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Operable Unit 3-14 Tank Farm Soil and Groundwater Phase I Remedial Investigation/ Feasibility Study Work Plan

INEEL
IDAHO NATIONAL ENGINEERING & ENVIRONMENTAL LABORATORY

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ABSTRACT

This Work Plan for the Waste Area Group 3, Operable Unit (OU) 3-14, remedial investigation/feasibility study (RI/FS) is the planning document for the remedial investigation, baseline risk assessment, and feasibility study for contaminated soil in the Tank Farm, the former Idaho Nuclear Technology and Engineering Center (INTEC) injection well and Snake River Plain Aquifer (SRPA) within the INTEC fence line, and three additional soil sites from OU 3-13 that were assigned to OU 3-14 in the OU 3-13 Record of Decision for the INTEC. Operable Unit 3-14 was created by the U.S. Department of Energy, Idaho Operations Office; the U.S. Environmental Protection Agency, Region 10; and the Idaho Department of Health and Welfare, Division of Environmental Quality, because of several unresolved issues and uncertainties associated with the OU 3-13 Comprehensive RI/FS. These issues and uncertainties impeded selection of a final remedy for the sites cited above, as required under the Comprehensive Environmental Response, Compensation, and Liability Act.

The Work Plan describes historical site information, the data collection tasks, and proposed methodology for data use and interpretation associated with the production of a RI/FS report that supports selection of a remedial alternative to address contamination in subsurface soil and in the injection well and aquifer within the INTEC perimeter. Site data will be collected to support the selection of the final remedy for the Tank Farm soil, the INTEC injection well and the Snake River Plain Aquifer within the INTEC fence line, and the three additional sites from OU 3-13 using two characterization investigation phases.

Phase I will involve (1) collecting field-screening gamma-radiation data and initial soil-characterization data from Tank Farm soil, (2) coring the sealed INTEC injection well and installing aquifer wells around the well, (3) preparing technical papers for OU 3-14, and (4) reevaluating site information for the three soil sites from OU 3-13. The scope of the Phase II activities will depend on the results of the Phase I efforts but will involve, at a minimum, more detailed soil characterization of hot spots within Tank Farm soil, soil moisture monitoring at the Tank Farm, and additional groundwater monitoring data from the aquifer wells around the injection well. The risk assessment and groundwater modeling strategy will be determined after the results of Phase I activities have been evaluated. Treatability studies also may be conducted using both non-radioactive and radioactive soil from the Tank Farm. Feasibility studies will be prepared evaluating remedial alternatives on the basis of the new data.

The implementation of the OU 3-14 RI/FS will result in a timely selection of remediation options for the OU.

SUMMARY

This Work Plan for the Waste Area Group (WAG) 3, Operable Unit (OU) 3-14, remedial investigation/feasibility study (RI/FS) is the planning document for the remedial investigation, baseline risk assessment, and feasibility study for contaminated soil in the Tank Farm, the former the Idaho Nuclear Technology and Engineering Center (INTEC) injection well and Snake River Plain Aquifer within the INTEC fence line, and three additional soil sites from OU 3-13 that were assigned to OU 3-14 in the OU 3-13 Record of Decision (ROD) for the INTEC. The project was initiated in compliance with the 1991 Federal Facility Agreement and Consent Order (FFA/CO) implemented under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) at the Idaho National Engineering and Environmental Laboratory (INEEL).

The current level of understanding of OU 3-14 sites is inadequate to make risk-based management decisions or to select appropriate remedies for Tank Farm soils and the former INTEC injection well and Snake River Plain Aquifer within the INTEC fence line. Therefore, an investigation of OU 3-14 sites is needed to reduce the level of uncertainty. This Work Plan summarizes what is known about the affected environment, the nature and extent of contamination, and risks posed by contamination. Data gaps are identified and tasks are described to gather additional information. The data will be used to assess the future fate and transport of contamination, to calculate risks to receptors, to compare to regulatory requirements, and to select appropriate remedies.

Over the next several years, the U.S. Department of Energy will close the eleven 300,000- and 318,000-gal and four 30,000-gal underground tanks within the Tank Farm because they do not comply with Resource Conservation and Recovery Act (RCRA) secondary containment requirements.

All known release sites within the INTEC were evaluated in the WAG 3 OU 3-13 Comprehensive RI/FS, which was finalized in December 1997. Because of greater than anticipated uncertainties associated with source estimation, contaminant mobility, and levels of contamination, a final remedy could not be selected for the sites. In January 1998, negotiations were begun between the U.S. Department of Energy, Idaho Operations Office (DOE-ID); the U.S. Environmental Protection Agency (EPA), Region 10; and the Idaho Department of Environmental Quality (IDEQ) to create the OU 3-14 RI/FS. The scope of the OU 3-14 RI/FS includes the contaminated soil at the INTEC Tank Farm, any residual contamination that may remain in the former INTEC injection well and the aquifer within the INTEC fence line, and contaminated soil within the three additional sites assigned to OU 3-14 from OU 3-13 in the OU 3-13 ROD.

Operable Unit 3-14 comprises one overarching site, CPP-96, the former INTEC injection well site, CPP-23, and the three sites carried over from OU 3-13:

- Site CPP-96. This site incorporates Tank Farm soil sites as defined in the OU 3-14 Scope of Work, CPP-15, CPP-20, CPP-25, CPP-26, CPP-27, CPP-28, CPP-31, CPP-32, CPP-33, CPP-58, CPP-79, and CPP-96, as well as three Tank Farm soil sites, CPP-16, CPP-24, and CPP-30, that were screened out for further action in the OU 3-13 RI/FS. In the OU 3-13 ROD, all Tank Farm soils and CERCLA sites were consolidated into CPP-96 to facilitate selection of remediation alternatives for the entire Tank Farm.

