 900 pounds per year of chrome shavings from leather tanning and finishing operation. In addition, the facility will treat and dispose of three non-listed wastes. Two wastes are corrosive only and there will be an estimated 200 pounds per year of each waste.

Line No.	A. Dangerous Waste No. (enter code)				B. Estimated Annual Quantity of Waste	C. Unit of Measure (enter code)	D. Processes			
							1. Process Codes (enter)			2. Process Description (If a code is not entered in D(1))
X-1	K	0	6	3	900	P	T03	D80		
X-2	D	002	0	2	200	P	T03	D80		
X-3	D	003	0	3	100	P	T03	D80		
X-4	D	0	0	0			T03	D80		Included with above

ECY 030-31 Form 3 (Rev. 7/97)

Photocopy this page before completing if you have more than 26 wastes to list.

I.D. Number *(enter from page 1)*	
W A 7 8 9 0 0 0 8 9 6 7	

IV. DESCRIPTION OF DANGEROUS WASTES *(continued)*

Line No.	A. Dangerous Waste No. *(enter code)*				B. Estimated Annual Quantity of Waste	C. Unit of Measure *(enter code)*			D. Processes				
									1. Process Codes *(enter)*				2. Process Description *(if a code is not entered in D(1))*
1	D	0	0	1	245,400		P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
2	F	0	0	3			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
3	W	C	0	2			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
4	W	T	0	2			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													

ECY 030-31 Form 3 (Rev. 7/97)

Photocopy this page before completing if you have more than 26 wastes to list.

I.D. Number *(enter from page 1)*	
W A 7 8 9 0 0 0 8 9 8 7	

IV. DESCRIPTION OF DANGEROUS WASTES *(continued)*

Line No.	A. Dangerous Waste No. *(enter code)*				B. Estimated Annual Quantity of Waste	C. Unit of Measure *(enter code)*			D. Processes				
									1. Process Codes *(enter)*				2. Process Description *(if a code is not entered in D(1))*
1	D	0	0	1	245,400		P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
2	F	0	0	3			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
3	W	C	0	2			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
4	W	T	0	2			P		S02	T04	S01		Storage-Tank/Treatment-Other Distillation/Storage-Container
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													
21													
22													
23													
24													
25													
26													
27													
28													
29													
30													
31													
32													
33													
34													
35													
36													
37													
38													
39													
40													

ECY 030-31 Form 3 (Rev. 7/97)

IV. DESCRIPTION OF DANGEROUS WASTE (continued)

E. Use this space to list additional process codes from Section D(1) on page 3.

The S-141 tank was used to store waste hexone (F003) that was used as a solvent in the REDOX Plant. The mixed waste was considered ignitable (D001) and a toxic state-only waste (WT02). The estimated annual quantity of waste that was treated and stored in the S-141 tank was approximately 20,000 gallons (76,000 liters).

The S-142 tank also was used to store waste hexone. In addition, the S-142 tank also stored waste NPH and TBP. This mixture was designated F003, D001, WT02, and a carcinogenic state-only waste (WC02). This waste resulted from a one-time campaign to separate americium, curium, and promethium from Shippingport reactor blanket fuel in 1966. The estimated annual quantity of waste that was treated and stored in the S-142 tank was approximately 16,000 gallons (61,000 liters).

V. FACILITY DRAWING Refer to attached drawing(s).

All existing facilities must include in the space provided on page 5 a scale drawing of the facility (see instructions for more detail).

VI. PHOTOGRAPHS Refer to attached photograph(s).

All existing facilities must include photographs (aerial or ground-level) that clearly delineate all existing structures; existing storage, treatment and disposal areas; and sites of future storage, treatment or disposal areas (see instructions for more detail).

VII. FACILITY GEOGRAPHIC LOCATION This information is provided on the attached drawings and photos.

LATITUDE *(degrees, minutes, & seconds)*	LONGITUDE *(degrees, minutes, & seconds)*

VIII. FACILITY OWNER

☒ A. If the facility owner is also the facility operator as listed in Section VII on Form 1, "General Information," place an "X" in the box to the left and skip to Section IX below.

B. If the facility owner is not the facility operator as listed in Section VII on Form 1, complete the following items:

1. Name of Facility's Legal Owner	2. Phone Number *(area code & no.)*

3. Street or P.O. Box	4. City or Town	5. St.	6. Zip Code

IX. OWNER CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(print or type)*	Signature	Date Signed
Keith A. Klein, Manager U.S. Department of Energy Richland Operations Office		7/1/02

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Name *(Print Or Type)*	Signature	Date Signed
See attachment		

ECY 030-31 Form 3 (Rev. 7/97)

X. OPERATOR CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

Owner/Operator
Keith A. Klein, Manager
U.S. Department of Energy
Richland Operations Office

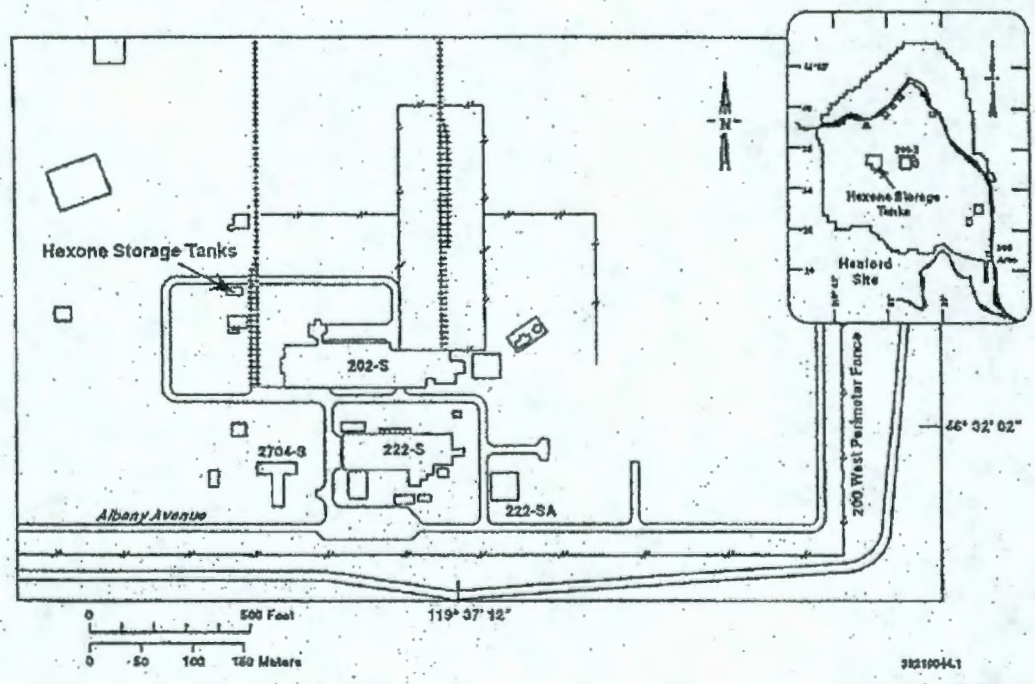
Date: 7/1/02

Co-operator
E. Keith Thomson
President and Chief Executive Officer
Fluor Hanford

Date: 5-30-02

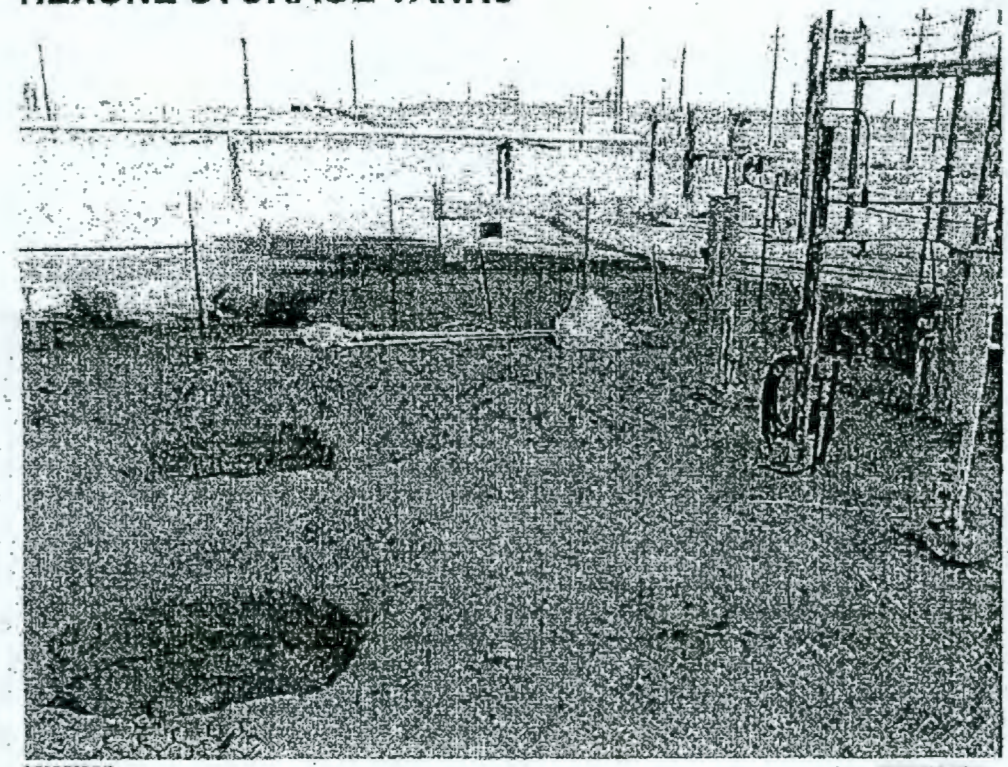
ECY 030-31 Form 3 (Rev. 7/97)

276-S-141 AND 142
HEXONE STORAGE TANKS SITE PLAN



ECY 030-31 Form 3 (Rev. 7/97)

276-S-141 AND 142
HEXONE STORAGE TANKS

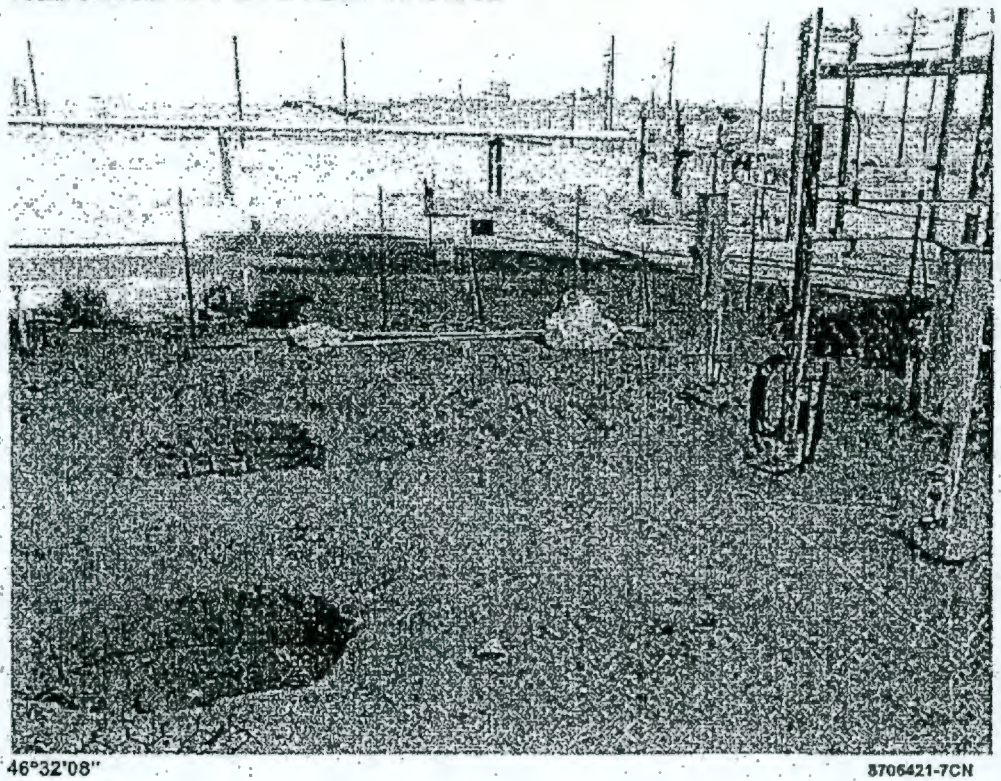


46°32'08"
119°37'23"

8706421-7CN
(PHOTO TAKEN 1987)

ECY 030-31 Form 3 (Rev. 7/97)

276-S-141 AND 142
HEXONE STORAGE TANKS



46°32'08"
119°37'23"

8706421-7CN
(PHOTO TAKEN 1987)

1 Table 3.3.2.4.1-15. Exemptions to Ignition Source Controls.

2

Table 3.3.2.4.1-15. Exceptions to Flammable Gas Ignition Source Controls. (2 sheets)

Item	Authorized activities
1	Use of nonconductive polymer and canvas gloves, Tyvek[1] and nonconductive polymer clothing, and masking tape inside waste-intruding equipment.
2	Use of nonconductive adhesive tape in the Waste Group A and Waste Group B DST tank headspaces during identified operations and inside waste-intruding equipment.
3	Use of portable alpha monitors inside waste-intruding equipment.
4	Use of nonconductive polymer bottles inside waste-intruding equipment.
5	Use of zip cords in Waste Group A and Waste Group B DST tank headspaces during identified operations and inside waste-intruding equipment.
6	Use of nonconductive polymer rope inside waste-intruding equipment.
7	Use of nonconductive polymer tubing in Waste Group A and Waste Group B DST tank headspaces during identified operations and inside waste-intruding equipment.
8	Use of nonconductive polymer gaskets in the miscellaneous facility intrusive region for tanks and vessels where ventilation has not been verified, and inside waste-intruding equipment.
9	Use of nonconductive polymer sprayers inside waste-intruding equipment.
10	Use of the grab sample cap, sampling and sludge weight retrieval device, and coated steel cable in the Waste Group A and Waste Group B DST tank headspaces during identified operations and inside waste-intruding equipment.
11	Use of manual tapes in Waste Group A and Waste Group B DST tank headspaces during identified operations.
12	Use of low- and high-pressure spray whirlies inside waste-intruding equipment.
13	Removing and installing fittings on openings ≤ 1-in. inside diameter without bonding or monitoring in Waste Group A and Waste Group B DST tank headspaces during identified operations and inside waste-intruding equipment.
14	Use of the Type 4 vapor sampling head in Waste Group A and Waste Group B DST tank headspaces during identified operations.
15	Use of installed equipment (e.g., flanges, flow indicator controller-level gauges, ENRAF[2]-level gauges, radar gauges, heated vapor probes, cameras, lights) in the Waste Group A DST tank headspace during waste transfers from the tank and air lift circulator operations and in the Waste Group B DST tank headspace during air lift circulator operations. This exception does not cover the presence of non-spark resistant materials in long-length installed equipment that might be moved by the operation of a large mixer pump such that mechanical sparks might result. Presence of installed equipment (e.g., thermocouple trees, steel liquid observation wells, multiple instrument trees, corrosion probes, velocity-density temperature trees) in the Waste Group A DST tank headspace during waste transfers from the tank and air lift circulator operations, in the Waste Group B DST tank headspace during air lift circulator operations, and in the miscellaneous facility intrusive region for tanks and vessels where ventilation has not been verified.
16	Use of installed pit cover blocks or plates, riser flanges, and shield plugs to allow access for entry monitoring in the miscellaneous facility intrusive region for tanks and vessels where ventilation has not been verified, and use of installed flanges inside waste-intruding equipment.

T3.3.2.4.1-25

This page intentionally left blank.

APPENDIX B

SAMPLING AND ANALYSIS PLAN

This page intentionally left blank.

CONTENTS

B1.0 INTRODUCTION B-1
B1.1 BACKGROUND B-1
B1.2 200-IS-1 AND 200-ST-1 OPERABLE UNIT/WASTE SITE LOCATIONS B-2
B1.3 SITE DESCRIPTION AND HISTORY B-2
B1.4 CONTAMINANTS OF CONCERN B-5
B1.4.1 Data Quality Objectives B-6
B1.4.2 Sample Design Summary B-7
B2.0 QUALITY ASSURANCE PROJECT PLAN B-14
B2.1 FIELD QUALITY CONTROL B-15
B2.1.1 Field Duplicates B-15
B2.1.2 Field Splits B-16
B2.1.3 Equipment Rinsate Blanks B-16
B2.1.4 Trip Blanks B-16
B2.1.5 Prevention of Cross-Contamination B-17
B2.2 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA B-17
B2.3 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES B-17
B2.4 ONSITE MEASUREMENTS QUALITY CONTROL B-17
B2.5 DATA MANAGEMENT B-18
B2.6 VALIDATION AND VERIFICATION REQUIREMENT B-18
B2.7 TECHNICAL PROCEDURES AND SPECIFICATIONS B-18
B2.7.1 Sample Location B-20
B2.7.2 Sample Identification B-20
B2.7.3 Field Sampling Log B-20
B2.7.4 Sample Custody B-21
B2.7.5 Sample Containers and Preservatives B-21
B2.7.6 Sample Shipping B-21
B3.0 FIELD SAMPLING PLAN B-29
B3.1 SAMPLING OBJECTIVES B-29
B3.2 FIELD MEASUREMENTS B-30

B3.2.1 Surface Radiation Surveys B-30

B3.3 SURFACE GEOPHYSICAL SURVEYS B-30

B3.4 SOIL GAS SAMPLING B-30

B3.4.1 Driven Soil Probes Surveys B-31
B3.4.2 Soil Screening B-31

B3.5 SOIL SAMPLING AND ANALYSIS B-32

B3.5.1 Driven Soil Probe Sampling B-32
B3.5.2 Borehole Sampling and Analysis B-32
B3.5.3 Test Pit Sampling and Analysis B-33
B3.5.4 Pre-Shipment Sample Screening B-34
B3.5.5 Summary of Sampling Activities B-34

B3.6 GEOPHYSICAL LOGGING B-34

B3.7 SURVEYING B-35

B3.8 WASTE MANAGEMENT SAMPLING B-35

B4.0 HEALTH AND SAFETY B-58

B5.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE B-58

B6.0 REFERENCES B-59

FIGURES

Figure B-1. Sampling Locations for the 200-E-111 Tank Farm Process Piping. B-36

Figure B-2. Sampling Locations for the 200-W-59 Diversion Box..... B-37

Figure B-3. Sampling Locations for the 2607-W3 Septic Tank. B-38

Figure B-4. Sampling Locations for the 276-S-141/142 Hexone Tanks. B-39

Figure B-5. Sampling Locations for the 241-CX-70 Tank. B-40

Figure B-6. Sampling Locations for the 241-CX-71 Tank. B-41

Figure B-7. Sampling Locations for the 241-CX-72 Tank. B-42

Figure B-8. Location of Planned Drive Casings and Existing Boreholes at the 200-E-111 Pipeline Farm Process Piping. B-43

Figure B-9. Location of Planned and Existing Boreholes at the 200-W-59 Diversion Box.... B-44

Figure B-10. Location of Planned and Existing Boreholes at the 2607-W3 Septic Tank. B-45

Figure B-11. Location of Planned and Existing Boreholes at the Hexone Storage and Treatment Facility. B-46

Figure B-12. Location of Planned and Existing Boreholes at the 241-CX Tank System..... B-47

TABLES

Table B-1. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List For Representative Sites – 200-W-59 Diversion Box B-8

Table B-2. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List For Representative Sites – 200-E-111 Pipeline B-9

Table B-3. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 2607-W-3 Septic Tank B-11

Table B-4. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 241-CX Tank System. B-12

Table B-5. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 276-S Hexone Storage and Treatment Facility. B-13

Table B-6. Decision Rules (From DQO Section 5.2 Table 10. Decision Rules FH 2002]). B-14

Table B-7. Analytical Performance Requirements. B-23

Table B-8. Sample Preservation, Container, and Holding Time Guidelines and Analytical Priorities. B-28

Table B-9. Field Screening Methods. B-48

Table B-10. 200-E-111 Tank Farm Process Piping Sampling Design. 48

Table B-11. 2607-W3 Septic Tank Sampling Design. 49

Table B-12. 200-W-59 Diversion Box Sampling Design. 50

Table B-13. 276-S-141/142 Hexone Tanks Sampling Design. 52

Table B-14. 241-CX-70 Tank Sampling Design. 53

Table B-15. 241-CX-71 Tank Sampling Design. 55

Table B-16. 241-CX-72 Tank Sampling Design. 56

Table B-17. Summary of Projected Sample Collection Requirements. 57

LIST OF TERMS

ASTM	American Society for Testing and Materials
BHI	Bechtel Hanford, Inc.
bgs	below ground surface
CAS	Chemical Abstract Service
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CLARC	Cleanup Levels and Risk Calculations
CFR	Code of Federal Regulations
COC	contaminant of concern
COPC	contaminant of potential concern
CVAA	cold vapor atomic absorption
DOE	U.S. Department of Energy
DQO	data quality objective
EMI	electromagnetic induction
EPA	U.S. Environmental Protection Agency
ERC	Environmental Restoration Contractor
FH	Fluor Hanford, Inc.
FS	feasibility study
GC	gas chromatograph
GEA	gamma energy analysis
GG/PN	gross gamma/passive neutron
GPR	ground-penetrating radar
HEIS	Hanford Environmental Information System
HSTF	Hexone Storage and Treatment Facility
ICP	inductively coupled plasma
IDW	investigation-derived waste
MS	mass spectrometry
NAVD88	North American Vertical Datum of 1988
NPH	normal paraffin hydrocarbon
OU	operable unit
PFP	Plutonium Finishing Plant
PRF	Plutonium Recovery Facility
PUREX	plutonium-uranium extraction (process or Plant)
QAPjP	quality assurance project plan
QC	quality control
RCRA	*Resource Conservation and Recovery Act of 1976*
RCT	radiological control technician
REDOX	reduction-oxidation (process or Plant)
RESRAD	RESidual RADioactivity Dose Model
RI	remedial investigation
RL	U.S. Department of Energy, Richland Operations Office
SAP	sampling and analysis plan
SST	single-shell tank
TBP	tributyl phosphate

TSD	treatment, storage, and disposal
UPR	unplanned release
VOA	volatile organic analyte
WDOH	Washington State Department of Health
WIDS	Waste Information Data System

This page intentionally left blank.

APPENDIX B

SAMPLING AND ANALYSIS PLAN

B1.0 INTRODUCTION

This sampling and analysis plan (SAP) directs those activities performed to characterize the vadose zone associated with the following *Resource Conservation and Recovery Act of 1976* (RCRA) treatment, storage, and disposal (TSD) units and representative sites in the 200-IS-1 and 200-ST-1 Operable Units (OU): the 241-CX Tank System, the 276-S Hexone Storage and Treatment Facility (HSTF), the 2607-W-3 Septic Tank, the 200-E-111 Pipeline 241-C-151-U1, and the 200-W-59 Diversion Box. The sampling and analyses described in this document will provide data to refine the conceptual contaminant distribution models, support an assessment of risk, and evaluate a range of remedial alternatives for waste sites in this OU. Characterization activities described in this plan are based on implementing the data quality objectives (DQO) process as documented in the *Remedial Investigation Data Quality Objectives Summary Report for the 200-IS-1 and 200-ST-1 Operable Units*.

The field activities described in this SAP include geophysical logging, soil gas sampling, and soil sampling to assess the integrity of the tanks in the 241-CX Tank System and at the 276-S Hexone Storage and Treatment Facility. Results of these activities also will be used to determine the nature and extent of contamination at the 200-E-111 Pipeline, 2607-W-3 Septic Tank, and the 200-W-59 Diversion Box. Based on the results of the initial investigation, additional characterization via soil borings or test pits may be done to collect soil samples for analyses of radiological and nonradiological contaminants of concern (COC) and selected physical properties. Sampling for waste designation will be addressed through a waste designation DQO process before the field characterization activities begin.

B1.1 BACKGROUND

The Tanks/Lines/Pits/Boxes Waste Group OU (200-IS-1) consists of structures used to convey or control the conveyance of waste from source-generating facilities to tank farms for disposal or to other processing facilities. The category consists of facilities used to handle the high-level plant waste generated from separations or volume-reduction processes. In general, no waste was intentionally released to the ground from this category, but a number of unplanned releases are known to have occurred. In some cases, diversion boxes, valve pits, sampler pits, pipelines, and other waste site types constructed to support a soil-column disposal waste site are considered as part of this group rather than the group in which the soil column disposal waste site has been placed.

The Septic Tanks and Drain Fields Group OU (200-ST-1) contains sites that have received or continue to receive largely nonradioactive, nonhazardous, sanitary sewer waste. Sewer waste includes human waste, as well as shower water, janitorial and lunchroom water, and drinking water. Small amounts of radiological contamination potentially were discharged through the shower and janitorial sink sources, but contamination from this source is expected to be minimal.

Chemical constituents such as soaps and detergents are expected in quantities that are small compared to the volume of waste water discharged. While the total quantities of liquids discharged typically were not tracked, the flow rate into the sites was documented in a number of cases (DOE/RL-98-28, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan–Environmental Restoration Program*).

B1.2 200-IS-1 AND 200-ST-1 OPERABLE UNIT AND WASTE SITE LOCATIONS

The 200-IS-1 and 200-ST-1 OUs are located on the Hanford Site in south-central Washington State, in the 200 East and 200 West Areas. All waste sites are located within the exclusive land-use boundary identified in DOE/EIS-0222-F, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*. Figures 2-1 and 2-6a and 2-6b in DOE/RL-2002-14, *Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group Operable Unit RIF/FS/Work Plan and RCRA TSD Unit Sampling Plan*, show the specific locations of waste sites in the OUs.

B1.3 SITE DESCRIPTION AND HISTORY

The following sections briefly describe the five representative and/or RCRA TSD waste sites that will be investigated. More detail is provided in Section 2.2 of DOE/RL-2002-14. Section 3.3 of DOE/RL-2002-14 contains information on the nature and extent of contamination and previous investigations.

B1.3.1.1 241-CX Tank System

The 241-CX Tank System is located east of B Plant in the 200 East Area on the Hanford Site. The 241-CX Tank System consists of three tanks: Tanks 241-CX-70, 241-CX-71, and 241-CX-72. Processes that were associated with these three tanks are as follows.

Tank 241-CX-70. This tank was used for approximately 1 year in the early 1950's to store high-level process waste from the reduction-oxidation (REDOX) pilot studies. The term REDOX was used for the reduction-oxidation chemical process used to separate plutonium and uranium from irradiated reactor fuel. Waste removal activities for Tank 241-CX-70 were initiated in the summer of 1987 with the construction of a sluicing-pumping system. The sluicing-pumping system involved using large volumes of water to sluice the solid mixed waste to the bottom of tank 241-CX-70 and pump it to the Double-Shell Tank System. Approximately 529,950 L (140,000 gal) of water were used to sluice the original waste volume of 38,986 L (10,300 gal) down to 2,839 L (750 gal). This amount of waste remained in Tank 241-CX-70 until December 20, 1991, when it was placed in approved containers and transferred to the 224-T Transuranic Waste Storage and Assay Facility. The design capacity of Tank 241-CX-70 is 113,550 L (30,000 gal).

Tank 241-CX-71. This tank was used from 1952 through 1957 for neutralizing the 201-C process condensate and coil and condenser cooling water. Tank 241-CX-71 received process condensate from REDOX and plutonium-uranium extraction (PUREX) operations, and decontamination flushes following the completion of PUREX operations. The mixed waste

remaining in Tank 241-CX-71 contains liquid process effluents that were passed through the tank to be neutralized by contact with a bed of limestone aggregate placed in the tank for this purpose. After the June 1957 decontamination flushes, Tank 241-CX-71 was taken out of service. The design capacity of Tank 241-CX-71 is 3,785 L (1,000 gal).

Tank 241-CX-72. This tank was used for approximately 1 year in 1956 when 8,725 L (2,305 gal) of Strontium Semi-Works Complex mixed waste was transferred into the tank for storage. Tank 241-CX-72 also was used to study the concentration of waste generated from the Strontium Semi-Works Complex pilot studies. Decontamination flushes from the Strontium Semi-Works Complex also might have been sent to Tank 241-CX-72. The waste in the tank was then heated until enough liquid evaporated that it was nearly dry. From 1960 through 1967, Tank 241-CX-72 remained idle until it was taken out of service in 1967. In 1986, Tank 241-CX-72 was filled with 7.3 m (24 ft) of grout over a 3.4 m (11 ft) heel of non-liquid mixed waste. The design capacity of Tank 241-CX-72 is 8,860 L (2,340 gal).

The 241-CX Tank System no longer receives waste and will be closed under interim status.

B1.3.1.2 Hexone Storage and Treatment Facility

The HSTF is located in the southeast corner of the 200 West Area of the Hanford Site. The HSTF consisted of two 91,000 L (24,000-gal) below-grade carbon steel tanks, Tanks 276-S-141 and 276-S-142, a distillation system, and railroad tank cars. The HSTF received liquid mixed waste from the REDOX Plant and, possibly, the Hot Semi-Works Plant. The HSTF was used from 1951 through 1967 to store reagent-grade methyl isobutyl ketone (hexone) for make-up as a solvent for the REDOX Plant. After 1967, the HSTF contained distilled hexone, part or all of which had been used in the REDOX Plant. Tank 276-S-142 also contained normal paraffin hydrocarbon (NPH) and tributyl phosphate (TBP) from a one-time campaign to separate americium, curium, and promethium from Shippingport reactor blanket fuel in 1966. Approximately 760 L (200 gal) of water were added to Tank 276-S-141 in 1988. Tank 276-S-142 received approximately 5,000 L (1,300 gal) of water in 1967, 1,900 L (500 gal) in the mid-1970's, and 760 L (200 gal) in the mid-1980's. The combined storage design capacity of Tanks 276-S-141 and 276-S-142 is 182,000 L (48,000 gal). The treatment design capacity of the distillation system was 11,400 L (3,000 gal) of waste per day. The storage design capacity of the railroad tank cars was 152,000 L (40,000 gal). The mixed waste was pumped from Tanks 276-S-141 and 276-S-142 through a distillation system to decrease the radioactivity of the waste. The distilled waste was sent to temporary storage in railroad tank cars located in the HSTF, until transfers to an offsite incinerator were completed in June 1992. Three distillation vessels containing process residue have been sampled and are stored at the Hanford Site as mixed waste. Tanks 276-S-141 and 276-S-142 currently contain up to 19 L to 114 L (5 to 30 gal) each of liquid mixed waste containing 93% NPH, 7% hexone, and up to 950 L (250 gal) of phosphate tar. The phosphate tar will be stored at the Hanford Site as mixed waste. The railroad tank cars have been emptied, cleaned, and moved to another location. The two 91,000 L (24,000-gal) below-grade carbon steel tanks are being closed under interim status.

B1.3.1.3 200-E-111 Tank Farm Process Piping

The 200-E-111 Tank Farm Process Piping, also referred to in the Waste Identification System (WIDS) as SST [Single-Shell Tank] System Transfer Line 241-C-151-U1, is an encased liquid waste transfer line running eastward from the 241-ER-151 Diversion Box, south of 7th Street, and branching off in two directions (forming a Y) southeast of the 216-C-10 Crib (Figure 2-14). From the "Y," it branches to the C Tank Farm and the 244-AR Vault. The pipeline is an underground encasement containing three 7.5 cm (3-in.)-diameter stainless steel waste transfer pipelines, numbered V108, 8618, 8653, except between the "Y" junction and 244-AR-Vault where the encasement contains two 7.5 cm (3-in.) pipelines numbered 809 and 818. Currently the entire length of the pipeline is marked with steel fence posts and is posted as an "Underground Radioactive Materials" area. The ground surface above the pipeline is bare in spots, other sections are vegetated with crested wheatgrass, tumbleweeds, and native grass species (WIDS).

Although specific operation dates have not been found, the facilities connected by the piping operated from 1945 (ER-151) to 1980 (C Tank Farm). The amount and content of liquid waste transported in the 200-E-111 Pipeline vary based on the source plant and time of transfer. In the late 1960's, high-level waste was sluiced from the A and AX Tank Farm tanks and routed through the AR-Vault and 200-E-111 Pipeline to B Plant for cesium and strontium removal (WIDS). Before sluicing, the A Tank Farm stored PUREX waste, including high-level waste, acid concentrator waste, organic wash waste, carbonate wash, and self concentrating waste (WHC-SD-WM-ER-308, Rev. 0) Before sluicing, the AX Tank Farm contained PUREX high-level waste, organic wash waste, PUREX acid waste, PUREX sludge supernatant liquid, and B Plant fission product waste (HNF-SD-HTI-TI-001, Rev. 0). The C Tank Farm received bismuth phosphate metal waste, PUREX sludge supernatant liquid en route to B Plant, first and second cycle waste and process decontamination waste from B Plant, and process waste generated by U Plant. B Plant and PUREX waste could be transferred by the 200-E-111 Pipeline, via the 200-AR Vault and the 241-ER-151 Diversion Box. Transfers from the 200 West Area were conducted through the cross-site transfer line to the 241-ER-151 Diversion Box and through the 200-E-111 Pipeline (WIDS).

An associated unplanned release (UPR) (UPR-200-E-86) occurred in February 1971 when a leak was discovered near the southwest corner of the C Tank Farm outside the tank farm fence. The line was being used to transfer process waste from the 244-AR Vault to the C Tank Farm. The leak was approximately 66,000 L (17,000 gal) containing 25,000 Ci of cesium-137 and contaminating approximately 36 m^3 (1,300 ft^3) of soil. A study in 1971 to define the extent of contamination found no contamination below 6 m (20 ft). During the study, eight borings were drilled around the leak to define the release area. The site is currently surrounded by concrete AC-540 marker posts at each corner. The surface has been covered with grout and is posted with "Underground Radioactive Material" signs (WIDS). This UPR is the focus of the sampling effort.

B1.3.1.4 200-W-59 Diversion Box

The 200-W-59 Diversion Box is a liquid waste site located southwest of the 234-5 Z Building, between the two fences that make up the double Z Plant exclusion area. The site is west of the

241-Z-361 Settling Tank and directly north of the 216-Z-12 Crib. The site consists of a 2.1 m by 2.1 m by 5.2 m concrete box containing equipment used to remotely route liquid process waste from the 241-Z-361 Settling Tank and the 200-W-58 Diversion Box to the 216-Z-12 Crib.

The 200-W-59 Diversion Box received process waste and analytical and development waste from the 234-5 Z Building (i.e., the Plutonium Finishing Plant [PFP]) (WIDS), with minor amounts of waste from the 232-Z Incinerator, the Plutonium Recovery Facility (PRF), and the 242-Z Waste Treatment Facility. The 200-W-59 Diversion Box received this waste from the 241-Z-361 Settling Tank via the 200-W-58 Diversion Box and diverted it to the 216-Z-12 Crib. The 200-W-59 Diversion Box was built as part of and was the sole source of waste to the 216-Z-12 Crib. The diversion box was in service until the crib was retired in 1973. Records indicate the 216-Z-12 Crib received waste from January 1959 to May 1973 (RHO-ST-44). During this period, 281,000,000 L (74,200,000 gal) of liquid waste containing a total 25 kg of plutonium was sent to the 216-Z-12 Crib via the 200-W-59 Diversion Box (RHO-ST-44). Waste diverted through the 200-W-59 Diversion Box was slightly basic, low-salt, sodium, fluoride and nitrate solutions containing small amounts of organic (RHO-ST-44). Bulk disposal of organic waste was sent to the 216-Z-1A Crib. Studies in the 1970's indicated plutonium contamination under the diversion box and crib, with the maximum concentration starting at 5 m and extending to a depth of between 6 m near the diversion box and 10 m near the crib. Leaks from the crib and diversion box are believed to be the sources of this plume, but subsequent studies showed that the most likely source was, instead, leaks from the unsealed joints in the vitrified clay piping connecting the crib and diversion box. Plutonium activity in the well closest to the 200-W-59 Diversion Box, approximately 12 m (40 ft) southeast of the diversion box, reached a maximum of 252,000 pCi/g (±15%) during the study. Currently, the diversion box is buried with its concrete lid slightly above ground level. The Z Plant fenced exclusion area is covered with gravel (WIDS).

B1.3.1.5 2607-W3 Septic Tank and Drain Field

The 2607-W3 is a sanitary sewage disposal site consisting of a reinforced concrete tank extending 6 in. above grade (Hanford Site Drawing W-71182) with a 54,428 L capacity, located northeast of the 241-T-361 Settling Tank, approximately 61 m (200 ft) north of 23rd Street and 244 m (800 ft) southwest of the 224-T Building. This site also includes a drain field that was expanded in the 1950's to 134 m by 61 m. The drain field flow capacity was 18,685 L/day (WHC-SD-LL-ES-020, *200 Area Sanitary Waste Management Engineering Study*). The tank received sanitary effluent from the 221-T, 222-T, 224-T, and 271-T Buildings from 1944 until it was pumped, filled with sand, and abandoned in place in August 1996. Before being abandoned, the 2607-W3 Septic System received 14,187 L/day of sanitary sewage. A contaminated process sewer line runs parallel to the sanitary sewer line in this area (WIDS).

B1.4 CONTAMINANTS OF CONCERN

The DQO process identifies the need to develop a list of contaminants of potential concern (COPC) for the 200-IS-1 and 200-ST-1 OU waste sites. Development of the COPCs is an essential step towards refining the preliminary conceptual contaminant distribution models. From an investigation of historical sources including process documents, logbooks, original plant

technical manuals, and interviews of plant operators, a list of potential contaminants was identified. Screening of this list was conducted during the DQO process to arrive at a final list of COCs for the 200-IS-1 and 200-ST-1 OU. Development of these lists is described in the 200-IS-1 and 200-ST-1 DQO summary report (CP-13196) and is summarized in Section 3.5 of DOE/RL-2002-14. The COCs are identified in Tables B-1 through B-5.

If contaminants not identified as COCs are detected during laboratory analysis, the data will be evaluated against regulatory standards, or risk-based contamination levels if exposure data are available, and existing process knowledge in support of remedial action decision making.

B1.4.1 Data Quality Objectives

The U.S. Environmental Protection Agency (EPA) document, EAP QA/G-4, *Guidance for the Data Quality Objectives Process*, was used to support the development of this SAP. The DQO process is a strategic planning approach that provides a systematic process for defining the criteria that a data collection design should satisfy. Using the DQO process ensures that the type, quantity, and quality of environmental data used in decision making will be appropriate for the intended application.

This section summarizes the key outputs resulting from the implementation of the DQO process. Additional details are included in the DQO summary report (CP-13196).

B1.4.1.1 Statement of the Problem

The 200-IS-1 and 200-ST-1 OUs consist of waste sites that stored or transferred liquid waste containing low to high concentrations of radionuclides and nonradiological constituents. The sites include RCRA TSD units and RCRA past-practice waste sites. A number of these sites are unplanned release sites. Vadose zone soils and, potentially, the groundwater might have been contaminated by releases from some of the 200-IS-1 and 200-ST-1 waste sites.

The objective of the DQO process for these OUs was to determine the environmental measurements necessary to support the remedial investigation/feasibility study (RI/FS) process and remedial decision making, including refinement of the preliminary conceptual contaminant distribution model for representative and/or RCRA TSD sites. The DQO process also supports development of this SAP.

B1.4.1.2 Decision Rules

Decision rules are developed from results of the principal study questions, decision statements, remedial action alternatives, data needs, COC action levels, analytical requirements, and scale of the decisions. Decision rules generally are structured as "if-then" statements that indicate the action that will be taken when a prescribed condition is met. Decision rules incorporate the parameters of interest (e.g., COCs), the scale of the decision (e.g., location), the preliminary action level (e.g., COC concentration), and the resulting actions. The decision statement for the 200-IS-1 and 200-ST-1 OUs are summarized in Table B-6.

B1.4.1.3 Error Tolerance and Decision Consequences

The consequence of selecting an inadequate nonstatistical sampling design is not considered severe. Based on Chapter 6 of the DQO summary report (CP-13196), the sampling design rigor requirements are not significant because of the combination of low severity and accessibility after remedial investigation sampling. If the sampling design is determined to be inadequate, additional sampling can be performed because the sites still will be accessible. DOE/RL-2002-14, Chapter 5, summarizes the sampling activities that are planned after the initial characterization efforts described in this SAP are evaluated.

B1.4.2 Sample Design Summary

A nonstatistical sampling design (professional judgment) was used to select sample locations at the waste sites. A biased (or focused) sampling approach was selected based on process knowledge, expected behavior of COCs, observed distribution of contamination, waste site configuration, and the preliminary conceptual contaminant distribution models developed for the waste sites. Using this approach, field screening measurements and/or soil sample locations are selected that increase the likelihood of encountering the worst case conditions or maximum concentrations of contaminants.

The total number of samples for the waste sites is selected based on the conceptual contaminant distribution models and the physical setting of the waste sites. The models suggest that the highest potential for contamination should be near the bottom of the structures and decrease with depth. Therefore, a greater number of field screening measurements and/or soil sample intervals is planned in the zone immediately below the potential release point of the contaminants. The number of field screening measurements and/or soil sample intervals generally will decrease with depth based on the expected distribution of contamination. Additional field screening measurements and/or soil samples can be collected at the discretion of the site geologist based on the field screening information and geological conditions encountered during the field investigation. All material excavated will be screened as described in Section 3.4.2 to reduce the potential of overlooking zones of significant contamination. The optimal sample design for this initial phase of characterization is presented in Tables B-10 through B-16.

Changes to the work scope detailed in the SAP may be required because of unexpected field conditions, new information, health and safety concerns, or other anomolies. Minor changes that have no adverse effect on the DQOs or schedule can be made in the field with the approval by the project manager or assigned task lead and documented in the daily field logbook and/or field summary reports. Changes that affect the DQOs will require concurrence by the U.S. Department of Energy, Richland Operations Office (RL),and the lead regulatory agency and can be documented through unit managers' meetings. Alternatively, if substantial changes are required, the SAP can be revised and issued as a separate document requiring RL and regulator approval.

Table B-1. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List for Representative Sites–200-W-59 Diversion Box. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239	14119-33-6	Plutonium-240
Inorganics			
7664-41-7	Ammonium	14280-30-9	Hydroxide
7440-38-2	Arsenic	7439-92-1	Lead
7440-39-3	Barium	7440-02-0	Nickel
7440-41-7	Beryllium	14797-55-8	Nitrate
7440-69-9	Bismuth	14797-65-0	Nitrite
24959-67-9	Bromide	14265-44-2	Phosphate
16887-00-6	Chloride	7440-22-4	Silver
7440-47-3	Chromium	14808-79-8	Sulfate
18540-29-9	Chromium (VI)	18496-25-8	Sulfides
16984-48-8	Fluoride		
Organics			
75-34-3	1,1-dichloroethane (DCA)	75-09-2	Dichloromethane (methylene chloride)
107-06-2	1,2-dichloroethane (DCA)	64742-81-0	Kerosene (Normal Paraffin Hydrocarbon)
51-28-5	2,4-Dinitrophenol	98-95-3	Nitrobenzene
67-64-1	Acetone	87-86-5	Pentachloro-phenol
120-12-7	Anthracene	1336-36-3	Polychlorinated biphenyls
35296-72-1	Butanol	108-88-3	Toluene
56-23-5	Carbon Tetrachloride	156-60-5	Trans-1,2-dichloroethylene

Table B-1. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List for Representative Sites–200-W-59 Diversion Box. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
108-90-7	Chlorobenzene	126-73-8	Tributyl phosphate
67-66-3	Chloroform	79-01-6	Trichloroethylene
156-59-2	Cis-1,2-dichloroethylene	1330-20-7	Xylene
10061-01-5	cis-1,3-dichloropropene	75-09-2	Dichloromethane (methylene chloride)

Table B-2. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List For Representative Sites–200-E-111 Pipeline. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
Inorganics			
7664-41-7	Ammonia	14280-30-9	Hydroxide
7440-36-0	Antimony	13709-38-1	Lanthanum fluoride
7440-39-3	Barium	7439-92-1	Lead
7440-41-7	Beryllium	7439-97-6	Mercury
7440-69-9	Bismuth	7440-02-0	Nickel
24959-67-9	Bromide	14797-55-8	Nitrate
7440-43-9	Cadmium	14797-65-0	Nitrite
16887-00-6	Chloride	14265-44-2	Phosphate
7440-47-3	Chromium	7782-49-2	Selenium
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate

Table B-2. 200-IS-1 and 200-ST-1 Final Contaminants of Concern List For Representative Sites–200-E-111 Pipeline. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
57-12-5	Cyanide	18496-25-8	Sulfides
16984-48-8	Fluoride		
Organics			
71-55-6	1,1,1-trichloroethane (TCA)	108-90-7	Chlorobenzene
79-34-5	1,1,2,2-tetrachloroethane	67-66-3	Chloroform
79-00-5	1,1,2-trichloroethane	10061-01-5	cis-1,3-dichloropropene
75-34-3	1,1-dichloroethane (DCA)	53-70-3	Dibenz[a,h]anthracene
75-35-4	1,1-dichloroethene	75-09-2	Dichloromethane (methylene chloride)
120-82-1	1,2,4-trichlorobenzene	100-41-4	Ethylbenzene
95-50-1	1,2-dichlorobenzene	118-74-1	Hexachlorobenzene
107-06-2	1,2-dichloroethane (DCA)	87-68-3	Hexachlorobutadiene
540-59-0	1,2-dichlofoehtene(total)	64742-81-0	Kerosene (normal paraffin hydrocarbon)
78-87-5	1,2-dichloropropane	78-93-3	Methyl ethyl ketone
541-73-1	1,3-dichlorobenzene	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
106-46-7	1,4-dichlorobenzene	91-20-3	Naphthalene
121-14-2	2,4-dinitrotoluene	98-95-3	Nitrobenzene
95-95-4	2,4,5-trichlorophenol	8008-20-6	Normal paraffin hydrocarbon (kerosene)
591-78-6	2-hexanone	87-86-5	Pentachloro-phenol
95-48-7	2-methylphenol (o-cresol)	108-95-2	Phenol
106-44-5	4-methylphenol (p-cresol)	1336-36-3	Polychlorinated biphenyls
67-64-1	Acetone	100-42-5	Styrene
71-43-2	Benzene	127-18-4	Tetrachloroethylene
207-08-9	Benzo(k)fluoranthene	108-88-3	Toluene
50-32-8	Benzo(a)pyrene	TOC	Total organic carbon
191-24-2	Benzo(ghi)perylene	10061-02-6	Trans-1,3-dichloropropene
207-08-9	Benzo(k)fluoranthene	126-73-8	Tributyl phosphate
35296-72-1	Butanol	79-01-6	Trichloroethylene
56-23-5	Carbon tetrachloride	1330-20-7	Xylene

Table B-3. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List–2607-W-3 Septic Tank. (3 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
Inorganics			
7664-41-7	Ammonia	14280-30-9	Hydroxide
7440-36-0	Antimony	13709-38-1	Lanthanum fluoride
7440-39-3	Barium	14797-55-8	Nitrate
7440-41-7	Beryllium	14797-65-0	Nitrite
16887-00-6	Chloride	14265-44-2	Phosphate
7440-47-3	Chromium	7782-49-2	Selenium
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
16984-48-8	Fluoride		
Organics			
67-64-1	Acetone	78-93-3	Methyl ethyl ketone
71-43-2	Benzene	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
35296-72-1	Butanol	91-20-3	Naphthalene
75-09-2	Dichloromethane (methylene chloride)	108-88-3	Toluene
64742-81-0	Kerosene (normal paraffin hydrocarbon)		

Table B-4. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 241-CX Tank System. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
Inorganics			
7664-41-7	Ammonia	57-12-5	Cyanide
7440-36-0	Antimony	16984-48-8	Fluoride
7440-39-3	Barium	14280-30-9	Hydroxide
7440-41-7	Beryllium	7439-92-1	Lead
7440-69-9	Bismuth	7439-97-6	Mercury
24959-67-9	Bromide	7440-02-0	Nickel
7440-43-9	Cadmium	14797-55-8	Nitrate
16887-00-6	Chloride	14797-65-0	Nitrite
7440-47-3	Chromium	14265-44-2	Phosphate
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
Organics			
71-55-6	1,1,1-trichloroethane (TCA)	35296-72-1	Butanol
120-82-1	1,2,4-trichlorobenzene	67-66-3	Chloroform
95-48-7	2-methylphenol (o-cresol)	78-93-3	Methyl ethyl ketone
67-64-1	Acetone	108-10-1	Methyl iso butyl ketone (MIBK, hexone)
71-43-2	Benzene	8008-20-6	Normal paraffin hydrocarbon (kerosene)
207-08-9	Benzo(k)fluoranthene	108-95-2	Phenol
50-32-8	Benzo(a)pyrene	127-18-4	Tetrachloroethylene

Table B-4. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 241-CX Tank System. (2 Pages)

CAS Number	Compound Name	CAS Number	Compound Name
191-24-2	Benzo(ghi)perylene	126-73-8	Tributyl phosphate
207-08-9	Benzo(k)fluoranthene	1330-20-7	Xylene

Table B-5. 200-IS-1 and 200-ST-1 Representative Sites Contaminants of Concern List – 276-S Hexone Storage and Treatment Facility

CAS Number	Compound Name	CAS Number	Compound Name
Radionuclides			
14596-10-2	Americium-241	14119-33-6	Plutonium-240
14762-75-5	Carbon-14	13982-63-3	Radium-226
10045-97-3	Cesium-137	15262-20-1	Radium-228
10198-40-0	Cobalt-60	10098-97-2	Strontium-90
14683-23-9	Europium-152	14133-76-7	Technetium-99
15585-10-1	Europium-154	7440-29-1	Thorium-232
14391-16-3	Europium-155	13968-55-3	Uranium-233
10028-17-8	Hydrogen-3 (tritium)	13966-29-5	Uranium-234
13994-20-2	Neptunium-237	15117-96-1	Uranium-235
13981-37-8	Nickel-63	13982-70-2	Uranium-236
13981-16-3	Plutonium-238	7440-61-1	Uranium-238
15117-48-3	Plutonium-239		
Inorganics			
7664-41-7	Ammonia	16984-48-8	Fluoride
7440-36-0	Antimony	14280-30-9	Hydroxide
7440-39-3	Barium	7439-97-6	Mercury
7440-41-7	Beryllium	14797-55-8	Nitrate
7440-69-9	Bismuth	14797-65-0	Nitrite
7440-47-3	Chromium	14265-44-2	Phosphate
18540-29-9	Chromium (VI)	7440-22-4	Silver
7440-50-8	Copper	14808-79-8	Sulfate
57-12-5	Cyanide		
Organics			
71-43-2	Benzene	8008-20-6	Normal paraffin hydrocarbon
207-08-9	Benzo(k)fluoranthene	126-73-8	Tributyl phosphate
108-10-1	Methyl iso butyl ketone (MIBK, hexone)		

Table B-6. Decision Rules[a] [1].

DR#	Decision Rule
1	If the true maximum (as estimated by the maximum detected sample values) activity of radionuclides within the soil samples in each of the applicable strata[b] is greater than or equal to 100 nCi/g (TRU waste definition) or the greater than Class C definition, evaluate special remedial alternatives in a FS, otherwise, evaluate conventional remedial alternatives in a FS.
2	If the true maximum (as estimated by the maximum detected sample value) activity of radionuclides dose greater than or equal to 15 to 100 mrem/yr above background, evaluate remedial alternatives in a FS, otherwise, evaluate the site for closure with no remedial action.
3	If the true maximum (as estimated by the maximum detected sample values) concentration of chemical constituents within the soil samples in each of the applicable strata[b] is greater than or equal to the preliminary action levels in Table 3-6, evaluate remedial alternatives in a FS, otherwise, evaluate the site for closure with no remedial action.

[a] From the Data Quality Objectives (CP-13196, Section 5.2, Table 10.

[b] The applicable strata include the highest potential contaminant concentration layers, the moderate-to-low potential contaminant concentration layers, and the low potential contaminant concentration layers.

CP-13196, 2002, *Remedial Investigation Data Quality Objectives Summary Report for the 200-IS-1 and 200-ST-1 Operable Units*, Fluor Hanford, Inc., Richland, Washington.

B2.0 QUALITY ASSURANCE PROJECT PLAN

The quality assurance project plan (QAPjP) establishes the quality requirements for environmental data collection, including sampling, field measurements, and laboratory analysis. The overall QAPjP for environmental restoration waste sites in the 200 Areas is included in Appendix A of the Implementation Plan (DOE/RL-98-28). The QAPjP complies with the requirements of the following:

- U.S. Department of Energy (DOE) Directive CRD 414.1A, *Quality Assurance*
- *Code of Federal Regulations* (CFR), 40 CFR 830.120, "Quality Assurance Requirements"
- *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, QA/R-5
- *Hanford Analytical Services Quality Assurance Requirements Documents*, DOE/RL-96-68.

The Implementation Plan (DOE/RL-98-28) provides the general framework of technical and administrative requirements that apply to OUs in the 200 Areas.

To meet the site-specific needs for the remedial investigation of the 200-IS-1 and 200-ST-1 Operable Units, this QAPjP identifies the following supplemental requirements developed from the DQO process.

- **Field Sampling Quality Control**. The frequency and type of quality control (QC) samples to be collected are addressed in Section B.2.1.
- **Analytical Performance**. The analytical methods identified for COC analyses including requirements for detection limits, precision, and accuracy are addressed in Section B.2.2.
- **Sample Preservation, Containers, and Holding Time**. The requirements for the specific test/laboratory methods are addressed in Section B.2.3 and in Table B-8.
- **Onsite Measurements Quality Control**. The specific types of QC samples for onsite measurements and the frequency of collection are addressed in Section B.2.4.
- **Data Management and Data Validation.** Specific data management and validation requirements are addressed in Sections B.2.5 and B.2.6, respectively.

The following sections describe the supplemental waste group quality requirements and the procedural controls applicable to this investigation. Note that the Bechtel Hanford, Inc. (BHI), procedures or manuals referenced in this section are in the process of being blue-sheeted to convert them to FH procedures. They are considered appropriate for reference at this time. The current approved version of the FH procedure will be used at the time of implementation in the field. This applies to all BHI procedures or manuals that are referenced throughout the remainder of this SAP. The 200 Areas QAPjP (DOE/RL-98-28, Appendix A) and this section of the SAP will serve as the QAPjP for the 200-IS-1 and 200-ST-1 RI.

B2.1 FIELD QUALITY CONTROL

Field QC samples shall be collected to evaluate the potential for cross-contamination and laboratory performance. Field QC for sampling in the 200-IS-1 and 200-ST-1 OU will require the collection of field duplicate, field split, equipment rinsate blank, and trip blank samples. If possible, field duplicate and field split samples should be collected from contaminated areas so that valid comparisons between the samples can be made. However, the samples should not be collected from zones that are expected to contain high levels of transuranic-contaminated soils because of the high cost and added handling requirements associated with transuranic materials.

B2.1.1 Field Duplicates

Each field duplicate shall be retrieved from the sample interval using the same equipment (collected from one split spoon or bowl) and sampling technique as the original sample. Field duplicates for soil are collected and homogenized before being divided into two samples in the field. If volatile organic analyte (VOA) samples are required, they should be collected before homogenization. The duplicate samples shall be sent to the primary laboratory in the same manner as the routine site samples. Field duplicates provide information regarding the homogeneity of the sample matrix and also can be used to evaluate the precision of the analysis process.

At least 5% of the total collected soil samples will be duplicated (1 field duplicate will be collected for every 20 samples). At least one field duplicate shall be collected from each representative waste site investigated. The duplicate samples shall be suitable for analysis by an offsite laboratory and shall be analyzed for all the COCs listed in Table B-7.

B2.1.2 Field Splits

Field split samples will be collected at the same frequency as field duplicate samples from each representative site sampled in the RI. Each split sample shall be retrieved from the same sample interval using the same equipment (collected from one split spoon) and sampling technique as the original sample. Samples shall be homogenized, split into two separate aliquots in the field, and sent to two independent laboratories. If VOA samples are required, they should be collected before homogenization. The splits will be used to verify the performance of the primary laboratory.

The split samples will be obtained from a sample medium that is expected to have some contamination and that is suitable for analysis in an offsite laboratory and shall be analyzed for all of the COCs listed in Table B-7.

B2.1.3 Equipment Rinsate Blanks

Equipment rinsate blanks are used to verify the adequacy sampling equipment decontamination procedures and shall be collected for each sampling method or type of equipment used. The field geologist can request that additional equipment blanks be taken. Equipment blanks shall consist of deionized water washed through decontaminated sampling equipment and placed in containers identified in the Sampling Authorization Forms. Equipment rinsate blanks shall be analyzed for the following:

- Gross alpha
- Gross beta
- Metals (excluding hexavalent chromium and mercury)
- Anions (except cyanide)
- Volatile organic analytes of interest.

These analytes are considered to be the best indicators of decontamination effectiveness.

B2.1.4 Trip Blanks

The volatile organic trip blanks will constitute at least approximately 5% of all volatile organic compound samples. If applicable, at least one trip blank shall be collected from each representative waste site investigated. Trip blanks shall consist of laboratory-grade deionized water added to a clean sample container. The trip blanks shall travel to the field with their associated bottle sets and will be returned to the laboratory with the samples. They will remain unopened during their transport and handling. Trip blanks are prepared as a check for possible

contamination originating from container preparation methods, shipment, handling, storage, or site conditions. The trip blank shall be analyzed for volatile organic compounds only.

B2.1.5 Prevention of Cross-Contamination

Special care should be taken to prevent cross-contamination of soil samples. Particular care will be exercised to avoid the following common ways in which cross-contamination or background contamination may compromise the samples:

- Improperly storing or transporting sampling equipment and sample containers
- Contaminating the equipment or sample bottles by setting them on or near potential contamination sources, such as uncovered ground
- Handling bottles or equipment with dirty hands
- Improperly decontaminating equipment before sampling or between sampling events.

B2.2 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Quality objectives and criteria for soil measurement data are presented in Table B-7 for radiological and nonradiological analytes, as well as physical properties of interest. Analysis of soil physical properties will be performed according to American Society for Testing and Materials (ASTM) procedures, if applicable.

B2.3 SAMPLE PRESERVATION, CONTAINERS, AND HOLDING TIMES

Soil sample preservation, containers, and holding times for radiological and nonradiological analytes of interest and physical property test are presented in Table B-8. Final sample collection requirements will be identified on the Sampling Authorization Form.

B2.4 ONSITE MEASUREMENTS QUALITY CONTROL

The collection of QC samples for onsite measurements does not apply to the field screening techniques described in this plan. The applicable field screening methods and performance requirements are presented in Table B-9 except for spectral gamma-logging analytical performance requirements, which are listed in Table B-7. Field screening instrumentation will be calibrated and controlled according to the procedures identified in Section B.2.7. Special care should be taken to prevent cross-contamination of field screening equipment by properly storing and handling the equipment and performing proper decontamination between sampling events.

B2.5 DATA MANAGEMENT

Data resulting from the implementation of this QAPjP will be managed and stored by the organization responsible for sampling and characterization, in accordance with BHI-EE-01, *Environmental Investigations Procedures*, Section 2.0, "Sample Management," or equivalent. At the direction of the task lead, all analytical data packages will be subject to final technical review by qualified personnel before their submittal to regulatory agencies or inclusion in reports. Electronic data access, when appropriate, will be via a database (e.g., Hanford Environmental Information System [HEIS] or a project-specific database). Where electronic data are not available, hard copies will be provided in accordance with Section 9.6 of the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al. 1989).

B2.6 VALIDATION AND VERIFICATION REQUIREMENT

Completed soil sample analysis data packages will be validated by qualified sample management personnel or by a qualified independent contractor. Validation will consist of verifying required deliverables, requested versus reported analyses, and transcription errors. Validation also will include the evaluation and qualification of results based on holding time, method blanks, matrix spikes, laboratory control samples, laboratory duplicates, and chemical and tracer recoveries, as appropriate to the methods used. No other validation or calculation checks will be performed. At least 5% of all data will be validated.

At least one data validation package shall be generated for each OU. Validation requirements identified in this section are consistent with Level C validation, as defined in BHI-01433, *Data Validation Procedure for Radiochemistry Analysis*, and BHI-01435, *Data Validation Procedure for Chemical Analysis*, or the equivalent. No validation for soil gas measurements, geophysical logging, or physical property data will be performed.

B2.7 TECHNICAL PROCEDURES AND SPECIFICATIONS

Soil sampling and onsite environmental measurements will be performed according to approved procedures. Sampling and field measurements will be conducted according to BHI-EE-01, *Environmental Investigations Procedures*; BHI-EE-05, *Field Screening Procedures*; and other approved procedures. Individual procedures that may be used during performance of this SAP include the following specific procedures or their equivalent:

Note: The manuals and/or procedures cited in this section are in the process of being blue sheeted to convert them to FH procedures. They are still considered appropriate for reference at this time. The current approved version of the FH procedure will be used at the time of implementation in the field.

- BHI-EE-01, *Environmental Investigations Procedures*
  - Section 1.0, General Information
    - Procedure 1.5, "Field Logbooks"
    - Procedure 1.6, "Survey Requirements and Techniques"

- Section 2.0, Sample Management
  - Procedure 2.0, "Sample Event Coordination"
  - Procedure 2.1, "Sampling Documentation Processing"
- Section 3.0, General Sampling
  - Procedure 3.0, "Chain of Custody"
  - Procedure 3.1, "Sample Packaging and Shipping"
  - Procedure 3.2, "Field Decontamination of Sampling Equipment"
- Section 4.0, Soil, Groundwater, and Biotic Sampling
  - Procedure 4.0, "Soil and Sediment Sampling"
  - Procedure 4.2, "Sample Storage and Shipping Facility"
- Section 5.0, Sampling Techniques
  - Procedure 5.2, "Test Pit Excavation in Contaminated Areas"
- Section 6.0, Drilling
  - Procedure 6.2, "Field Cleaning and/or Decontamination of Geoprobe and Drilling Equipment"
- Section 7.0, Geologic and Hydrologic Data Collection
  - Procedure 7.0, "Geologic Logging"
  - Procedure 7.2, "Geophysical Survey Work"

- BHI-EE-02, *Environmental Requirements*
  - Procedure 14.0, "Drilling, Maintaining, Remediating, and Decommissioning Resource Protection Wells, Geoprobe™, and Geotechnical Soil Borings"
- BHI-EE-05, *Field Screening Procedures*
  - Procedure 1.0, "Routine Field Screening"
  - Procedure 2.13, "MDA and Scan Speed Determinations for Environmental Radiological Surveys"
  - Procedure 4.1, "Classification of Areas for Radiological Release"
  - Procedure 4.2, "Preparation of Environmental Radiological Task Instructions"
  - Procedure 4.3, "Radiological Background Measurements"
  - Procedure 4.4, "Documenting Environmental Radiological Surveys"
  - Procedure 4.5, "Performance of Environmental Radiological Measurements"
- BHI-EE-10, *Waste Management Plan*, Part II
  - Procedure 9.0, "Control of CERCLA and Other Past-Practice Investigation-Derived Waste"
- *Specification for Environmental drilling Services Specific to 200-IS-1 and 200-ST-1*
- *Sampling Services Procedures Manual*, ES-SSPM-001, Rev. 0, Procedure 2-5, "Laboratory Cleaning of Sampling Equipment."

B2.7.1 Sample Location

Sampling locations (e.g., soil probes, boreholes) will be identified in the field before starting the activity. Locations will be staked by the technical lead or field team leader assigned by the project manager. After the locations have been staked, minor adjustments to the location may be made to mitigate unsafe conditions. Locations will be identified during or after sampling, following BHI-EE-01, Procedure 1.6, "Survey Requirements and Techniques," or equivalent. Changes in sample locations that do not affect the DQOs will require approval of the project manager. Changes to sample locations that result in impacts to the DQOs will require concurrence by RL and the lead regulator.

Surface geophysical and radiation surveys will be conducted at all sampling locations. The surface geophysical surveys will be conducted using ground-penetrating radar and/or electromagnetic imaging and will aid in verifying waste site construction and geometry and in selecting locations to avoid subsurface obstructions. The surface radiation surveys will identify areas of surface contamination that might affect the field activities and health and safety.

B2.7.2 Sample Identification

The sample and data tracking database will be used to track the samples through the collection and laboratory analysis process. The HEIS database is the repository for the laboratory analytical results. The HEIS sample numbers will be issued to the sampling organization for this project in accordance with BHI-EE-01, Procedure 2.0, "Sample Event Coordination," or equivalent. Each radiological/nonradiological and physical properties sample will be identified and labeled with a unique HEIS sample number. The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook.

Each sample container will be labeled with the following information using a waterproof marker on firmly affixed water-resistant labels:

- HEIS number
- Sample collection date and time
- Name or initials of person collecting the sample
- Analysis required
- Preservation method, if applicable.

Soil gas measurements will be assigned a unique HEIS sample number and their HEIS number, collection location and depth, will be documented in the samplers field log book.

B2.7.3 Field Sampling Log

All information pertinent to field sampling and analysis will be recorded in bound logbooks in accordance with BHI-EE-01, Procedure 1.5, "Field Logbooks," or equivalent. The sampling team will be responsible for recording all relevant sampling information including, but not limited to, the information listed in Procedure 1.5, Appendix A. Entries made in the logbook will be dated and signed by the individual who made the entry.

B2.7.4 Sample Custody

A chain-of-custody record will be initiated in the field at the time of sampling and will accompany each set of samples shipped to any laboratory in accordance with BHI-EE-01, Procedure 3.0, "Chain of Custody," or equivalent. The analyses requested for each sample will be indicated on the accompanying chain-of-custody form. Chain-of-custody procedures will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained. Each time responsibility for custody of the sample changes, the current and the new custodians shall both sign the record and note the date and time. The sampler will make a copy of the signed record before sample shipment and transmit it to Sample Management within 24 hours of shipping, as detailed in BHI-EE-01, Procedure 2.1, "Sampling Documentation Processing," or equivalent.

A custody seal (i.e., evidence tape) shall be affixed to the lid of each sample jar. The container seal will be inscribed with the sampler's initials and the date sealed. Sample containers collected inside a glovebag or glovebox that are "bagged out" to control radiological contamination may have the evidence tape affixed to the seal of the bag to demonstrate that tampering has not occurred.

B2.7.5 Sample Containers and Preservatives

The EPA precleaned sample containers will be used for soil samples collected for radiological and nonradiological analysis. Container sizes could vary depending on laboratory-specific volumes needed to meet analytical detection limits. If, however, the dose rate on the outside of a sample jar or the curie content exceeds levels acceptable by an offsite laboratory, the sampling lead and task lead may send smaller volumes to the laboratory after consulting with Sample Management to determine acceptable volumes. Preliminary container types and volumes are identified in Table B-8. Final types and volumes will be provided on the Sampling Authorization Form.

B2.7.6 Sample Shipping

The outside of each sample jar will be surveyed by the radiological control technician (RCT) to verify that the container is free of smearable surface contamination. The RCT also measure the radiological activity on the outside of the sample container (through the container) and will mark the container with the highest contact radiological reading in either disintigrations per minute or millirems per hour, as applicable. Total activity analysis performed by the Radiological Counting Facility, the 222-S Laboratory, or another suitable onsite laboratory will be used for determining U.S. Department of Transportation shipping criteria. This information, along with other data that could prequalify the samples, will be used to select proper packaging, marking, labeling, and shipping paperwork in accordance with U.S. Department of Transportation regulations (49 CFR) and to verify that the sample can be received by the offsite analytical laboratory in accordance with the laboratory's acceptance criteria. The sampler will send copies of the shipping documentation to Sample Management within 24 hours of shipping, as detailed in BHI-EE-01, Procedure 2.1, "Sampling Documentation Processing," or equivalent.

As a general rule, samples with activities of less than 1 mrem/hr will be shipped to an offsite laboratory. Samples with activities greater than 1 mrem/hr could be shipped to an offsite laboratory; samples with activities in this range will be evaluated on a case-by-case basis by Sample Management. If no offsite laboratory can be identified for high-activity samples, the samples will be sent to an onsite laboratory arranged by sample management.

Table B-7. Analytical Performance Requirements – Shallow and Deep Zone Soils. (5 Pages).

COCs	CAS #	Preliminary Action Level[a]			Name/Analytical Technology[1]	Required Target Quantitation Limits[c]				Precision Water	Accuracy Water	Precision Soil	Accuracy Soil
		15 mrem/yr[b] (pCi/g)	500 mrem/yr[b] (pCi/g)	GW Protection[b] (pCi/g)		Water Low Activity (pCi/L)	Water High Activity (pCi/L)	Soil-Other Low Activity (pCi/g)	Soil-Other High Activity (pCi/g)				
Radionuclides													
Americium-241	14596-10-2	335	112,000	N/A	Americium isotopic – AEA	1	400	1	4,000	±20%	80-120%	±35%	65-135%
Cesium-137	10045-97-3	23.4	780	N/A	GEA	15	200	0.1	2,000	±20%	80-120%	±35%	65-135%
Cobalt-60	10198-40-0	4.90	164	N/A	GEA	25	200	0.05	2,000	±20%	80-120%	±35%	65-135%
Europium-152	14683-23-9	11.4	388	N/A	GEA	50	200	0.1	2,000	±20%	70-130%	±35%	70-130%
Europium-154	15585-10-1	10.3	345	N/A	GEA	50	200	0.1	2,000	±20%	70-130%	±35%	70-130%
Europium-155	14391-16-3	426	14,200	N/A	GEA	50	200	0.1	2,000	±20%	70-130%	±35%	70-130%
Iodine-129	15046-84-1	–	–	–	Chem sep low energy photon spectroscopy	5	N/A	2	N/A	±20%	70-130%	±35%	70-130%
Plutonium-238	13981-16-3	470	15,700	N/A	Plutonium isotopic – AEA	1	130	1	1,300	±20%	80-120%	±35%	65-135%
Plutonium-239/240	Pu-239/240	425	14,200	N/A	Plutonium isotopic – AEA	1	130	1	1,300	±20%	80-120%	±35%	65-135%
Strontium-90	Rad-Sr	2,410	80,300	N/A	Total radioactive strontium – GPC	2	80	1	800	±20%	80-120%	±35%	65-135%
Technetium-99	14133-76-7	412,000	13,700,000	171	Technetium-99 – liquid scintillation	15	400	15	4,000	±20%	80-120%	±35%	65-135%
Tritium (H-3)	10028-17-8	66,900	2,230,000	4,100	Tritium – liquid scintillation	400	400	400	400	±20%	80-120%	±35%	65-135%
Uranium-233/234	13966-29-5	2,660	88,800	39.5	Uranium isotopic – AEA (pCi) ICPMS (mg)	1	0.002 mg/L	1	0.02 mg/kg	±20%	80-120%	±35%	65-135%
Uranium-235/236	15117-96-1	101	3,370	3.92	Uranium isotopic – AEA (pCi) ICPMS (mg)	1	0.002 mg/L	1	0.02 mg/kg	±20%	80-120%	±35%	65-135%
Uranium-238	U-238	504	16,800	38.1	Uranium isotopic – AEA (pCi) ICPMS (mg)	1	0.002 mg/L	1	0.02 mg/kg	±20%	80-120%	±35%	65-135%

Table B-7. Analytical Performance Requirements – Shallow and Deep Zone Soils. (5 Pages)

COCs	CAS #	Preliminary Action Level[a]			Name/Analytical Technology	Required Target Quantitation Limits[c]				Precision Water	Accuracy Water	Precision Soil	Accuracy Soil
		WAC 173-340-745 Method C[d] (mg/kg)	GW Protection[e] (mg/kg)	Terrestrial Biota Protection[f] (mg/kg)		Water Low Conc. (mg/L)	Water High Conc. (mg/L)	Soil-Other Low Conc. (mg/kg)	Soil-Other High Conc. (mg/kg)				
Metals													
Cadmium	7440-43-9	139 k	0.81 h	4	Metals – 6010 – ICP	0.005	0.01	0.5	1	g	g	g	g
					Metals – 6010i – ICP (trace)	0.005	N/A	0.5	N/A	g	g	g	g
Chromium (total)	7440-47-3	Unlimited	2,000 j	42	Metals – 6010 – ICP	0.01	0.01	1	2	g	g	g	g
					Metals – 6010 – ICP (trace)	0.01	N/A	1	N/A	g	g	g	g
Chromium VI	18540-29-9	21 k	7.7 l	42	Chromium (hex) – 7196 – colorimetric	0.01	4	0.5	200	g	g	g	g
Copper	7440-50-8	130,000	22 h	50	Metals – 6010 – ICP	0.025	0.025	2.5	2.5	g	g	g	g
Lead	7439-92-1	1,000 m	840 l	50	Metals – 6010 – ICP	0.1	0.2	10	20	g	g	g	g
					Metals – 6010 – ICP (trace)	0.01	N/A	1	N/A	g	g	g	g
Mercury	7439-97-6	1,050	0.33 h	0.33 h	Mercury - 7470 – CVAA	0.0005	0.005	N/A	N/A	g	g	g	g
					Mercury - 7471 – CVAA	N/A	N/A	0.2	0.2	g	g	g	g
Silver	7440-22-4	17,500	0.88 j	2	Metals – 6010 – ICP	0.02	0.02	2	2	g	g	g	g
					Metals – 6010 – ICP (trace)	0.005	N/A	0.5	N/A	g	g	g	g
Uranium (total)	7440-61-1	10,500 n	115	5	Uranium total – kinetic phosphorescence analysis	0.0001	0.02	1	0.2	±20%	80-120%	±35%	65-135%
Inorganics													
Cyanide	57-12-5	70,000	0.80 j	N/A	Total cyanide - 9010 – colorimetric	0.005	0.005	0.5	0.5	g	g	g	g
Fluoride	16984-48-8	210,000	16 j	N/A	Anions – 300.0 – IC	0.5	5	5	5	g	g	g	g
Nitrate	14797-55-8	Unlimited	40 j	N/A	Anions – 300.0 – IC	0.25	10	2.5	40	g	g	g	g
Nitrite	14797-65-0	350,000	4 j	N/A	Anions – 300.0 – IC	0.25	15	2.5	20	g	g	g	g
Phosphate	14265-44-2	N/A	N/A	N/A	Anions – 300.0 – IC	0.5	15	5	40	g	g	g	g
Sulfate	14808-79-8	N/A	1,000 j	N/A	Anions – 300.0 – IC	0.5	15	5	40	g	g	g	g
Organics													
Acetone (2-propanone)	67-64-1	350,000	3.21	N/A	Volatile organics – 8260 – GCMS	0.02	0.02	0.02	0.02	g	g	g	g
Benzene	71-43-2	2,390	2.42	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
n-butyl alcohol	71-36-3	350,000	6.62	N/A	GC organic - 8015	5	5	5	5	g	g	g	g
Butyl benzene; n	104-51-8	N/A	N/A	N/A	Volatile organics – 8260 – GCMS	0.005	N/A	0.005	N/A	N/A	N/A	N/A	N/A
Dichloroethane; 1,1	75-34-3	350,000	4.37	N/A	Volatile organics – 8260 – GCMS	0.01	0.01	0.01	0.01	g	g	g	g
Dichloroethane; 1,2	107-06-2	1,440	0.00232	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Dichloroethylene; 1,2- (trans)	156-60-5	31,500	0.36 j	N/A	Volatile organics – 8260 – GCMS	0.001	0.001	0.001	0.001	g	g	g	g

Table B-7. Analytical Performance Requirements – Shallow and Deep Zone Soils. (5 Pages)

COCs	CAS #	Preliminary Action Level[a]			Name/Analytical Technology	Required Target Quantitation Limits[c]				Precision Water	Accuracy Water	Precision Soil	Accuracy Soil
		WAC 173-340-745 Method C[d] (mg/kg)	GW Protection[e] (mg/kg)	Terrestrial Biota Protection[f] (mg/kg)		Water Low Conc. (mg/L)	Water High Conc. (mg/L)	Soil-Other Low Conc. (mg/kg)	Soil-Other High Conc. (mg/kg)				
Dichloroethylene; 1,2-cis-	156-59-2	31,500	0.36 j	N/A	Volatile organics – 8260 – GCMS	0.001	0.001	0.001	0.001	g	g	g	g
Ethylbenzene	100-41-4	350,000	6.91	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Methyl ethyl ketone (MEK; 2-butanone)	78-93-3	Unlimited	N/A	N/A	Volatile organics – 8260 – GCMS	0.01	0.01	0.01	0.01	g	g	g	g
Methyl isobutyl ketone (MIBK hexone)	108-10-1	280,000	N/A	N/A	Volatile organics – 8260 – GCMS	0.01	0.01	0.01	0.01	g	g	g	g
Methylene chloride (dichloromethane)	75-09-2	17,500	0.022 j	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
PCBs	1336-36-3	10 m	0.0021	0.65	PCBs – 8082 – GC	0.0005	0.005	0.0165	0.1	g	g	g	g
Tetrachloroethylene	127-18-4	2,570	0.0091	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Toluene	108-88-3	70,000	7.3 j	200	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Tributyl phosphate	126-73-8	N/A	N/A	N/A	Semi-volatiles – 8270 – GCMS	0.1	0.5	3.3	5	g	g	g	g
Trichlorethane; 1,1,1	71-55-6	Unlimited	57	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Trichloroethylene	79-01-6	11,900	0.0263	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Xylene (total)	1330-20-7	Unlimited	135	N/A	Volatile organics – 8260 – GCMS	0.005	0.005	0.005	0.005	g	g	g	g
Total petroleum hydrocarbons – diesel to oil range (kerosene)	68334-30-5	2,000m	2,000m	200	WTPH-D	0.5	0.5	5	5	g	g	g	g
Total petroleum hydrocarbons – gasoline range	8006-61-9	30m	30m	100	WTPH-G	0.5	0.5	5	5	g	g	g	g
Normal paraffin hydrocarbons	8008-20-6	2,000 m	2,000 m	200	Nonhalogenated VOA – 8015M – GC modified for hydrocarbons	0.5	0.5	5	5	g	g	g	g
Normal paraffins (grease; heavy oils)	8008-20-6	2,000 m	2,000 m	N/A	Oil and grease (total recoverable) – 413.N	2	N/A	200	N/A	g	g	g	g
Field Screening Measurements													
pH	N/A	N/A	N/A	N/A	TBD	TBD		TBD		TBD	TBD	TBD	TBD
Americium-241	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		~25 nCi/g		N/A	N/A	70-130	+30
Cesium-137	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		0.3 pCi/g		N/A	N/A	70-130	+30
Cobalt-60	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		0.2 pCi/g		N/A	N/A	70-130	+30

Table B-7. Analytical Performance Requirements – Shallow and Deep Zone Soils. (5 Pages)

COCs	CAS #	Preliminary Action Level[a]			Name/Analytical Technology	Required Target Quantitation Limits[c]				Precision Water	Accuracy Water	Precision Soil	Accuracy Soil
		WAC 173-340-745 Method C[d] (mg/kg)	GW Protection[e] (mg/kg)	Terrestrial Biota Protection[f] (mg/kg)		Water Low Conc. (mg/L)	Water High Conc. (mg/L)	Soil-Other Low Conc. (mg/kg)	Soil-Other High Conc. (mg/kg)				
Europium-152	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		2 pCi/g		N/A	N/A	70-130	+30
Europium-154	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		2 pCi/g		N/A	N/A	70-130	+30
Europium-155	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		5 pCi/g		N/A	N/A	70-130	+30
Neptunium-237	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		~100 pCi/g		N/A	N/A	70-130	+30
Plutonium-239-240	N/A	N/A	N/A	N/A	Spectral Gamma Logging	TBD		~50 nCi/g		N/A	N/A	70-130	+30
Soil Physical Properties													
Bulk density	N/A	N/A	N/A	N/A	D2937, or BHI-EE-05, Procedure 3.9	N/A		wt%		N/A	N/A	N/A	N/A
Lithology	N/A	N/A	N/A	N/A	BHI-EE-01, Procedure 7.0	N/A		Descriptive		N/A	N/A	N/A	N/A
Moisture content	N/A	N/A	N/A	N/A	ASTM D2216	N/A		wt%		N/A	N/A	N/A	N/A

Table B-7. Analytical Performance Requirements – Shallow and Deep Zone Soils. (5 Pages)

COCs	CAS #	Preliminary Action Level[a]			Name/Analytical Technology	Required Target Quantitation Limits[c]				Precision Water	Accuracy Water	Precision Soil	Accuracy Soil
		WAC 173-340-745 Method C[d] (mg/kg)	GW Protection[e] (mg/kg)	Terrestrial Biota Protection[f] (mg/kg)		Water Low Conc. (mg/L)	Water High Conc. (mg/L)	Soil-Other Low Conc. (mg/kg)	Soil-Other High Conc. (mg/kg)				
Particle size distribution	N/A	N/A	N/A	N/A	ASTM D422	N/A		wt%		N/A	N/A	N/A	N/A

The preliminary action level is the regulatory or risk-based value used to determine appropriate analytical requirements (e.g., detection limits). Remedial action levels will be proposed in the FS, will be finalized in the record of decision, and will drive remediation of the sites.

[b]15 mrem/yr = nonrad worker industrial exposure scenario; 2,000 hrs/yr onsite, 60% indoors, 40% outdoors. 500 mrem/yr = rad-worker industrial scenario; 2,000 hrs/yr onsite, 60% indoors, 40% outdoors. GW = groundwater protection radionuclide values based on RESRAD modeling of drinking water exposure with the entire vadose zone presumed to be contaminated. Groundwater protection may be evaluated using STOMP code or another model to predict movement of contaminants through the vadose zone.