- Site CPP-23, the former INTEC injection well. The activities associated with this site also include all contamination in the Snake River Plain Aquifer within the INTEC fence line.
- Sites CPP-61, CPP-81, and CPP-82. These three sites were carried over to OU 3-14 from OU 3-13 because DOE-ID, EPA, and IDEQ determined that the data for these sites used in the OU 3-13 RI/FS were inadequate to make remediation decisions as required by CERCLA. The OU 3-13 ROD consolidated the three sites to OU 3-14 with all previously identified Tank Farm soil release sites and the intenstitial soils within the CPP-96 boundary.

The Work Plan provides historical site information, and describes the data collection tasks, and the proposed methodology for data use and interpretation associated with the performance of a RI/FS and production of a RI/FS report that supports selection of a remedial alternative to address contamination in subsurface soil and in the injection well and aquifer within the INTEC fence line. Site data will be collected to support the final remedy for the Tank Farm soil, the INTEC injection well and Snake River Plain Aquifer within the INTEC fence line, and the three additional sites from OU 3-13 using two characterization investigation phases.

Phase I will involve (1) collecting field-screening gamma-radiation data and initial soil-characterization data from Tank Farm soil, (2) coring the sealed INTEC injection well and installing aquifer wells around the well, (3) preparing technical papers for OU 3-14, and (4) reevaluating site information for the three soils sites carried over from OU 3-13. The scope of the Phase II activities will depend on the results of the Phase I efforts but will involve, at a minimum, more detailed soil characterization of hot spots within Tank Farm soil, soil moisture monitoring in the Tank Farm, and additional groundwater monitoring data from the aquifer wells around the injection well. Risk assessment and groundwater strategies will be determined after the Phase I data have been reviewed. Treatability studies also will be conducted using both cold and hot soil from the Tank Farm. Feasibility studies will be prepared evaluating remedial alternatives on the basis of the new data.

The implementation of the OU 3-14 RI/FS will allow timely selection of remediation options.

The objectives of the OU 3-14 RI/FS are as follows:

Tank Farm Soil

- Evaluate process knowledge, facility documentation, and sampling of secondary sources in the environment to develop an estimate of the quantities of contaminants released to the environment through spills, leaks, and the disposal of waste liquids.
- Define the distribution, quantities, and concentrations of contaminants, especially plutonium isotopes, in Tank Farm soil to estimate soil volume and waste types requiring remediation.

- Collect site-specific soil chemistry and soil distribution coefficients (K_ds) for the contaminants of concern (COCs) defined in the OU 3-13 RI/FS and ROD, especially plutonium isotopes, for use in risk analysis and in understanding long-term risk reduction needs when evaluating remedial alternatives.
- Collect site-specific data to better bound and estimate the total contaminant mass source term in the soil for the contaminant transport simulations, in order to reduce the uncertainty of release estimates to the environment and the risks calculated for the Tank Farm.
- Define the soil waste types and volumes requiring remediation. Process knowledge indicates that high-level and low-level waste, high-activity waste, mixed waste (including suspected listed hazardous constituents), and transuranic (TRU) waste may be present in Tank Farm soil.
- Provide data for use in evaluating remedial alternatives for residual contamination waste types (if required) dealing with high-radiation fields during excavation, treatment, storage, and disposal.
- Provide a better understanding of moisture migration and the contaminant flux through Tank Farm soil.
- Develop a list of alternatives for remediating Tank Farm soil and evaluate alternatives using the nine CERCLA criteria established for remediation selection.

Injection Well and Aquifer Within the INTEC Fence Line

- Evaluate process knowledge, facility documentation, and sampling of secondary sources within the Snake River Plain Aquifer within the INTEC fence line to develop an estimate of the quantities of contaminants released to the environment through the injection of waste into the SRPA
- Define the distribution, quantities, and concentrations of contaminants in the INTEC injection well (CPP-23) and subsequent secondary sources from the injection of waste into the SRPA within the INTEC fence line to define their contribution of the risk to the groundwater pathway
- Develop a list of alternatives for remediating the injection well, if it poses an unacceptable risk, and evaluate alternatives using the nine CERCLA criteria established for remediation selection.

Additional Sites from OU 3-13

- Collect and review existing site-specific data for three sites assigned to OU 3-14 from OU 3-13 in the OU 3-13 ROD. Sites CPP-61, CPP-81, and CPP-82 will require further assessment because DOE-ID, EPA, and IDEQ determined that data for sites used in the OU 3-13 RI/FS were inadequate to make remediation decisions for the sites. The information derived from the data review will be summarized in a technical report for each site and reviewed by DOE-ID, EPA, and IDEQ.

To meet the objectives of the OU 3-14 RI/FS, several areas of uncertainty will be investigated, as described below.

From 1953 to 1992, INTEC reprocessed spent nuclear fuel, during which a variety of liquid waste was generated. High-level liquid waste was typically 1 to 3 molar nitric acid containing fission products, transuranic elements, and metals such as mercury and cadmium. The high-level liquid waste was sent to the underground Tank Farm for temporary storage. Other radioactive liquid waste was sent to the Tank Farm for storage or was sent to the Process Equipment Waste (PEW) Evaporator for concentration. The concentrated evaporator bottoms were sent to the Tank Farm for temporary storage. Liquid waste in the tanks was subsequently solidified for more secure extended storage. During transfers of waste liquids and maintenance operations, a number of spills and leaks occurred releasing liquid waste into the soil of the Tank Farm.

Risk from Tank Farm soil cannot be estimated with available data. The principal sources of uncertainty involved with estimating risk and selecting remedial alternatives for Tank Farm soil are:

- The total activity in the Tank Farm soil source
- The possible presence of other sources, not yet identified
- The volume and depth distribution of contaminated material
- The mobility of contaminants
- How contaminants react with geologic materials to retard their movement relative to the movement of water.
- The amount of water moving through Tank Farm soil
- The rate and timing of the release of contaminants from the source in surface soil to underlying basalt
- The activity and form of residuals left in the underground tanks after closure
- Material properties for assessment of treatment alternatives.

The condensate from the PEW Evaporator was combined with other plant process wastewater for disposal. From 1953 to 1982, these process wastewaters were disposed of to the Snake River Plain Aquifer through the injection well. In 1982, this water was rerouted to infiltration ponds. The injection well mainly discharged process wastewater directly into the aquifer. The injection well was abandoned and grouted in 1986, and sludge was left in the wellbore. The impact of the injection well on the water quality of the aquifer has been monitored for the past 40 years by the U. S. Geological Survey. The monitoring looked at mobile contaminants, sludge, and other residuals together, not at their individual contributions. With the closure of the injection well, the major contaminants in the injection well currently are contained in the sludge in the borehole. But the sludge and the area around the injection well have not been characterized to establish their contribution of risk to the aquifer within the INTEC fence line. Existing aquifer monitoring data are not sufficient to demonstrate that this sludge or other residuals from the injection of waste into the SRPA do not pose a long-term risk to human health.

The principal sources of uncertainty in estimation of risk and selection of a remedial alternative for the injection well comprise the following:

- Residual contamination within and near the wellbore and the mobility of any residual contamination
- The presence of contamination in the interbed lying between the H and I basalt flows, identified as the HI interbed (at a depth of 177 to 183 m [580 to 600 ft]) within the Snake River Plain Aquifer.

Inadequate data used in the OU 3-13 RI/FS for the three additional sites from OU 3-13, Sites CPP-61, CPP-81, and CPP-82, precluded making remediation decisions for these three sites.

A drilling and sampling program will be undertaken to obtain data on the nature and extent of contamination, to better refine the source, to look for additional sources and to obtain information on material properties of the Tank Farm soil. Wells will be drilled and completed around the area of the injection well in the Snake River Plain Aquifer within the INTEC fence line. Aquifer characterization and monitoring will permit assessment of the injection well as a continuing secondary source of contamination to the aquifer. Soil samples will be collected from Tank Farm soil to quantify the amount of contamination in the source and to look for additional sources. The primary target of additional sources is sources that pose a risk to the aquifer.

To predict the fate and transport of contaminants, the volume of water available to carry contaminants downward must be determined. The volume will be calculated by quantifying plant operations water releases, precipitation, evaporation, and moisture movement in the Tank Farm soil. Contaminants interact with geologic materials, and through this interaction are slowed relative to the movement of water. Laboratory studies on soil will be conducted to quantify such interaction for Tank Farm soil. The effects of the low pH of the initial releases will be addressed. Measurements of contaminants and other tracer species in soil can be used to calibrate the transport portions. From these investigations, an understanding of the geologic framework, the volume of water available to carry contaminants, and the interactions of contaminants with geologic materials will be developed. The understanding will be used to predict the fate of contaminants as they migrate through the Tank Farm soil.

A variety of potential technologies and techniques will be examined in the OU 3-14 feasibility study to determine whether they are plausible remedial solutions. A preliminary list of potential remedial technologies and techniques has been developed. Remedial technologies are grouped according to general response actions, which are broad descriptions of the remedial techniques that could be used to satisfy the remedial action objectives. Each general response action includes several specific technologies or techniques that will be evaluated to determine whether the action will satisfy the remedial action objectives. Treatability studies are planned to determine the viability of remedial alternatives. The studies would be used to demonstrate the technical feasibility of an alternative or to refine a technology for application to the unique circumstances of the Tank Farm and the injection well and aquifer within the INTEC fence line. In addition, the studies may be necessary to obtain accurate cost information for alternative comparison.

The organization of the Work Plan is described below:

- Section 1 contains introductory material

- Section 2 provides information related to the current status and operational history of the Tank Farm and the former INTEC injection well to aid in identifying data needs for the Work Plan
- Section 3 summarizes an initial evaluation of the work performed in the OU 3-13 RI/FS
- Section 4 summarizes the Work Plan rationale
- Section 5 presents identified RI/FS tasks including the characterization investigations that will be performed
- Section 6 contains the proposed schedule for OU 3-14 RI/FS activities
- Section 7 explains the project management plan
- Section 8 contains a compilation of the references used in the Work Plan

Information in the main body of the report is supplemented with several appendices and attachments. Appendices A through F support the Tank Farm history discussion in Section 2. Appendix G summarizes an investigation of potential release sites.

The following attachments to the Work Plan provide procedures for implementing RI/FS activities:

- *Phase I Tank Farm Soil Field Sampling Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study* directs Tank Farm soil field sampling activities and contains detailed procedures for collecting and analyzing data
- Phase I Idaho Nuclear Technology and Engineering Center Injection Well Field Sampling Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study directs INTEC injection well field sampling activities and contains detailed procedures for collecting and analyzing data
- *Phase 1 Waste Management Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study* identifies the waste types and quantities expected to be generated during the implementation of the RI/FS.
- *Phase I Tank Farm Soil Health and Safety Plan for the Operable Unit 3-14 RI/FS* establishes the procedures and requirements that will be used to eliminate or minimize health and safety risks to persons performing tasks for the Tank Farm soil
- Phase I Idaho Nuclear Technology and Engineering Center Injection Well Health and Safety Plan for the Operable Unit 3-14 Remedial Investigation/Feasibility Study establishes the procedures and requirements that will be used to eliminate or minimize health and safety risks to persons performing tasks for the injection well drilling and sampling project

- *Quality Assurance Project Plan for Waste Area Groups 1, 2, 3, 4, 5, 6, 7, 10 and Inactive Sites* includes procedures designed to ensure the integrity of samples collected, the precision and accuracy of the analytical results, and the representativeness and completeness of environmental measurements collected for CERCLA projects at the Idaho National Engineering and Environmental Laboratory (INEEL)