[c]Water values for sampling quality control (e.g., equipment blanks/rinses) or drainable liquid (if recovered). For both water and soil media, matrix affects may impact on specific sample basis.

[d]*Washington Administrative Code* (WAC) 173-340-745, "Soil Cleanup Standards for Industrial Properties," Method C industrial soil values for direct exposure from the CLARC Version 3.1 tables, updated November 2001.

[e]Washington Administrative Code (WAC) 173-340-747, "Deriving Soil Concentrations for Ground Water Protection," soil concentrations protective of groundwater based on Method B values for groundwater from the CLARC Version 3.1 tables, updated August 2001, except as noted.

[f]Value is the lowest concentration for each analyte (adjusted for background) from Tables 749-2 and 749-3 of *Washington Administrative Code* (WAC) 173-340-900, amended February 12, 2001.

[g]Precision and accuracy requirements as identified and defined in the referenced EPA procedures implemented by laboratory analysis and QA procedures.

[h]Cleanup value is less than Hanford Site soil background. Therefore, the soil background concentration is used as the preliminary action level.

[i]All four-digit numbers refer to SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*.

[j]Calculated using WAC 173-340-720 drinking water standards as inputs to the three-phase model for protection of drinking water [WAC 173-340-747(4), amended February 12, 2001], except as noted.

[k]Calculated using air cleanup standards from WAC 173-340-750(3)(a)(ii)(B), page 210, equation 750-2, with WDOH mass loading of particulates in air of 10^{-4} g/m^3.

[l]Calculated using standards for surface water protection (40 CFR 131 and WAC 173-201A-040) as inputs to the 3-phase model for protection of drinking water [WAC 173-340-747(4), February 12, 2001].

[m]Based on WAC 173-340-900, Tables 740-1 and 745-1, amended February 12, 2001.

[n]Value based on nickel or uranium soluble salts value.

40 CFR 131, "Water Quality Standards," *Code of Federal Regulations*, as amended.

ASTM, 1993, *1993 Annual Book of ASTM Standards*, Volume 04.08, American Society for Testing and Materials, Philadelphia, Pennsylvania.

PNNL-11216, 1997, *STOMP – Subsurface Transport Over Multiple Phases: Application Guide*, Pacific Northwest National Laboratory, Richland, Washington.

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

WAC 173-201a, 1992, "Water Quality Standards for Surface Waters of the State of Washington," *Washington Administrative Code*, as amended.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

AEA = Alpha energy analysis.
ASTM = American Society for Testing and Materials.
CAS = Chemical Abstract Service.
CLARC = Cleanup levels and risk calculations
CVAA = Cold vapor atomic absorption.
EPA = U.S. Environmental Protection Agency
GC = Gas chromatography.
GCMS = Gas chromatography/mass spectrometry.
GEA = Gamma energy analysis.
IC = Ion chromatography.
ICP = Inductively coupled plasma.
ICP/MS = Inductively coupled plasma/mass spectrometry.
N/A = Not applicable.
PCB = Polychlorinated biphenyls.
QA = Quality assurance.
RESRAD = RESidual RADioactivity Dose Model.
TBD = To be determined.
VOA = Volatile organic analyte.
WDOH = Washington State Department of Health.

Table B-8. Sample Preservation, Container, and Holding Time Guidelines and Analytical Priorities. (2 Pages)

Analytes	Analytical Priority	Matrix	Bottle		Amount[a,b,c]	Preservation	Packing Requirements	Holding Time
			Number	Type				
Radionuclides								
Americium-241	10	Soil	1	G/P	10-1000 g	None	None	6 months
Cesium-137	1	Soil	1	G/P	100-1500 g	None	None	6 months
Cobalt-60	1	Soil						
Europium-152	1	Soil						
Europium-154	1	Soil						
Europium-155	1	Soil						
Iodine-129	13	Soil	1	G/P	10-1000 g	None	None	6 months
Plutonium-238	1	Soil	1	G/P	10-1000 g	None	None	6 months
Plutonium-239/240	1	Soil						
Strontium-90	1	Soil	1	G/P	10-1000 g	None	None	6 months
Technetium-99	5	Soil	1	G/P	10-1000 g	None	None	6 months
Tritium (H-3)	13	Soil	1	G	100-500 g	None	None	6 months
Uranium-233/234	1	Soil	1	G/P	10-1000 g	None	None	6 months
Uranium-235/236	1	Soil						
Uranium-238	1	Soil						
Chemicals								
Ammonia/ ammonium – 350.1	3	Soil	1	G/P	50-500 g	None	Cool 4°C	
IC anions – 300.0	3	Soil	1	G/P	50-500 g	None	Cool 4°C	28 days/ 48 hours
IC anions – 353.1 for nitrate/nitrite	3	Soil	1	G/P	50-500 g	None	Cool 4°C	28 days/ 48 hours
ICP metals – 6010A	2	Soil	1	G/P	10-500 g	None	None	6 months
Chromium hex – 7196	4	Soil	1	G/P	5-500 g	None	Cool 4°C	30 days
Mercury – 7471 – (CVAA)	2	Soil	1	G	5-125 g	None	None	28 days
Total cyanide – 9010	11	Soil	1	G	10-1000 g	None	Cool 4°C	14 days
pH (soil) – 9045	14	Soil	1	G/P	10-250 g	None	None	ASAP
SVOA – 8270A	6	Soil	1	AG	125-1000 g	None	Cool 4°C	14/40 days
VOA - 8260	7	Soil	1	AG	125 g	None	Cool 4°C	14 days
Nonhalogenated VOA – 8015M – GC modified for normal paraffin hydrocarbon	8	Soil	1	AG	125-250 g	None	Cool 4°C	14 days
NWTPH – diesel	8	Soil	1	G	50-150 g	None	Cool 4°C	14 days
NWTPH – gasoline	8	Soil	1	G	50-150 g	None	Cool 4°C	14 days
Oil and grease	9	Soil	1	G	200 g	None	Cool 4°C	28 days

Table B-8. Sample Preservation, Container, and Holding Time Guidelines and Analytical Priorities. (2 Pages)

Analytes	Analytical Priority	Matrix	Bottle		Amount[a,b,c]	Preservation	Packing Requirements	Holding Time
			Number	Type				
PCBs – EPA 8082	12	Soil	1	G	10-50g	None	Cool 4°C	14 days
Physical Properties								
Bulk density – D2937	15	Soil	1	Liner	Liner	None	None	None established for analysis
Moisture content – ASTM D2216	16	Soil	1	Moisture Tin[d]	250 g	None	None	None established for analysis
Particle size distribution – ASTM D422	17	Soil	1	G/P	100-4000 g	None	None	None established for analysis

[a]Optimal volumes, which may be adjusted downward to accommodate the possibility of retrieval of small amount of sample. Minimum sample size will be defined in the Sampling Authorization Form.

[b]Should samples be liquid rather than soils, the following volumes need to be collected:

Radionuclides – 4 L for all radionuclides (except carbon-14, tritium, and technetium-99; they require approximately 500 mL each sample).

Chemicals – All liquid samples require the amount as listed for soil samples. Preservation and holding times are also affected if liquid samples are collected. Consult Sample Management staff for details.

[c]Mixed soil samples may be obtained and submitted to the analytical laboratory for analyses for specific analytes, including the following:

Radionuclides – 100 g of soil for all radionuclides (except carbon-14, tritium, and technetium-99; they require approximately 10 g each sample).

Chemicals – A 10-g soil sample is required for all ICP analysis, 10-g soil sample is required for IC anion analysis, 5-g soil sample for hexavalent chromium analysis, 10-g soil sample for CA analysis, 10-g soil sample for 8015 analysis, and 125-g soil samples for each 8270 and TOC analyses.

[d]Vessel must be sealed.

ASTM, 1993, *1993 Annual Book of ASTM Standards*, Volume 04.08, American Society for Testing and Materials, Philadelphia, Pennsylvania.

AG = Amber glass.
ASAP = As soon as possible.
ASTM = American Society for Testing and Materials.
CVAA = Cold vapor atomic absorption.
G = Glass.
GC = Gas chromatography.
IC = Ion chromatography.
ICP = Inductively coupled plasma.
NWTPH = Northwest Total Petroleum Hydrocarbons
P = plastic.
PCB = Polychlorinated biphenyl.
SVOA = semivolatile organic analyte
TBD = to be determined
VOA = volatile organic analyte

B3.0 FIELD SAMPLING PLAN

B3.1 SAMPLING OBJECTIVES

The primary objective of the field sampling plan is to identify and describe sampling and field measurement activities that will be conducted to resolve decision rules identified in Section B.1.5.2. Decision rule statements indicate that remedial action could be necessary if preliminary action levels and annual exposure protection limits are exceeded. The field sampling plan uses the sampling design proposed in the DQO Report and describes pertinent elements of the sampling program. Sample methods, procedures, locations, and frequencies are identified in this section.

This plan will specify a variety of field sampling methods. The combination of methods used will be specific to each representative or TSD site covered in the plan. Each site investigation will be conducted using an observational approach. Initially, surface radiological surveys and

surface geophysical surveys will be conducted at each site to assess the general condition of the site, locate underground piping and tanks, and determine the exact locations for subsurface sampling. Driven soil probes will be installed at/or near each tank site to facilitate in situ radiological measurements and collect discrete soil samples. For the 276-S hexone tanks, soil gas samples will be collected instead of taking in situ radiological measurements. Based on the initial in situ measurements obtained using the drive casings, a borehole or test pit could be installed at the site. The borehole activity will include collecting soil samples at specified depths from the vadose zone for full suite laboratory analysis (Table B-7). A split-spoon sampler will be the primary sampling device used to collect soil samples from the boreholes. The boreholes will be logged for gamma-emitting radionuclides and moisture content.

The following sections describe the general methodologies available to be deployed. Later sections will describe the specific methodologies used at each site included in this plan. The planned sampling locations are shown in Figures B-1 through B-7.

B3.2 FIELD MEASUREMENTS

Planned field measurements include surface radiation surveys, surface geophysical surveys, and soil gas sampling.

B3.2.1 Surface Radiation Surveys

A surface radiation survey will be performed at each waste site investigated to document existing surface contamination. This information will be used in preparing the supporting health and safety documents. The surface radiation surveys will be conducted by qualified RCTs in accordance with applicable procedures. A survey report will be prepared for each site. Surveys will be performed in accordance with BHI-EE-05, Procedure 2.5, "Operation of Mobile Surface Contamination Monitor II," or equivalent or other applicable approved procedures. A survey will be performed at the conclusion of field work at each sampling site to ensure that sampling activities have not contributed to surface contamination.

B3.3 SURFACE GEOPHYSICAL SURVEYS

Surface geophysical surveys will be used to determine the location of tanks and other underground features. The survey results also will be used to determine the detailed location for soil gas and soil sampling. Two different geophysical survey techniques will be employed; ground penetrating radar (GPR) and electromagnetic induction (EMI).

B3.4 SOIL GAS SAMPLING

A Geoprobe Model 5400 hydraulic ram system will be used to install soil gas sampling points near Hexone Storage Tanks 276-S-141 and 246-S-142. The hydraulic ram will be operated in accordance with the manufacturer's instructions and BHI-EE-02, *Environmental Requirements*, Section 14.0, "Drilling, Maintaining, Remediating, and Decommissioning Resource Protection Wells, Geoprobe and Geotechnical Soil Borings," or equivalent. The system is equipped with a

4.45 cm (1.75-in.)-diameter probe and a detachable steel tip. When the tip reaches the desired depth, a 16.5 cm (6.5-in.)-long fine-mesh stainless steel sampling point connected to the surface with 0.79 cm (5/16-in.)-outside diameter tygon tubing will be inserted down the center of the push rod. The push rod assembly then will be withdrawn approximately 30.5 cm (12 in.) to release the steel tip and allow the sampling point to extend into the void space below the push rod. Approximately 250 mL of 20/40 mesh silica sand then will be added around the sampling point through the center of the push rod. The push rod then will be removed and soil allowed to collapse around the tygon tubing. At approximately 0.9 (3 ft) bgs, granular bentonite will be added through the center of the push rod. The bentonite will not be hydrated.

After allowing each soil vapor point to equilibrate for at least 24 hours, approximately 500 mL soil vapor samples will be collected and analyzed for the volatile COCs specific to the 276-S-141/142 Tank System. The soil gas samples will be collected and analyzed in accordance with BHI-EE-05, *Field Screening Procedures*, Procedure 1.6, "Analysis of Volatile Organic Compounds in Soil Gas," or equivalent.

B3.4.1 Driven Soil Probes Surveys

Driven soil probe casing will be installed using the Geoprobe 5400 hydraulic ram system, or other comparable equipment, in selected locations near each tank site to provide access for small-diameter geophysical logging probes. Small-diameter gross gamma/passive neutron (GG/PN) probes will be used to detect the presence of radiological contamination and support development of radiological contamination profiles. Soil samples will undergo laboratory analyses for COCs. Vertical casing will be installed up to 10.7 m (35 ft) below ground surface (bgs). Small-diameter GG/PN detectors will be lowered to the total depth of the push rods to detect in situ levels of potential radioactive contaminants including cobalt-60, cesium-137, amercium-241, plutonium-239, and neptunium-237. Radiological contaminant profiles will be plotted for each tank system and used to determine regions of potential contamination.

GG/PN, coupled with the results of soil samples (see DOE/RL-2002-14, Section 3.5.1), will be used to determine the need and location for a subsequent borehole or test pit for additional sampling and analysis.

B3.4.2 Soil Screening

Using appropriate instrumentation, the RCT or other qualified personnel will field screen all soil samples and cuttings from driven core samplers, boreholes, and test pits for evidence of radioactive contamination by,. Potential screening instruments are listed in Table B-9 with their respective detection limits. The RCT will record all field measurements, noting the depth of the sample and the instrument reading.

Before driving casing, excavating, or drilling, a local area background reading will be taken using the field screening instruments at a site to be selected in the field. Field screening and interpretations of geologic features will be used to identify the bottom of the waste site, adjust vertical sampling points, assist in determining sample shipping requirements, and support worker health and safety monitoring.

The action level for field radionuclide screening is three times the background level. Soils with activity above the action level will be assessed for sampling by the field geologist. Samples exceeding 0.5 mrem/hr will be stored at a temporary radioactive material storage area at the field location until shipment to the laboratory. Samples with levels of less than 0.5 mrem/hr will be stored at an approved facility until shipment to the laboratory.

Field screening instruments will be used, maintained, and calibrated in accordance with the manufacturer's specifications and other approved procedures. The field geologist will record field screening results on the borehole log.

B3.5 SOIL SAMPLING AND ANALYSIS

The following sections discuss the details of sampling soil from driven soil probes, boreholes, and test pits.

B3.5.1 Driven Soil Probe Sampling

Driven soil probe casing will be installed using the Geoprobe 5400 hydraulic ram system or other comparable equipment in selected locations near each tank site to (provide access for) facilitate the use of small diameter hollow, core samplers.

A discrete soil sample will be collected at the location indicating the highest levels of contaminants detected by the GG/PN logging system. The soil sample will be collected using a hollow core sampler with a retractable tip that will be driven to the desired depth using the drive casing. The soil sample will be analyzed for the contaminants of concern prescribed for each tank system. Because the volume of soil obtained from the core samplers will be small, the analyses will be prioritized by the field team lead to ensure that critical COCs are analyzed for.

The soil sample results and GG/PN will be used to determine need and location for a subsequent borehole or test pit for additional soil sampling and laboratory analysis if needed. If no contamination is detected by the GG/PN logging system, a driven soil sample will be collected from a location beneath the tank to verify the absence of contamination. The field team lead will determine the sample location.

B3.5.2 Borehole Sampling and Analysis

A borehole will be placed at the 200-E-111 Tank Farm Process Pipeline, the 200-W-59 Diversion Box, and the 2607-W3 Septic Tank Waste sites. In addition, based on the extent of contamination detected by the driven soil probe casing sampling, boreholes could be installed to characterize the soil around and beneath the tank systems. Borehole sample collection will be guided by the sampling approaches and logic outlined in Tables A-10 through A-16. Actual sampling intervals can vary from the tables depending on the location of contamination detected by the field radiological instruments. Additional borehole samples could be collected and analyzed at the discretion of the field geologist, based on field conditions, measurements, or observations made during the conduct of remedial investigations.

In general, the bottoms of the waste sites are considered critical sample points because the highest levels of contamination are expected at this location. Samples from 4.6 m (15 ft) bgs and 7.6 m (25 ft) bgs also are considered critical sampling points to evaluate exposure scenarios and remedial alternatives. Sample from depths greater than 7.6 m (25 ft) bgs will be used to verify the conceptual contaminant distribution models and to evaluate remedial action alternatives and potential groundwater impacts.

For waste sites requiring characterization boreholes, the drill depth and associated soil sampling will be based on site-specific conditions. When available information indicates deep vadose zone contamination or that groundwater has been contaminated by a waste site, soil sampling to the water table could be performed. For waste sites where deep contamination has not been observed, the drilling and sampling depths will be determined based on the observational approach.

Sampling will be performed in accordance with BHI-EE-01, Procedure 4.0, "Soil and Sediment Sampling," or equivalent, using a split-spoon sampler. The split-spoon samplers will be equipped with four separate stainless steel liners. The drill crew will not overdrive the sampling device. Except for the volatile organic analyte samples, soil will be transferred to a precleaned, stainless steel mixing bowl, homogenized, then containerized as required in the sampling procedure. The analytes of interest are presented in Table B-7. If sample volume requirements cannot be met, samples will be collected according to the priority presented in Table B-8. Radiological and nonradiological samples always will take precedence over physical-property samples.

Physical-property samples will be collected from the boreholes to provide site-specific values to support RESRAD and other modeling efforts. Soil properties of interest are moisture content, grain-size distribution, and soil density. Soil density samples shall be collected with a split-spoon sampler equipped with four separate stainless steel or lexan liners. Physical property samples will be analyzed in accordance with American Society for Testing and Materials (ASTM) methods listed in Table B-7 (ASTM 1993) or in accordance with procedures identified in Table B-8 or equivalent. The physical-property samples will be collected from lithologies that represent the major facies in the vadose zone as identified in Tables B-10 through B-16. The samples will be collected coincident with nonradiological and radiological split-spoon sample intervals, where possible.

Investigation-derived waste generated during this activity will be handled according to procedures listed in Section B.5 and the waste control plan (to be prepared/approved before the start of field activities).

B3.5.3 Test Pit Sampling and Analysis

Based on the extent of contamination detected by the direct push sampling, a test pit might be excavated to characterize the soil around and beneath Tank 241-CX-71. Proposed sampling locations are shown in Figure A-15.

If field screening measurements show radiological contamination greater than twice background at the maximum reach of the excavating equipment (approximately 7.6 m [25 ft]), a direct push

will be installed directly adjacent to the test pit and logged with the GG/PN logging system. The direct-push boring can be limited by subsurface conditions. The maximum depth of approximately 10.7 m (35 ft) bgs is anticipated.

The soil at the bottom of Tank 241-CX-71 is considered a critical sample point because the highest levels of contamination are expected at this location. Samples from 4.6 m [15 ft] bgs and 7.6 m [25 ft] also are considered critical sampling points, and these data will be used for evaluating exposure scenarios and remedial alternatives.

Sampling from the excavator bucket will be performed in accordance with BHI-EE-01, Procedure 4.0, "Soil and Sediment Sampling," or equivalent. Analytes of interest are presented in Table B-7. If sample volume requirements cannot be met, samples will be collected and analyzed in the sequence shown in Table B-8.

The test pit will be excavated in a manner that minimizes the dust generation from the site boundary. To minimize dust during backhoe operations, water will be sprayed on the site before and during the activity. Samples will be collected from dry soils whenever possible. This contamination control measure is necessary to prevent the release of contamination to the air and stabilized areas within the site boundary. If visible emissions cannot be controlled, the activity will be postponed.

Waste generated during this activity will be handled according to procedures listed in Section B.2.7 and in the waste control plan.

B3.5.4 Pre-Shipment Sample Screening

A representative portion of each sample to be shipped to an offsite laboratory, or will be submitted to the Radiological Counting Facility, 222-S Laboratory, or other suitable onsite laboratory for total activity analysis before shipment. Total activities will be used for sample preshipment characterization. Samples that slightly exceed the offsite laboratory criterion discussed in Section B.2.7.6 may be reduced in volume to allow offsite shipment. Onsite and offsite laboratories will be identified before initiating field activities and will be mutually acceptable to the Fluor Hanford, Inc. (FH), Sample Management group and the Task Lead.

B3.5.5 Summary of Sampling Activities

Table B-17 summarizes the number and types of samples to be collected at all five waste sites.

B3.6 GEOPHYSICAL LOGGING

The planned and selected existing boreholes will be geophysically logged with the high-resolution spectral gamma-ray logging system to determine the vertical distribution and concentration of gamma-emitting radionuclides. Soil moisture, may be measured using a neutron logging tool as determined by the field team leader. These methods are described in DOE/RL-2002-14, Section 4.3. The new boreholes will be logged before telescoping of casing and before abandonment. The starting point for logging (usually ground surface or top of casing)

will be recorded. The site geologist will witness logging runs and verify before and after field calibrations and repeat log intervals.

Table B-17 lists the existing boreholes and wells that will be logged with the radionuclide logging system. These boreholes represent data collection points in the vicinity of the individual waste sites. Logging of these boreholes will provide additional, updated, site-specific information on contaminant distribution, both laterally and vertically in the area of the waste sites.

B3.7 SURVEYING

The location of all driven soil-probe boreholes, and the test pit will be surveyed after the sampling and abandonment activities are completed. Surveys will be performed according to BHI-EE-01, Procedure 1.6, "Survey Requirements and Techniques," or equivalent. Data will be recorded in the North American Vertical Datum of 1988 (NAVD88) and the Washington State Plane (South Zone) North American Datum of 1983 (NAD83), with the 1991 adjustment for horizontal coordinates. All survey data will be recorded in meters and feet.

B3.8 WASTE MANAGEMENT SAMPLING

A waste designation DQO effort will be performed immediately before the characterization activities to ensure that the proper information is collected during the field effort to support the designation of all project investigation-derived waste (IDW). Any additional sampling requirements or analytes needed to support designation activities will be identified and implemented through the waste-designation DQO summary report that will be prepared at that time.

In addition, the data needs of other core projects such as the RL Groundwater Protection Program, the Office of River Protection Program, or the Science and Technology Project will be solicited at this time. If practicable, these data needs will be integrated into the IDW DQO as additional sampling requirements or analytes.

Figure B-1. Sampling Locations for the 200-E-111 Tank Farm Process Piping.

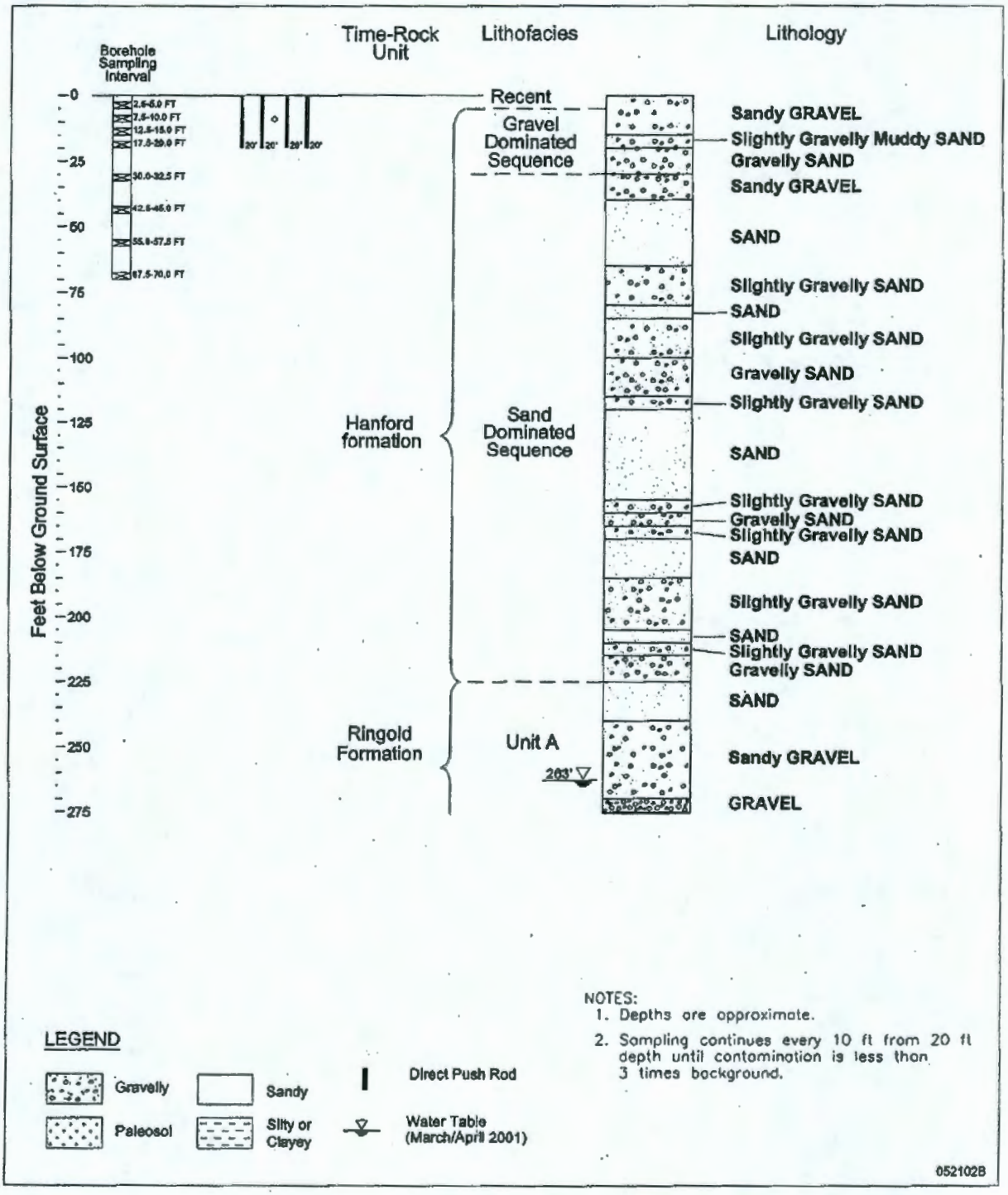


Figure B-2. Sampling Locations for the 200-W-59 Diversion Box.

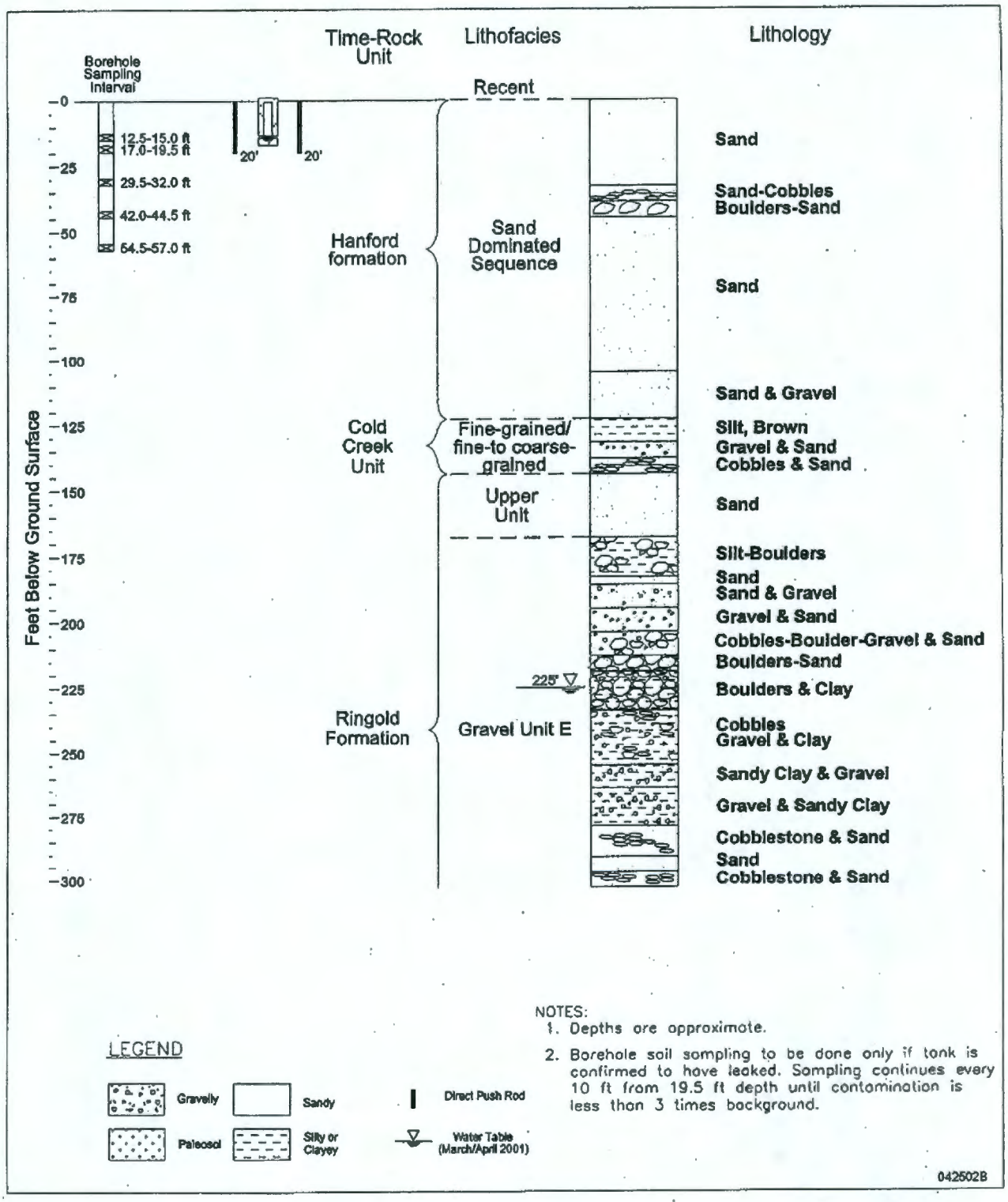


Figure B-3. Sampling Locations for the 2607-W3 Septic Tank.

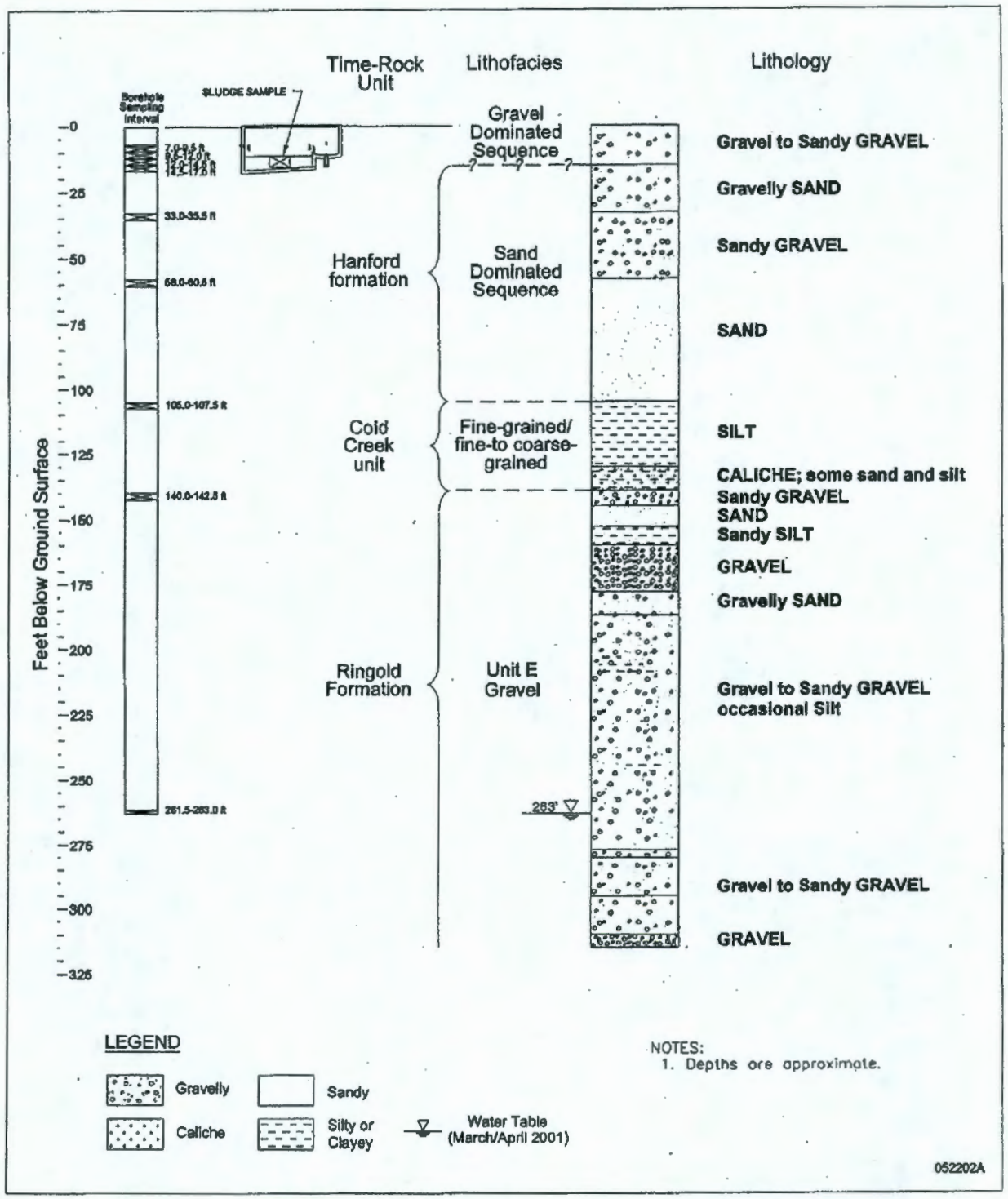


Figure B-4. Sampling Locations for Hexone Tanks 276-S-141 and 276-S-142.

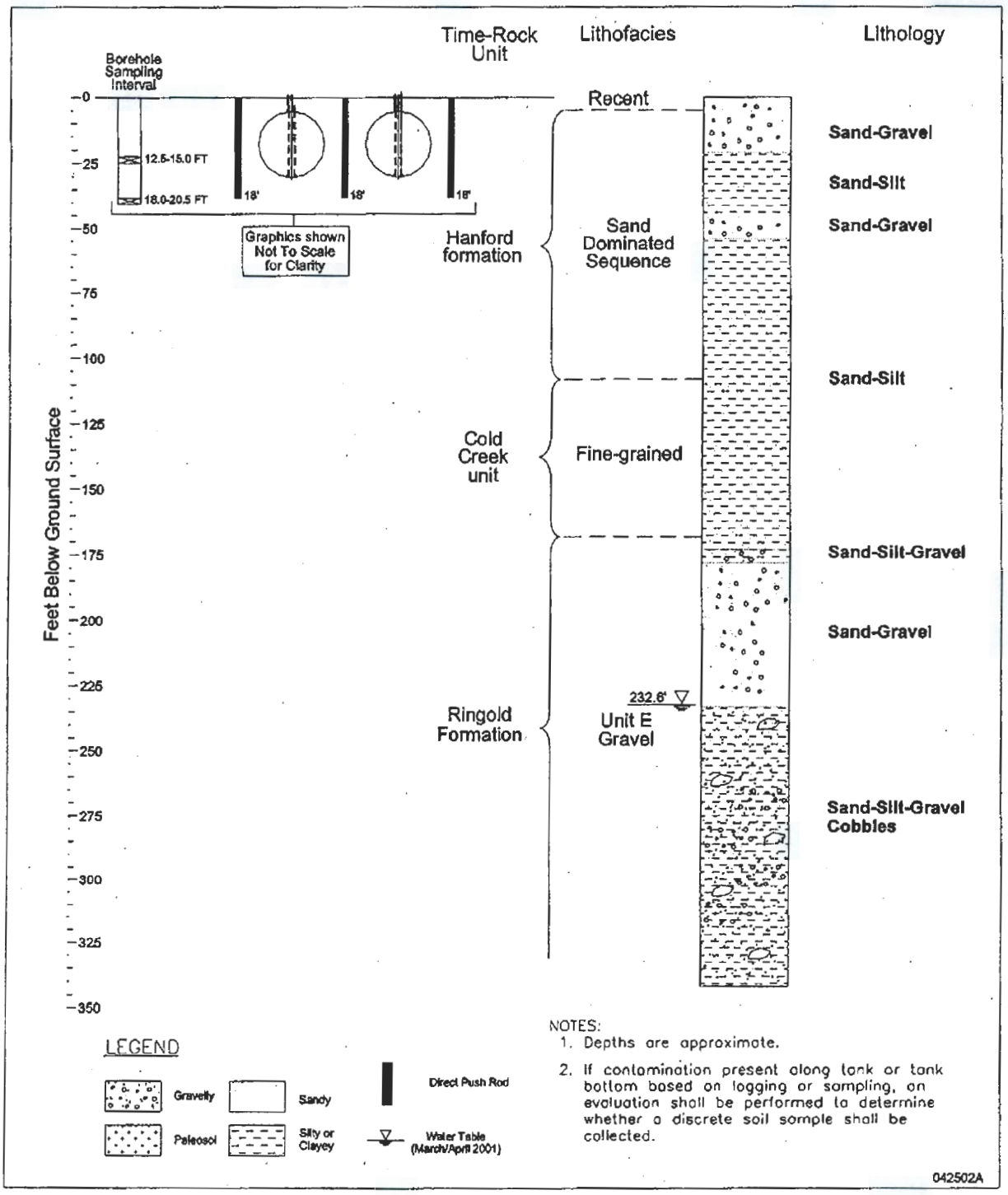


Figure B-5. Sampling Locations for the Tank 241-CX-70.

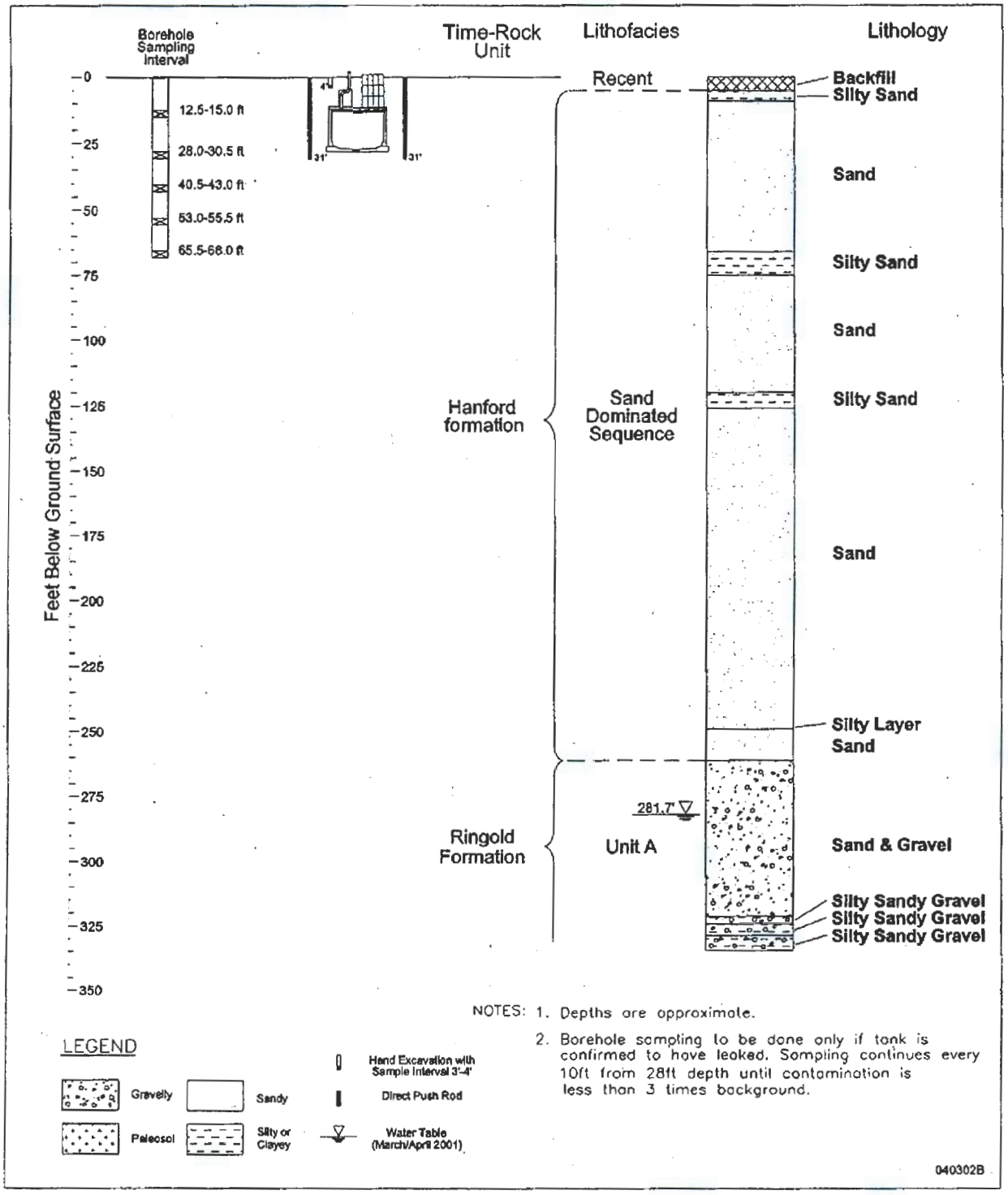


Figure B-6. Sampling Locations for the Tank 241-CX-71.