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ACRONYMS AND ABBREVIATIONS

AA	alternative actions
AOC	area of containment
ANL-W	Argonne National Laboratory West
ARAR	applicable or relevant and appropriate requirement
BLM	Bureau of Land Management
BRA	baseline risk assessment
bgs	below ground surface
CDL	conservation data center
CEC&C	closure evaluation criteria and checklist
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CLP	contractor laboratory program
COC	contaminant of concern
COPC	contaminant of potential concern
cpm	counts per minute
CPP	Chemical Processing Plant
CPT	cone penetrometer test
CSCR	cursory subcontractual compliance review
CSSF	Calcined Solids Storage Facility
D&D&D	deactivation, decontamination and dismantlement
DEQ	Idaho Department of Environmental Quality
DOE	U.S. Department of Energy
DOE-ID	U.S. Department of Energy, Idaho Operations Office
DQO	data quality objective
DR	decision rule

DS	decision statement
ECA	environmental controlled area
EDP	electrical dissolution process
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ERIS	environmental restoration information system
ESRP	Eastern Snake River Plain
FAST	Fluorinel Dissolution and Process Storage Facility
FDP	fluorinel dissolution process
FFA/CO	Federal Facility Agreement and Consent Order
FS	feasibility study
FSP	field sampling plan
HASP	health and safety plan
HDR	hydrologic data repository
HLLW	high-level liquid waste
HLW	high-level waste
HLW&FD EIS	High-Level Waste & Facilities Disposition Environmental Impact Statement
HWMA	Hazardous Waste Management Act
ICDF	INEEL CERCLA Disposal Facility
ICPP	Idaho Chemical Processing Plant
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDW	investigation-derived waste
IEDMS	integrated environmental data management system
INEEL	Idaho National Engineering and Environmental Laboratory

INTEC	Idaho Nuclear Technology and Engineering Center
LDR	land disposal restrictions
LDUA	light duty utility arm
LET&D	liquid effluent treatment and disposal facility
LLW	low-level waste
MCL	maximum contaminant level
MCP	management control procedure
MDL	method detection limit
MIBK	methyl isobutyl ketone
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NRF	Naval Reactor Facility
NRTS	national reactor testing station
NSI	new site identification
NWCF	New Waste Calcining Facility
OU	Operable unit
PCB	polychlorinated biphenyls
PEW	process equipment waste
PRG	preliminary remediation goal
PSQ	principal study question
QAPjP	quality assurance project plan
RAF	Remote Analytical Facility
RAGS	Risk Assessment Guidance for Superfund

RAL	radiological analysis laboratory
RAO	remedial action objective
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
RD/RA	remedial design/remedial action
RG	regulatory guide
RI	remedial investigation
RI/BRA	remedial investigation/baseline risk assessment
RI/FS	remedial investigation/feasibility study
ROD	record of decision
RPD	relative percent difference
RSD	relative standard deviation
RWMC	Radioactive Waste Management Complex
RWMIS	radioactive waste management system
SIR	submarine intermediate reactor
SMO	sample management office
SNF	spent nuclear fuel
SOW	scope of work
SRPA	Snake River Plain Aquifer
SSSTF	staging, storage, stabilization and treatment facility
SVOC	semivolatile organic compound
TAN	Test Area North
TBC	to be considered
TBP	tributyl phosphate
TCLP	toxicity characteristic leaching procedure
TLD	thermoluminescent dosimeter

TPR	technical procedure
TRA	Test Reactor Area
TRU	transuranic
TSCA	Toxic Substances Control Act
UREP	utilities replacement and expansion project
USGS	U.S. Geological Survey
VOC	volatile organic compound
VOG	vessel offgas
WAG	waste area group
WCF	Waste Calcining Facility
WIPP	Waste Isolation Pilot Plant
WIR	waste incidental to reprocessing

DEFINITIONS

The following definitions that apply to current or former Idaho Nuclear Technology and Engineering Center operations are provided to facilitate understanding of the material within this Work Plan:

- **Bottoms**—That portion of the material in an evaporation process that does not vaporize but remains in the body of the evaporator. Evaporator bottoms may be transferred as a batch or collected continuously in an overflow tank. The batch style is used in the Process Equipment Waste (PEW) Evaporator (in the Waste Treatment Building [CPP-604]) and in the High-Level Liquid Waste (HLLW) Evaporator (in the New Waste Calcining Facility) (NWCF) (CPP-659). The continuous style was used historically in the INTEC in the Fuel Processing facility (CPP-601) and is used in the Liquid Effluent Treatment and Disposal facility (LET&D) (CPP-1618) in the fractionating column (a series of multiple boiling and condensing steps).

- **Calcine**—Liquid radioactive waste that has been converted to a solid granular form. During the calcination process, the liquid in the radioactive waste is evaporated and the dissolved metals and fission products are converted to salts and oxides. Each granule is about 0.3 to 0.7 mm (0.01 – 0.03 in.) in size. Calcination typically reduces the volume of liquid waste by 2 to 10 times. Calcination at the INEEL is performed at the NWCF.

- **Heel**—The heel is the liquid and solid residue left in a tank after all possible waste has been removed using installed transfer jets. At the Tank Farm, the depth of the liquid heel typically varies from 7.6 – 254 mm (3 to 10 in.). The amount of that remains after the use of the installed equipment depends on the character of the heel itself and the location of the transfer jet suction. For example, a pump will be less effective at removal of the heel on one that is mostly solid than one that is mostly liquid. The solid heel results from precipitation of solids and other material to the bottom of a vessel. At the Tank Farm, the solid heel typically comprises 25.4 – 102 mm (1 to 4 in.) of solids at the bottom of the tank and is likely composed of solids precipitation, lesser amounts of undissolved process solids, and traces of dirt and debris. The balance of the heel is liquid up to the level of the jet suction.

- **High-activity waste**—Operationally based definition of a process radioactive waste stream that contains the relatively high fraction of radionuclides. Currently, this term is used when describing waste processes such as waste treatment that rely on separating waste into two fractions: "high" activity and "low" activity. Because the term has no regulatory basis, a high-activity waste stream could contain waste defined regulatorily as high-level waste transuranic waste, sodium-bearing waste, or Process Equipment Waste (PEW) bottoms. Initially at the INTEC, high-activity waste was classified and stored as first-cycle raffinates (aluminum waste, zirconium waste, and fluoride waste), second- and third-cycle raffinates, and sodium-bearing waste. The classifications were based on the additives that a type of waste required for calcination.

- **High-level waste**—Source-based definition of high-level waste. Such waste results from the reprocessing of spent nuclear fuel. However, there is no precise widespread agreement currently about what constitutes high-level waste. For example, the U.S. Nuclear Regulatory Commission defines high-level waste as waste resulting from first-cycle extraction activities (10 CFR 61) while the U.S. Department of Energy (DOE) definition below from DOE Manual 435.1-1 clearly centers on the presence of radioactive constituents that would require permanent isolation through storage at a facility such as Yucca Mountain: "High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation." Using the DOE definition, second- or third-cycle extraction waste and, therefore, sodium-bearing waste, could conceivably be considered high-level waste.

- **Incidental waste**—Radioactive waste incidental to uranium reprocessing operations; therefore, it does not meet the criteria for high-level waste. Examples of such waste ranges from wastewater used in the cleanup and flushing of process equipment and off-gas condensates to contaminated laboratory clothing, tools, and equipment. Such waste is classified as either transuranic or low-level waste.

- **Low-activity waste**—Operationally based definition of a process radioactive waste stream that includes the relatively low fraction of radionuclides. Currently, this term is sometimes used when describing waste processes such as waste treatment that rely on separating waste into two fractions: "high" activity and "low" activity. Because the term has no regulatory basis, the low-activity waste fraction could be low-level waste, transuranic waste, or even high-level waste.

- **Low-level waste**—Radioactive waste that is not high-level waste, spent nuclear fuel, transuranic waste, byproduct material, or naturally occurring radioactive material (DOE Manual 435.1-1). At the INTEC, this dilute, low-level waste is concentrated in the PEW Evaporator to conserve storage space and to facilitate future waste treatment. The High-Level Liquid Waste (HLLW) Evaporator is used to concentrate radioactive liquid waste that exceeds the radioactivity and chemical limits of the PEW Evaporator. After a waste stream is evaporated in the HLLW Evaporator, the overheads are sent to the PEW Evaporator and the Liquid Effluent Treatment and Disposal system to clean the stream before release to the environment via the Main Stack. Low-level liquid waste is generated at the INTEC by a variety of processes such as off-gas treatment, facility decontamination, equipment decontamination, and spent nuclear fuel storage.

- **Overheads**—That portion of the material in an evaporation process that vaporizes or is entrained in the vapor phase. The overheads can be condensed using a heat exchanger (i.e., a condenser) and collected in another tank or heated in a superheater for discharge as a vapor stream. In all INTEC processes, except the LET&D, overheads are condensed in condensers. In the LET&D, a superheater is used to achieve a dry gas and thereby prevent condensation of the vapors in the Main Stack (CPP-708).

- **Raffinate**—The waste from refinement processes. At the INTEC, raffinate referred historically to the waste products from the refinement of waste involved in first-, second-, and third-cycle reprocessing of spent nuclear fuel. Historically, the raffinates were separated into two categories: high-level waste from first-cycle extraction and sodium-bearing waste from second- and third-cycle extraction, which were blended with concentrated bottoms from the PEW Evaporator.

- **Sodium-bearing waste**—Waste generated from second- and third-cycle fuel extraction activities including the cleanup of solvent used to recover uranium and from decontamination. At the INTEC, such waste has historically been managed as high-level waste though it is actually mixed transuranic waste. An incidental waste determination would be required for sodium-bearing waste to be managed as transuranic waste. Sodium-bearing waste must be blended with non-radioactive materials such as aluminum nitrate before calcination.

- **Transuranic waste**—Radioactive waste (other than high-level waste or low-level waste) containing more than 100 nCi of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20-years. Transuranic waste does not require burial in a geologic repository but does require long-term storage in an approved transuranic storage facility such as the Waste Isolation Pilot Plant or the Nevada Test Site.

- **Waste incidental to reprocessing determination**—A determination issued by the U.S. Department of Energy, Idaho Operations Office, that a type of waste is incidental (as opposed to a direct result of reprocessing operations) to reprocessing operations. The determination can result in a categorization of the waste as either transuranic or low-level waste. The determination being sought for Tank Farm waste is to manage the waste as transuranic waste.

1. INTRODUCTION

This Work Plan provides a description of the data collection tasks and proposed methodology for data use and interpretation associated with the production of the Operable Unit (OU) 3-14, Tank Farm soil and groundwater remedial investigation/feasibility study (RI/FS). Operable Unit 3-14 is located in the north central portion of the Idaho Nuclear Technology and Engineering Center (INTEC) at the Idaho National Engineering and Environmental Laboratory (INEEL) and comprises all surface soil within the Tank Farm boundary in accordance with the OU 3-14 Scope of Work (DOE-ID 1999c), the portion of the Snake River Plain Aquifer (SRPA) under the perimeter of the INTEC, and three additional soil sites within the INTEC. The Work Plan is prepared is accordance with EPA Guidance for Conducting Remedial Investigations and Feasibility Studies (EPA 1988) in compliance with the Comprehensive Environmental Response, Compensation, and Recovery Act (CERCLA) (42 USC § 9601 et seq.) and the Federal Facilities Agreement and Consent Order (FFA/CO) (DOE-ID 1991). A contour map of the INEEL showing the location of OU 3-14 is presented in Figure 1-1.