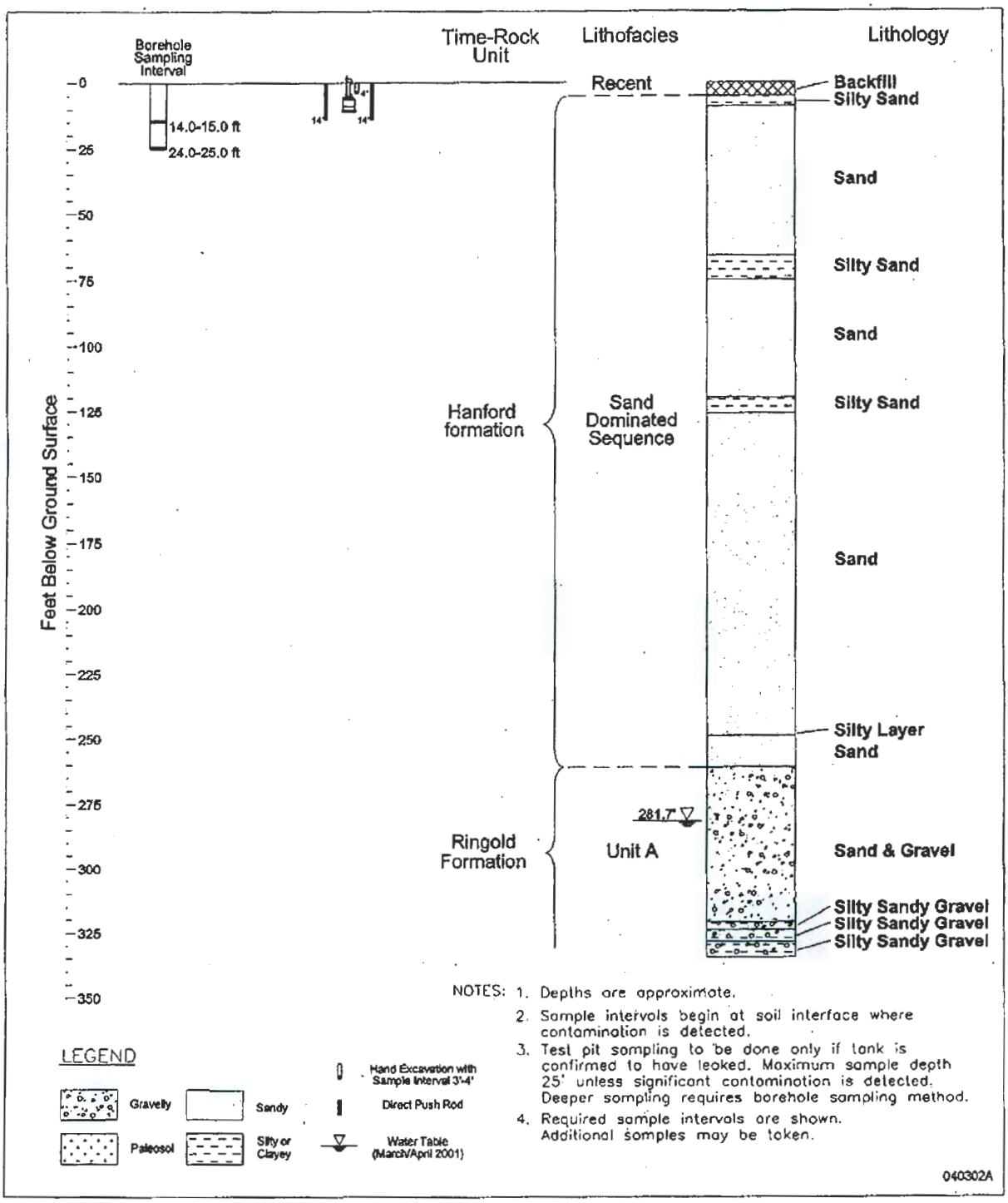


Figure B-7. Sampling Locations for the Tank 241-CX-72.

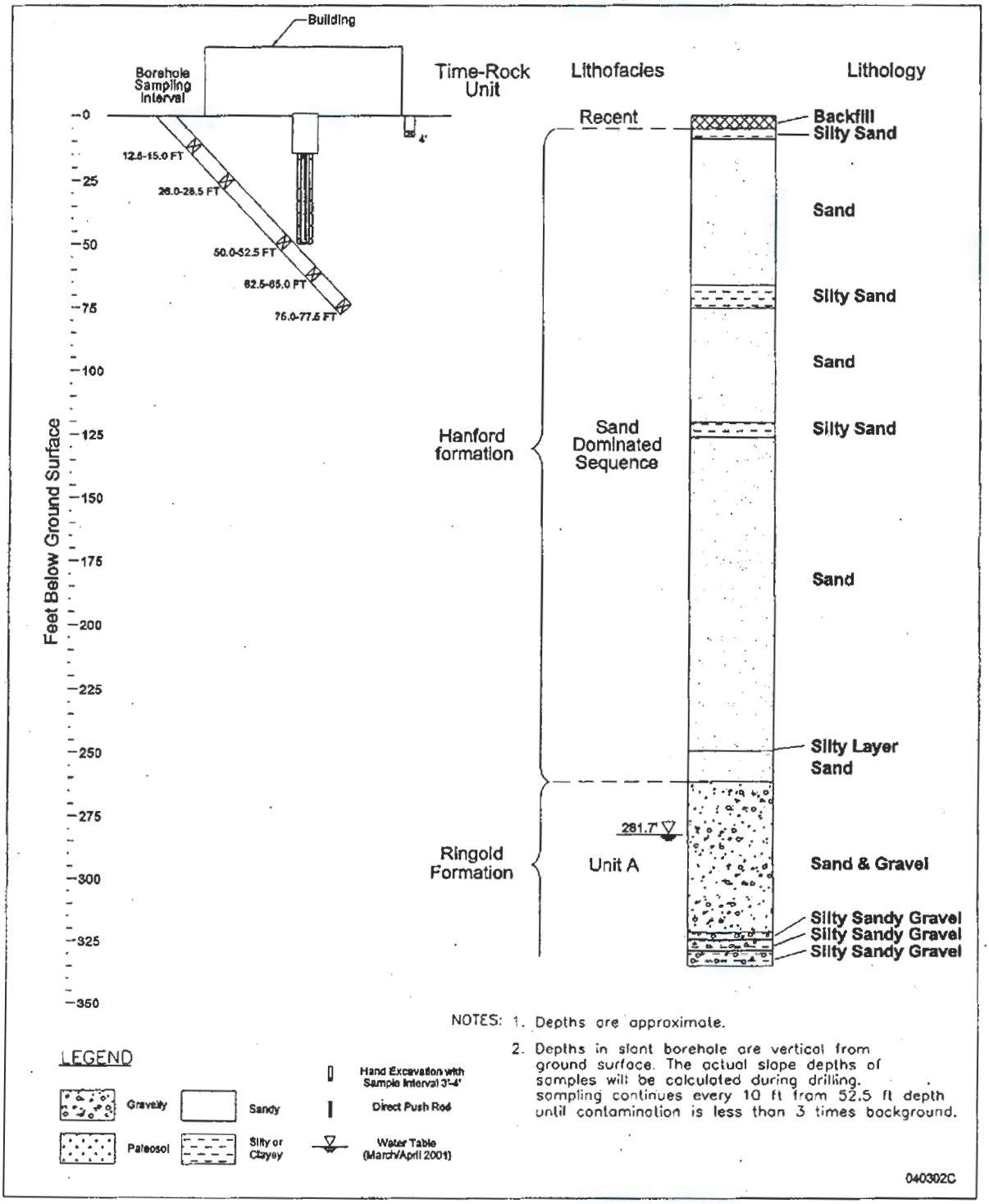
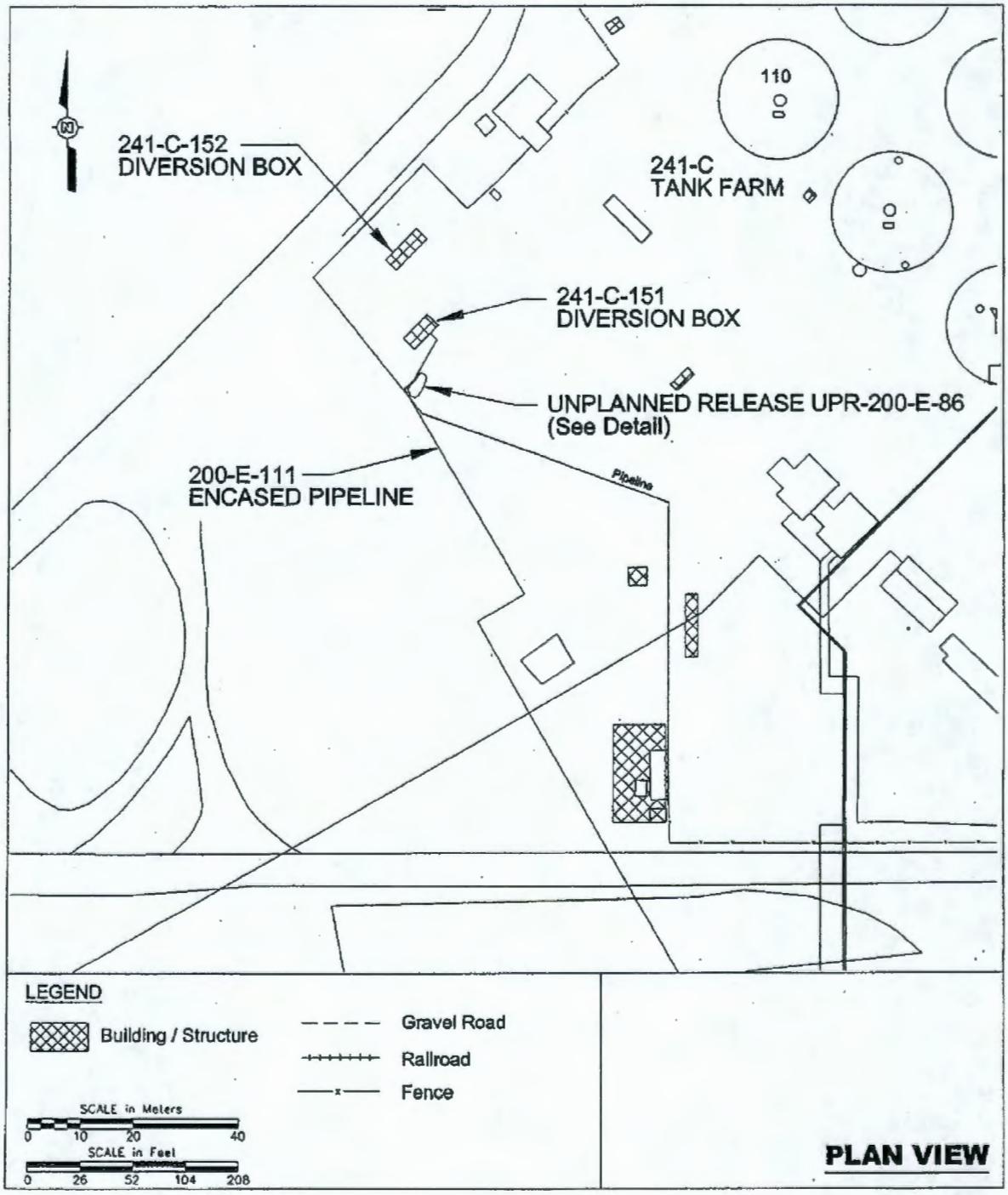


Figure B-8. Location of Planned Drive Casings and Existing Boreholes at the 200-E-111 Pipeline Farm Process Piping.



052302C

Figure B-9. Location of Planned and Existing Boreholes at the 200-W-59 Diversion Box.

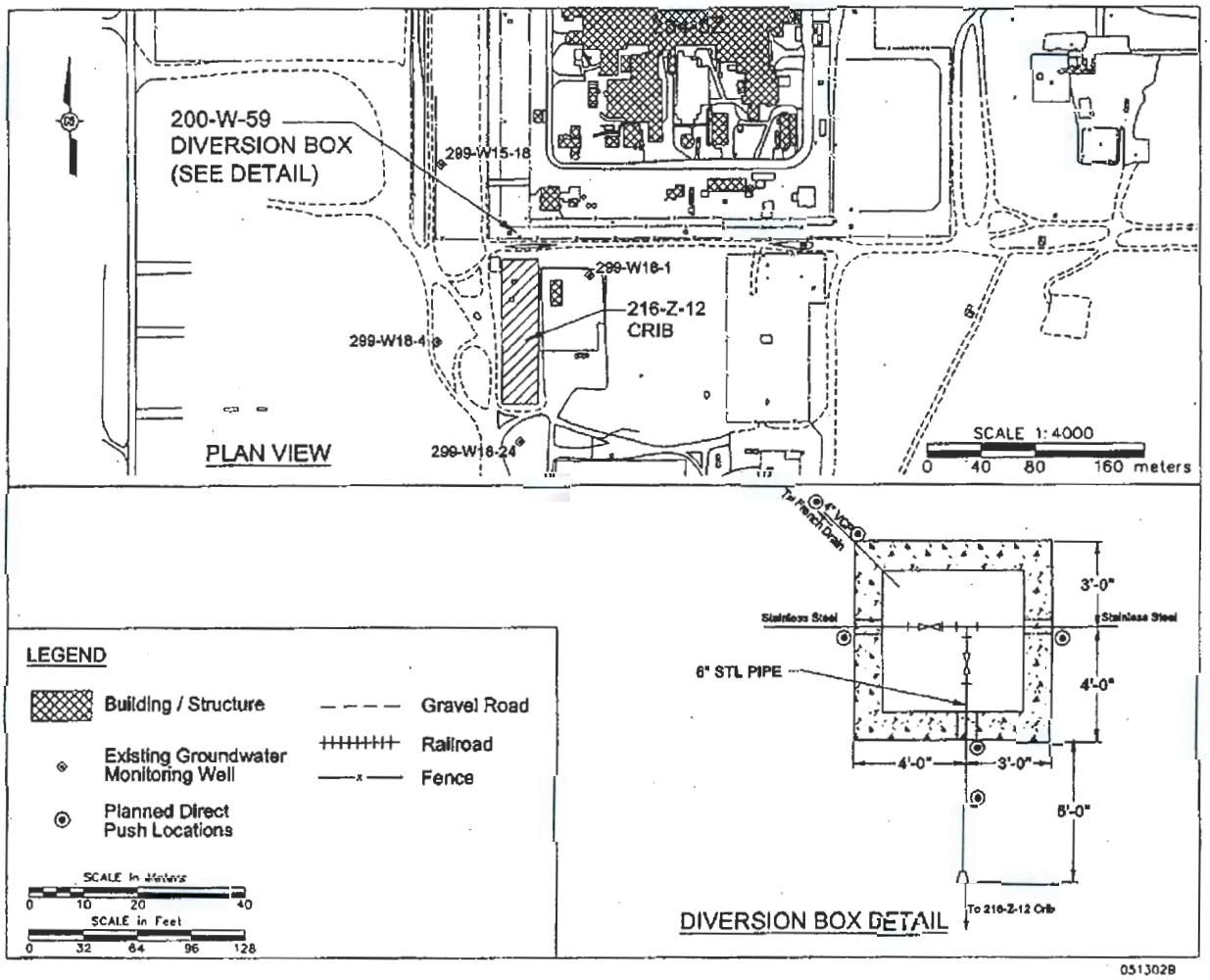


Figure B-10. Location of Planned and Existing Boreholes at the 2607-W3 Septic Tank.

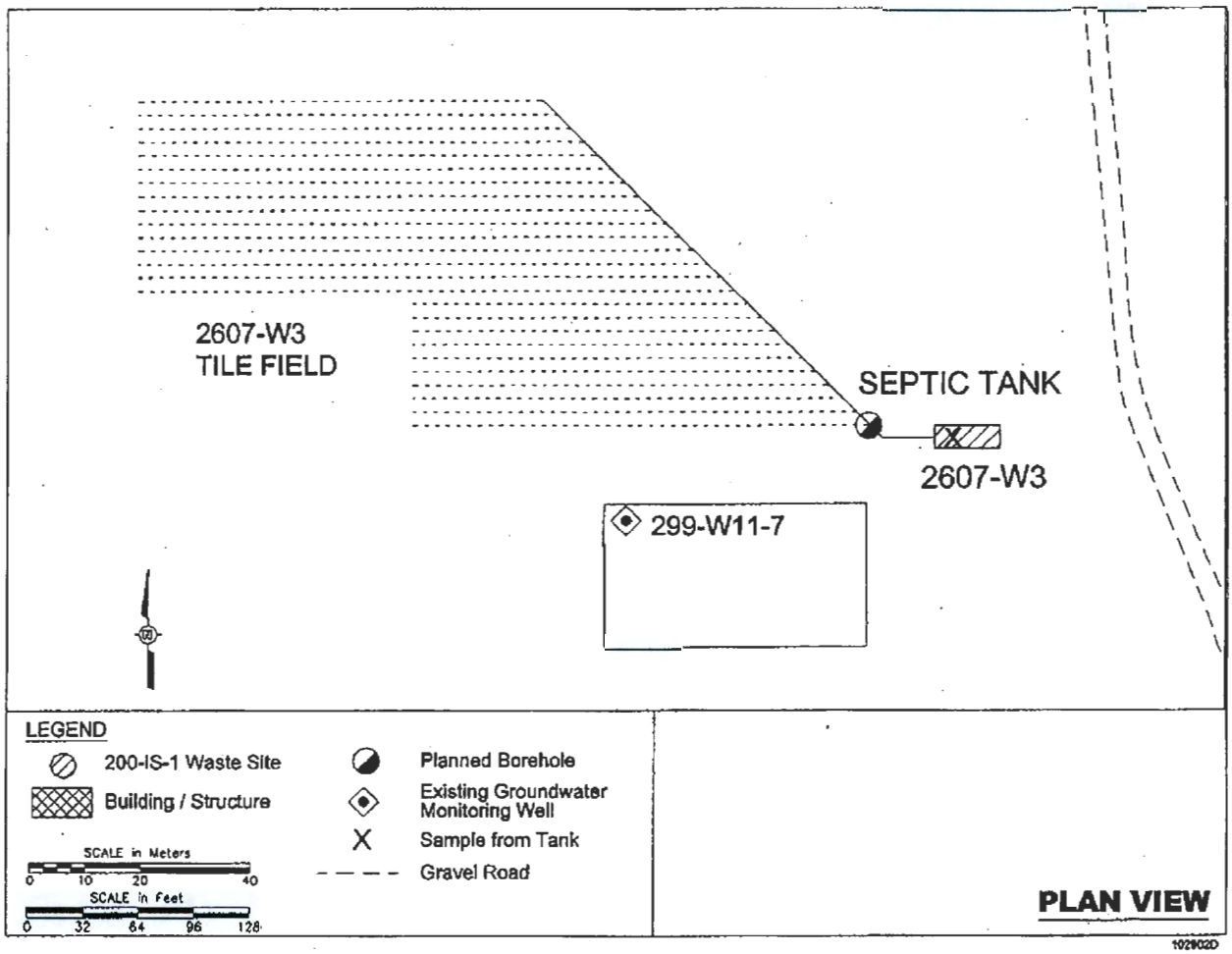


Figure B-11. Location of Planned and Existing Boreholes at the Hexone Storage and Treatment Facility.

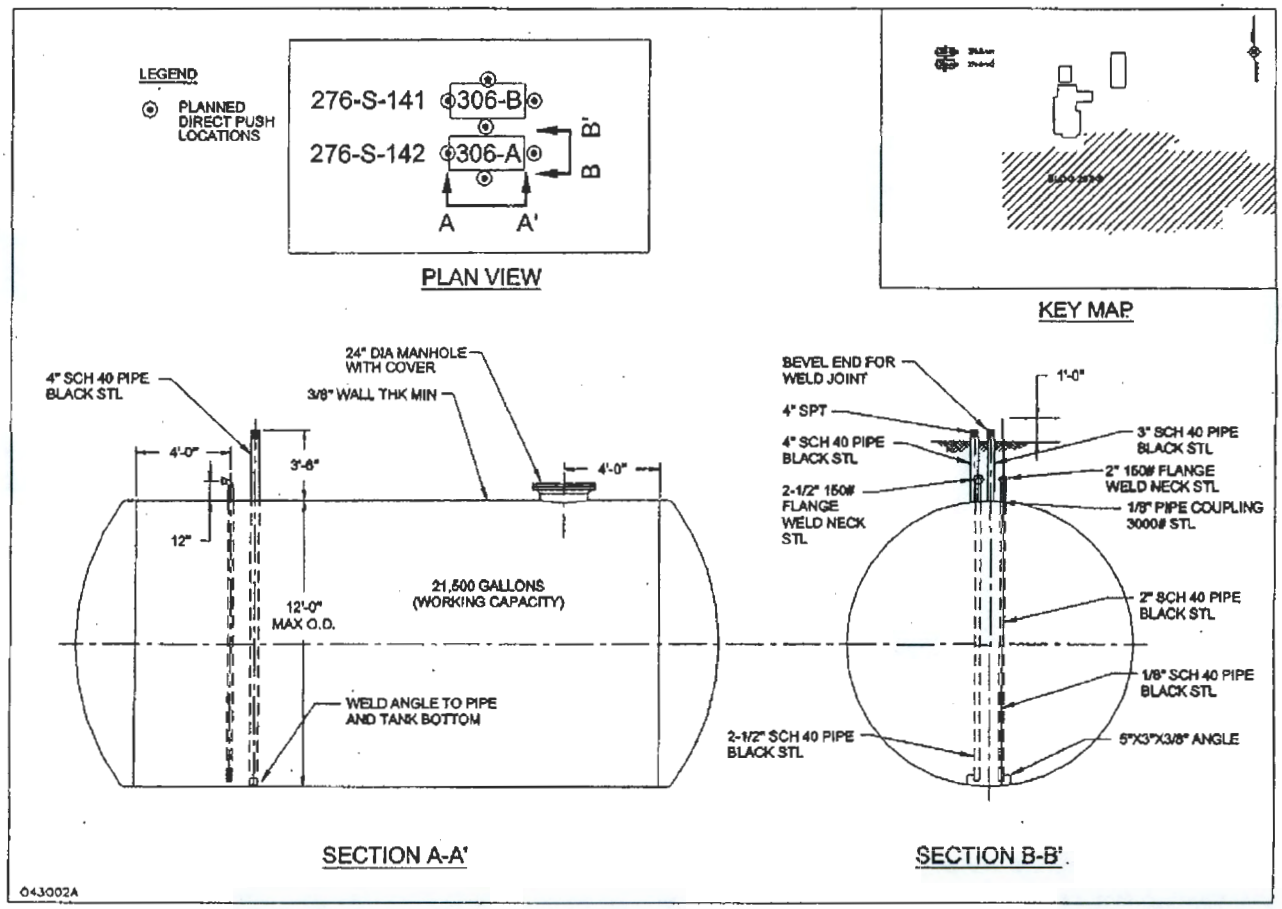


Figure B-12. Location of Planned and Existing Boreholes at the 241-CX Tank System.

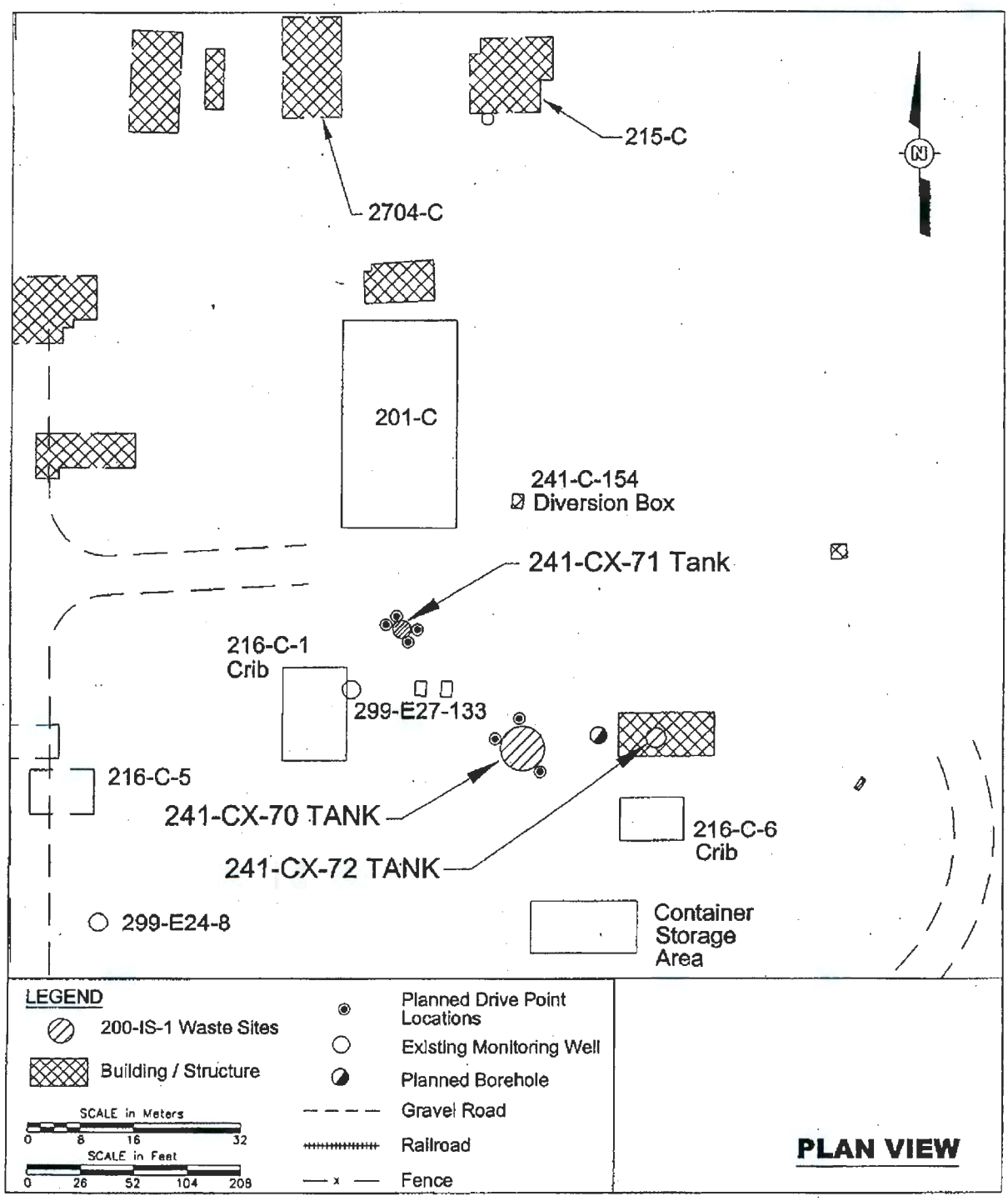


Table B-9. Field Screening Methods.

Measurement Type	Emission Type	Method/Instrument	Detection Limit
Exposure/dose rate	Beta/gamma	RO-20/RO-03 portable ionization chamber	0.5 mrem/hr
Contamination level	Alpha/beta-gamma	E-600 ratemeter with a SHP380-A/B scintillation probe	100 dpm α/ 100 cm^2 1,921 dpm β–γ/ 100 cm^2
Vapor screening	Volatile organic compounds	Photo ionization detector	2 ppm (may be higher for some compounds)
SGL	Gamma isotopic emissions	HPGe	~25 nCi/g for Am-241 and Pu-239. ~100 pCi/g for Np-237
Gross gamma logging	Gamma emissions	Bismuth-germanium detector	~25 nCi/g for Am-241 and Pu-239
Passive neutron logging	Neutron emissions	Helium-3 detector	~100 nCi/g for Am-241 and Pu-239
Vapor analysis	Carbon tetrachloride, chloroform	Bruel and Kjoer vapor analyzer	TBD

HPGe = High-purity germanium.
SGL = Spectral gamma-ray logging
TBD = to be determined

Table B-10. 200-E-111 Tank Farm Process Piping Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of pipeline.	Surface geophysical surveys used to locate pipelines.
Vertical geophysical survey	Install direct push rods to a depth of 6.1 m (20 ft) bgs for gross gamma and passive neutron (GG/PN) logging. Nominally, 12 pushes will be installed around the pipeline.	Vertical geophysical survey data will be used to determine if the tank leaked by evaluating the presence of plutonium and Cs-137 immediately adjacent to the tank in regions where leaks likely would have occurred. Cs-137 is considered a good indicator of contamination because of its prevalence in the waste stream and ease of identification. High levels of plutonium could be detected by the PN detector.
Borehole characterization	Drill borehole near the region of highest contamination detected by the vertical geophysical survey.	If contamination is present near the pipeline based on logging and sampling, an evaluation will be performed to determine if a borehole should be installed.

Table B-10. 200-E-111 Tank Farm Process Piping Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Split-spoon soil samples	Split-spoon soil samples will be collected at 2.5 ft bgs, 7.5 ft bgs, 12.5 ft bgs, 17.5 ft bgs, and at 10-ft intervals until contamination levels are less than three times background. Soil samples should also be collected at major changes in lithology. Submit sample for laboratory analysis of -200-E-111 specific COCs.	The 12.5-15 ft bgs sample will be collected to support risk assessment. Soil samples collected at 17.5 ft bgs and deeper will be field screened for gross radionuclide contamination. If contamination levels are above three times background, drilling and sampling will resume to the next sample interval until contamination is less than three times background. A final sample will be collected at the interval where contamination is less than three times background.
Split-spoon soil samples	Collect bulk density, grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.
Split-spoon soil samples	Collect field QC samples. Submit sample for laboratory analysis of -200-E-111 specific COCs.	Field QC samples will be used to evaluate the potential for cross-contamination and to evaluate laboratory performance.
Borehole Geophysical Survey	Perform borehole spectral gamma logging (SGL) and neutron moisture logging from the surface to bottom of the borehole.	SGL will be performed to verify gamma-emitting contamination and to refine the conceptual contaminant distribution model. Cesium-137 will be the main target isotope for the SGL because of its prevalence and ease in identification. Soil moisture data will support the site conceptual model.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GG = Gross-gamma.
GPR = Ground-penetrating radar.
QC = Quality control.
SGL = Spectral gamma logging.

Table B-11. 2607-W3 Septic Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of septic tank and head end of tile field.	Surface geophysical surveys used to locate pipelines.
Tank sludge sample	Collect sample from the septic tank and submit to the laboratory for 2607-W3 tank-specific COCs.	Will be used to determine what contaminants entered the drain field.
Borehole sampling and characterization	Locate borehole at the head end of the tile field. Location will be based on facility drawings and the surface geophysical survey.	The maximum contamination potential is assumed to be present near the head end of the tile field.

Table B-11. 2607-W3 Septic Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Split-spoon soil samples	Soil samples will be collected continuously from 7 ft bgs to 17 ft bgs (sampler length with shoe is about 2.5 ft). Below 17 ft, samples will be collected at the interface of lithologic changes including the Hanford formation, Cold Creek unit, Ringold unit E, and just above the water table. All samples will be analyzed for 2607-W3 tank-specific COCs.	Soil samples will be collected continuously in the region of highest potential contamination. Additional soil samples will be collected in regions where contamination is likely to accumulate. The 12- to 14.5-ft-bgs sample will be collected to support risk assessment.
Split-spoon soil samples	Collect bulk density and grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.
Split-spoon soil samples	Collect field QC samples. Submit to the lab for 2607-W3 tank-specific COCs.	Field QC samples are collected to evaluate the potential for cross-contamination and to evaluate laboratory performance.
Borehole Geophysical Survey	Perform borehole SGL and neutron moisture logging from the surface to the bottom of the borehole.	SGL logging will be performed to verify gamma-emitting contamination and to refine the conceptual contaminant distribution model. Cesium-137 will be the main target isotope for the SGL because of its prevalence and ease in identification. Soil moisture data will support the site conceptual model.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GPR = Ground-penetrating radar.
SGL = Spectral gamma logging.

Table B-12. 200-W-59 Diversion Box Sampling Design. (3 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of the diversion box.	Surface geophysical surveys used to locate diversion box and pipelines.

Table B-12. 200-W-59 Diversion Box Sampling Design. (3 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Vertical geophysical survey	Install direct push rods to a depth of 6.1 m (20 ft) bgs for GG/PN logging. Nominally, four installations will be outside of the diversion box circumference; near the inlet line from the 200-W-58 Diversion Box, near the south outlet to the 216-Z-12 Crib, near the west outlet to the 216-Z-12 Crib, and near the outlet to the drain field to the northwest. In addition, nominally, two installations to a depth of 7.6 m (25 ft) bgs will be placed near the head end of the drainfield and at the end of the stainless steel pipe outlet to the 216-Z-12 Crib.	Vertical geophysical survey data will be used to determine if the tank leaked by evaluating the presence of plutonium and Cs-137 immediately adjacent to the tank in regions where leaks likely would have occurred. Cs-137 is considered a good indicator of contamination because of its prevalence in the waste stream and ease of identification. High levels of plutonium can be detected by the PN detector.
Driven soil core sampler	The soil sample collected from the region of highest contamination detected by vertical geophysical survey. Use a driven soil core sampler and submit sample for laboratory analysis of gross alpha, gross beta, gross gamma, GEA, ICP metals, and VOAs (in order of priority). If insufficient material is available for all analyses, prioritize analyses.	Discrete soil sample will be collected to confirm levels of contamination detected by vertical geophysical logging. The subsurface soil sample will be collected even if no contamination is detected by the vertical geophysical survey.
Supplemental Sampling Required if Subsurface Soil Sample Confirms Diversion Box Leaked		
Borehole soil sampling and characterization (Based on deep soil sample results)	Drill borehole near the region of highest potential contamination. Location will be based upon interpretation of the vertical geophysical logging data and deep soil sample. Submit sample for laboratory analysis of 200-W-59-specific COCs.	Characterize extent of vertical contamination if subsurface soil sample indicates significant leakage from the tank.
Split-spoon soil samples	Split spoon soil samples will be collected at 12.5 ft bgs, 17 ft bgs, and at 10-ft intervals until contamination levels are less than three times background. Soil samples should be collected at major changes in lithology. Soil samples will be analyzed for site-specific COCs.	The 12.5-ft bgs sample will be collected to support risk assessment. Soil samples collected at 17 ft bgs and deeper will be field screened for gross radionuclide contamination. If contamination levels are above three times background, drilling and sampling will resume to the next sample interval until contamination is less than three times background. A final sample will be collected at the interval where contamination is less than three times background.
Split-spoon soil samples	Collect bulk density, grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.

Table B-12. 200-W-59 Diversion Box Sampling Design. (3 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Split-spoon soil samples	Collect field QC samples. Submit sample for laboratory analysis of 200-W-59 specific COCs.	Field QC samples will be used to evaluate the potential for cross-contamination and to evaluate laboratory performance.
Borehole geophysical survey	Perform borehole SGL and neutron moisture logging from the surface to bottom of the borehole.	SGL will be performed to verify gamma-emitting contamination and to refine the conceptual contaminant distribution model. Cesium-137 will be the main target isotope for the SGL because of its prevalence and ease of identification. Soil moisture data will support the site conceptual model.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GEA =Gamma energy analysis
GG = Gross gamma.
GPR = Ground-penetrating radar.
ICP = Inductively coupled plasma.
PN = Passive neutron.
QC = Quality control.
SGL = Spectral gamma logging.
VOA = Volatile organic analyte.

Table B-13. 276-S-141/142 Hexone Tanks Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of tank.	Surface geophysical surveys used to locate tank and pipelines.
Soil gas samples	Install soil gas screens for soil gas sampling. Nominally, 6 deep soil gas screens will be installed outside the tank circumference on the east end, north side, and west end of each tank to a depth of 5.5 m (18 ft) bgs. Also a 5.5 m (18-ft)-deep soil gas screen will be installed between the tanks. In addition, 2 shallow soil gas screens will be installed to a depth of 1.0 m (39 in.) near the underground piping on the east end of the tank.	Screen soil gas from all points for total VOC. Collect at least two soil gas samples for comfirmatory analysis of hexone concentrations with a GC or similar analytical instrument.
Driven soil core sampler	One soil sample collected from the region of highest contamination detected by soil gas samples. Use driven soil core sampler and submit sample for laboratory analysis of VOAs, GEA, gross alpha, gross beta, gross gamma, and ICP metals (in order of priority). If insufficient material is available for all analyses, prioritize analyses.	Discrete soil sample will be collected to confirm levels of contamination detected by soil gas samples. The subsurface soil sample will be collected even if no contamination is detected in the soil gas samples.
Supplemental Sampling Required if Subsurface Soil Sample Confirms Diversion Box Leaked		
Borehole soil sampling and characterization (Based on subsurface soil sample results)	Drill borehole near the region of anticipated contamination directly beneath the tank at a depth of 5.5 m (18 ft) bgs. A slant drilling technique will be required because of the tank access limitations.	Characterize potential contamination directly beneath the tanks.

Table B-13. 276-S-141/142 Hexone Tanks Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sampling Design
Split-spoon soil samples	Split-spoon soil samples will be collected at 12.5 ft bgs and 18 ft bgs. Submit samples for laboratory analysis of Tank 276-S-141 and 241-S-142-specific COCs.	The 12.5 ft bgs sample will be collected to support risk assessment. Soil samples collected at 18 ft bgs will be analyzed for Hexone Storage and Treatment Facility-specific COCs.
Split-spoon soil samples	Collect bulk density, grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.
Split-spoon soil samples	Collect field QC samples.	Field QC samples will be used to evaluate the potential for cross-contamination and to evaluate laboratory performance.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GC = Gas chromatography
GEA = Gamma energy analysis
GPR = Ground-penetrating radar.
QC = Quality control.
VOA = Volatile organic analyte.
VOC = Volatile organic carbon.

Table B-14. 241-CX-70 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of tank.	Surface geophysical surveys used to locate tank and pipelines.
Surface soil sample	Hand excavate to approximately 3 ft bgs or below soil stabilization area near a tank riser to collect soil sample. Alternatively, use a driven soil probe to penetrate the stabilization area and a core sampler to obtain the soil sample.	The location for the hand excavation is based on the assumption that soil contamination is more likely near entry points to the tank. Surface stabilization for the 216-C-1 Crib UPR in 1979, which included a 10 cm (4-in.) sand pad with Ureabor (herbicide) at the rate of 450 kg/ha (500 lb/acre), a layer of plastic covered with30 cm (12 in.) of sand, and 10 cm (4 in.) of pit run gravel (WIDS), may have extended to the area around Tank 241-CX-70 Tank.
	Collect one soil sample and QC samples between 3 and 4 ft and submit for laboratory analyses of the CX Tank System COCs.	Potential contamination in surface soils from the 216-C-1 Crib overflow
Vertical geophysical survey	Install direct push rods to a depth of 9.4 m (31 ft) for GG/PN logging. Nominally, four pushes will be installed outside of the tank circumference; near the inlet line, near the riser opening, 180 degrees from the inlet line, and 180 degrees from the riser opening.	Vertical geophysical survey data will be used to determine if the tank leaked by evaluating the presence of plutonium and Cs-137 immediately adjacent to the tank in regions where leaks likely would have occurred. Cs-137 is considered a good indicator of contamination because of its prevalence in the waste stream and ease of identification. High levels of plutonium may be detected by the PN detector.

Table B-14. 241-CX-70 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Driven soil core sampler	A soil sample is collected from the region of highest contamination detected by vertical geophysical survey. Use driven soil core sampler and submit sample for laboratory analysis of gross alpha, gross beta, gross gamma, GEA, ICP metals, and VOAs (in order of priority). If insufficient material is available for all analyses, prioritize analyses.	A discrete soil sample will be collected to confirm levels of contamination detected by vertical geophysical logging. The subsurface soil sample will be collected even if no contamination is detected by the vertical geophysical survey.
Supplemental Sampling Required if Subsurface Soil Sample Confirms Tank Leaked		
Borehole soil sampling and characterization (Based on subsurface soil sample results)	Drill borehole near the region of highest potential contamination. Location will be based on interpretation of the vertical geophysical logging data and subsurface soil sample. Submit sample for laboratory analysis of CX Tank System COCs.	Characterize extent of vertical contamination if subsurface soil sample indicates significant leakage from the tank.
Split-spoon sample	Split-spoon soil samples will be collected at 12.5 ft bgs, 28 ft bgs, and at 10-ft intervals until contamination levels are less than three times background. Soil samples should also be collected at major changes in lithology.	The 12.5-ft-bgs sample will be collected to support risk assessment. Soil samples collected at 28 ft bgs and deeper will be field screened for gross radionuclide contamination. If contamination levels are above three times background, drilling and sampling will resume to the next sample interval until contamination is less than three times background. A final sample will be collected at the interval where contamination is less than three times background.
Split-spoon sample	Collect bulk density, grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.
Split-spoon sample	Collect field QC samples.	Field QC samples will be used to evaluate the potential for cross-contamination and to evaluate laboratory performance.
Borehole geophysical survey	Perform borehole SGL and neutron moisture logging from the surface to bottom of the borehole.	SGL will be performed to verify gamma-emitting contamination and to refine the conceptual contaminant distribution model. Cesium-137 will be the main target isotope for the SGL because of its prevalence and ease in identification. Soil moisture data will support the site conceptual model.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

WIDS, *Waste Information Data System Report*, Hanford Site database.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GEA = Gamma energy analysis
GG = Gross gamma.
GPR = Ground-penetrating radar.
ICP = Inductively coupled plasma.
PN = Passive neutron.
QC = Quality control.
UPR = Unplanned release.
VOA = Volatile organic analyte.
WIDS = Waste Information Data System.

Table B-15. 241-CX-71 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of tank.	Surface geophysical surveys used to locate tank and pipelines.
Surface soil sample	Hand excavate to approximately 3 ft bgs or below the soil stabilization area near a tank riser to collect the soil sample. Alternatively, use a direct push to penetrate the stabilization area and a core sampler to obtain the soil sample.	The location for the hand excavation is based on the assumption that soil contamination is more likely near entry points to the tank. Surface stabilization for the 216-C-1 Crib UPR in 1979, which included a 10 cm (4-in.) sand pad with Ureabor (herbicide) at the rate of 450 kg/ha(500 lb/acre), a layer of plastic covered with 0.3 m (12 in.) of sand, and 10 cm (4 in.) of pit run gravel (WIDS), may have extended to the area around Tank 241-CX-71.
	Collect 1 soil sample between 3 and 4 ft and submit for laboratory analyses of CX Tank System COCs.	Potential contamination in surface soils from 216-C-1 Crib overflow. Ecological sample.
Vertical geophysical survey	Install direct push rods to a depth of 4.9 m (16 ft) for GG/PN logging. Nominally, four pushes will be installed outside the tank circumference; near the inlet line from 201-C, near the inlet line from the Hot Shop sinks, near the drywell, and near the outlet line to the 216-C-1 and 216-C-5 Cribs.	Vertical geophysical survey data will be used to determine if the tank leaked by evaluating the presence of plutonium and Cs-137 immediately adjacent to the tank in regions where leaks likely would have occurred. Cs-137 is considered a good indicator of contamination because of its prevalence in the waste stream and ease of identification. High levels of plutonium may be detected by the PN detector.
Driven soil core sampler	A soil sample collected from the region of highest contamination detected by vertical geophysical survey. Use driven soil core sampler and submit sample for laboratory analysis of gross alpha, gross beta, gross gamma, GEA, ICP metals, and VOAs (in order of priority). If insufficient material is available for all analyses then prioritize analyses.	Discrete soil sample will be collected to confirm levels of contamination detected by vertical geophysical logging. The subsurface soil sample will be collected even if no contamination is detected by the vertical geophysical survey.
Supplemental Sampling Required if Deep Soil Sample Confirms Tank Leaked		
Test pit soil sampling and characterization	Dig test pit near the region of highest potential contamination. Location will be based on interpretation of the vertical geophysical logging data and subsurface soil sample.	Characterize extent of vertical contamination if subsurface soil sample indicates significant leakage from the tank.

Table B-15. 241-CX-71 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Soil grab sample	Collect samples from excavated test pit soil at 14 ft bgs, 25 ft bgs, and at contaminated areas between 14 and 25 ft bgs. Soil samples also should be collected at major changes in lithology. Submit sample for laboratory analysis of CX Tank System COCs.	The 14 ft bgs sample will be collected to support risk assessment. Soil samples collected between 14 and 25 ft bgs will be field screened for gross radionuclide contamination. If contamination levels are above three times background, a sample will be collected from that region. A final sample will be collected at 25 ft bgs.
Soil grab sample	Collect bulk-density, grain-size distribution, and moisture samples at 24 to 25 ft bgs.	Soil physical properties will be used to support the site conceptual model.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.
WIDS, *Waste Information Data System Report*, Hanford Site database.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GEA = Gamma energy analysis
GG = Gross gamma.
GPR = Ground-penetrating radar.
ICP = Inductively coupled plasma.
PN = Passive neutron.
QC = Quality control.
UPR = Unplanned release.
VOA = Volatile organic analyte.
WIDS = Waste Information Data System.

Table B-16. 241-CX-72 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Surface geophysical survey	Perform GPR and/or EMI over the general area of the tank.	Surface geophysical surveys used to locate tank and pipelines.
Surface soil sample	Hand excavate to approximately 3 ft bgs or below soil stabilization area near the tank to collect soil sample. Alternatively, use a direct push to penetrate the stabilization area and a core sampler to obtain the soil sample.	The location for the hand excavation is based on the assumption that soil contamination is more likely near entry points to the tank. Surface stabilization for the 216-C-1 Crib UPR in 1979, which included a 10 cm (4-in.) sand pad with Ureabor (herbicide) at the rate of 450 kg/ha (500 lb/acre), a layer of plastic covered with 0.3 m (12-in.) of sand, and 10 cm (4 in.) of pit run gravel (WIDS), may have extended to the area around Tank 241-CX-72.
	Collect soil sample between 3 and 4 ft and submit for laboratory analyses of -CX Tank System COCs.	Potential contamination in surface soils from 216-C-1 Crib overflow.
Borehole soil sampling and characterization	Bore near the region of anticipated contamination directly beneath the tank at about 15.24 m (50 ft) bgs. A slant drilling technique will be required due to the building and concrete pad located directly over the tank.	Characterize potential contamination directly beneath the tank.

Table B-16. 241-CX-72 Tank Sampling Design. (2 Pages)

Sampling Method	Key Features of Design	Basis for Sample Design
Split-spoon soil samples	Split spoon soil samples will be collected at 12.5 ft bgs, 26 ft bgs, and 50 ft bgs. Submit for laboratory analyses of CX Tank System COCs.	The 12.5-ft bgs sample will be collected to support risk assessment. Soil samples collected at 26 and 50 ft bgs will be analyzed for tank-specific COCs.
Split-spoon soil samples	Collect bulk-density, grain-size distribution, and moisture samples at major changes in lithology.	Soil physical properties will be used to support the site conceptual model.
Split-spoon soil samples	Collect field QC samples.	Field QC samples will be used to evaluate the potential for cross-contamination and to evaluate laboratory performance.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.
WIDS, *Waste Information Data System Report*, Hanford Site database.

bgs = Below ground surface.
COC = Contaminant of concern.
EMI = Electromagnetic induction.
GEA =Gamma energy analysis
GPR = Ground-penetrating radar.
UPR = Unplanned release.
VOA = Volatile organic analyte.
WIDS = Waste Information Data System.

Table B-17. Summary of Projected Sample Collection Requirements.

Sample Type	200-W-59 Diversion Box	200-E-111 Unplanned Release	2607-W3 Septic Tank	276-S-141/ 142 Hexone Tanks	241-CX Tank System
Driven Probes for Geophysical Logging	4	12	N/A	N/A	8
Boreholes for geophysical logging	1[a]	1	1	1[a]	2[a]
Samples for Radiological and/or Chemical COCs					
Soil gas samples	N/A	N/A	N/A	6	N/A
Internal sludge sample	N/A	N/A	1	N/A	N/A
Shallow soil samples	N/A	1	N/A	N/A	3
Driven core soil samples	1	N/A	N/A	1	2
Borehole/test pit soil samples	5[a]	5	7	2[a]	10[a]
Samples for Physical Properties					
Bulk-density, moisture content, particle size[a]	2[a]	2	3	1[a]	5[a]
QC samples					
Duplicates	1[a]	1	1	1[a]	3[a]
Splits	1[a]	1	1	1[a]	3[a]
Equipment blanks	1[a]	1	1	1[a]	2[a]
Trip blank	1[a]	1	1	1[a]	3[a]
Total number of QC samples	4[a]	4	4	4[a]	11[a]

[a]Samples collected and geophysical logging (boreholes only) only if borehole or test pit is required based screening sample results.

COC = Contaminant of concern.
N/A = Not applicable.
QC = Quality control.

B4.0 HEALTH AND SAFETY

All field operations will be performed in accordance with health and safety requirements as outlined in BHI-SH-01, *ERC Safety and Health Program*, or equivalent. In addition, appropriate documentation will be prepared in accordance with the BHI-EE-02 procedures for drilling and test pit activities or equivalent. This documentation will include an activity hazard analysis, site-specific health and safety plan, and applicable radiological work permits.

The sampling procedures and associated activities will take into consideration exposure reduction and contamination control techniques that will minimize the radiation exposure to the sampling team as required by BHI-QA-01, *ERC Quality Program*, or equivalent, and BHI-RC-01, *Radiation Protection Program Manual*, or equivalent.

B5.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste generated by characterization activities will be managed in accordance with BHI-EE-10, *Waste Management Plan*, and DOE/RL-98-28, Appendix E, or equivalent. Containment, labeling, and tracking requirements are specified in BHI-EE-10, Part II, Procedure 9.0, "Control of CERCLA and Other Past Practice Investigation Derived Waste," or equivalent. These procedures have been prepared to implement the requirements of the Washington State Department of Ecology, found in *Strategy for Management of Investigation Derived Waste* (Ecology et al. 1999). Management of IDW, minimization practices, and waste types applicable to 200-IS-1 and 200-ST-1 waste control are described in the waste control plan.

Unused samples and associated laboratory waste from the analysis will be dispositioned in accordance with the laboratory contract, which in most cases will allow the laboratory to dispose of this material. The approval of the remedial project manager is required before unused samples or waste may be returned from offsite laboratories.

A waste-designation DQO will be completed before the initiating characterization activities to ensure that information necessary to support designation of all project IDW is collected during the field effort. During the IDW DQO effort, any listed waste issues will be resolved. Additional sampling or analysis required to support designation activities will be identified in the waste designation DQO summary report.

B6.0 REFERENCES

40 CFR 131, "Water Quality Standards," *Code of Federal Regulations*, as amended.

40 CFR 830.120, "Quality Assurance Requirements," *Code of Federal Regulations*, as amended.

49 CFR, "Transportation," *Code of Federal Regulations*, as amended.

ASTM, 1993, *1993 Annual Book of ASTM Standards*, Volume 04.08, American Society for Testing and Materials, Philadelphia, Pennsylvania.

BHI-01433, 2000, *Data Validation Procedure for Radiochemistry Analysis*, Rev 0, Bechtel Hanford, Inc., Richland, Washington.

BHI-01435, 2000, *Data Validation Procedure for Chemical Analysis*, Rev 0, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-01, *Environmental Investigations Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-02, *Environmental Requirements*, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-05, *Field Screening Procedures*, Bechtel Hanford, Inc., Richland, Washington.

BHI-EE-10, *Waste Management Plan*, Bechtel Hanford, Inc., Richland, Washington.

BHI-QA-01, *ERC Quality Program*, Bechtel Hanford, Inc., Richland, Washington.

BHI-RC-01, *Radiation Protection Program Manual*, Bechtel Hanford, Inc., Richland, Washington.

BHI-SH-01, *ERC Safety and Health Program*, Bechtel Hanford, Inc., Richland, Washington.

CP-13196, 2002, *Remedial Investigation Data Quality Objectives Summary Report – 200-IS-1 and 200-ST-1 Operable Units*, CP-13196, Internal Draft, Fluor Hanford, Inc., Richland, Washington.

DOE Directive CRD 414.1A, *Quality Assurance*, as amended, U.S. Department of Energy, Washington, D.C.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C.

DOE/RL-96-68, 1996, *Hanford Analytical Services Quality Assurance Requirements Documents*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-98-28, 1999, *200 Areas Remedial Investigation/Feasibility Study Implementation Plan – Environmental Restoration Program*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

DOE/RL-2002-14, 2002, *Tanks/Lines/Pits/Boxes/Septic Tank and Drain Fields Waste Group Operable Unit RIF/FS/Work Plan and RCRA TSD Unit Sampling Plan*, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

EAP QA/G-4, 1994, *Guidance for the Data Quality Objectives Process*, U.S. Environmental Protection Agency, Washington, D.C.

Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

Ecology, EPA, and DOE, 1999, *Strategy for Management of Investigation Derived Waste*, (letter from R. Stanley, Washington State Department of Ecology, D. R. Sherwood, U.S. Environmental Protection Agency, and K. M. Thompson, U.S. Department of Energy, Richland Operations Office, dated July 26, 1995), Richland, Washington.

ES-SSPM-001, 1998, *Sampling Services Procedures Manual*, Rev. 0, Waste Management Northwest, Richland, Washington.

HNF-SD-HTI-TI-001, 1997, *AX Tank Farm Waste Inventory Study for the Hanford Tank Initiative Project*, Rev. 0, Numatec Hanford Corporation, Richland, Washington.

QA/R-5, 1994, *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*, U.S. Environmental Protection Agency, Quality Assurance Division, Washington, D.C.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

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

WAC 173-201a, 1992, "Water Quality Standards for Surface Waters of the State of Washington," *Washington Administrative Code*, as amended.

WAC 173-340, "Model Toxics Control Act – Cleanup," *Washington Administrative Code*, as amended.

WHC-MR-0517, 1993, *200 Area Sanitary Waste Management Engineering Study*, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

WHC-SD-WM-ER-308, 1994, *Supporting Document for the Historical Tank Content Estimate for A Tank Farm*, Rev. 0, ICF Kaiser Hanford Company for Westinghouse Hanford Company, Richland, Washington.

WIDS, W*aste Information Data System Report*, Hanford Site database.

This page intentionally left blank.

APPENDIX C

200-IS-1 AND 200-ST-1 OPERABLE UNITS SITES REVIEW PROCESS

This page intentionally left blank.