The goal of the Work Plan activities and planned data collection efforts is to provide sufficient data to complete the feasibility study and support selection of remedial alternatives to address contamination from release sites in OU 3-14: (1) Tank Farm soil sites, (2) the former INTEC injection well (Site CPP-23) and the aquifer underneath the area within the INTEC fence line, and (3) three additional soil sites, CPP-61, CPP-81, and CPP-82, carried over from OU 3-13. The three carried-over sites were assigned to OU 3-14 in the OU 3-13 Record of Decision (ROD) (DOE-ID 1999b) because the U.S. Department of Energy (DOE-ID), the Environmental Protection Agency (EPA), and the Idaho Department of Environmental Quality (IDEQ) determined that data for the sites used in the OU 3-13 RI/FS were inadequate to make remediation decisions as required by CERCLA.

1.1 INTEC and OU 3-14 Background

The INTEC is located in the south-central portion of the INEEL, as illustrated in the topographical map of the INTEC area (see Figure 1-2). Construction of the INTEC began in 1950, nuclear fuel storage operations began in 1952, and INTEC reprocessing of spent nuclear fuel was conducted from 1953 to 1992 (see Section 2). From 1953 until INTEC calcination activities began, the liquid waste from fuel dissolution and extraction reprocessing activities, often extremely high in radioactivity (i.e., containing thousands of curies of activity), accumulated in the Tank Farm, a series of underground stainless steel tanks enclosed in underground concrete vaults. From 1963 to 1981, the Waste Calcining Facility (CPP-663) operated on a plant scale, receiving Tank Farm liquid waste for calcination (the conversion of liquid radioactive waste to a granular solids form). After the first calcining facility was closed, the New Waste Calcining Facility began operations. Until June 2000, liquid waste from the Tank Farm was transferred to the New Waste Calcining Facility (NWCF) (CPP-659), the world's first production-scale calciner. The NWCF has the capability of reducing the liquid-waste volume by 2 to 10 times. The calcined granular solids are stored at the Calcined Solids Storage Facility (WINCO 1986; Palmer et al. 1998; DOE-ID 1997a).

Descriptions of OU 3-14 contamination sites are provided in Table 1-1. The locations of the contamination sites that compose OU 3-14 are shown in Figure 1-3.

Processes at the INTEC generated large volumes of service wastewater, particularly plant cooling waters and condensates, containing small proportions of radioactive and inorganic contaminants. From 1952 to 1984, the former INTEC injection well was used to discharge the low-level radioactive and chemical waste directly to the SRPA. The well was taken out of routine service in 1984 and used only for emergencies until 1986. No waste has been routed to the well since 1986, and the well was sealed and grouted with cement in 1989.

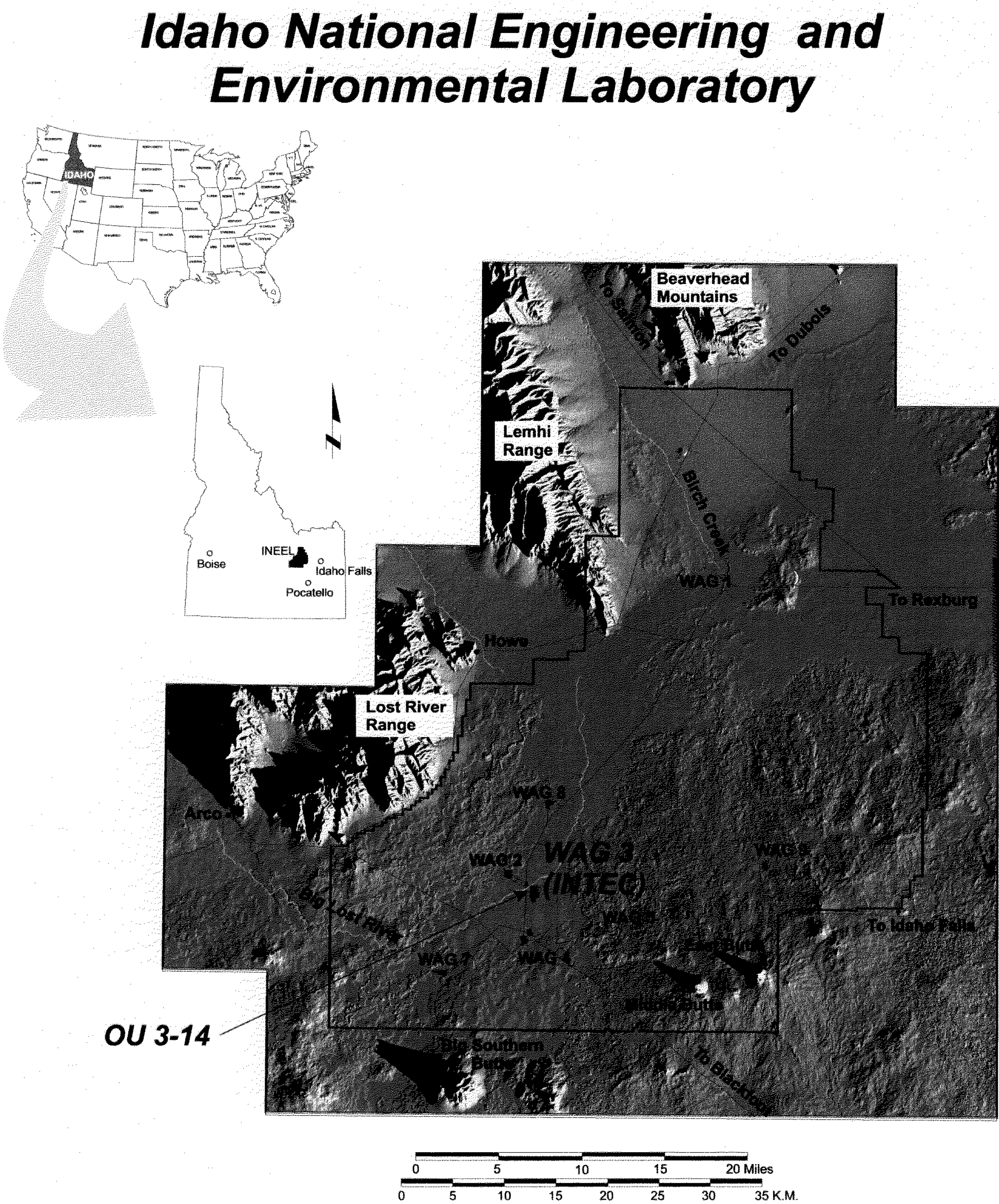


Figure 1-1. Map of the INEEL, showing the location of OU 3-14.