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
200-IS-1 Tanks/Lines/Pits/Boxes WIDS Sites							
200-E-111	200-E-111, Encased Pipeline from 241-ER-151 Diversion Box to 241-C Tank Farm and 244-AR Vault; 3-38 Encasement	Accepted		The site is an underground piping encasement that contains three 7.5 cm (3-in.)-diameter stainless steel waste transfer pipelines, numbered V108, 8618, 8653, that run from the 241-ER-151 Diversion Box through a "Y" that branches to the C Tank Farm and the 244-AR Vault. The section from the "Y" to the 244-AR Vault contains two 7.5 cm (3-in.) pipelines numbered 809 and 818. A posted Contamination Area is on top of the line at the Y Junction where the line branches to the C Tank Farm and the 244-AR Vault. The entire length of the pipeline is marked with steel fence posts and is posted as an "Underground Radioactive Materials" area. The ground surface above the pipeline is bare in spots; other sections are vegetated with crested wheatgrass, tumbleweeds, and native grass species.	The encased pipeline runs eastward from the 241-ER-151 Diversion Box, south of 7th Street, and branches off in two directions (forming a Y) at a point southeast of the 216-C-10 Crib. From the Y, it branches to the C Tank Farm and the 244-AR Vault.	Ecology	200-IS-1
200-E-116	200-E-116, Pipelines from 241-B-154 Diversion Box to 241-C-151 and 241-C-152 Diversion Boxes	Accepted		The pipeline is posted as an "Underground Radioactive Pipeline" that extends from the 241-B-154 Diversion Box to the 241-C-151 and 241-C-152 Diversion Boxes. Vegetation over the pipeline has been crushed by vehicle traffic. An area located just north of the 241-B-154 Diversion Box was posted as a High Contamination Area in September 2000, but was covered with a bio-barrier and gravel in February 2001. It is now a rectangular posted URM area over a portion of the pipeline. Another area of contamination was found on this pipeline in June 2001. This area was covered with gravel and posted as a URM in August 2001.	The site is located north of and runs parallel to 7th St, between B Plant and the C Tank Farm in the 200 East Area.	Ecology	200-IS-1
200-W-100	200-W-100, Encased Pipeline from 241-UX-154 to 241-SX-152 Diversion Box	Accepted		The site is a cement-encased underground pipeline. The pipeline is marked with "Underground Radioactive Material – Pipeline" signs.	The pipeline begins on the east side of the 221-U Building and extends southwest to terminate at the 241-SX-152 Diversion Box, located on the east side of S and SX Tank Farms.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
200-W-16	200-W-16, 292-T Underground Tanks, IMUST, Inactive Miscellaneous Underground Storage Tank, 292-TK-1, 292-TK-2	Accepted		Two metal riser pipes extend about 0.5 m (1.5 ft) above grade near the southeast corner of the 292-T Building addition. Both are capped and one appears to have a pressure relief vent. These pipes extend from two buried tanks (292-TK-1 and -2). A chain link fence encloses the area where the tanks are located. The fence is posted with "Access Restricted" signs. The site is within a chained area posted "Contamination Area."	The underground tanks are near the southeast corner of the 292-T Building addition. The 292-T Building is south of the 291-T stack and north of the 222-T Building.	Ecology	200-IS-1
200-W-58	200-W-58, Z-Plant Diversion Box #1	Accepted		The concrete lid of the diversion box is visible above ground. The Z Plant fenced exclusion area is covered with gravel.	Z Plant Diversion Box 1 is located south of the 234-5Z Building between the two fences that make up the double Z Plant exclusion area. It is directly south of the 361-Z Settling Tank. The diversion box is buried 2.7 m (9 ft) deep with its upper surface (a thick concrete lid) slightly above ground level.	Ecology	200-IS-1
200-W-59	200-W-59, Z-Plant Diversion Box #2	Accepted		The diversion box is buried with its concrete lid slightly above ground level. The Z Plant fenced exclusion area is covered with gravel.	Z Plant Diversion Box 2 is located southwest of the 234-5Z Building between the two fences that make up the double Z Plant exclusion area. It is west of the 216-Z-361 Settling Tank and directly north of the 216-Z-12 Crib.	Ecology	200-IS-1
200-W-7	200-W-7, 246-L, 241-S-TK-1, 243S-TK-1, 243-S-TK1, 200-W Personnel Decontamination Facility Catch Tank, IMUST	Accepted		The underground tank is inside a chained area that measures approximately 3 m by 3 m (9 ft by 9 ft), with three risers extending to the surface. The tank is posted with IMUST signs and radiological postings.	The site is located northwest of 242-S Evaporator and just north of Trailer MO-326.	Ecology	200-IS-1
200-W-78	200-W-78; Pipeline between TX, TY, and T Tank Farms	Accepted		The site is an encased, underground pipeline that runs between the 241-TXR-151 Diversion Box in the TX Tank Farm and the 241-TR-153 Diversion Box in the T Tank Farm. Outside the tank farm fence, the line is marked with "Radioactive Pipeline" signs. Several stabilized, individually radiologically posted areas are on top of or adjacent to this pipeline near the east side of the TY Tank Farm perimeter fence.	The underground line is located in the 200 West Area between the T, TX, and TY Tank Farms, on the west side of Camden Ave.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
200-W-97	200-W-97, Encased Pipeline from 240-S-151 Diversion Box to 241-S-151 Diversion Box	Accepted		The site is an underground concrete-encased pipeline. The surface is marked with "Underground Radioactive Material - Pipeline" signs. Yellow swab risers are located along the pipeline. One swab riser, near the 204-S Facility, has been surrounded with posts and chain and posted with "Soil Contamination Area" signs.	The pipeline extends northwest from the REDOX facility to the S and SX Tank Farms.	Ecology	200-IS-1
200-W-98	200-W-98, Encased Pipeline from 240-S-151 to 241-U-153 Diversion Box	Accepted		The site is a cement-encased underground pipeline. The pipeline is marked with "Underground Radioactive Material - Pipeline" signs.	The pipeline is located south of 16th Street, extending in a southeast direction from the 241-U-153 Diversion Box to 204-S and the REDOX facility.	Ecology	200-IS-1
200-W-99	200-W-99, Encased Pipeline from 241-U-151 to 241-S-151 Diversion Boxes	Accepted		The site is a cement encased, underground pipeline. The pipeline is marked with Underground Radioactive Material - Pipeline signs.	The pipeline is located south of 16th St, extending from the 241-U-151 Diversion Box to the 241-S-151 Diversion Box.	Ecology	200-IS-1
216-TY-201	216-TY-201, Supernatant Disposal Flush Tank, IMUST	Accepted		The 216-T-26, 216-T-27 and 216-T-28 Cribs and the 216-TY-201 Tank are enclosed in a common area with a steel post and chain barricade. The area is posted "Underground Radioactive Material." The 216-TY-201 flush tank is located in the northeast corner of the area. It has three risers protruding from a mound of earth. Tank 216-TY-201 is delineated with steel posts and chain and marked with "Inactive Miscellaneous Underground Storage Tank" signs.	The unit is located in the 200 West Area. It is east of Camden Ave and south of 23rd St.	Ecology	200-IS-1
240-S-151	240-S-151, 240-S-151 Diversion Box	Accepted		This unit is constructed of reinforced concrete and is rectangular in shape. The 240-S-151 Diversion Box has been weather covered.	The 240-S-151 Diversion Box is located north of the 202-S Canyon Building.	Ecology	200-IS-1
240-S-152	240-S-152, 240-S-152 Diversion Box	Accepted		This unit is constructed of reinforced concrete and is rectangular in shape. The 240-S-152 Diversion Box has been weather covered.	The 240-S-152 Diversion Box is located north of the 202-S Canyon Building.	Ecology	200-IS-1
240-S-302	240-S-302, 240-S-302 Catch Tank, IMUST	Accepted		This unit is a horizontally oriented cylindrical steel tank. The 240-S-302 Catch Tank is buried underground to provide shielding from radiation. The tank is surrounded with posts and chain and posted with "radiological" and "IMUST" signs.	This unit is located north of the 202-S Building and east of the 240-S-151 Diversion Box.	Ecology	200-IS-1
241-A-151	241-A-151, 241-A-151 Diversion Box	Accepted		The site is a reinforced-concrete structure with cover blocks. Most of the structure is below grade. It is marked and radiologically posted.	The diversion box is located south of the east end of the 202-A Building.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
241-A-302A	241-A-302A, 241-A-302-A Catch Tank	Accepted		The unit is an underground cylinder made of carbon steel. It sits inside a pump pit with a riser extending to the surface. It is surrounded with posts and chain and marked with "radiological" and "IMUST" signs.	The catch tank is located south of the east end of the 202-A Building and west of the 241-A-151 Diversion Box. It is located inside the PUREX security fence.	Ecology	200-IS-1
241-A-302B	241-A-302B, 241-A-302-B Catch Tank, IMUST	Accepted		The east slope of the A Tank Farm has been sprayed with shotcrete. The shotcrete surrounds the area where Catch Tank 241-A-302B is located. A riser and electrical box are visible. A staircase has been installed to provide access to the tank surface. The underground tank is positioned horizontally. The tank is marked and radiologically posted.	Catch Tank 241-A-302B is buried outside the tank farm perimeter fence, east of the A Tank Farm, adjacent to Canton Ave.	Ecology	200-IS-1
241-B-154	241-B-154, 241-B-154 Diversion Box	Accepted		The site is a diversion box that connects Diversion Boxes 241-B-151 and 241-B-152 with the 221-B Building. The rectangular, reinforced concrete structure has been sprayed with gray, weatherizing foam.	The unit is located east of the 221-B Building, at the intersection of Baltimore Ave and Seventh St.	Ecology	200-IS-1
241-B-302B	241-B-302B, 241-B-302-B Catch Tank, 241-B-302, IMUST	Accepted		This unit is an underground, horizontal carbon steel tank. The catch tank and the 241-B-154 Diversion Box are surrounded by a post-and-chain barrier. The surface of the area inside the chain has been covered with grave and sprayed with gray weatherizing material. The site is marked with "radiological" and "IMUST" signs.	This catch tank is located north of the 241-B-154 Diversion Box, adjacent to the corner of 7th St and Baltimore Ave.	Ecology	200-IS-1
241-BX-154	241-BX-154, 241-BX-154 Diversion Box	Accepted		The 241-BX-154 Diversion Box is a reinforced-concrete structure.	This diversion box is located south of the 221-B Building and east of the 241-BX-302B Catch Tank.	Ecology	200-IS-1
241-BX-155	241-BX-155, 241-BX-155 Diversion Box	Accepted		The 241-BX-155 Diversion Box is a reinforced-concrete structure that has been isolated and covered with waterproof gray grout. The area around the diversion box has been surface stabilized with gravel and posted with "Underground Radioactive Material" signs, except for the surface area above Tank 241-B-302-C. This area does not have the additional layer of gravel and remains posted as a contamination area.	This diversion box is located northeast of B Plant on the south side of Atlanta Ave.	Ecology	200-IS-1
241-BX-302B	241-BX-302B, 241-BX-302-B Catch Tank, IMUST	Accepted		Catch Tank 241-BX-302-B is buried and covered with gravel. It is surrounded with post and chain. The tank is marked with "radiological" and "IMUST" signs.	Catch Tank 241-B-302-B is located on the south side of the 221-B Building (near section 12), and northwest of 241-BX-154 Diversion Box.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
241-BX-302C	241-BX-302C, 241-BX-302-C Catch Tank, IMUST	Accepted		Catch Tank 241-BX-302-C is a horizontal cylinder of direct-buried carbon steel inside a recently graveled URM area, related to the 241-BX-155 Diversion Box surface stabilization. The tank was not covered with extra gravel and is separately posted as a contamination area. The tank is marked with "radiological" and "IMUST" signs.	Catch Tank 241-BX-302C is located southeast of the 241-BX--155 Diversion Box, between Atlanta Ave and Baltimore Ave.	Ecology	200-IS-1
241-C-154	241-C-154, 241-C-154 Diversion Box	Accepted		The diversion box has been covered with clean backfill material (ash) and no longer is visible. It is located within the larger Hot Semi-Works surface stabilized area (200-E-41).	The diversion box is located south of 7th St, southeast of the (demolished) 201-C Building and northeast of the 216-C-1 Crib.	Ecology	200-IS-1
241-CX-70	241-CX-70, 241-CX-TK-70 Tank, Strontium Hot Semi-works, IMUST	Accepted		The 241-CX-70 underground tank is surrounded with a post-and-chain barrier. It is posted with "Hazardous Waste, Restricted Area-Inactive Tank" signs.	The tank is located south of 7th Street, within the Hot Semi-Works stabilized area (200-E-41).	Ecology	200-IS-1
241-CX-71	241-CX-71, 241-CX-TK-71, 241-CX Neutralization Tank, Strontium Hot Semi-Works, IMUST	Accepted		The underground tank is surrounded with steel posts and chain. It is posted with "Hazardous Waste, Restricted Area-Inactive Tank" signs.	The tank is located south of 7th Street, within the Hot Semi-Works stabilized area (200-E-41). It is near the northeast corner of the 216-C-1 Crib.	Ecology	200-IS-1
241-CX-72	241-CX-72, 241-CX-TK-72 Vault and Tank, 241-CX-72 Waste Self Concentrator, Strontium Hot Semi-Works, IMUST	Accepted		Tank 241-CX-72 is located inside a small building. A cover has been placed over the tank with radiological postings and "Keep Out" signs.	The tank is located south of 7th St, within the Hot Semi-Works stabilized area (200-E-41).	Ecology	200-IS-1
241-ER-151	241-ER-151, 241-ER-151 Diversion Box	Accepted		The diversion box is located inside a locked chain link fence. The fence is posted with "Caution - contact Radiological Control and Tank Farm Shift Office prior to entry" signs. The diversion box is surrounded with a metal safety barricade.	The site is located southwest of the B Plant near the corner of 7th St and Atlanta Ave.	Ecology	200-IS-1
241-ER-152	241-ER-152, 241-ER-152 Diversion Box	Accepted		Most of the reinforced concrete diversion box structure is underground. The floor and lower portions of the walls are lined with stainless steel. Cover blocks with lifting hooks are visible from the surface. The 241-ER-152 Diversion Box is surrounded with radiation rope and "Contamination Area" signs.	This 241-ER-152 Diversion Box is southeast of the 224-B Building, and east of 241-ER-151 Diversion Box, near the corner of Atlanta Ave and 7th St.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
241-ER-311	241-ER-311, 241-ER-311 Catch Tank, 241-ER-311A Replacement Tank	Accepted		The underground tank is located inside the 241-ER-151 locked chain link fence. The fence is posted as a contamination area and URM, and is labeled with "IMUST" signs. Catch Tank 241-ER-311 is the furthest south, nearest the chain link fence. Catch Tank 241-ER-311A is located adjacent to the north side of Tank 241-ER-311 (in the middle of the three structures). The 241-ER-151 Diversion Box is north of Catch Tank 241-ER-311A.	The tank is located south of the B Plant, and west of Atlanta Ave, inside the 241-ER-151 Diversion Box fence.	Ecology	200-IS-1
241-ER-311A	241-ER-311A, 241-ER-311A Catch Tank, old 241-ER-311, Original 241-ER-311 Catch Tank, IMUST	Accepted		These tanks are located within a chain link fence that is posted as a contamination area and URM Area, and is labeled with "IMUST" signs. The 241-ER-151 Diversion Box and Catch Tanks 241-ER-311 and 241-ER-311A are all located inside this chain link fence. Catch Tank 241-ER-311 is the farthest south, nearest the chain link fence. Catch Tank 241-ER-311A is adjacent to the north side of Tank 241-ER-311 (in the middle of the three structures). The 241-ER-151 Diversion Box is north of Catch Tank 241-ER-311A.	This unit is below grade. The tank is located southwest of the B Plant. It is south of 7th St and west of Atlanta Ave.	Ecology	200-IS-1
241-EW-151	241-EW-151, 241-EW-151 Vent Station Catch Tank, 241-EW-151 Vent Station, Vent Station, 200 Area East-West Vent Station	Accepted		The vent station is surrounded by a chain link fence with a locked gate. It consists of an underground concrete structure containing a stainless steel tank in a vault with a jumper pit above the tank. The tank has two vent risers that extend above grade and a riser for the unit's leak detection system. At the bottom of the stairwell access is a floor drain that connects to a nearby French drain. Several hazard and radiological warning signs are posted on the fence. Two areas outside the fence, adjacent to the northeast side of the vent station are posted with URM signs.	The site is located south of Route 3, approximately half way between the 200 East and West Areas. It is south of the 609-A Fire Station.	Ecology	200-IS-1
241-SX-302	241-SX-302, 241-SX-302 Catch Tank, SX-304, IMUST	Accepted		Catch Tank 241-SX-302 is a stainless steel cylinder buried in a horizontal position. Three yellow risers are visible on the surface. It is surrounded with post and chain and marked with "radiological" and "IMUST" signs.	Catch Tank 241-SX-302 is located east of Tank 241-SX-101, inside the tank farm fence.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
241-TX-152	241-TX-152, 241-TX-152 Diversion Box	Accepted		The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. A few inches of the structure that extends above ground is covered with a gray weather coating. It is surrounded with light posts and chain and is posted with various radiological postings.	This unit is located east of the TX Tank Farm. It is east of Camden Ave and south of 23rd St. It is north of the 200 West Area Powerhouse Pond.	Ecology	200-IS-1
241-TX-154	241-TX-154, 241-TX-154 Diversion Box	Accepted		The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. The diversion box is surrounded with post and chain. It is labeled and radiologically posted. The adjacent area has been covered with shotcrete.	This unit is located on the east side of the 221-T Building.	Ecology	200-IS-1
241-TX-155	241-TX-155, 241-TX-155 Diversion Box	Accepted		The diversion box is a rectangular reinforced concrete structure. Most of the structure is below ground. A few inches of the structure that extends above ground is covered with a gray weather coating. It is surrounded with light posts and chain and Contamination Area signs.	This unit is located east of the TX Tank Farm, south of 23rd St and north of the 200 West Area Powerhouse Pond.	Ecology	200-IS-1
241-TX-302B	241-TX-302B, 241-TX-302-B Catch Tank, IMUST	Accepted		This unit is an underground, cylindrical tank made of steel. The ground surface around the tank has been covered with gravel. The tank is surround with light posts and chain and posted with "Contamination Area" and "IMUST" signs.	This tank is located east of the TX Tank Farm, northeast of the 241-TX-155 Diversion Box.	Ecology	200-IS-1
241-TX-302BR	241-TX-302BR, 241-TX-302BR Catch Tank, 241-TXR-302BR, IMUST	Accepted		This unit is an underground, horizontal, cylindrical tank made of steel. The ground surface around the tank has been covered with gravel. The tank is surrounded with posts and chain and labeled with "IMUST" signs.	Catch Tank 241-TX-302BR is located east of the 241-TX-155 Diversion Box. It is located east of Camden Ave and south of 23rd St.	Ecology	200-IS-1
241-TX-302C	241-TX-302C, 241-TX-302-C Catch Tank	Accepted		This unit is an underground horizontal, cylindrical tank made of carbon steel. The tank area has been sprayed with shotcrete to control surface contamination.	Catch tank 241-TX-302 is located southeast of the center of the 221-T Building.	Ecology	200-IS-1
241-U-151	241-U-151, 241-U-151 Diversion Box	Accepted		The diversion box is marked and radiologically posted. This unit is constructed of reinforced concrete with multiple encased liquid waste transfer lines. The diversion box structure is mostly below ground. It has three layers of cover blocks.	The 241-U-151 Diversion Box is located northeast of the intersection of Camden Ave and 16th St, east of the U Tank Farm.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
241-U-152	241-U-152, 241-U-152 Diversion Box	Accepted		The diversion box is marked and radiologically posted. The unit is constructed of reinforced concrete with multiple encased liquid waste transfer lines. The diversion box structure is mostly below ground. It has three layers of cover blocks.	The 241-U-152 Diversion Box is located northeast of the intersection at Camden Ave and 16th St, east of the 241-U Tank Farm.	Ecology	200-IS-1
241-UX-154	241-UX-154, 241-UX-154 Diversion Box	Accepted		The diversion box is marked and radiologically posted. The unit is mostly below grade, constructed of reinforced concrete. Multiple encased liquid waste transfer lines enter the box through its southeast wall.	The 241-UX-154 Diversion Box is located southeast of the 221-U Canyon Building.	Ecology	200-IS-1
241-UX-302A	241-UX-302A, 241-U-302 Catch Tank, 241-UX-302 Catch Tank, 241-UX-302	Accepted		The catch tank is an underground tank. It is covered with gravel, marked, and radiologically posted.	The tank is located southeast of the 221-U Building and south of the 241-UX-154 Diversion Box.	Ecology	200-IS-1
241-WR VAULT	241-WR VAULT, 241-WR Vault (Tanks -001 through -009), 241-WR-01 thru 09, 241-WR Diversion Station Vault, 244-WR Vault, 296-U-6 Stack, IMUST	Accepted		The vault is a below grade, reinforced-concrete structure with 9 compartments arranged in 2 rows with a 189,000 L (50,000 gal) tank in each compartment. A concrete wall separates the two rows of tanks. In addition to the tanks, the vault contains miscellaneous agitators, pumps, and valves. It is marked and posted with URM area signs. An exhaust stack just north of the vault is included in this site. See sub-site description.	This site is located northeast of the 221-U Building, west of Beloit Ave.	Ecology	200-IS-1
241-Z	241-Z, 241-Z Treatment and Storage Tanks, 241-Z Tank Farm, 241-Z Treatment and Storage System, 241-Z-D-4, 241-Z-D-5, 241-Z-D-7, 241-Z-D-8, 241-Z Sump, 241-Z Tank Pit	Accepted		Site consists of an above ground, weather protected area (metal building) containing controls and monitoring systems for the below grade concrete vault containing four storage and treatment tanks. The operating capacity of the tank system is 65,000 L (17,000 gal). The site was activated on November 24, 1948. The RCRA TSD consists of the tanks (excluding D-6), the internal piping, the concrete vaults, ancillary equipment and the soil directly below the tanks. Pipelines leading from buildings in 234-5Z to the 241-Z facility are not considered part of this site.	The site is located inside the Z Plant Security Fence, near the south end of the complex.	Ecology	200-IS-1
276-S-141	276-S-141, 276-S-TK-141, 276-S-306A, 276-S-141 Solvent Storage Tank, Tank 276-141, Hexone Storage Tank, 244-SX-15, IMUST	Accepted		The site is a below-grade carbon steel tank enclosed in a chain line fenced area. The tank is the southernmost tank in a two-tank network connected to the 276-S Solvent Handling Facility. The tank had an 89,000 L (23,575 gal) capacity. The tank has been filled with cement.	The underground tank is north of 276-S Building and directly south of Tank 276-S-142. The tank is west of the REDOX railroad tracks.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
276-S-142	276-S-142, 276-S-TK-142, 276-S-306B, 276-S-142 Solvent Storage Tank, Tank 276-142, Hexone Storage Tank, 244-SX-15, IMUST	Accepted		The site is a below-grade carbon steel tank. The tank is the northernmost tank in a two-tank network connected to the 276-S Solvent Handling Facility. The tank has an 89,000 L (23,575-gall) capacity.	The underground tank is north of the 276-S Building and directly north of Tank 276-S-141. The system is west of the railroad tracks.	Ecology	200-IS-1
600-269	600-269, Cross Site Transfer Line Replacement, New Cross-Site Transfer Line	Accepted		The site is an underground pipeline. It is marked on the surface with "Underground Radioactive Material - Pipeline" signs. An associated diversion box, Diversion Box 6241-A, is located east of Beloit Avenue in the 200 West Area. An associated vent station, Vent Station 6241-V, is located between 200 East and West Areas, northwest of the 241-EW-151 Vent Station.	The pipeline extends from the SY Tank Farm inside the 200 West Area to the 244-A Lift Station in 200 East Area. A large portion of the line is located between the 200 West and 200 East Areas, south of Route 3.	Ecology	200-IS-1
HSVP	HSVP, Hot Semiworks Valve Pit, 201-C Diversion Box, Semi-Works Valve Pit	Accepted		The site is a sealed, concrete-filled, vertically configured, stainless steel cylinder that is buried beneath the ash barrier that was placed over the decommissioned 201-C Process Building (see 200-E-41). The surface stabilized area is posted with URM signs. The valve pit is not separately marked or posted.	This valve pit is adjacent to the remains of the 201-C Building and southeast of the main canyon area. It is located within the surface stabilized area known as 200-E-41.	Ecology	200-IS-1
UPR-200-E-1	UPR-200-E-1, Waste Line Failure on South Side of 221-B	Accepted		The unplanned release is not separately marked or posted.	The release occurred on the south side of the 221-B Building.	Ecology	200-IS-1
UPR-200-E-117	UPR-200-E-117, Contaminated Liquid Spill, UN-200-E-117	Accepted		The release was identified above an encased waste line on the south of PUREX and west of the railroad tunnel. The release site is no longer marked or posted. The release site is within a larger area that was surface stabilized in 1999, known as 200-E-103.	The spill occurred on the south side of the 202-A Building, west of the railroad tunnel.	Ecology	200-IS-1
UPR-200-E-25	UPR-200-E-25, Contamination Spread from the 241-A-151 Diversion Box, UN-200-E-25	Accepted		The release is not separately marked or posted. The area south of PUREX, inside the facility fence had been posted as a contamination area. In 1999, the large posted contamination area was covered with clean backfill and changed to a URM Area (200-E-103). It is possible this release contributed to the contamination in the area.	The area of contamination extended southwest of PUREX, as far as 61 m (200 ft) beyond the 200 East Area fence.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-E-26	UPR-200-E-26, 241-A-151 Release, UN-200-E-26	Accepted		The release is not separately marked or posted. The area south of PUREX, inside the facility fence had been posted as a contamination area. In 1999, the large posted contamination area on the south side of the PUREX Facility was covered with clean backfill and changed to a URM Area (200-E-103). It is possible this release contributed to the contamination in the area.	Contamination from this release spread southwest of the 241-A-151 Diversion Box, outside of the 200 East Area perimeter fence and across Route 4S.	Ecology	200-IS-1
UPR-200-E-3	UPR-200-E-3, Line leak from 221-B to 241-BX-154, UN-200-E-3	Accepted		The release is not separately marked or posted.	The release occurred on the south side of the 221-B Building, between the 221-B Building and Tank 241-BX-154.	Ecology	200-IS-1
UPR-200-E-31	UPR-200-E-31, 241-A-151 Release, UN-200-E-31	Accepted		The release is not separately marked or posted. The area south of the PUREX Facility, inside the facility fence had been posted as a contamination area. In 1999, the large posted contamination area, located on the south side of the PUREX Facility, was covered with clean backfill and changed to a URM Area (200-E-103). It is possible this release contributed to the contamination in the area.	In 1961, the contamination spread from the 241-A-151 Diversion Box (located on the south side of 202-A), affected the PUREX exclusion area, areas northeast of PUREX and east of the 200 East Area fence.	Ecology	200-IS-1
UPR-200-E-41	UPR-200-E-41, UN-200-E-41 Soil Contamination in the Vicinity of R-13 Stairwell (221-B), UPR-200-E-85	Accepted		*This is a duplicate of UPR-200-E-85.	The site is located in the vicinity of the R-13 stairwell at the 221-B Building.	Ecology	200-IS-1
UPR-200-E-42	UPR-200-E-42, 241-AX-151 Release, UN-200-E-42	Accepted		The unplanned release site currently in not marked or posted.	The 241-AX-151 Diversion Box is located near the corner of 4th Street and Buffalo Ave, adjacent to the 204-AR Unloading Station. The unplanned release site included a dirt bank east of the 241-151-AX Diversion Box and weeds east of the established parking lot.	Ecology	200-IS-1
UPR-200-E-44	UPR-200-E-44, UN-200-E-44, BCS Waste Line Leak South of 221-B	Accepted		The release site is not separately marked or posted. There is no visual evidence of the area that caved in.	The unplanned release occurred south of 221-B, near the R-17 Change House north of 7th St. The change house no longer exists.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-E-45	UPR-200-E-45, UN-200-E-45, Contamination Spread from the 241-B-154 Diversion Box	Accepted		A large area on the northeast corner of 7th Street and Baltimore Avenue is surrounded with post and chain and marked as an Underground Radioactive Material (URM) area. The URM surrounds the 241-B-154 Diversion Box, that has been covered with a coating of gray grout. The original Unplanned Release is not separately marked or posted.	The 241-B-154 Diversion Box is located at the corner of 7th St and Baltimore Ave. The release involved loose contamination spreading in a southeasterly direction from the 241-B-154 Diversion Box.	Ecology	200-IS-1
UPR-200-E-65	UPR-200-E-65, UN-216-E-65, 241-A-151 Diversion Box Radioactive Contamination, UN-200-E-65	Rejected (Proposed)		The release is not separately marked or posted. The area south of PUREX, including this release site, is posted as an Underground Radioactive Material Area (site 200-E-103).	The release occurred south of the 202-A Building (PUREX), inside the facility fence and around Diversion Box 241-A-151.	Ecology	200-IS-1
UPR-200-E-67	UPR-200-E-67, UN-216-E-67, Excavation of Radioactively Contaminated Pipe Encasement, UN-200-E-67	Rejected (Proposed)		The 1984 excavation has been backfilled. The site is no longer marked or posted.	This site was located in an excavation site, north of the 272-AW parking lot, near the corner of 4th Street and Canton Avenue.	Ecology	200-IS-1
UPR-200-E-77	UPR-200-E-77, UN-216-E-5, 241-B-154 Diversion Box Ground Contamination, UN-200-E-77	Accepted		A large graveled area on the northeast corner of 7th Street and Baltimore Avenue is surrounded with post and chain and marked as a URM area. The URM surrounds the 241-B-154 Diversion Box, which has been covered with a coating of gray grout. The area appears to have been posted in stages. A large posted oval area (URM) extends north and east from the diversion box. Another posted area (URM) extends west to Baltimore Avenue and turns northward. In January 2000, a separate contamination area was posted around a power pole (adjacent to a manhole) within the larger URM. In 2002, the posting around the power pole was removed and a "Fixed Contamination Area" sign was attached to the pole.	This site is located east of 221-B Building, at the northeast corner of Baltimore Avenue and 7th Street. It surrounds the 241-B-154 Diversion Box,	Ecology	200-IS-1
UPR-200-E-78	UPR-200-E-78, UN-216-E-6, 241-BX-155 Diversion Box ground contamination, UN-200-E-78	Accepted		The diversion box has been isolated and covered with gray grout. The area around the diversion box and the surface area above Tank 241-B-302-C have been surface stabilized with gravel and posted with URM signs.	This site is located in the area around the 241-BX-155 Diversion Box, south of the 241-BX Tank Farm, northeast of B Plant between Atlanta and Baltimore Aves.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-E-80	UPR-200-E-80, UN-216-E-8, 221-B R-3 Line Break, R-3 Radiation Zone, UN-200-E-80	Accepted		The unplanned release is not separately marked or posted.	The release occurred in an underground pipeline, located on the south side of the 221-B Canyon Building, near the R-3 stairwell. The leak resulted in a contaminated area measuring 30 m (100 ft) wide by 152 m (500 ft) long, along the south side of the 221-B Building.	Ecology	200-IS-1
UPR-200-E-84	UPR-200-E-84, 241-ER-151 Catch Tank Leak, UN-200-E-84, UN-216-E-12	Accepted		The 241-ER-151 Diversion Box and Catch Tank 241-ER-311 are located inside a chain link fence that is radiologically posted. The release is not separately marked or posted.	The release occurred adjacent to the 241-ER-151 Diversion Box, southwest of the 221-B Building.	Ecology	200-IS-1
UPR-200-E-85	UPR-200-E-85, Line Leak at 221-B Stairwell R-13, UN-216-E-13, UPR-200-E-41, UN-200-E-85, UN-200-E-41	Accepted		The site was stabilized in 1984 and posted with URM signs. The release site is not labeled. The R-13 Utility Pit was covered with a steel lid.	UPR-200-E-85 occurred south of the center of the 221-B Building, near the R-13 Utility Pit.	Ecology	200-IS-1
UPR-200-E-87	UPR-200-E-87, UN-216-E-15, 224-B South Side Plutonium Ground Contamination, UN-200-E-87, 216-E-15	Accepted		Some areas on the south side of 224-B are posted with URM signs. The release site is not specifically marked.	The UPR-200-E-87 site is located on the south side of the 224-B Building in the 200 East Area.	Ecology	200-IS-1
UPR-200-E-96	UPR-200-E-96, Ground Contamination SE of PUREX, UN-216-E-24, UN-200-E-96	Accepted		The site was described in 1980 as an area measuring approximately 1.0 hectare (2.5 acres) located adjacent to the east and south sides of 202-A (PUREX). These areas are now covered with gravel and posted as URM areas.	The release site include contaminated areas on the south and east sides of PUREX.	Ecology	200-IS-1
UPR-200-W-102	UPR-200-W-102, UN-216-W-12, UN-200-W-102, 224-T Underground Line Leak	Accepted		The east and south sides of the 224-T Building are covered with gravel. The area along the east side of the 224-T building is posted as an URM area.	UPR-200-W-102 occurred adjacent to the south and east sides of the 224-T Building.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-113	UPR-200-W-113, Soil Contamination East of 241-TX, UN-216-W-23, Contamination Areas Around 241-TX-155 Diversion Box, UN-200-W-113	Accepted		The original contaminated area was surface stabilized in 1990 and is surrounded with concrete marker posts and posted as a URM area. In 1998, 1999, and 2000 additional surface contamination was identified adjacent to the surface stabilized area and on the north, south, east, and west sides of the diversion boxes. Contamination Areas have also been identified on the surface of underground transfer lines associated with the 241-TX-155 Diversion Box. The additional contamination areas, also considered a part of this site, are marked with posts, chain, and "Contamination Area" and "Soil Contamination Area" signs. One small contamination area, southeast of 241-T (located on a transfer line to the diversion box) was recently stabilized with gravel and is now posted with URM signs.	The site is an area east of the TX Tank Farm, on the east side of Camden Ave. Posted Contamination Areas are located west, south, north and east of the 241-TX-155 and 241-TX-152 Diversion Boxes.	Ecology	200-IS-1
UPR-200-W-114	UPR-200-W-114, UN-216-W-24, Ground Contamination East of 241-SX Tank Farm, UN-200-W-114	Accepted		This site is no longer marked or posted. The release site, for many years, had been a large area posted with a light chain barricade with "Surface Radiation Contamination" warning signs. The 216-S-8, the 216-S-1, and the 216-S-2 Cribs were located within the larger contamination zone. The surface contamination was scraped up and consolidated into other nearby waste sites. The other waste sites were individually surface stabilized and reposted with URM signs.	UPR-200-W-114 was located east of the SX Tank Farm.	Ecology	200-IS-1
UPR-200-W-115	UPR-200-W-115, UN-216-W-25, Ground Contamination above Transfer Line Along Cooper Street	Rejected (Proposed)		The site had been delineated with light chain barricade and "Surface Contamination" warning signs. A waste site inspection, done in February 1998, found the area has been covered with gravel and posted as an URM area.	UPR-200-W-115 is located above the encased transfer line that runs along the east side of Cooper St. The pipeline extends between the 242-S Evaporator Facility and the U Tank Farm.	Ecology	200-IS-1
UPR-200-W-131	UPR-200-W-131, Release from 241-TX-155	Accepted		The 241-TX-155 Diversion Box and Catch Tank 241-TX-302B are surrounded with post and chain and "Contamination Area" signs. Clean gravel has been placed around the diversion box and a sign has been added to the chain boundary identifying this to be the location of UPR-200-W-131.	The release occurred near the 241-TX-155 Diversion Box, located east of Camden Ave and east of the TX Tank Farm.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-135	UPR-200-W-135, Release from 241-TX-155, UN-200-W-135	Accepted		There are three major encased transfer lines associated with the 241-TX-155 Diversion Box. There have been many areas of contamination identified on these transfer lines during 1999, 2000, and 2001. This unplanned release is not separately marked or posted. UPR-200-W-113 is located on a transfer line directly west of the 241-TX-155 Diversion Box and is surrounded with concrete marker posts and URM signs.	The cave-in associated with UPR-200-W-135 was located approximately 46 m (150 ft) northwest of the 241-TX-155 Diversion Box. The diversion box is located east of Camden Ave and east of the TX Tank Farm.	Ecology	200-IS-1
UPR-200-W-160	UPR-200-W-160, Line Break at 241-TX-302C, UPR-200-W-38, UPR-200-W-40, 216-T-30	Rejected (Proposed)		The area around the 241-TX-154 Diversion Box has been stabilized with shotcrete. This UPR is a duplicate of UPR-200-W-40 and UPR-200-W-38. UPR-200-W-38 is the site that will remain.	The release location is the area around the 241-TX-154 Diversion Box and Catch Tank 241-TX-302, and between the 221-T Building and the 222-T Building, near section R-11 of 221-T.	Ecology	200-IS-1
UPR-200-W-161	UPR-200-W-161, UN-216-W-35, UN-200-W-161	Accepted		The site is a large radiologically controlled area posted with URM signs.	The site is located east of U Tank Farm, on the east side of Camden Ave. It extends northward from the corner of 16th St and Camden Ave and the 241-U-152 Diversion Box.	Ecology	200-IS-1
UPR-200-W-164	UPR-200-W-164, Overhead UNH Line Leak, UN-216-W-29	Accepted		The above ground UNH line has been removed. The "Radiation Area" signs that surrounded the pipeline were also removed. A portion of the site was interim stabilized in 1993. An area of contaminated soil found under the steam line, adjacent to the 216-S-9 Crib, was covered with clean soil and posted with URM warning signs.	UPR-200-W-164 affects the soil beneath the aboveground UNH pipeline that extended from 204-S to 224-U. The UNH line was attached to a steam line, located north of the 204-S Building.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-167	UPR-200-W-167, Contamination Migration from 241-TY, UN-216-W-32	Accepted		The original release site, identified in 1985, was a soil contamination area located adjacent to the east side of the TY Tank Farm. After the contamination was scraped and removed in 1986, the site was no longer marked or posted. Later, in 2000, three areas on the east and northeast sides of the TY Tank Farm (within the original boundaries of this Unplanned Release) were reposted as "Contamination Areas" (CA). Contaminated anthills and growing contaminated vegetation was found on top of a tank farm transfer line located outside the eastern tank farm fence (also see WIDS site code 200-W-78). In November 2000, the contaminated areas were covered with bio-barrier material and gravel. These areas were reposted with URM signs. The underground radioactive pipeline is marked with posts and "Radioactive Pipeline" signs. The pipeline runs through the recently stabilized areas.	UPR-200-W-167 was located adjacent to the TY Tank Farm fence, extending east and north from the fence.	Ecology	200-IS-1
UPR-200-W-2	UPR-200-W-2, UN-200-W-2, Underground Waste Line Leak	Accepted		The area around stairwell R-19 at the 221-T Facility is currently paved with asphalt. A long, narrow URM area is posted around the R-19 area.	The cave-in occurred on the southeast side of the 221-T facility, near stairwell R-19.	Ecology	200-IS-1
UPR-200-W-21	UPR-200-W-21, UN-200-W-21, UN-216-W-36, Process Line Cave-in at 241-TX-154 Diversion Box	Accepted		The release affected an area between 221-T and 222-T. This area is currently covered with shotcrete and posted with URM signs.	The release occurred at the 241-TX-154 Diversion Box, located east of the 221-T Building.	Ecology	200-IS-1
UPR-200-W-27	UPR-200-W-27, Transfer Line Leak at 23rd and Camden, UN-200-W-27, UN-216-W-5, Duplicate of UPR-200-W-29	Accepted		This is a duplicate of UPR-200-W-29, which occurred on November 15, 1954, at the corner of 23rd St and Camden Ave. This site code is scheduled to be reclassified to be rejected.	The site is located at the southeast corner of the intersection of Camden Ave and 23rd St.	Ecology	200-IS-1
UPR-200-W-28	UPR-200-W-28, Release from 241-TX-155 Diversion Box, UN-200-W-28	Accepted		The unplanned release site is not separately marked or posted. The documented contaminated area was found at the 241-TX-155 diversion box. There is a large posted URM area west of the diversion box and several smaller radiologically posted areas in this vicinity (see UPR-200-W-113 and UPR-200-W-135). The diversion box has been isolated and weather covered and is marked and posted with various radiological control signs.	The release site is located adjacent to the 241-TX-155 Diversion Box, approximately 244 m (800 ft) east of the TX Tank Farm and north of the 200 West Area Powerhouse Pond.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-29	UPR-200-W-29, Transfer Line Leak, UN-200-W-29, UPR-200-W-27, UN-200-W-27, UN-216-W-5, 23rd and Camden Line Break	Accepted		The area is currently surrounded with steel posts, covered with gravel and posted as an URM Area.	The site is located at the southeast corner of the intersection of Camden Ave and 23rd St.	Ecology	200-IS-1
UPR-200-W-32	UPR-200-W-32, UNH Transfer Line Break, UN-200-W-32	Accepted		The release site is not currently marked or posted. The above ground pipeline has been removed.	The release occurred near the northwest corner of the REDOX exclusion in 1954.	Ecology	200-IS-1
UPR-200-W-33	UPR-200-W-33, Ground Contamination at 224-U, UN-200-W-33	Accepted		The release site occurred inside the fenced 224-U Facility boundary. The site is no longer marked or posted.	The site is located approximately 28 m (90 ft) east of the 224-U Building.	Ecology	200-IS-1
UPR-200-W-35	UPR-200-W-35, Ground Contamination Near UNH Process Line, UN-200-W-35, REDOX to 224-U UNH Line Leak	Accepted		Much of the area north of REDOX has been surface stabilized. The unplanned release site is not marked or posted.	The site was located along the above ground UNH process line, that ran from REDOX to U Plant, at a location just outside and to the north of the REDOX exclusion area.	Ecology	200-IS-1
UPR-200-W-38	UPR-200-W-38, Line Break at 241-TX-302C, UPR-200-W-160, UPR-200-W-40, UN-200-W-38, 216-T-30	Accepted		The area around the 241-TX-154 Diversion Box and the catch tank has been stabilized with shotcrete. The area is posted with URM signs, but the unplanned release is not specifically marked.	The release occurred on the southeast side of T Plant (221-T), between the 241-TX-154 Diversion Box and the 241-TX-302 Catch Tank. The liquid release affected a large area between the 221-T and 222-T Buildings.	Ecology	200-IS-1
UPR-200-W-40	UPR-200-W-40, Line Break near 241-TX-154, UPR-200-W-38, UPR-200-W-160, 216-T-30, UN-200-W-40,	Rejected (Proposed)		This site code is recommended for deletion because it is a duplicate of UPR-200-W-38 and UPR-200-W-160. UPR-200-W-38 has been selected to be the "surviving" site code for this incident.	The spill occurred in the 200 West Area, southeast of the 221-T Building between the 241-TX-154 Diversion Box and Catch Tank 241-TX-302C.	Ecology	200-IS-1
UPR-200-W-49	UPR-200-W-49, Contamination Southeast of 241-SX, UN-200-W-49	Accepted	Rejected (Consolidation)	The SX Tank Farm is surrounded by a chain link fence posted with various radiological warning signs. The unplanned release located outside the tank farm fence, as described in 1958, is not marked or posted.	In 1958, contamination from inside SX Tank Farm was spread by the wind, causing an area of approximately 464.5 m^2 (5,000 ft^2) outside of the southeast corner of SX Tank Farm to be contaminated.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-5	UPR-200-W-5, Overflow at 241-TX-155, UN-200-W-5	Accepted		The unplanned release no longer is marked or separately posted. In 2000 and 2001 multiple areas of soil and vegetation contamination were identified and all were posted. For consolidation purposes, all of the new contamination areas were recorded and mapped as UPR-200-W-113.	The site consists of the 241-TX-155 Diversion Box and the adjacent hillside to the west. The diversion box is located east of Camden Ave, east of the TX Tank Farm.	Ecology	200-IS-1
UPR-200-W-6	UPR-200-W-6, UN-200-W-6, Contamination Spread from 241-U-151 and 241-U-152 Diversion Boxes	Accepted		The ground around the 241-U-151 and the 241-U-152 Diversion Boxes has been covered with gravel. The diversion boxes are marked and posted but the unplanned release is not separately identified.	The contamination spread occurred at the 241-U-151 and 152 Diversion Boxes, located east of the U Tank Farm, near the corner of 16th St and Camden Ave.	Ecology	200-IS-1
UPR-200-W-64	UPR-200-W-64, Road Contamination at 23rd and Camden, UN-200-W-64	Accepted		The corner of 23rd St and Camden Ave has been stabilized with clean gravel because of two waste line leak events. The stabilized area is surrounded with chain and posted with URM signs. The road shoulders are not posted. This UPR site is not separately marked or posted from the stabilized UPR-200-W-29 and UPR-200-W-97 release sites.	The release is located between the east shoulder of Camden Avenue and the posted URM area (UPR-200-W-29/ UPR-200-W-97), near the corner of 23rd St and Camden Ave.	Ecology	200-IS-1
UPR-200-W-79	UPR-200-W-79, Contamination Spread at 241-Z, UN-200-W-79	Accepted		Alpha contamination was spread inside and outside of the 241-Z Sump radiation zone fence. The area was decontaminated and is no longer marked or posted. It occurred in the graveled and concrete area around the 241-Z Building.	The release occurred at the 241-Z area, south of the 234-5Z Building, and inside the 234-5Z Exclusion Fence.	Ecology	200-IS-1
UPR-200-W-97	UPR-200-W-97, Transfer Line Leak, UN-216-W-5, UN-200-W-97	Accepted		The site is located at the corner of 23rd Street and Camden Ave. It is marked and posted as URM. The release site was stabilized with clean soil, sand, Ureabore herbicide, and crushed rock.	The release occurred southeast of the T Tank Farm at the corner of 23rd St and Camden Ave.	Ecology	200-IS-1
UPR-200-W-98	UPR-200-W-98, UN-216-W-6, 221-T Waste Line Break at R-19, UN-200-W-98	Accepted		The area around door R-19 is paved with asphalt and posted as a URM area. The area is not specifically marked as an unplanned release site.	The release site is located near the southeast corner of the 221-T Canyon Building, at door R-19.	Ecology	200-IS-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-600-20	UPR-600-20, UN-216-E-41, Cross Country Transfer Line Contamination, Cross Site Transfer Line	Accepted		The underground transfer line extends from the U Plant in the 200 West Area to the 241-ER-151 Diversion Box in 200 East Area. The site includes the contaminated soil and vegetation located on the surface of the cross-site transfer line, as well as the pipeline itself. The surface of the underground line has been stabilized and is currently posted with URM signs. A large mound of soil, located south of the 241-EW-151 Vent Station, is associated with the original transfer line surface stabilization activities. The soil mound is posted with URM signs.	The site extends from the 241-ER-151 Diversion Box in the 200 East Area and to the 241-UX-154 Diversion Box in the 200 West Area. The majority of the transfer line is located in the 600 Area, between the 200 East and West Areas, south of Route 3. The pipeline is approximately 2.3 mi long.	Ecology	200-IS-1
200-ST-1 Septic Tanks and Drain Fields WIDS Sites							
200-E-24	200-E-24, 6607-11, 2704-HV Septic System	Accepted		The septic and dosing tank area (about 60 ft by 10 ft) has 5 manholes at grade and two 7-ft-high 4-in.-diameter metal pipe air vents. The drain field is within a fenced area about 300 ft north of the septic tank area. The drain field fenced area is about 130 ft by 360 ft; and has six valve boxes and a gate at the south end. The drain field consists of three trenches and one trench reserved for future use.	The site is west of B Plant and east of Route 4 south. It is east of 2704-HV and west of the 216-B-62 Crib. A GPS survey was done in August 1998.	Ecology	200-ST-1
200-E-5	200-E-5, 2607-E2, 2607-E2 Septic Tank and Tile Field	Accepted		The septic tank has three access ports. It is a single compartment 18,730 L (4,950-gal) capacity tank with a 1900 L (500- gal) dosing siphon. As of February 15, 2001, it was not marked in the field.	The tank and drain field are located in the south portion of 200 East Area, adjacent to 1st St and east of Baltimore Ave.	Ecology	200-ST-1
200-E-6	200-E-6, Septic Tank, Sanitary Sewer Repair and Replacement 2607-E4	Accepted		The septic tank is surrounded by chain with four steel posts painted yellow. The tank is posted with a septic tank sign. The tank has two 10 cm (4-in.) PVC pipes that protrude vertically from the ground. The sanitary tile field is surrounded with a steel post and chain barricade and is posted with "Caution Underground Radioactive Material" signs.	The site is located just east of the 221-B Building and south of the inactive 2607-E4 Septic Tank.	Ecology	200-ST-1
200-E-7	200-E-7, 2607-EO Septic Tank and Tile Field	Accepted		The tank is part of the 2607-EP System. Current and proposed additions to this system bring its design daily flow to 20,440 L (5,400 gal). The tank was prefabricated with a 1.500-gal first chamber and a 1000-gal second chamber. The associated drain field has been abandoned.	This septic tank/pump station is located east of the 2711-E Building and north of 4th St.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
200-E-9	200-E-9, 2607-EN, 2727-E Septic System, 2607-EN Septic Tank/Pump Station	Accepted		The above-ground area is posted "Septic Tank 2607-EN." The area is surrounded with metal fence posts and chain. Three concrete and one PVC cylinders (manholes) with covers protrude above grade in the underground tank area. The surface is disturbed and covered with Russian thistle, cheat grass, and other weedy species. Two "Sanitary Tile Field" signs are located south of the septic tank.	The site is 75 ft south of the southwest corner of the 2727-E Safeguards and Security Building, which is in the 200 East Area on 4th St.	Ecology	200-ST-1
200-W-34	200-W-34, 272-WA Septic System North of 213W, 2607-WL, Duplicate of 2607-WL	Rejected (Proposed)		This site is a duplicate of 2607-WL, which also is listed in WIDS as servicing the 272-WA Building and being north of that facility.		Ecology	200-ST-1
200-W-51	200-W-51, Septic Tank (abandoned)	Accepted		The site is an abandoned septic tank that has been filled and covered. The septic tank was discovered during excavations (for exhauster upgrades) outside SY Tank Farm. The tank is not marked or posted.	The site is located north (and slightly east) of the SY-101 tank, north of the SY Tank Farm fence.	Ecology	200-ST-1
2607-E1	2607-E1	Accepted		This septic tank is constructed of reinforced concrete with walls and floors. The associated drain field is 778 m^2 (8,376 ft^2).	This septic tank is located north of 4th St and east of Baltimore Ave. The tile field is north of the tank.	Ecology	200-ST-1
2607-E11	2607-E11	Accepted		This unit is a two-chamber tank. The tank has an associated drain field and a capacity of 3,500 L (927 gal) per day.	The site is located inside 200 East Area, north of 4th St and east of Baltimore Ave. The system is located southeast of the Dry Materials Receiving and Handling Facility silos.	Ecology	200-ST-1
2607-E12	2607-E12, 2607-E12 Septic System	Accepted		The septic system consists of the old 18,927 L (5,000 gal) () tank (the old drain field was plugged off) that was converted to a dosing chamber when the new 37,854 L (10,000 gal) septic tank was installed approximately 45 ft (13.7 m) to the south. The trench-like drain field for this system is located approximately 122 m (400 ft) east of the tanks.	Both septic tanks are located east of Canton Ave, north of 4th St and west of the 207-A South retention basins. The drain field is located east of the retention basins and has a barricade marker fence around the large depression.	Ecology	200-ST-1
2607-E1A	2607-E1A, 2607-E1A Septic System, L-272 Regional System	Accepted		The system includes a septic tank, a dosing chamber and a three-section drain field. The area is covered with gravel and marked appropriately.	The septic system is located inside the 200 East Area, north of 4th St and west of Baltimore Ave.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-E3	2607-E3, 2607-E3 Septic Tank and Drainfield, 2607-E3 Septic System, TFS of 218-E-4, Tile Field South of 218-E-4	Accepted		The site is a septic tank and drain field. It is surrounded with a chain and marked with a sign that reads "Sanitary Sewer/Drain Field." The septic tank is constructed of reinforced concrete. The tank is 8.7 m (28 ft 8 in.) long, 2.7 m (9 ft) wide, and 3.8 m (12 ft 6 in.) deep (interior dimensions). The tank had a design capacity of 38,680 L (10,220 gal) based on a user capacity of 292 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface. The tank was accessed through three 0.9 m (3 ft) manholes. The drain field consists of at least 712 m (2,336 ft) of vitrified clay pipe or drain tile (at least 2.4 m [8 ft] per capita). The laterals are open jointed and are spaced 2.4 m (8 ft) apart.	This unit is located approximately 100 m (400 ft) north of the 221-B Building. The drain field is located north of the septic tank and south of the 218-E-4 Burial Ground.	Ecology	200-ST-1
2607-E4	2607-E4, 2607-E4 Septic Tank and Tile Field	Accepted		The septic tank and tile field are marked with a Sanitary Sewer/Drain Field sign and lie with a posted area. The 2607-E4 Septic Tank is constructed of reinforced concrete that drains to an adjacent tile field.	The 2607-E4 Septic Tank is located northeast of the 221-B Building. The tile field is northeast of the tank.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-E5	2607-E5	Accepted		This septic system receives sanitary wastewater and sewage. This system includes a single compartment tank with a dosing system and a leaching trench. The site includes an abandoned tile field that was replaced by the sanitary leaching trench. The construction details for the sanitary leach trench are contained in Hanford Site Drawing H-2-4602. The trench is 22.9 m (75 ft) long, 1.5 m (5 ft) wide at the bottom, and approximately 3.1 m (10 ft) deep. The excavation had a 1.5:1 side slope and is lined with 3 rows of 20 cm x 20 cm x 41 cm (8 x 8 x 16 in.) bond beam concrete blocks that run the entire length of the trench site on top of 0.6 m (2 ft) of cobble fill. The trench was covered with 0.3 m (1 ft) of gravel and a polyethylene cover and backfilled with the centerline of the trench to 0.3 m (1 ft) above the original grade. A distribution box at the eastern edge of the trench received waste from the up-gradient septic tanks and distributed it into the concrete block channels. The following information was obtained from HW-22955, *Hot Semiworks Manual Part I*: All waste from the 2704-C Office and Gate House and 2707-C Change House was considered sanitary waste and was disposed of separately from the chemical, or production waste. A 10.2 cm (4-in.) tile sewer ran from these buildings to a septic tank and tile field outside the Hot Semi-Works exclusion area. The sewer ran parallel to and 20.7 m (68 ft) south of the exclusion area north fence. The septic tank is 19.2 m (63 ft) west of the exclusion area west fence.	This unit lies north of the 209-E Building and east of the 2607-C Sanitary Crib.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
				The septic tank is a buried concrete settling tank 3.65 m (12 ft) long by 1.8 m (6 ft) long by 1.5 m (5 ft) deep (inside dimensions). The bottom and walls are 20.3 cm (8 in) thick. The top is 15.2 cm (6 in) thick and has two 61 cm (24-in.) diameter access ports. The overflow is 1.18 m (46.5 in.) from the bottom resulting in a hold-up of 7948.5 L (2,100 gal). The overflow from the septic tank drained to a tile field. This field consists of 6 runs of 10.2 cm (4-in.) tiles, each 15.2 m (50 ft) long. The tile was laid with open joints in an 45.7 cm (18-in.) gravel bed 61 cm to 91 cm (2 to 3 ft) below grade			
2607-E6	2607-E6	Accepted		The site is a septic tank and drain field. The drain field is surrounded by a wooden fence. The surface is vegetated with brush.	This unit is located inside the 200 East Area, north of Mobile Office 405 (MO405), between two railroad spurs.	Ecology	200-ST-1
2607-E7A	2607-E7A, 2607-E7	Accepted		This septic tank receives sanitary wastewater and sewage. This tank is a 1.7 m (5.5-ft) by 2.7 m (8.75-ft) precast concrete septic tank with a single 61 cm (24-in.) diameter cover. The tank is inline with the 2607-E5 Septic Tank and the 2607-E (WIDS 2607-E7B). The septic tank drains to the sanitary leaching trench.	This system lies north of the 209-E Building and west of the 2607-E5 Septic Tank.	Ecology	200-ST-1
2607-E7B	2607-E7B, 2607-E7B Septic System, 2607-E7	Accepted		This septic tank receives sanitary wastewater and sewage. This tank is a 1.7 m (5.5-ft) by 2.7 m (8.75-ft) precast concrete septic tank with a single 61 cm (24-in.) diameter cover. The tank is in line with the 2607-E5 Septic Tank and the 2607-E7 (WIDS 2607-E7A). The septic tank drains to the sanitary leaching trench.	This system lies north of the 209-E Building and west of the 2607-E5 Septic Tank.	Ecology	200-ST-1
2607-E8	2607-E8, 2607-E8 Septic Tank and Tile Field	Accepted		The septic tank surface is identified by two circular access ports surrounded with concrete. A sign, on the ground in April 2001, reads "2607-E8." The associated drain field had a capacity of 13,400 L (3,533 gal) per day.	This unit is located north of 1st St and east of Baltimore Ave, across from the 2101-M Building.	Ecology	200-ST-1
2607-E8A	2607-E8A, 2607-E8A Regional Septic System	Discovery		The septic system is surrounded with light-duty posts and chain.	The septic system is located south of the 284-E Powerhouse, on the east side of Baltimore Ave.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-E9	2607-E9, 242B/BL Septic Tank	Accepted		This 1900 L (500-gal) septic tank received sanitary wastewater and sewage from the 242-B and the 242-BL Buildings. This system has an associated drain field. It was abandoned and the tank filled with sand. The site is in a contamination area. A brief visit was made to the site in February 2000 to find the drain field and to try to improve the mapping of the site. A "Drain field" sign was found on the ground on the eastern side of the contamination area that surrounds the site. The former extent of the drain field can be approximated using fence posts (some of which still have chain attached) inside the contamination area, fallen chain on the ground plus the fence posts making up the eastern boundary of the contamination area. No access ports, lids, or risers associated with the septic tank were visible. Evidence of the septic tank may have been obscured by tumbleweeds growing in the center of the contamination area near the drain field.	This unit lies north of the 207-B Retention Basin and east of the 242-B Building.	Ecology	200-ST-1
2607-EA	2607-EA, 2607-EA Septic Tank and Drywell	Accepted		This unit includes a drain field.	The septic system is located west of the A Tank Farm and directly south of the 244 AR Building.	Ecology	200-ST-1
2607-EC	2607-EC	Accepted		This unit includes a drain field. It is located inside the A Tank Farm near the northeast corner.		Ecology	200-ST-1
2607-EE	2607-EE, 2607-EE Septic System	Accepted		The site is a septic tank with a drain field extending northeast of the septic tank. The area is surrounded with light-duty posts and chain. One riser pipe is visible.	The septic tank is located northeast of the 202-A Building, east of the railroad cut, inside the PUREX exclusion fence.	Ecology	200-ST-1
2607-EH	2607-EH, 2607-EH Septic System	Accepted	Rejected	WIDS site 2607-EH has been described as a septic tank and associated drain field.	This septic system has been described as being located on the west side of Baltimore Ave adjacent to the east side of the 2101-M Building.	Ecology	200-ST-1
2607-EK	2607-EK	Accepted	Closed Out	The 2607-EK Septic Tank is a reinforced concrete tank and posted in the field as "Septic Tank 2607EK." The associated drain field is east of the tank. The drain field consists of 11 parallel runs of 15 cm (6-in.) perforated drain pipe. The runs are 27 m (90 ft) long and spaced 2.4 m (8 ft) apart.	The 2607-EK septic system is located east of Baltimore Ave, northeast of the 2750-E Building, and south of the 2607-E8 Septic System.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-EL	2607-EL, 2607-EL Septic Tank/Pump Station	Accepted		The site is surrounded with steel posts and chain. It in marked with "Septic Tank" signs. Three access ports are visible on the surface. This septic tank-pump station is a part of the 2607-EP System, which was reconstructed in 1994. 2607-EL is permitted and approved by the Washington State Department of Health for a flow of 54, 890 L per day.	The site is located south of 4th St, near the western entrance to the 200 East Area. The septic system is located south of 2727-E and west of the MO-294 Building.	Ecology	200-ST-1
2607-EM	2607-EM	Accepted		The 2607-EM Septic Tank is constructed of reinforced concrete and receives sanitary wastewater and sewage from the 2721-E Building. The system drains to the 2607-ED Drain field.	This unit lies northwest of the associated drain field and southeast of the 2721-Building.	Ecology	200-ST-1
2607-EP	2607-EP	Accepted		The 2607-EP System includes a septic tank and associated drain field.	This unit lies southeast of the MO-388 and northeast of the 2721-E Buildings.	Ecology	200-ST-1
2607-EQ	2607-EQ	Accepted		The 2607-EQ Septic Tank is constructed of reinforced concrete. The associated drain field is approximately 431 m^2 (4,644 ft^2).	This unit lies northwest of the 2753-E Building and southeast of the Ames Ave and 2nd St intersection.	Ecology	200-ST-1
2607-ER	2607-ER	Accepted	Closed Out	The 2607-ER system includes a septic tank and a trench-type drain field. The tank has two access ports. As of February 20, 2001, it was not posted in the field.	The site is located north of the 2101-M Building and west of Baltimore Ave, just south of the railroad tracks.	Ecology	200-ST-1
2607-FSM	2607-FSM, 609 Building Septic Tank 2607-FSM, 100 Area Fire Station Septic Tank, 1607-FSM, 6607-FSM	Accepted		The 6607-FSM Septic Tank is a single-chamber, reinforced concrete tank. This unit includes a drain field.	The septic system lies at the southwest corner of the 609 Building (100N Fire Station) and northwest of the intersection of Route 1 and Route 4 North in the 600 Area.	Ecology	200-ST-1
2607-FSN	2607-FSN, 609A Building Septic Tank 2607-FSN	Accepted		The 2607-FSN Septic Tank and drain field lie beneath an asphalt walkway and several trees. The system was abandoned and replaced by the 6607-4 Septic System in 1988.	The 2607-FSN Septic System was located at the southeast corner of the 609-A Building, which is located on the south side of Route 3 in the 600 Area.	Ecology	200-ST-1
2607-GF	2607-GF, 2607-GF Septic System, 2607-GF Septic Tank and Drain Field	Accepted	Rejected	WIDS site 2607-GF was described in Cramer (1987) as a septic tank and associated drain field. However, it likely does not exist.	This system has been described as being located north of the Dry Materials Receiving and Handling Facility (2400E) and across the railroad tracks that run on the north side of the facility.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-N	2607-N	Accepted		The site is a septic tank and drain field. The tank is a rectangular, open-topped, concrete tank buried to grade level. The 2607-N Septic Tank is constructed of reinforced concrete. The tank is 1.2 m (4 ft) long, 60 cm (2 ft) wide and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gall) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The unit is located 6 m (20 ft) south of the 2743-N Guard House foundation and south of the 212-N Building. The drain field lies south of the septic tank system.	Ecology	200-ST-1
2607-P	2607-P	Accepted		The site is a septic tank and drain field. The tank is a rectangular, open-topped, soil-filled concrete tank buried to grade level. The 2607-N Septic Tank is constructed of reinforced concrete. The tank is 1.2 m (4 ft) long, 0.6 m (2 ft) wide and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gal) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The site is located south of the 2743-P Guard House foundation and south the 212-P Building. The drain field lies south of the septic tank.	Ecology	200-ST-1
2607-R	2607-R	Accepted		The site is a septic tank and drain field. The tank is a rectangular, open-topped, soil-filled concrete tank buried to grade level. The 2607-N Septic Tank is constructed of reinforced concrete. The tank is 1.2 m (4 ft) long, 0.6 m (2 ft) wide and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gal) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The unit is located south of the 2743-R Guard House foundation and south of the 212-R Building. The drain field lies south of the septic tank.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-W1	2607-W1	Accepted		The 2607-W1 Septic Tank was constructed in 1994 of reinforced concrete and receives sanitary wastewater and sewage. The system has an associated drain field.	This unit lies southeast and across Bridgeport Ave from the associated drain field, and northeast of the 2713-WB Building.	Ecology	200-ST-1
2607-W2	2607-W2	Accepted		The 2607-W2 Septic Tank is surrounded by posts with no radiation warning signs. This system was taken out of service and formally abandoned in 1994. The drain field lines have been cut and the septic tank was filled with soil. The drain field had a capacity of 2970 L (785 gal) per day. A gravity tie line was installed to connect this small system to a collection that serves the 2607-W1 Septic Tank.	This unit lies southwest of the main 200 West Area guard gate and southeast of the 2704-W Building.	Ecology	200-ST-1
2607-W3	2607-W3	Accepted		The 2607-W3 Septic Tank has been pumped, filled with sand, and abandoned in place. The 2607-W3 Septic Tank was constructed of reinforced concrete. At one time, the eastern access was posted with a "Radioactive Material" warning sign. This system includes a drain field that was expanded in the 1950's.	This unit lies northeast of the 241-T-361 Settling Tank, approximately 61 m (200 ft) north of 23rd St and 244 m (800 ft) southwest of the 224-T Building.	Ecology	200-ST-1
2607-W4	2607-W4, T Plant Septic Tank and Drain Field	Accepted		The 2607-W4 Septic Tank is a single compartment tank constructed of reinforced concrete. The drain field measures 3.1 by 9.2 m (10 ft by 30 ft). The site is surrounded by a light-duty chain barricade. At one time the area was marked with surface contamination warning signs. A site visit in October 1998 indicates the area is no longer a radiation area. This system includes a drain field and receives sanitary wastewater and sewage from the 221-T Canyon Building.	This unit lies northwest of the 221-T Canyon Building and southwest of the 216-T-1 Ditch.	Ecology	200-ST-1
2607-W5	2607-W5, Septic Tank and Drain Field	Accepted		The 2607-W5 Septic Tank is a single-compartment tank constructed of concrete and has three entry openings on the top, each protected by a wooden cover. A pipe connects the septic tank to two concrete diversion box in succession before entering the drain field. The septic tank and diversion boxes are located within a URM area related to the 216-U-1 and 216-U-2 Cribs and the 241-U-361 Stabilization Tank. Only the south slope of the drain field is inside the URM boundary.	This unit lies southwest of the 221-U Canyon Building and east of the 207-U Retention Basin. It is north of the 241--U-361 Settling Tank.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-W6	2607-W6	Accepted		The 2607-W6 system was reconstructed in 1995 and is labeled correctly. A concrete structure with three metal access port covers lies on the surface. The 2607-W6 Septic Tank is constructed of reinforced concrete and receives sanitary wastewater and sewage.	This unit lies southwest of the 222-S Laboratory and southeast of the MO-291 Building.	Ecology	200-ST-1
2607-W7	2607-W7, Septic Tank	Accepted		The 2607-W7 Septic Tank was a 950 L (350-gal) reinforced-concrete tank. Earlier documentation stated that the 2607-W7 Septic System includes a septic tank and drain field that lie within a radiation zone. A 1999 site visit found the septic tank to be located between two URM areas. The location of the drain field was visually not apparent. HNF-SD-LL-SP-001 shows the drain field west of the septic tank.	This unit lies 14 m (45.9 ft) north of the northernmost corner of the 221-U Canyon Building.	Ecology	200-ST-1
2607-W8	2607-W8	Accepted		This system is located adjacent to a posted radiation zone containing the 216-Z-5 and 216-Z-4 Cribs. The 2607-W8 Septic Tank is constructed of reinforced concrete and has three access port covers visible on the surface. It is a single compartment tank with an attached dosing siphon. This unit includes a tile field. The site is marked with a sign that read "Septic Tank - 2607-W8."	This unit lies northeast of the 231-Z Building and east of the 216-Z-16 Crib.	Ecology	200-ST-1
2607-W9	2607-W9, 2707-SX Septic Tank	Accepted		A gravel surface covers the 2607-W9 Septic Tank and Tile Field. Two posts with a sun bleached sign mark the location of the tile field.	This system lies northwest of the 2707-SX Change House and southeast of the 216-S-25 Crib. The exact location of this septic tank is not visible from the surface.	Ecology	200-ST-1
2607-WA	2607-WA	Accepted		The 2607-WA Septic System consists of two separate septic tanks and two separate drain fields. The septic tanks currently receive sanitary wastewater and sewage. This system was upgraded to meet state requirements in 1994.	This unit lies southwest of the 19th St and Camden Ave intersection and north of the Z Plant trailers MO-011, MO-244, MO-249, and MO-250.	Ecology	200-ST-1
2607-WB	2607-WB, 2607-WB Septic System	Accepted	Closed Out	The site is a septic system that consists of three inactive septic tanks, one drain field, and the underground lines from connecting the tanks and drain field to the mobile offices they serviced.	The septic tanks are south of Trailer MO-016 (200 West - Z Plant Area). The drain field is south of MO-939.	Ecology	200-ST-1
2607-WC	2607-WC, 2607-WC Septic System	Accepted		The 2607-WC Septic System consists of two tanks and a trench-type drain field.	This unit lies west of the 242-S Evaporator Building and northeast of the 272-S Maintenance Shop.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-WL	2607-WL, 2607-WL Septic System	Accepted		The 2607-WL Septic System is constructed of reinforced concrete. The septic system includes a trench-type drain field. The septic tank and drain field are surrounded by a chain barricade with a sign stating "Septic Tank.".	This unit lies north of the 272-WA Building and west of the 2401-W Building.	Ecology	200-ST-1
2607-WWA	2607-WWA, 2607-WWA Septic System	Rejected (Proposed)		This site does not exist as a separate site; it is likely an alias for 2607-WL.		Ecology	200-ST-1
2607-WZ	2607-WZ	Accepted		The 2607-WZ Septic System includes a drain field. This unit lies within the fenced 200 West Area.	This unit lies southwest of the 241-SX Tank Farm and southeast of the 216-S-25 Crib.	Ecology	200-ST-1
2607-Z	2607-Z	Accepted		The 2607-Z Septic Tank and drain field lie in a fenced area. The septic tank is a two-chamber concrete tank. Three access ports are provided for personnel entry. The drain field measures approximately 59 m (150 ft) in length and 110 m (280 ft) in width, located in an otherwise flat field.	This unit lies east of the 236-Z Building and southeast of the 234-5Z Building.	Ecology	200-ST-1
2607-Z1	2607-Z1, Septic Tank and Drainfield	Accepted		The system (septic tank and drain field) was constructed in 1958 and has been pumped once a week for the past few years. The drain field location has been used as a lay-down area in the past and the underground laterals could have been damaged.	The site is located west of the 2721-Z Building.	Ecology	200-ST-1
2607-Z8	2607-Z8	Accepted	Rejected	WIDS site 2607-Z8 was described in Cramer (1987) as a septic tank and associated drain field. However, it likely does not exist.	This septic system has been described as being located along the fence southeast of the 234-5Z Building.	Ecology	200-ST-1
600 ESST	600 ESST, 600 Area Exploratory Shaft Septic Tank, Septic Tank - Exploratory Shaft	Accepted	Closed Out	This was the site of the Exploratory Shaft Facility septic tank. This area has been reclaimed because of project cancellation. No visual evidence of a septic tank remains.	This site is at the Exploratory Shaft Facility, west of 200 West Area and southeast of the Yakima Barricade, near Army Loop Rd.	Ecology	200-ST-1
600 NSTFST	600 NSTFST, 600 Area Near Surface Test Facility Septic Tank, Septic Tank, Near Surface Test Facility	Accepted	Closed Out	This site is a septic tank and associated tile field. The septic tank serviced the trailer village that was located at the base of Gable Mountain. The septic tank was pumped out and backfilled.	This site is located at the west end at the base of the north side of Gable Mountain,.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
600 NSTFUT	600 NSTFUT, 600 Area Near Surface Test Facility Underground Tank, Underground Tank, Near Surface Test Facility	Accepted	Closed Out	This site consists of two sanitary waste holding tanks. The tanks supported the mobile office trailers that were located on the tunnel bench for the Near Surface Test Facility. Each tank had a 3785 L (1,000-gal) capacity and was emptied every other week. This facility has been decommissioned and reclaimed.	The tanks were located on the tunnel bench for the Near-Surface Test Facility, on the north side of Gable Mountain.	Ecology	200-ST-1
600-212	600-212, Relocatable Latrine Facility Holding Tank System	Accepted		The site is surrounded by 14 steel posts painted yellow. The top of the tank is visible at grade level and measures 9 ft by 15 ft. Two concrete covers are located on top of the tank, one has a steel access port for pumping. The electrical conduit for transmitting to the alarm system is visible on top of the tank.	The site is located just west of the 200 East Area, between Route 4 North and the 200 East Area perimeter fence. The site is within the trailer village established for the HWVP Project approximately 8 m west of Trailer MO-730.	Ecology	200-ST-1
600-217	600-217, H-61-H Anti-Aircraft Artillery Site Sewer System	Accepted		The sewer system extends from the kitchen and toilet and shower buildings and ran into a septic tank on the east side of the site. The access ports and septic tank have been filled in with clean sand (September 2001). Twelve toilet drains and five floor drains were observed on the toilet and shower building foundation floor. A sewer access port is located just northeast of the toilet and shower buildings. The kitchen foundation has four floor drains and a grease trap. A sewer access port is located northwest of the kitchen. A 34-ft x 37-ft x10-ft-deep pit located in the northwest portion of the site in1997 was thought to have been used for sewage disposal, but the septic tank was subsequently located. The bottom of the pit is concrete and was once covered with wooden beams. Visibility of the pit is obscured by blown-in tumbleweeds	This site is located just southwest of the intersection of Route 11 and Route 6. It is 0.4 mi south of Route 11 and just west of Army Loop Rd. The site is in the east half of the northeast quarter of Section 34, Township 13 north, Range 25 east.	Ecology	200-ST-1
622-R ST	622-R ST, 622-R Septic Tank, 622-R Atmospheric Physics Laboratory Septic Tank	Accepted		This site consists of a septic tank, distribution box, and tile field. A pump station was added in 1997 to reroute raw sewage to Septic System 6609-09. The septic tank was emptied and will remain available as an emergency holding tank in case of pump failure.	This site is located just northwest of the 622-R Atmospheric Physics Laboratory Building. This building is northwest of the 200 West Area between Routes 2 and 3.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
6607-1	6607-1, H-40 Gun Site Septic Tank	Accepted		This site includes an access port located near the kitchen and mess hall and toilet and shower foundations and a below-ground concrete septic tank with three access ports. The access ports and the septic tank have been backfilled with clean pit run material and are no longer visible, and the ground over the tank is gravel as of June 2001.	This site is located 1.1 km (0.7 mi) southeast of the southeast corner of 200 East Area, on the south side of Route 4 South. Trees viewed from Route 4 South aid in locating the site. The septic tank is located in the eastern portion of the H-40 Gun Site.	Ecology	200-ST-1
6607-2	6607-2, Gun Site H-42 Septic Tank	Accepted		This site includes an access port, two septic tanks and the connecting tile field. In May 2001, the open holes associated with the septic system were backfilled. The original manhole measured 71 cm (28 in.) in diameter by 86 cm (34 in.) deep, with two inlet pipes and one outlet pipe and is constructed of cement bricks and mortar. The large septic tank is below grade and had three access ports and a concrete box structure visible above grade. The access ports were covered with concrete covers. The center access port was broken, providing visual access to the interior of the tank before the tank being backfilled. In 1997, the tank contained water. An above-ground structure, located at the west end of the tank, appears to have been used as a pumping station to pump liquid to the smaller tank located to the west. The overall site dimensions of the large tank are 21 m by 9 m (70 by 30 ft). The small tank to the west measures 2.2 m by 1.7 m (7.3 by 5.8 ft) and has one covered access port. The structures had been surrounded by orange plastic fencing, but the fencing was destroyed in the 2000 grass fire. The open features were backfilled in 2001.	The site is located 6.4 km (4 mi) south of the 200 East Area, on the south side of Army Loop Rd and east of the power line road to Rattlesnake Mountain.	Ecology	200-ST-1
6607-3	6607-3, Anti-Aircraft Artillery Site H-51 Septic Tank	Accepted		The septic tank is constructed of concrete, has three open access ports and an above-ground square concrete box-like structure located on the east end. This box-like structure might have been used to support a pump for pumping liquid to the drain field. The tank is below grade. The roped off section measures 17 m by 4.6 m (55 by 15 ft) and the tank interior is 3.4 m (11 ft) deep. The drain field is located east of the septic tank. The septic tank and four access ports are delineated by orange plastic fencing.	This site is located approximately 2.4 km (1.5 mi) southwest of 200 West Area just west of Army Loop Rd between Highway 240 and Army Loop Rd.	Ecology	200-ST-1

Table C-1 Waste Information Data System Waste Sites Assigned to 200-IS-1 and 200-ST-1 Operable Units (1). (31 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
6607-5	6607-5, 616 Building Septic System	Accepted		The unit consists of a septic tank and a drain field. The septic tank is surrounded by four yellow posts and is covered by gravel. The drain field is surrounded by metal posts and chain. The drain field is not marked by a sign.	The tank is located on the south side of the 616 Building. The drain field extends southwest of the tank.	Ecology	200-ST-1
TFS OF 218-E-4	TFS OF 218-E-4, Tile Field South of 218-E-4, 2607-E3 Tile Field	Accepted		The tile field south of the 218-E Burial Ground consists of vitrified clay pipe and drain tile. The laterals of the tile field are open jointed and are spaced 2.4 m (7.9 ft) apart.	This tile field is located southwest of the 218-E-4 Burial Ground and north of the 2607-E3 Septic Tank.	Ecology	200-ST-1

Footnote (1) The listing of waste sites is based on WIDS as of 11/27/02.

Hanford Site Drawing H-2-4602

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Fluor Hanford, Inc., Richland, Washington.

HW-22955, 1956, *Hot Semiworks Manual Part I*, General Electric Company, Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

WIDS, *Waste Information Data System Report*, Hanford Site database.

Ecology = Washington State Department of Ecology.
GPS = Global positioning system.
HWVP = Hanford Waste Vitrification Plant.
IMUST = Inactive miscellaneous underground storage tank.
PUREX = Plutonium-Uranium Extraction (process or Plant).
PVC = Polyvinyl chloride.
RCRA = *Resource Conservation and Recovery Act of 1976*.
REDOX = Reduction-Oxidation (process or Plant).
TSD = Treatment, storage, and disposal.
UNH = Uranyl nitrate hexahydrate.
UPR = Unplanned release.
URM = Underground radioactive material.
WIDS = Waste Information Data System.

Table C-2. WIDS Rejected Sites and Proposed Rejected for 200-IS-1 and 200-ST-1 Waste Sites Not Considered in this Work Plan. (4 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-W-49	UPR-200-W-49, Contamination Southeast of 241-SX, UN-200-W-49	Accepted	Rejected (consolidation)	The SX Tank Farm is surrounded by a chain link fence posted with various radiological warning signs. The unplanned release located outside the tank farm fence, as described in 1958, is not marked or posted.	In 1958, contamination from inside SX Tank Farm was spread by the wind, causing an area of approximately 464.5 m^2 (5,000 ft^2) contaminating the area outside of the southeast corner of SX Tank Farm.	Ecology	200-IS-1
2607-EH	2607-EH, 2607-EH Septic System	Accepted	Rejected	WIDS site 2607-EH has been described as a septic tank and associated drain field.	This septic system has been described as being located on the west side of Baltimore Ave adjacent to the east side of the 2101-M Building.	Ecology	200-ST-1
2607-GF	2607-GF, 2607-GF Septic System, 2607-GF Septic Tank and Drain Field	Accepted	Rejected	WIDS site 2607-GF was described in Cramer (1987) as a septic tank and associated drain field. However, it likely does not exist.	This system has been described as being located north of the Dry Materials Receiving and Handling Facility (2400E) and across the railroad tracks that run on the north side of the facility.	Ecology	200-ST-1
2607-Z8	2607-Z8	Accepted	Rejected	WIDS site 2607-Z8 was described in Cramer (1987) as a septic tank and associated drain field. However, it likely does not exist.	This septic system has been described as being located along the fence southeast of the 234-5Z Building.	Ecology	200-ST-1
2607-EK	2607-EK	Accepted	Closed out	The 2607-EK Septic Tank is a reinforced concrete tank posted in the field as "Septic Tank 2607EK." The associated drain field is east of the tank. The drain field consists of 11 parallel runs of 15 cm (6-in.) perforated drain pipe. The runs are 27 m (90 ft) long and are spaced 2.4 m (8 ft) apart.	The 2607-EK septic system is located east of Baltimore Avenue, northeast of the 2750-E Building, and south of the 2607-E8 Septic System.	Ecology	200-ST-1
2607-ER	2607-ER	Accepted	Closed out	The 2607-ER system includes a septic tank and a trench-type drain field. The tank has two access ports. As of February 20, 2001, it was not posted in the field.	The site is located north of the 2101-M Building and west of Baltimore Ave, just south of the railroad tracks.	Ecology	200-ST-1

Table C-2. WIDS Rejected Sites and Proposed Rejected for 200-IS-1 and 200-ST-1 Waste Sites Not Considered in this Work Plan. (4 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
2607-WB	2607-WB, 2607-WB Septic System	Accepted	Closed out	The site is a septic system that consists of three inactive septic tanks, one drain field, and the underground lines that connected the tanks and drain field to the mobile offices they serviced.	The septic tanks are south of Trailer MO-016 (200 West Area-Z Plant Area). The drain field is south of Trailer MO-939.	Ecology	200-ST-1
600 ESST	600 ESST, 600 Area Exploratory Shaft Septic Tank, Septic Tank - Exploratory Shaft	Accepted	Closed out	This was the site of the Exploratory Shaft Facility septic tank. This area has been reclaimed because of project cancellation. No visual evidence of a septic tank remains.	This site is at the Exploratory Shaft Facility, west of 200 West Area and southeast of the Yakima Barricade, near Army Loop Rd.	Ecology	200-ST-1
600 NSTFST	600 NSTFST, 600 Area Near Surface Test Facility Septic Tank, Septic Tank, Near Surface Test Facility	Accepted	Closed out	This site is a septic tank and associated tile field. The septic tank serviced the trailer village that was located at the base of Gable Mountain. The septic tank was pumped out and backfilled.	This site is located at the west end of Gable Mountain, at the base of the north side.	Ecology	200-ST-1
600 NSTFUT	600 NSTFUT, 600 Area Near Surface Test Facility Underground Tank, Underground Tank, Near Surface Test Facility	Accepted	Closed out	This site consists of two sanitary waste holding tanks. The tanks supported the mobile office trailers that were located on the tunnel bench for the Near Surface Test Facility. Each tank had a 3,785 L (1,000-gal) capacity and was emptied every other week. This facility has been decommissioned and reclaimed.	The tanks were located on the tunnel bench for the Near Surface Test Facility on the north side of Gable Mountain.	Ecology	200-ST-1
UPR-200-E-65	UPR-200-E-65, UN-216-E-65, 241-A-151 Diversion Box Radioactive Contamination, UN-200-E-65	Rejected (proposed)		The release is not separately marked or posted. The area south of the PUREX Facility, including this release site, is posted as a URM (site 200-E-103).	The release occurred south of the 202-A Building (PUREX), inside the facility fence and around the 241-A-151 Diversion Box.	Ecology	200-IS-1

Table C-2. WIDS Rejected Sites and Proposed Rejected for 200-IS-1 and 200-ST-1 Waste Sites Not Considered in this Work Plan. (4 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
UPR-200-E-67	UPR-200-E-67, UN-216-E-67, Excavation of Radioactively Contaminated Pipe Encasement, UN-200-E-67	Rejected (proposed)		The 1984 excavation has been backfilled. The site is no longer marked or posted.	This site was located in an excavation site, north of the 272-AW parking lot, near the corner of 4th St and Canton Ave.	Ecology	200-IS-1
UPR-200-W-115	UPR-200-W-115, UN-216-W-25, Ground Contamination above Transfer Line Along Cooper Street	Rejected (proposed)		The site had been delineated with a light-duty chain barricade and "Surface Contamination" warning signs. A waste site inspection, done in February 1998, found that the area has been covered with gravel and posted as a URM area.	UPR-200-W-115 is located above the encased transfer line that runs along the east side of Cooper St. The pipeline extends between the 242-S Evaporator Facility and the U Tank Farm.	Ecology	200-IS-1
UPR-200-W-160	UPR-200-W-160, Line Break at 241-TX-302C, UPR-200-W-38, UPR-200-W-40, 216-T-30	Rejected (proposed)		The area around the 241-TX-154 Diversion Box has been stabilized with shotcrete. This UPR is a duplicate of UPR-200-W-40 and UPR-200-W-38. UPR-200-W-38 is the site that will remain.	The release location is the area around the 241-TX-154 Diversion Box and the 241-TX-302 Catch Tank, and between the 221-T and 222-T Buildings, near section R-11 of 221-T.	Ecology	200-IS-1
UPR-200-W-40	UPR-200-W-40, Line Break near 241-TX-154, UPR-200-W-38, UPR-200-W-160, 216-T-30, UN-200-W-40,	Rejected (proposed)		This site code is recommended for deletion because it is a duplicate of UPR-200-W-38 and UPR-200-W-160. UPR-200-W-38 has been selected as the 'surviving' site code for this incident.	The spill occurred in 200 West Area, southeast of the 221-T Building between the 241-TX-154 Diversion Box and the 241-TX-302C Catch Tank.	Ecology	200-IS-1
UPR-200-E-41	UPR-200-E-41, UN-200-E-41 Soil Contamination in the Vicinity of R-13 Stairwell (221-B), UPR-200-E-85	Accepted	Proposed rejected	This is a duplicate of the UPR-200-E-85 site.	The site is located in the vicinity of the R-13 stairwell at 221-B Building.	Ecology	200-IS-1
UPR-200-E-117	UPR-200-E-117, Contaminated Liquid Spill, UN-200-E-117	Accepted	Proposed rejected (consolidated)	The release site is within a larger area, known as 200-E-103 that was surface stabilized in 1999 and should be consolidated.	The spill occurred on the south side of 202-A, west of the railroad tunnel.	Ecology	200-IS-1

Table C-2. WIDS Rejected Sites and Proposed Rejected for 200-IS-1 and 200-ST-1 Waste Sites Not Considered in this Work Plan. (4 Pages)

Code	Names	Classification	Reclassification Status	Description	Location Description	Lead Regulatory Agency	Operable Unit
200-W-34	200-W-34, 272-WA Septic System North of 213W, 2607-WL, Duplicate of 2607-WL	Rejected (proposed)		This site is a duplicate of 2607-WL, which also is listed in WIDS as servicing the 272-WA Building and being north of that facility.	N/A	Ecology	200-ST-1
2607-WWA	2607-WWA, 2607-WWA Septic System	Rejected (proposed)		This site does not exist as a separate site; it is likely an alias for 2607-WL.	N/A	Ecology	200-ST-1

Footnote (1) The listing of waste sites is based on WIDS as of 11/27/02.

WIDS, *Waste Information Data System Report*, Hanford Site database.

Ecology = Washington State Department of Ecology.
N/A = Not available.
PUREX = Plutonium-Uranium Extraction (process or Plant).
UPR = Unplanned release.
WIDS = Waste Information Data System.

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
6607-5	6607-5, 616 Building Septic System	The unit consists of a septic tank and a drain field. The septic tank is surrounded by four yellow posts and is covered by gravel. The drain field is surrounded by metal posts and chain. The drain field is not marked by a sign.	The tank is located on the south side of the 616 Building. The drain field extends southwest of the tank.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
6607-3	6607-3, Anti-Aircraft Artillery Site H-51 Septic Tank	The septic tank is constructed of concrete, has three open access ports and an above-ground square concrete box-like structure located on the east end. This structure might have been used to support a pump for pumping liquid to the drain field. The tank is below grade. The roped off section measures 17 m by 4.6 m (55 by 15 ft) and the tank interior is 3.4 m (11 ft) deep. The drain field is located east of the septic tank. The septic tank and four access ports are delineated by orange plastic fencing.	This site is located approximately 2.4 km (1.5 mi) southwest of the 200 West Area just west of Army Loop Rd between Highway 240 and Army Loop Rd.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
6607-2	6607-2, Gun Site H-42 Septic Tank	This site includes an access port, two septic tanks, and a connecting tile field. In May 2001, the open holes associated with the septic system were backfilled.	The site is located 6.4 km (4 mi) south of the 200 East Area, on the south side of Army Loop Rd and east of the power line road to Rattlesnake Mountain.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
6607-1	6607-1, H-40 Gun Site Septic Tank	This site includes an access port located near the kitchen-mess hall and toilet-shower foundations and a below-ground concrete septic tank with three access ports. The access ports and the septic tank have been backfilled with clean pit run material and no longer are visible, and the ground over the tank is gravel as of June 2001.	This site is located 1.1 km (0.7 mi) southeast of the southeast corner of the 200 East Area, on the south side of Route 4 South. Trees viewed from Route 4 South aid in locating the site. The septic tank is located in the eastern portion of the H-40 Gun Site.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
622-R ST	622-R ST, 622-R Septic Tank, 622-R Atmospheric Physics Laboratory Septic Tank	This site consists of a septic tank, distribution box, and tile field. A pump station was added in 1997 to reroute raw sewage to Septic System 6609-09. The septic tank was emptied and will remain available as an emergency holding tank in case of pump failure.	This site is located just northwest of the 622-R Atmospheric Physics Laboratory Building. This building is northwest of the 200 West Area between Route 2 and Route 3.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-WL	2607-WL, 2607-WL Septic System	The 2607-WL Septic System is constructed of reinforced concrete. The septic system includes a trench-type drain field. The septic tank and drain field are surrounded by a chain barricade posted with a "Septic Tank" sign.	This unit lies north of the 272-WA Building and west of the 2401-W Building.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
2607-W2	2607-W2	The 2607-W2 Septic Tank is surrounded by posts with no radiation warning signs. This system was taken out of service and formally abandoned in 1994. The drain field lines were cut and the septic tank was filled with soil. The drain field had a capacity of 2970 L (785 gal) per day. A gravity tie line was installed to connect this small system to a collection that serves the 2607-W1 system.	This unit lies southwest of the main 200 West Area guard gate and southeast of the 2704-W Building.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-R	2607-R	The site is a septic tank and drain field. The rectangular, concrete tank is open-topped, filled with soil, - and buried to grade level. The 2607-R reinforced-concrete septic tank is 1.2 m (4 ft) long, 0.6 m (2 ft) wide, and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gal) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The unit is located south of the 2743-R Guard House foundation and south of the 212-R Building. The drain field lies south of the septic tank.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-P	2607-P	The site is a septic tank and drain field. The rectangular, concrete tank is open-topped, filled with soil, - and buried to grade level. The 2607-P reinforced-concrete septic tank is 1.2 m (4 ft) long, 0.6 m (2 ft) wide, and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gal) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The site is located south of the 2743-P Guard House foundation and south the 212-P Building. The drain field lies south of the septic tank.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-N	2607-N	The site is a septic tank and drain field. The rectangular, concrete tank is open-topped, and buried to grade level. The 2607-P reinforced-concrete septic tank is 1.2 m (4 ft) long, 0.6 m (2 ft) wide, and 2.5 m (8.25 ft) deep (inner dimensions). The tank had a design capacity of 795 L (210 gal) based on a user capacity of 6 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface and the tank is accessible through a 0.9 m (3-ft) access port.	The unit is located 6 m (20 ft) south of the 2743-N Guard House foundation and south of the 212-N Building. The drain field lies south of the septic tank system.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
2607-FSN	2607-FSN, 609A Building Septic Tank 2607-FSN	The 2607-FSN Septic Tank and drain field lie beneath an asphalt walkway and several trees. The system was abandoned and replaced by the 6607-4 Septic System in 1988.	The 2607-FSN Septic System was located at the southeast corner of the 609-A Building, which is located on the south side of Route 3 in the 600 Area.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-E8	2607-E8, 2607-E8 Septic Tank and Tile Field	The septic tank surface is identified by two circular access ports surrounded with concrete. A sign, on the ground in April 2001, reads "2607-E8." The associated drain field had a capacity of 13,400 L (3,533 gal) per day.	This unit is located north of 1st St and east of Baltimore Ave, across from the 2101-M Building.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-E6	2607-E6	The site is a septic tank and drain field. The drain field is surrounded by a wooden fence. The surface is vegetated with brush.	This unit is located inside the 200 East Area, north of Mobile Office 405 (MO405), between two railroad spurs.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-E11	2607-E11	This unit is a two-chamber tank. The tank has an associated drain field and a capacity of 3,500 L (927 gal) per day.	The site is located inside the 200 East Area, north of 4th St and east of Baltimore Ave. The system is located southeast of the Dry Materials Receiving and Handling Facility silos.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-E1	2607-E1	This septic tank is constructed of reinforced concrete with walls and floors. The associated drain field is 778 m^2 (8,376 ft^2).	This septic tank is located north of 4th St and east of Baltimore Ave. The tile field is north of the tank.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
200-E-5	200-E-5, 2607-E2, 2607-E2 Septic Tank & Tile Field	The septic tank has three access ports. It is a single-compartment 18,730 L (4,950-gal)-capacity tank with a 1900 L (500-gal) dosing siphon. As of February 15, 2001, it was not marked in the field.	The tank and drain field are located in the south portion of 200 East Area, adjacent to 1st St and east of Baltimore Ave.	Planned for removal from Appendix C and CERCLA and recategorized as "septic."	200-ST-1
2607-WA	2607-WA	The 2607-WA septic system consists of two separate septic tanks and two separate drain fields. The septic tanks currently receive sanitary wastewater and sewage. This system was upgraded to meet state requirements in 1994.	This unit lies southwest of the 19th St and Camden Ave intersection and north of the Z Plant trailers MO-011, MO-244, MO-249, and MO-250.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
2607-EQ	2607-EQ	The 2607-EQ Septic Tank is constructed of reinforced concrete. The associated drain field is approximately 431 m^2 (4,644 ft^2).	This unit lies northwest of the 2753-E Building and southeast of the Ames Ave and 2nd St intersection.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
2607-EP	2607-EP	The 2607-EP System includes a septic tank and associated drain field.	This unit lies southeast of the MO-388 trailer and northeast of the 2721-E Building.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
2607-EM	2607-EM	The 2607-EM Septic Tank is constructed of reinforced concrete and receives sanitary wastewater and sewage from the 2721-E Building. The system drains to the 2607-ED Drain Field.	This unit lies northwest of the associated drain field and southeast of the 2721 Building.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
2607-EL	2607-EL, 2607-EL Septic Tank/Pump Station	The site is surrounded with steel posts and chain. It in marked with "Septic Tank" signs. Three access ports are visible on the surface. This septic tank-pump station is part of the 2607-EP System, which was reconstructed in 1994. The 2607-EL System is permitted and approved by the Washington Department of Health for a flow of 54, 890 L per day.	The site is located south of 4th St, near the western entrance to the 200 East Area. The septic system is located south of the 2727-E Building and west of the MO-294 trailer.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
200-E-9	200-E-9, 2607-EN, 2727-E Septic System, 2607-EN Septic Tank/Pump Station	The above-ground area is posted "Septic Tank 2607-EN" and is surrounded by metal fence posts and chain. Three concrete and one PVC cylinders (access ports) with covers protrude above grade in the underground tank area. The surface is disturbed and covered with Russian thistle, cheat grass, and other weedy species. Two "Sanitary Tile Field" signs are located south of the septic tank.	The site is 75 ft south of the southwest corner of the 2727-E Safeguards and Security Building (which is in the 200 East Area on 4th St).	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
2607-FSM	2607-FSM, 609 Building Septic Tank 2607-FSM, 100 Area Fire Station Septic Tank, 1607-FSM, 6607-FSM	The 6607-FSM Septic Tank is a single-chamber, reinforced concrete tank. This unit includes a drain field.	The septic system lies at the southwest corner of the 609 Building (100N Fire Station) and northwest of the intersection of Route 1 and Route 4 North in the 600 Area.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
200-E-7	200-E-7, 2607-EO Septic Tank & Tile Field	The tank is part of the 2607-EP Septic System. Current and proposed additions to this system bring its design flow to 20,440 L (5400 gal) daily. The tank was prefabricated with a 1,500-gal first chamber and a 1,000-gal second chamber. The associated septic field has been abandoned.	This septic tank-pump station is located east of the 2711-E Building and north of 4th St.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
200-E-24	200-E-24, 6607-11, 2704-HV Septic System	The septic and dosing tank area (about 60 ft by 10 ft) has five access ports at grade and two 7-ft high 4-in-diameter metal pipe air vents. The drain field is within a fenced area about 300 ft north of the septic tank area. The drain field fenced area is about 130 ft by 360 ft; and has 6 valve boxes and a gate at the south end. The drain field consists of three trenches in use and one trench reserved for future use.	The site is west of B Plant and east of Route 4 South. It is east of the 2704-HV Building and west of the 216-B-62 Crib. A GPS survey was done in August 1998.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also ,this site status is "Active."	200-ST-1
600-217	600-217, H-61-H Anti-Aircraft Artillery Site Sewer System	The sewer system extended from the kitchen and toilet-shower buildings and ran into a septic tank on the east side of the site. The access ports and septic tank have been filled with clean sand (September 2001). Twelve toilet drains and five floor drains were observed on the toilet-shower building foundation floor. A sewer access port is located just northeast of the toilet-shower building. The kitchen foundation has four floor drains and a grease trap. A sewer access port is located northwest of the kitchen.	This site is located just southwest of the intersection of Route 11 and Route 6. It is 0.4 mi south of Route 11 and just west of Army Loop Rd. The site is in the east half of the northeast quarter of Section 34, Township 13 north, Range 25 east.	Planned for removal from Appendix C and CERCLA and recategorized as "septic." Also, this site status is "Active."	200-ST-1
600-212	600-212, Relocatable Latrine Facility Holding Tank System	The site is surrounded by 14 steel posts painted yellow. The top of the tank is visible at grade level and measures 9 ft by 15 ft. Two concrete covers are located on top of the tank, one has a steel access port for pumping. The electrical conduit for transmitting to the alarm system is visible on top of the tank.	The site is located just west of the 200 East Area, between Route 4 North and the 200 E Area perimeter fence. The site is within the trailer village established for the HWVP Project approximately 8 m west of the MO-730 Trailer.	This site status is "Active."	200-ST-1
2607-WC	2607-WC, 2607-WC Septic System	The 2607-WC Septic System consists of two tanks and a trench-type drain field.	This unit lies west of the 242-S Evaporator Building and northeast of the 272-S Maintenance Shop.	This site status is "Active."	200-ST-1
2607-W6	2607-W6	The 2607-W6 system was reconstructed in 1995. The unit is correctly labeled. A concrete structure with three metal access-port covers lies on the surface. The 2607-W6 Septic Tank is constructed of reinforced concrete and receives sanitary wastewater and sewage.	This unit lies southwest of the 222-S Laboratory and southeast of the MO-291 Trailer.	This site status is "Active."	200-ST-1
2607-W5	2607-W5, Septic Tank and Drain Field	The 2607-W5 Septic Tank is a concrete single-compartment tank with three entry openings on the top, each protected by a wooden cover. A pipe connects the septic tank to a concrete diversion box, then to a second concrete diversion box before the pipe enters the drain field.	This unit lies southwest of the 221-U Canyon Building and east of the 207-U Retention Basin. It is north of the 241-U-361 Settling Tank.	This site status is "Active."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
2607-W1	2607-W1	The 2607-W1 Septic Tank is constructed of reinforced concrete and receives sanitary wastewater and sewage. A drain field is associated with the system. This system was reconstructed in 1994.	This unit lies southeast and across Bridgeport Ave from the associated drain field, and northeast of the 2713-WB Building.	This site status is "Active."	200-ST-1
2607-EC	2607-EC	This unit includes a drain field. It is located inside the A Tank Farm near the northeast corner.		This site status is "Active."	200-ST-1
2607-EA	2607-EA, 2607-EA Septic Tank and Drywell	This unit includes a drain field.	The septic system is located west of the A Tank Farm and directly south of the 244 AR Building.	This site status is "Active."	200-ST-1
2607-E8A	2607-E8A, 2607-E8A Regional Septic System	The septic system is surrounded with light-duty posts and chain.	The septic system is located south of the 284-E Powerhouse, on the east side of Baltimore Ave.	This site status is "Active."	200-ST-1
2607-E7B	2607-E7B, 2607-E7B Septic System, 2607-E7	This septic tank receives sanitary wastewater and sewage. This tank is a 1.7 m (66-in.) by 2.7 m (105-in.) precast concrete septic tank with a single 61 cm (24-in.)-diameter cover. The tank is in line with the 2607-E5 Septic Tank and the 2607-E7 Septic System (WIDS 2607-E7A). The septic tank drains to the sanitary leaching trench.	This system lies north of the 209-E Building and west of the 2607-E5 Septic Tank.	This site status is "Active."	200-ST-1
2607-E7A	2607-E7A, 2607-E7	This septic tank receives sanitary wastewater and sewage. This tank is a 1.7 m (66-in.) by 2.7 m (105-in.) precast concrete septic tank with a single 61 cm (24-in.) diameter cover. The tank is in line with the 2607-E5 Septic Tank and the 2607-E Septic System (WIDS 2607-E7B). The septic tank drains to the sanitary leaching trench.	This system lies north of the 209-E Building and west of the 2607-E5 Septic Tank.	This site status is "Active."	200-ST-1
2607-E5	2607-E5	This septic system receives sanitary wastewater and sewage. This system includes a single-compartment tank with a dosing system and a leaching trench. An abandoned tile field that was replaced by the sanitary leaching trench also is included with this site.	This unit lies north of the 209-E Building and east of the 2607-C Sanitary Crib.	This site status is "Active."	200-ST-1
2607-E1A	2607-E1A, 2607-E1A Septic System, L-272 Regional System	The system includes a septic tank, a dosing chamber, and a three-section drain field. The area is covered with gravel and marked appropriately.	The septic system is located inside the 200 East Area, north of 4th St and west of Baltimore Ave.	This site status is "Active."	200-ST-1

Table C-3. WIDS 200-ST-1 Septic System Waste Sites Considered Active or Under Another Regulatory Authority and Not In This Work Plan. (7 Pages)

Code	Names	Description	Location Description	Justification for Exclusion	Operable Unit
2607-E12	2607-E12, 2607-E12 Septic System	The septic system consists of the old 18,927 L (5,000-gal) tank that was converted to a dosing chamber when the new 37,854 L (10,000-gal) septic tank was installed approximately 13.7 m (45 ft) to the south. The trench-like drain field for this system is located approximately 122 m(400 ft) east of the tanks. (The old drain field was plugged off.)	Both septic tanks are located east of Canton Ave, north of 4th St and west of the 207-A South Retention Basins. The drain field is located east of the retention basins and has a barricade marker fence around the large depression.	This site status is "Active."	200-ST-1
200-E-6	200-E-6, Septic Tank, Sanitary Sewer Repair and Replacement 2607-E4	The septic tank is surrounded by chain suspended from four steel posts painted yellow. The tank is posted with a septic tank sign. Two 10 cm (4-in.) PVC pipes protrude vertically from the ground. The sanitary tile field is surrounded by a steel post and chain barricade and is posted with "Caution Underground Radioactive Material" signs.	The site is located just east of the 221-B Building and south of the inactive 2607-E4 Septic Tank.	This site status is "Active."	200-ST-1

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 601, et seq.
WIDS, *Waste Information Data System Report*, Hanford Site database.

CERCLA= *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
GPS = Global positioning system.
HWVP = Hanford Waste Vitrification Project.
PVC = Polyvinyl chloride.
WIDS = Waste Information Data System.