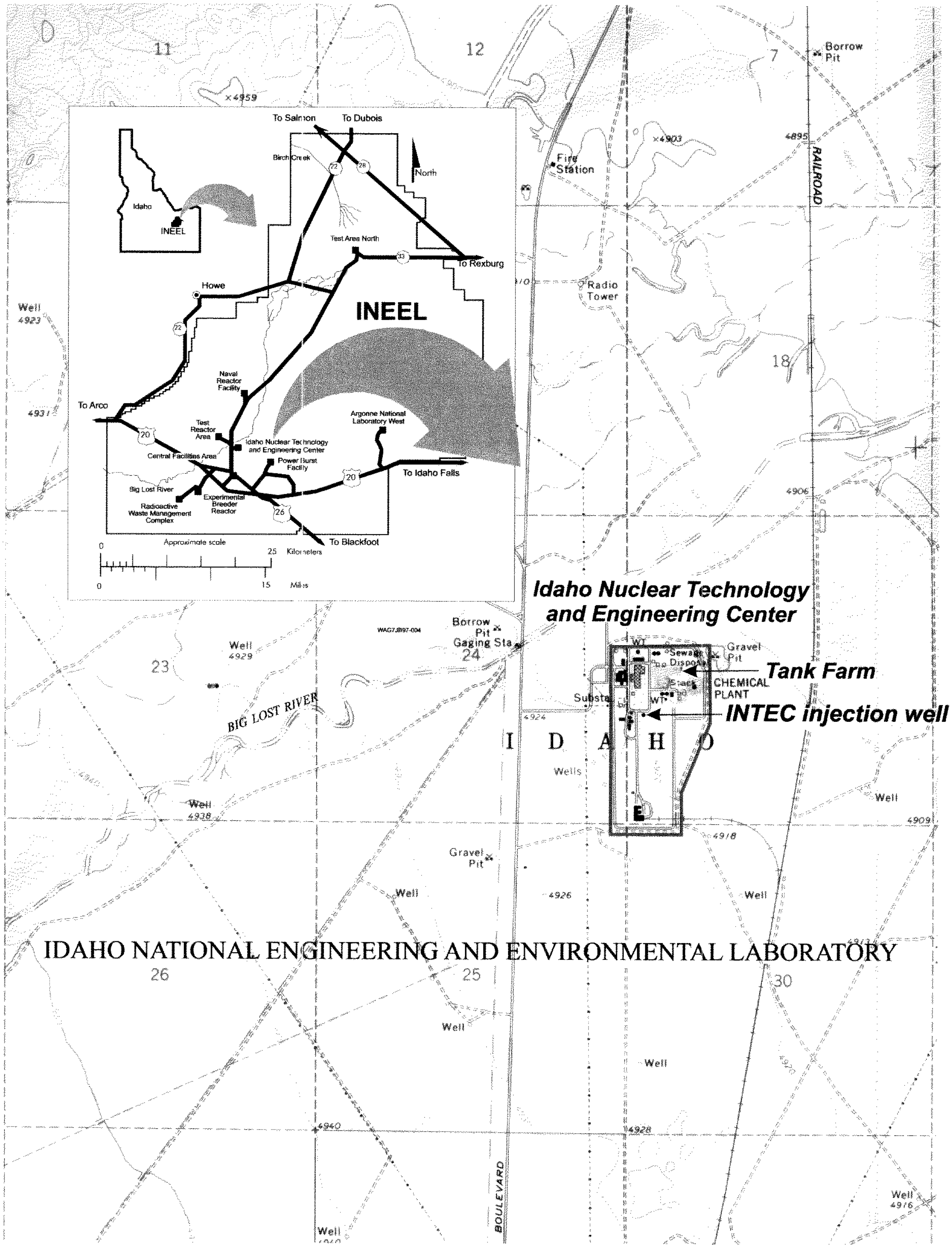


Figure 1-2. Map of the INTEC at the INEEL (topography adapted from U.S. Geological Survey Circular Butte 3SW, contour interval 10 ft, scale 1:24000) showing the Tank Farm and the INTEC injection well.

Table 1-1. Description of known release sites within OU 3-14.