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
200-W-97	200-W-97, Encased Pipeline from 240-S-151 Diversion Box to 241-S-151 Diversion Box	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
200-W-98	200-W-98, Encased Pipeline from 240-S-151 to 241-U-153 Diversion Box	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
200-W-99	200-W-99, Encased Pipeline from 241-U-151 to 241-S-151 Diversion Boxes	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
240-S-151	240-S-151, 240-S-151 Diversion Box	Accepted	200-RO-3	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
240-S-152	240-S-152, 240-S-152 Diversion Box	Accepted	200-RO-3	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
241-B-154	241-B-154, 241-B-154 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
	UPR-200-E-45, UN-200-E-45, Contamination Spread from the 241-B-154 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit, which is associated with a waste site that is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
241-BX-154	241-BX-154, 241-BX-154 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit, which is associated with a waste site that is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
241-BX-155	241-BX-155, 241-BX-155 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit, which is associated with a waste site that is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
241-C-154	241-C-154, 241-C-154 Diversion Box	Accepted	200-SO-1	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
241-EW-151	241-EW-151, 241-EW-151 Vent Station Catch Tank, 241-EW-151 Vent Station, Vent Station, 200 Area East-West Vent Station	Accepted	200-IU-5	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
241-TX-155	241-TX-155, 241-TX-155 Diversion Box	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
600-269	600-269, Cross Site Transfer Line Replacement, New Cross-Site Transfer Line	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit, which is included in the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
200-E-111	200-E-111, Encased Pipeline From 241-ER-151 Diversion Box to 241-C Tank Farm and 244-AR Vault; 3-38 Encasement	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit, which is associated with the 244-AR Vault, which is covered under the *Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks*.	200-IS-1
200-E-116	200-E-116, Pipelines from 241-B-154 Diversion Box to 241-C-151 and 241-C-152 Diversion Boxes	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
200-W-51	200-W-51, Septic Tank (Abandoned)	Accepted	200-RO-4	The ORP has accepted programmatic responsibility for this unit.	200-ST-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
200-W-7	200-W-7, 246-L, 241-S-TK-1, 243S-TK-1, 243-S-TK1, 200-W Personnel Decontamination Facility Catch Tank, IMUST, Inactive Miscellaneous Underground Storage Tank	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
200-W-78	200-W-78; Pipeline Between 241-TX/TY and 241-T Tank Farms	Accepted	N/A	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
240-S-302	240-S-302, 240-S-302 Catch Tank, IMUST	Accepted	200-RO-3	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-A-151	241-A-151, 241-A-151 Diversion Box	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-A-302A	241-A-302A, 241-A-302-A Catch Tank	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-A-302B	241-A-302B, 241-A-302-B Catch Tank, IMUST	Accepted	200-PO-5	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-B-302B	241-B-302B, 241-B-302-B Catch Tank, 241-B-302, IMUST	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-BX-302B	241-BX-302B, 241-BX-302-B Catch Tank, IMUST	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-BX-302C	241-BX-302C, 241-BX-302-C Catch Tank, IMUST	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-ER-151	241-ER-151, 241-ER-151 Diversion Box	Accepted	200-BP-9	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-ER-152	241-ER-152, 241-ER-152 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-ER-311	241-ER-311, 241-ER-311 Catch Tank, 241-ER-311A Replacement Tank	Accepted	200-BP-9	The ORP has accepted programmatic responsibility for this unit.	200-IS-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
241-ER-311A	241-ER-311A, 241-ER-311A Catch Tank, old 241-ER-311, Original 241-ER-311 Catch Tank, IMUST	Accepted	200-BP-9	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-SX-302	241-SX-302, 241-SX-302 Catch Tank, SX-304, IMUST	Accepted	200-RO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-TX-152	241-TX-152, 241-TX-152 Diversion Box	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-TX-154	241-TX-154, 241-TX-154 Diversion Box	Accepted	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-TX-302B	241-TX-302B, 241-TX-302-B Catch Tank, IMUST	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-TX-302BR	241-TX-302BR, 241-TX-302BR Catch Tank, 241-TXR-302BR, IMUST	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-TX-302C	241-TX-302C, 241-TX-302-C Catch Tank	Accepted	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-U-151	241-U-151, 241-U-151 Diversion Box	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-U-152	241-U-152, 241-U-152 Diversion Box	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-UX-154	241-UX-154, 241-UX-154 Diversion Box	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-UX-302A	241-UX-302A, 241-U-302 Catch Tank, 241-UX-302 Catch Tank, 241-UX-302	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
2607-W9	2607-W9, 2707-SX Septic Tank	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-ST-1
2607-WZ	2607-WZ	Accepted	200-RO-1	The ORP has accepted programmatic responsibility for this unit.	200-ST-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
UPR-200-E-25	UPR-200-E-25, Contamination Spread from the 241-A-151 Diversion Box, UN-200-E-25	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-26	UPR-200-E-26, 241-A-151 Release, UN-200-E-26	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-31	UPR-200-E-31, 241-A-151 Release, UN-200-E-31	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-42	UPR-200-E-42, 241-AX-151 Release, UN-200-E-42	Accepted	200-PO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-77	UPR-200-E-77, UN-216-E-5, 241-B-154 Diversion Box Ground Contamination, UN-200-E-77	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-78	UPR-200-E-78, UN-216-E-6, 241-BX-155 Diversion Box ground contamination, UN-200-E-78	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-84	UPR-200-E-84,241-ER-151 Catch Tank Leak, UN-200-E-84, UN-216-E-12	Accepted	200-BP-9	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-113	UPR-200-W-113, Soil Contamination East of 241-TX, UN-216-W-23, Contamination Areas Around 241-TX-155 Diversion Box, UN-200-W-113	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-115	UPR-200-W-115, UN-216-W-25, Ground Contamination above Transfer Line Along Cooper Street	Rejected (Proposed)	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-131	UPR-200-W-131, Release from 241-TX-155	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-135	UPR-200-W-135, Release from 241-TX-155, UN-200-W-135	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
UPR-200-W-160	UPR-200-W-160, Line Break at 241-TX-302C, UPR-200-W-38, UPR-200-W-40, 216-T-30	Rejected (Proposed)	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-161	UPR-200-W-161, UN-216-W-35, UN-200-W-161	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-167	UPR-200-W-167, Contamination Migration from 241-TY, UN-216-W-32	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-21	UPR-200-W-21, UN-200-W-21, UN-216-W-36, Process Line Cave-in at 241-TX-154 Diversion Box	Accepted	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-27	UPR-200-W-27, Transfer Line Leak at 23rd and Camden, UN-200-W-27, UN-216-W-5, Duplicate of UPR-200-W-29	Accepted	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-28	UPR-200-W-28, Release from 241-TX-155 Diversion Box, UN-200-W-28	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-29	UPR-200-W-29, Transfer Line Leak, UN-200-W-29, UPR-200-W-27, UN-200-W-27, UN-216-W-5, 23rd and Camden Line Break	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-38	UPR-200-W-38, Line Break at 241-TX-302C, UPR-200-W-160, UPR-200-W-40, UN-200-W-38, 216-T-30	Accepted	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-40	UPR-200-W-40, Line Break near 241-TX-154, UPR-200-W-38, UPR-200-W-160, 216-T-30, UN-200-W-40,	Rejected (Proposed)	200-TP-4	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-49	UPR-200-W-49, Contamination Southeast of 241-SX, UN-200-W-49	Accepted	200-RO-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-5	UPR-200-W-5, Overflow at 241-TX-155, UN-200-W-5	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit
UPR-200-W-6	UPR-200-W-6, UN-200-W-6, Contamination Spread from 241-U-151 and 241-U-152 Diversion Boxes	Accepted	200-UP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-64	UPR-200-W-64, Road Contamination at 23rd and Camden, UN-200-W-64	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-W-97	UPR-200-W-97, Transfer Line Leak, UN-216-W-5, UN-200-W-97	Accepted	200-TP-2	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-600-20	UPR-600-20, UN-216-E-41, Cross Country Transfer Line Contamination, Cross Site Transfer Line	Accepted	200-IU-5	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
UPR-200-E-45	UPR-200-E-45, UN-200-E-45, Contamination Spread from the 241-B-154 Diversion Box	Accepted	200-BP-6	The ORP has accepted programmatic responsibility for this unit.	200-IS-1
241-Z	241-Z, 241-Z Treatment and Storage Tanks, 241-Z Tank Farm, 241-Z Treatment and Storage System, 241-Z-D-4, 241-Z-D-5, 241-Z-D-7, 241-Z-D-8, 241-Z Sump, 241-Z Tank Pit	Accepted	200-ZP-2	DOE-TPD has accepted programmatic responsibility for the 241-Z Facility. The 241 Z Treatment and Storage Tanks RCRA TSD unit is supporting the PFP Nuclear Materials Stabilization Project and subsequent facility D&D until 2011 and has an approved RCRA Closure Plan (DOE-RL 1997b)	200-IS-1
UPR-200-W-79	UPR-200-W-79, Contamination Spread at 241-Z, UN-200-W-79	Accepted	200-ZP-2	DOE-TPD has accepted programmatic responsibility for this site, which is associated with the 241-Z Treatment and Storage Tanks RCRA TSD unit.	200-IS-1
216-TY-201	216-TY-201, Supernatant Disposal Flush Tank, IMUST	Accepted	200-TP-2	This flush tank received waste from the T and TY Tank Farms and discharged to the 216-T-26, 216-T-27, and 216-T-28 cribs. It is considered part of the ancillary equipment for these cribs and should be in the 200-TW-1 OU.	200-IS-1 to 200-TW-1

Table C-4. WIDS 200-IS-1 and 200-ST-1 Waste Sites With Other DOE Programmatic Responsibility and not Considered in This Work Plan. (8 Pages)

Code	Names	Classification	Previous Operable Unit	Justification for Exclusion	Operable Unit

Hanford Site Dangerous Waste Part A Permit for Single-Shell Tanks
Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

D&D = Decontamination and decommissioning.
IMUST = Inactive miscellaneous underground storage tank.
N/A = Not available.
ORP = U.S. Department of Energy, Office of River Protection.
OU = Operable Unit.
PFP = Plutonium Finishing Plant.
RCRA = *Resource Conservation and Recovery Act of 1976*
TPD = Treatment Programs Division.
TSD = Treatment, storage, and disposal.
UPR = Unplanned release.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
Tanks								
200-W-16 Storage Tank	200-W-16, 292-T Underground Tanks, IMUST, 292-TK-1, 292-TK-2	The underground tanks are near the southeast corner of the 292-T Building addition. The 292-T Building is south of the 291-T stack and north of the 222-T Building.	1944 to 1970	T Plant	Unknown quantity of material placed into tanks.	N/A	0.9 m by 0.6 m (3 ft by 2 ft)	Two metal riser pipes extend about 0.5 m (1.5 ft) above grade near the southeast corner of the 292-T Building addition. Both are capped and one appears to have a pressure relief vent. These pipes extend from two buried tanks (292-TK-1 and 2). A chain link fence encloses the area. The fence is posted with "Access Restricted" signs. The site is in a chained area posted "Contamination Area."
241-CX-72 Storage Tank	241-CX-72, 241-CX-TK-72 Vault and Tank, 241-CX-72 Waste Self Concentrator, Strontium Hot Semi-works, IMUST	The tank is located south of 7th Street, within the Hot Semi-Works stabilized area (200-E-41).	1957 to 1976	Tank 241-CX-72 was an experimental tank used to study the characteristics of self-concentrating waste from the PUREX process.	N/A	Overburden Depth = 4.3 ft	11 m x 1.01 m (8 ft x 5.5 ft)	Tank 241-CX-72 is located inside a small building. A cover has been placed over the tank with radiological postings and "Keep Out" signs.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
241-CX-70 Storage Tank	241-CX-70, 241-CX-TK-70 Tank, Strontium Hot Semi-works, IMUST	The tank is located south of 7th Street, within the Hot Semi-Works stabilized area (200-E-41).	1952 to 1957	The unit was used to store high-level process waste in support of the Semi-Works process.	Before sluicing, the unit contained approximately 1.45 m (4.75 ft) of sludge, which roughly equals 39,000 L (10,300 gal) of waste. Contaminants included 20 CiPu-239/240; 500 Ci of Cs-137; 2,900 Ci of Sr-90; 7080 kg (7.8 tons) sodium nitrate; 1,000 kg (1.1 tons) sodium nitrite; 1090 kg(1.2 tons) sodium fluoride; 450 kg (0.5 tons) aluminum sulfate; and 180 kg (0.2 tons) sodium chromate. After sluicing only a small amount of solids and residual caustic and water remain. The estimated contamination levels for piping and equipment are the volume remaining after the 3 Ci of plutonium and 6,000 Ci of beta/gamma. The residue after the tank was sluiced was estimated to be 500 gal of liquid and 250 gal of solids. Later more liquids and gravel-like solids were removed. The tank was dried and is considered to be empty.	Overburden depth: 3.4 m (11 ft)	4.6 m x 6.1 m (15 ft x 20 ft)	Tank 241-CX-70 is surrounded with post and chain. It is posted with "Hazardous Waste, Restricted Area-Inactive Tank" signs.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
276-S-141 Storage Tank	276-S-141, 276-S-TK-141, 276-S-306A, 276-S-141 Solvent Storage Tank, Tank 276-141, Hexone Storage Tank, 244-SX-15	The underground tank is north of 276-S Building and directly south of Tank 276-S-142. The system is west of the railroad tracks for the REDOX Plant.	1951 to 1969	The tank is the southernmost tank in a two-tank network connected to the 276-S Solvent Handling Facility. The tank stored liquid mixed waste until 1992, when most of the waste was transferred to tank cars for offsite incineration. From 1951 to 1967 the tank was used to store reagent-grade hexone for makeup as a solvent at the REDOX Plant.	The unit contained radiologically contaminated liquids made up of NPHs, hexone, and phosphate tar. In 1992, Tanks 276-S-141 and 276-S-142 each contained from 19 L to 114 L (5 to 30 gal) of 93% NPHs and 7% hexone. They also contained up to 950 L (250 gal) of phosphate tar. A nitrogen gas blanket and offgas filtration were implemented in 1990 during the distillation phase. The remaining 19 L to 114 L (5 to 30 gal) of liquid are expected to be removed by evaporation over time by the nitrogen purge process.	N/A	8.5 m x 3.5 m (28 ft x 12 ft)	The site is a below-grade carbon steel tank inside a chain line fenced area. The tank is the southernmost tank in a two-tank network connected to the 276-S Solvent Handling Facility. The tank has an 89,000 L (23,575-gal) capacity.
276-S-142 Storage Tank	276-S-142, 276-S-TK-142, 276-S-306B, 276-S-142 Solvent Storage Tank, Tank 276-142, Hexone Storage Tank, 244-SX-15, IMUST	The underground tank is north of the 276-S Building and directly north of the 276-S-141 Tank. The system is west of the railroad tracks.	1951 to 1969	The tank is the northernmost tank in a two-tank network connected to the 276-S Solvent Handling Facility. From 1951 to 1967 the tank was used to store reagent-grade hexone for makeup as a solvent at the REDOX Plant.	The unit contained radiologically contaminated liquids made up of NPHs, hexone, and phosphate tar. In 1992, Tanks 276-S-141 and 216-S-142 contained from 19 L to 114 L (5 to 30 gal) of 93% NPHs and 7% hexone. They also contain up to 950 L (250 gal) of phosphate tar. A nitrogen blanket was added to the tank. The remaining 19 L to 114 L (5 to 30 gal) of liquid are expected to be removed by evaporation over time by the nitrogen purge process.	N/A	8.5 m x 3.5 m (28 ft x 12 ft)	The site is a below grade carbon steel tank. The tank is the northernmost tank in a two tank network connected to the 276-S Solvent Handling Facility. The tank has an 89,000 L (23,575 gal) capacity.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
241-CX-71 Neutralization Tank	241-CX-71, 241-CX-TK-71, 241-CX Neutralization Tank, Strontium Hot Semi-Works, IMUST	The tank is located south of 7th St, in the Hot Semi-Works stabilized area (200-E-41).	1952 to 1957	This tank provided acidic waste neutralization via a flow-through limestone layer for 201-C Building process condensate and the coil and condensate cooling water stream before discharge to the 216-C-1 Crib. The tank may also have received process condensates from REDOX and PUREX pilot plant operations, decontamination flushes, and hot shop sink waste.	5.0×10^{-2} Ci Cs-137; $9.3 \times 10^{+2}$ Ci Sr-90	Depth = 3.15 m (10 ft), Overburden depth = 1.07 m (3.5 ft)	3.2 m x 1.5 m (10 ft x 5.0 ft)	The underground tank is surrounded with steel posts and chain. It is posted with "Hazardous Waste, Restricted Area-Inactive Tank" signs.
241-WR Vault	241-WR Vault, 241-WR Vault (Tanks -001 through -009), 241-WR-01 thru 09, 241-WR Diversion Station Vault, 244-WR Vault, 296-U-6 Stack, IMUST	This site is located northeast of the 221-U Building, west of Beloit Ave.	1952 to 1976	The vault is associated with the 296-U-6 Stack, 221-U Plant processes, PUREX Facility, REDOX Facility, 241-UX-152, and BC Cribs and Trenches.	The site waste contains nitric acid, tributyl phosphate, UNH from the TBP process, and thorium nitrate storage. The unit also contains radioactively contaminated equipment and structures. Approximately 60 Ci of beta contamination remains inside the vault structure. A contamination incident occurred in the 1960's when a tank overflowed and filled its cell. When the tank (002) was subsequently pumped out it floated loose from its base, rupturing its line, jumpers, and mechanical connections. Significant cleanup was required to return the facility to service.	14 m (45 ft)	39 m x 20 m (128 ft x 66 ft)	The vault is a below-grade, reinforced-concrete structure with 9 compartments arranged in two rows and a 189,000 L (50,000-gal) tank in each compartment. A concrete wall separates the two rows of tanks. In addition to the tanks, the vault contains miscellaneous agitators, pumps, and valves. It is marked and posted with URM signs. An exhaust stack just north of the vault is included in this site. See sub-site description.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
Diversion Boxes and Valve Pits								
200-W-59 Diversion Box (Rep. Site)	200-W-59, Z-Plant Diversion Box #2	Z-Plant Diversion Box 2 is located southwest of the 234-5Z Building, between the two fences that make up the double Z Plant exclusion area. It is west of the 216-Z-361 Settling Tank and directly north of the 216-Z-12 Crib.	N/A	Z-Plant. This diversion box directed the flow of process waste via the 241-Z-361 Settling Tank to the 216-Z-12 Crib.	N/A	5.2 m (17 ft)	2.1 m x 2.1 m (6.9 ft x 6.9 ft)	The diversion box is buried with its concrete lid slightly above ground level. The Z Plant fenced exclusion area is covered with gravel.
200-W-58 Diversion Box	200-W-58, Z-Plant Diversion Box #1	Z-Plant Diversion Box #1 is located south of 234-5Z, in between the two fences that make up the double Z-Plant exclusion area. It is directly south of the 361-Z settling tank.	Unknown	The diversion box directed the flow of Z Plant process waste to cribs and tile fields located south of the Z Plant complex.	N/A	2.8 m (9.2 ft)	2.1 m x 2.1 m (6.9 ft x 6.9 ft)	The concrete lid of the diversion box is visible above ground. The Z-Plant fenced exclusion area is covered with gravel. The diversion box is buried to a depth of 2.7 m (9 ft) with its upper surface (a thick concrete lid) being slightly above ground level.
HSVP	HSVP, Hot Semi-Works Valve Pit, 201-C Diversion Box, Semi-Works Valve Pit	This valve pit is adjacent to the remains of the 201-C Building and southeast of the main canyon area. It is located within the 200-E-41 surface stabilized area.	1952-1963	201-C Facility	N/A	N/A	N/A	This site is a sealed, concrete-filled, vertically configured, stainless-steel cylinder buried beneath the asphalt barrier that was placed over the decommissioned 201-C Process Building. The surface stabilized area is posted with URM signs. The valve pit is not marked or posted separately.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
Pipelines								
UPR-200-W-2	UPR-200-W-2, UN-200-W-2, Underground Waste Line Leak	The cave-in occurred on the southeast side of the 221-T facility, near stairwell R-19.	June 1947	This site is associated with 221-T and UPR-200-W-98	N/A	3 to 3.3 m (10 to 11 ft)	N/A	On June 23, 1947, a minor ground cave-in occurred at the rear of the T Plant Canyon Building opposite the R-19 stairwell and directly over one of the underground waste transfer lines. Hydrostatic tests showed that the 9-1 "metal waste line" had failed and discharged liquid waste to ground. The 1947 survey was completed and the temporary "danger zone" status was eliminated. A permanent danger zone was established at stairwell R-19.
UPR-200-W-98	UPR-200-W-98, UN-216-W-6, 221-T Waste Line Break at R-19, UN-200-W-98	The release site is located near the southeast corner of the 221-T Canyon Building, at door R-19.	1945	This site is associated with the 221-T Building and UPR-200-W-2	Approximately 10 Ci of high-salt, neutral to basic fission products with a maximum dose rate of 20 rad per hour (in 1945) at 5 cm (2 in.).	N/A	N/A	In the spring of 1945, a broken underground process transfer line caused contaminated liquid to surface near the R-19 stairwell at the 221-T Building. The liquid from the "metal waste line" surfaced and spread mixed fission contamination over a small ground area. Following the incident in 1945, the area was covered with approximately 1.2 m (4 ft) of clean soil. A blacktop road, in daily use, has since been constructed over the top of the site..

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-102	UPR-200-W-102, UN-216-W-12, UN-200-W-102, 224-T Underground Line Leak	The UPR occurred adjacent to the south and east sides of the 224-T Building.	Early 1970's	The release is associated with the 224-T Building.	The release consisted of alpha-laden moisture from process tank lines that contaminated the soil around the pipeline. An estimated 72 g of plutonium were contained in the contaminated soil that was removed when the leak was discovered.	3.66 m (12.00 ft)	15.24m x 3.66m (50.00 ft x 12.00 ft)	The contaminated soil was discovered in February 1972. The leak is believed to have occurred several years earlier, when the building was used for processing plutonium. Contamination seeped into the ground on the "rear" of the 224-T Building. Most documents have assumed this to be the east side where a process line exits the cell portion of the building and goes to Tank 241-T-361.
UPR-200-W-114	UPR-200-W-114, UN-216-W-24, Ground Contamination East of 241-SX Tank Farm, UN-200-W-114	UPR-200-W-114 was located east of the 241-SX Tank Farm.	1980	The release is associated with the 241-SX Tank Farm and the 241-SX-151 and 241-S-151 Diversion Boxes	N/A	N/A	106.68 m x 137.16 m (350.00 ft x 450.00 ft)	The release consisted of migrating radioactive particulate matter from operational activities at the SX Tank Farm and the 241-SX-151 and 241-S-151 Diversion Boxes over many years. The contamination spread to the ground surface east of the SX Tank Farm. The resulting large area was posted "Surface Contamination Area" and was assigned a UPR number in 1980.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-164	UPR-200-W-164, Overhead uranyl nitrate hexahydrate (UNH) Line Leak, UN-216-W-29	The release occurred beneath the aboveground UNH pipeline that extended from 204-S to 224-U.	The release occurred in 1952	The 204-S Facility	An unknown amount of UNH	N/A	N/A	The above-ground UNH transfer line from the 204-S Storage Tanks to the 224-U Building (hung from an existing steam line) was posted as a radiation zone from 1952 to 1967. The zone was established because of a low-level gamma field (dose rate) emanating from the transfer line. In 1981 correspondence, Harold Maxfield states that he believes the area was incorrectly designated as a UPR, because the posting was necessary because of the dose rate, not a release. Later, a small area of soil contamination was identified under the steam line, adjacent to the 216-S-9 Crib.
UPR-200-W-32	UPR-200-W-32, UNH Transfer Line Break, UN-200-W-32	The release occurred near the northwest corner of the REDOX Plant.	The release occurred in 1954	The 204-S Facility	An unknown amount of UNH	N/A	N/A	During the summer of 1954, the above-ground UNH transfer line connecting 224-U to REDOX broke, releasing an unknown amount of the UNH solution to the ground. The contaminated area was covered and marked as a radiation zone by use of magenta and yellow tape and radiation zone signs.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-33	UPR-200-W-33, Ground Contamination at 224-U, UN-200-W-33	The site is located approximately 28 m (90 ft) east of the 224-U Building.	The release occurred in March 1955.	The release is associated with the Uranium Recovery process at the 224-U facility.	N/A	N/A	0.84 m^2 (9.00 ft^2)	A leaking flange of the C-5 Condensate Line from the 224-U Building caused a 3 m by 4.5 m (10 by 15 ft) area of ground to become contaminated.
UPR-200-W-35	UPR-200-W-35, Ground, UN-200-W-35, REDOX to 224-U UNH Line Leak	Located just outside and to the north of the REDOX exclusion area.	The release occurred in September 1955.	The 204-S Facility	An unknown amount and concentration/activity of UNH solution.	N/A	N/A	A leak occurred in the above-ground UNH line from REDOX to U Plant. The area of surface contamination and the quantity or activity of contaminants has not been reported.
UPR-200-E-1	UPR-200-E-1, Waste Line Failure on South Side of 221-B	The release occurred on the south side of the 221-B Building.	The release occurred in September 1946.	B-Plant	The original line break was waste from the metal waste line.	N/A	N/A	ARH-780 documents an underground waste line leak that occurred June 17, 1946 (UPR-200-E-80). In September 1946, additional contamination was found 24 m (80 ft) from the June 1946 leak location. The second contaminated area (documented in a September monthly report dated October 14, 1946) was assumed to migration from the leak reported in June 1946.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-E-3	UPR-200-E-3, Line leak from 221-B to 241-BX-154, UN-200-E-3	The release occurred on the south side of 221-B, between the 221-B Building and 241-BX-154.	The exact date of the occurrence is unknown.	B-Plant	The release consisted of B Plant first cycle waste.	N/A	N/A	A failure of first cycle waste line from the 221-B building to 241-BX-154 Diversion Box was identified. Efforts to excavate and inspect for the cause were abandoned when readings of 120 rads/hr were found with 46 cm (18 in.) of soil still remaining over the pipe. The exact date of the occurrence in unknown, but the reference document, HW-22610, was written on November 21, 1951.
UPR-200-E-44	UPR-200-E-44, UN-200-E-44, BCS Waste Line Leak South of 221-B	The unplanned release occurred south of 221-B, near the R-17 Change House. north of 7th Street. The Change House no longer exists.	The release occurred in August 1972.	B- Plant	N/A	N/A	0.30 m (1.00 ft) in diameter	A small cave-in was discovered south of the R-17 Change House next, to 7th St. No radiological reading was identified in the cave-in at the time of discovery. An excavation was done after lunch that identified a leak in the 15 cm (6 in.) crib line. Soil removed from the excavation was contaminated from 10,000 to 20,000 cpm. The dose rate on the pipe was 20 mrad/hr. No contamination spread beyond the excavation.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-E-80	UPR-200-E-80, UN-216-E-8, 221-B-R-3 Line Break, R-3 Radiation Zone, UN-200-E-80	The release occurred in and underground pipeline, located on the south side of the 221-B Canyon Building, near the R-3 stairwell.	The release occurred in June1946.	B Plant	N/A	N/A	30 m (100 ft) wide by 152 m (500 ft) in length	An underground metal waste line failure was detected near section R-3 on the south side of the 221-B Building. The dose rate at ground surface level was 400 rad/hr. The leak was confirmed by hydrostatic testing. Operations were halted for 6 days to change the waste routing and cover the area with several feet of gravel. A portion of the area had caved in. The excavated contaminated soil was taken to the Dry Waste Burial Ground. The excavation was backfilled. After covering the contamination, the dose rate was reduced to 100mrad/hr.
UPR-200-E-85	UPR-200-E-85, Line Leak at 221-B Stairwell R-13, UN-216-E-13, UPR-200-E-41, UN-200-E-85, UN--200-E-41	UPR-200-E-85 occurred south of the center of the 221-B Building, near the R-13 Utility Pit.	The release occurred in July 1972.	The unencased transfer line from Ion Exchange Tank 18-1, in the 221-B Building, to the 241-BX-154 Diversion Box.	The waste line contained ion exchange waste from Tank 18-1, located inside the B Plant canyon. Soil samples collected in 1972 identified the release as predominantly Cs-137. Approximately 30 Ci of cesium were released, but half of the release was removed with the soil excavated to expose the line leak.	4.57 m (5.00 ft)	15.24 m x 15.24 m (50 ft x 50 ft)	During a routine survey, an unencased transfer line from the ion exchange tank 18-1, in the 221-B building, to the 241-BX-154 Diversion Box was found to have leaked process waste near the R-13 Utility Pit. The contaminated waste apparently seeped through a wall joint and ran into the electric utility pit. Radiation measurements were taken near the bottom of the pit. The measurements read 15 rad/hr 5 cm (2 in.) from the source.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-E-87	UPR-200-E-87, UN-216-E-15, 224-B South Side Plutonium Ground Contamination, UN-200-E-87, 216-E-15	The UPR-200-E-87 site is located on the south side of the 224-B Building in the 200 East Area.	No confirmed release occurred.	Underground pipelines located on south side of the 224-B Building	N/A	N/A	N/A	Suspected leak into the soil from underground pipelines located on south side of the 224-B Building based on discovery of a large amount of plutonium-contaminated soil during excavating near pipelines at 224-T in 1972.
UPR-200-E-96	UPR-200-E-96, Ground Contamination SE of PUREX, UN-216-E-24, UN-200-E-96	The release site include contaminated areas on the south and east sides of PUREX.	N/A	The release site is associated with 200-E-103, 200-E-107, the 291-A Stack and the 241-A-151 Diversion Box	N/A	N/A	Approximately 1 ha (2.5 acres)	From a conversation with Harold Maxfield on October 8, 1981, it was determined the area had became contaminated by residual specks from the 291-A Stack operation and work activities in the 241-A-151 Diversion Box during PUREX Plant operations.
UPR-200-E-117	UPR-200-E-117, Contaminated Liquid Spill, UN-200-E-117	The spill occurred on the south side of the 202-A Building, west of the railroad tunnel	The release occurred in April 1972.	The site is associated with the 241-A-151 Diversion Box	N/A	N/A	N/A	While excavating an encased waste line on April 20, 1972, employees encountered liquid spurting up from the ground in the hole they had dug. The excavation was within a few inches of the top of the encasement. Personnel were evacuated from the caisson in which they were working.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
Septic Tanks								
2607-W3 Septic Tank (Rep. Site)	2607-W3	This unit lies northeast of the 241-T-361 Settling Tank, approximately 61 m (200 ft) north of 23rd St and 244 m (800 ft) southwest of the 224-T Building.	1944 to 1996	The 2607-W1 Septic Tank is associated with the 2607-W1 drain field, 2707-W, 2713-W, 283-W, 277-W, 275-W, 274-W, 284-W, 2723-W, 2704-W, 2719-WB, 272-W, MO-278, MO-279, MO-235, MO-406, MO-412, MO-215, MO-056, MO-204, MO-240, and MO-287.	N/A	N/A	6.4 m x 2.74 m x 3.81 m	In August 1996, under Project W-396, the 2607-W3 Septic Tank was pumped, filled with sand and abandoned in place. The 2607-W3 Septic Tank was constructed of reinforced concrete. At one time, the eastern access was posted with a "Radioactive Material" sign. This system includes a drain field that was expanded in the 1950's. The 2607-W3 effluent was redirected to the 2607-W1 system. The tie-line is expected to remain operational for the rest of the Hanford Site mission. A contaminated process sewer line runs parallel to the sanitary sewer line in this area.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-E3 Septic Tank	2607-E3, 2607-E3 Septic Tank and Drainfield, 2607-E3 Septic System, TFS of 218-E-4, Tile Field South of 218-E-4	This unit is located approximately 100 m (400 ft) north of the 221-B Building. The drain field is located north of the septic tank and south of the 218-E-4 Burial Ground.	1948 to 1997	The 2607-E3 system is associated with B Plant facilities.	N/A	N/A	8.74 m x 2.74 m x 4.11 m	The site is a septic tank and drain field surrounded with a chain and marked with a sign that reads "Sanitary Sewer/Drain Field." The septic tank is constructed of reinforced concrete tank 8.7 m (28 ft 8 in) long, 2.7 m (9 ft) wide, and 3.8 m (12 ft 6 in) deep (interior dimensions). The tank had a design capacity of 38,680 L (10,220 gal) based on a user capacity of 292 persons, a flow of 132 L (35 gal) of sewage per capita per day, and an average detention time of 1 day. The top of the tank is at the ground surface. The tank was accessed through three 0.9 m (3-ft) access ports. The drain field consists of at least 712 m (2,336 ft) of vitrified clay pipe or drain tile (at least 2.4 m [8 ft] per capita). The laterals are open jointed and are spaced 2.4 m (8 ft) apart. The system was replaced with the new regional system under Project L-272.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-E4 Septic Tank	2607-E4, 2607-E4 Septic Tank and Tile Field	The 2607-E4 Septic Tank is located northeast of the 221-B Building. The tile field is northeast of the tank.	1963 to 1998	The 2607-E3 Septic System was associated with B-Plant facilities.	N/A	N/A	1.22 m x 0.61 m x 2.53 m	The septic tank and tile field are marked with a "Sanitary Sewer/Drain Field" sign and lie within a posted URM area. The 2607-E4 Septic Tank is constructed of reinforced concrete that drains to an adjacent tile field. DOE/RL-92-05 states that this system is not known to contain radionuclide or hazardous chemicals. However, the site is posted with URM signs. No information has been located to explain the radiological posting.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-E9 Septic Tank	2607-E9, 242B/BL Septic Tank	This unit lies north of the 207-B Retention Basin and east of the 242-B Building.	1951- present	The 2607-E7B Septic System is associated with the 209-E, 2704-C, 2718-E, MO-337 (moved) and the MO-543 (moved) Buildings. This system is in series with the 2607-E5, 2607-E7A septic tanks and a leaching trench.	N/A	0.46	30.48 m x 3.66 m capacity 5,678 liters	This 1,900 L (500-gal) septic tank received sanitary wastewater and sewage from the 242-B and the 242-BL Buildings. This system has an associated drain field. It was abandoned and the tank was filled with sand. The site is in a contamination area. A brief visit was made to the site in February 2000 to find the drain field and to try to improve the mapping of the site. A "Drainfield" sign was found on the ground on the east side of the contamination area that surrounds the site. The former extent of the drain field can be approximated using fence posts inside the contamination area (some of which still have chain attached), fallen chain on the ground plus the fence posts making up the eastern boundary of the contamination area. No access ports, lids, or risers associated with the septic tank were

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-E9 Septic Tank (con't)								visible. Evidence of the septic tank may have been obscured by tumbleweeds growing in the center of the contamination area near the drain field. The area of the 242-B Building, where the 2607-E9 Septic Tank and associated drain field are located, is barricaded with light-duty chain with "Contamination Area" signs. Contaminated particulate releases from the B Tank Farm are the most likely source for the contamination.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-EE Septic Tank	2607-EE Septic System	The septic tank is located northeast of 202-A, east of the railroad cut, inside the PUREX exclusion fence.	1956 to 1999	The site is associated with the 202-A Facility and 200-E-107 stabilized area	N/A	N/A	18 m x 18 m	The site is a septic tank with a drain field extending northeast of the septic tank. The area is surrounded with light-duty posts and chain. One riser pipe is visible. The unit is not being used, and is believed to be blanked off. The system was scheduled to be abandoned in 1999. The septic system is located within a larger radiologically posted area known as 200-E-107. The 200-E-107 Contamination Area was surface stabilized in the summer of 2001 and downposted to an underground radioactive material area. This site was incorrectly identified in BHI-00178 as 2607-EL. The unit received sanitary wastewater and sewage from the PUREX Facility. The source area is in a potentially contaminated zone; therefore, the waste has the potential of being contaminated.
2607-W4 Septic Tank	2607-W4, T Plant Septic Tank and Drain Field	This unit lies northwest of the 221-T Canyon Building and southwest of the 216-T-1 Ditch.	1944 to 1998	The 2607-W3 Septic Tank is associated with the 221-T, the 222-T, the 224-T, and the 271-T Buildings.	N/A	N/A	1.31 m x 0.61 m	The 2607-W4 Septic Tank is a single-compartment tank constructed of reinforced concrete. The drain field measures 3.1 m by 9.2 m (10 by 30 ft). The site is surrounded by a light-duty chain barricade. At one time the area was marked with surface contamination

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-W4 Septic Tank (con't)								warning signs. A site visit in October of 1998 indicates the area no longer is a radiation area. This system includes a drain field and receives sanitary wastewater and sewage from the 221-T Canyon Building. In 1991, the 2607-W4 septic system was within a radiological zone. In 1998, the area had been down-posted. The septic tank was abandoned in June 1998, per WAC 246-272-18501 requirements. The lid was left on, but the inlet and outlet piping were grouted. The septic tank was filled with sand. The drain field remains in place.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-W7 Septic Tank	2607-W7, Septic Tank	This unit lies 14 m (45.9 ft) north of the northernmost corner of the 221-U Canyon Building.	1954 to 1999	This unit is associated with the northernmost corner of the 221-U Canyon Building.	No radioactive materials are known to have been released to the system.	N/A	1.22 m x 0.61 m with capacity of 908 liters	The 2607-W7 Septic Tank was a small 950 L (350-gal) tank constructed of reinforced concrete. The septic system was abandoned in 1999 in accordance with WAC 246-272. The septic tank has been pumped, filled with sand, and abandoned in place. By agreement with the WDOH, the system lids were left in place. A site visit in 1999 found the septic tank to be located between two underground radioactive material areas. The location of the drain field was visually not apparent. HNF-SD-LL-SP-001 shows the drain field west of the septic tank.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-W8 Septic Tank	2607-W8	This unit lies northeast of the 231-Z Building and east of the 216-Z-16 Crib.	1944 to 1998	The 2607-W7 Septic Tank is associated with the 221-U Canyon Building.	N/A	N/A	5.94 m x 1.83 m x 3.66 m	This system is located adjacent to a posted radiation zone containing the 216-Z-5 and 216-Z-4 Cribs. The 2607-W8 Septic Tank is constructed of reinforced concrete and has three access port covers visible on the surface. It is a single-compartment tank with an attached dosing siphon. This unit includes a tile field. The site is marked with a sign that read "Septic Tank - 2607-W8." The 2607-W8 Septic Tank is associated with a sanitary tile field and the 231-Z Building. The system was abandoned 1998 in accordance with WAC 246-272.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-Z Septic Tank	2607-Z	This unit lies east of the 236-Z Building and southeast of the 234-5Z Building.	1949 to present	The 2607-Z Septic Tank is associated with the 234-5Z, 2704-Z, 270-Z, 236-Z, 292-Z, 2701-Z, 2701-ZA, and 2701-ZB Buildings	N/A	N/A	10.97 m x 3.35 m x 7.01 m	The 2607-Z Septic Tank and drain field lie in a fenced area. The concrete two-chamber septic tank has three access ports for personnel entry. The drain field measures approximately 59 m (150 ft) long and 110 m (280 ft) wide, located in an otherwise flat field. This system was replaced. An upgrade or replacement of the existing system was necessary as this unit was well beyond its useful life. The new regional system also serves the 2607-Z1, the 2607-WL, and the 2607-WB systems.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
2607-Z1 Septic Tank	2607-Z1, Septic Tank and Drainfield	The site is located west of the 2721-Z Building.	1944 to 1997	The 2607-Z Septic Tank is associated with the 234-5Z, 2704-Z, 270-Z, 236-Z, 292-Z, 2701-Z, 2701-ZA, and the 2701-ZB Buildings.	N/A	N/A	2,839 liters	The septic tank and drain field were constructed in 1958 and have been pumped weekly for the past few years. The drain field has been used as a lay-down area in the past and the underground laterals could have been damaged. The septic system was abandoned per the requirements of WAC 246-272-1851. All seepage inside the tank was removed and the empty tank was filled to eliminate void spaces. No records of sampling during abandonment are available. By agreement with the WDOH, the septic system lids were left in place.
TFS OF 218-E-4 Drain/ Tile Field	TFS OF 218-E-4, Tile Field South of 218-E-4, 2607-E3 Tile Field	This tile field is located southwest of the 218-E-4 Burial Ground and north of the 2607-E3 Septic Tank.	1944 to 1997	This tile field is associated with the 2607-E3 Septic Tank and received sanitary wastewater and sewage from B Plant Facilities.	N/A	N/A	N/A	The tile field south of the 218-E Burial Ground consists of vitrified clay pipe and drain tile. The laterals of the tile field are open jointed and are spaced 7.9 ft (2.4 m) apart. The tile field was entered into the WIDS as a separate waste site from the septic tank. The tank and tile field have been consolidated into the 2607-E3 site to be consistent with other septic systems at the Hanford Site.

Table C-5. Summary of Information for the 200-IS-1 and 200-ST-1 Waste Sites Included in This Work Plan. (24 Pages)

Site Code Type	Site Names	Location	Dates of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description

ARH-780, 1968, *Chronological Record of Significant Events in Chemical Separations Operations*, Atlantic Richfield Hanford Company, Richland, Washington.

DOE/RL-92-05, 1993, *B Plant Source Aggregate Area Management Study Report*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

HNF-SD-LL-SP-001, 1998, *200 and 600 Areas Sanitary Wastewater Master Plan*, Fluor Hanford, Inc., Richland, Washington.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

WAC 246-272, "On Site Sewage Disposal," *Washington Administrative Code*, as amended.

WIDS, *Waste Information Data System Report*, Hanford Site database.

cpm = Counts per minute
REDOX = Reduction-Oxidation (Plant or process).
IMUST = Inactive miscellaneous underground storage tank.
N/A = Not available.
NPH = normal paraffin hydrocarbon.
PUREX = Plutonium-Uranium Extraction (Plant or process).
TBP = Tributyl phosphate.
UNH = uranyl nitrate hexahydrate
UPR = Unplanned release.
URM = Underground radioactive material.
WAC = *Washington Administrative Code.*
WDOH = Washington State Department of Health.
WIDS = Waste Information Data System.

Table C-6. 200-IS-1 and 200-ST-1 Operable Unit Conceptual Contaminant Distribution Model and Associated Waste Sites.[1]

Tank/Vault Conceptual Contaminant Distribution Model
241-CX Tank System* (FH - Semi Works) **Hexone Storage and Treatment Facility[2] (FH – REDOX)** 200-W-16 Storage Tank (FH - 292-T Building) 241-WR Vault (FH-U Plant)
Diversion Box Conceptual Contaminant Distribution Model
200-W-59 Diversion Box (FH-NMSP - PFP) 200-W-58 Diversion Box (FH-NMSP - PFP) HSVP Valve Pit (FH - Semi Works)
Pipeline Conceptual Contaminant Distribution Model
200-E-111 Encased Pipeline (Note: Waste Site is used to collect data on conceptual model only. The site is the programmatic responsibility of ORP) UPR-200-W-2 (FH-WMP - T Plant), UPR-200-W-98 (FH-WMP - T Plant), UPR-200-W-2 (FH T Plant), UPR-200-W-98 (FH T Plant), UPR-200-W-102 (FH T Plant), UPR-200-W-114 (FH S Plant), UPR-200-W-164 (FH U Plant), UPR-200-W-32 (FH S Plant), UPR-200-W-33 (FH U Plant), UPR-200-W-35 (FH S Plant), UPR-200-E-1 (FH B Plant), UPR-200-E-3 (FH B Plant), UPR-200-E-44 (FH B Plant), UPR-200-E-80 (FH B Plant), UPR-200-E-85 (FH B Plant), UPR-200-E-87 (FH B Plant), UPR-200-E-96 (FH PUREX), UPR-200-E-117 (FH PUREX)
Septic Tank System Conceptual Contaminant Distribution Model
2607-W3 Septic Tank (FH T Plant) 2607-E3 Septic Tank (FH B Plant facilities) 2607-E4 Septic Tank (FH B Plant Facilities) 2607-E9 Septic Tank (FH RCP-242-B/242-BL) 2607-EE Septic Tank (FH-202A) 2607-W4 Septic Tank (FH T Plant) 2607-W7 Septic Tank (FH U Plant) 2607-W8 Septic Tank (FH 231-Z) 2607-Z Septic Tank (FH PFP) 2607-Z1 Septic Tank (FH PFP) TFS of 218-E-4 Drain/Tile Field (FH B Plant)

[1]RCRA TSD Units and Representative Sites appear in **bold face type**)
[2]Treatment, storage, and disposal site.

FH = Fluor Hanford, Inc.
PFP = Plutonium Finishing Plant.
PUREX = Plutonium-Uranium Extraction (process or Plant)
REDOX = Reduction-Oxidation (process or Plant)
TFS = Tank farm surveillance.

THIS PAGE INTENTIONALLY
LEFT BLANK