Site	Description	Past Investigation
Site CPP-96, Tank Farm soil sites		
CPP-15	Site CPP-15 is the location of a waste solvent spill in the solvent burner east of CPP-605. The solvents contained primarily kerosene and tributyl phosphate degradation products with small quantities of radionuclides. The facility consisted of a firebrick-lined enclosure that used a standard furnace burner. The burner and building were removed in 1984. Radiological contamination was discovered at this site in 1995. Solvent-contaminated soil was removed during dismantling of the furnace and removal of the feed tank.	OU 3-08 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)
CPP-16	Site CPP-16 is the site of a leak on January 16, 1976, through an open-bottom valve box during a routine transfer from WM-181 to Process Equipment Waste Tank, WL-102. The leak of low-level contaminated service wastewater drained out the bottom of the valve box into the soil to 0.9 m (3 ft) beneath the valve box, which was at a depth of 1.7 m (5 ft 8 in) (WINCO 1976, 1991). This valve box was replaced on January 19, 1976, with a concrete bottom valve box with a stainless steel liner that extends 2.0 m (6 feet 9 in.) below ground surface. The volume in WM-181 before the attempted transfer was 405,511L (89,200 gal) and after was 389,600 L (85,700 gal) (Ward 2000); therefore, no more than 15,911 L (3,500 gal) leaked onto the soil. This site was screened as a no further action site in the OU 3-13 RI/FS. CPP-16 is being reevaluated in the OU 3-14 RI/FS as part of the Tank Farm soil investigation.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a)
CPP-20	Site CPP-20 is the location of the Radioactive Waste Unloading Area north of the PEW Evaporator (CPP-604). Waste from other INEEL facilities was transported to the INTEC where it was unloaded via transfer hoses to an underground storage tank before concentration in the Process Equipment Waste (PEW) Evaporator. The entire area was excavated and replaced with low-level radioactively contaminated backfill during upgrades in the Tank Farm.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)
CPP-24	Site CPP-24 is the result of a 4.5-L (1-gal) bucket spill of radioactively contaminated solution from Tank WM-180 in 1954. The spill occurred in the vicinity of a WM-180 tank riser and covered a 0.9 × 1.8 m (3 × 6-ft) area. Levels of radioactivity were surveyed at approximately 400 mR/hour. The spill would have contained mercuric nitrate, nitric acid, and radionuclides. In a Radioactivity Incident Report, the spill area was reported to be decontaminated. This site was screened as a no further action site in the OU 3-13 RI/FS. CPP-24 is being reevaluated in the OU 3-14 RI/FS as part of the Tank Farm soil investigation.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)
CPP-25	Site CPP-25 is the location of a release from a line rupture near Building CPP-604, which contaminated the building and adjacent soil. The area was excavated because of upgrades in the Tank Farm, and low-level radioactively-contaminated soil was used as backfill.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)
CPP-26	Site CPP-26 is the location of a radioactive steam release that occurred during decontamination of the transfer line before it was attached to the square vault inlets. This release is assumed to have contaminated 5.26 nectares (13 acres) to the northeast of CPP-635. The contaminated area has been designated as "inside" and "outside" the Tank Farm perimeter. As summarized in OU 3-13 RI/BRA, the Track 2 investigation recommendation for no further action was approved only for the "outside" area.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d DOE-ID 1997a, 1997b)
CPP-27	Site CPP-27 consists of soil contaminated by a subsurface release of high-level liquid waste from the Tank Farm transfer system near the northeast corner of Building CPP-604. The soil contamination has been determined to be from a badly corroded section of a pressure relief vent line 3.7 m (12 ft) bgs.	OU 3-08 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)

Table 1-1. (continued).

Site	Description	Past Investigation
CPP-28	Site CPP-28 is the location of about a 13,600-L (3,600-gal) high-level liquid waste leak to the surrounding soil from a 7.6-cm- (3-in.-) diameter stainless steel transfer line. This line was used to transfer radioactive first-cycle-extraction waste solution from the uranium recovery process to the underground storage tanks in the Tank Farm.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a, 1997b)
CPP-30	Site CPP-30 is an area of radioactively-contaminated soil near Tank Farm Valve Box B-9 discovered by maintenance personnel in 1975. The contamination covered an area of 30 m^2 (400 ft^2) and produced radiation levels of up to 1 R/hour. The contamination resulted from a one-time maintenance event in which residual decontamination solution from the floor of the valve box contaminated worker clothing and equipment. This site was screened as a no further action site in the OU 3-13 RI/FS and is being reevaluated in the OU 3-14 RI/FS as part of the Tank Farm soil investigation.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a, 1997b)
CPP-31	Site CPP-31 is the location of a release of about 52,000 L (14,000 gal) of nonhigh-level liquid waste to the surrounding soil during a transfer between tank WM-181 and WM-180. The release was caused by the failure of a 7.6-cm- (3-in.-) diameter, carbon steel, waste transfer line.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a, 1997b)
CPP-32E	Site CPP-32E is a contaminated area suspected to have originated from a surface release of condensate originating from a vent tube in valve box B-4. The area of contamination was originally identified as 0.74 m^2 (8 ft^2) and extended to a depth of 0.3 m (1 ft) below ground surface (bgs). Since the discovery of the contamination, the area has been covered with approximately 0.61 m (2 ft) of soil, the Tank Farm membrane, and another 15 cm (6 in.) of soil.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a, 1997b)
CPP-32W	Site CPP-32W is the location of a release of radioactive liquid from a 5.1-cm (2-in.) aboveground transfer line. The site was located approximately 15.2 m (50 ft) northwest of valve box, B-4. This release covered an area approximately 0.9 × 0.6 m (3 × 2 ft), having a radiation level as high as 2 R/hr.	OU 3-07 Track 2 and the OU 3-13 RI/FS (WINCO 1993d; DOE-ID 1997a, 1997b)
CPP-33	Site CPP-33 is the location of a radioactive liquid waste subsurface release from a leak of the Tank Farm transfer system.	OU 3-06 Track 2 and the OU 3-13 RI/FS (WINCO 1993c; DOE-ID 1997a, 1997b)
CPP-58E	Site CPP-58E is the location of a subsurface release of approximately 76,000 L (20,000 gal) of radioactively-contaminated PEW condensate. The release was caused by a failure of the condensate transfer line between the PEW Evaporator and Service Waste Diversion System. The line was excavated and repaired, but contaminated soil was left in place and covered with several feet of clean soil.	OU 3-11 Track 2 (WINCO 1993a)
CPP-58W	Site CPP-58W is the location of a subsurface release 1.8 to 2.4 m (6 to 8 ft) bgs of low-level radioactively-contaminated liquid from the underground transfer line from the PEW Evaporator to the monitoring station in CPP-709. This release occurred in 1954. Since the time of the release, Building CPP-649 was constructed on top of the area containing the spill. Minimum excavation for footings was 3.6 m (12 ft) bgs. The size and amount of the spills are unknown, but are believed to be contained under the building.	OU 3-11 Track 2 (WINCO 1993a)
CPP-79	Site CPP-79 is the location of a release of low-level radioactivity, heavy metals, and trace organic compounds from a transfer line between the Waste Calcining Facility and Tank WL-102. The release occurred in July and August 1986. The transfer line and valve box were at a depth of 3 m (10 ft) bgs.	OU 3-08 Track 2 and the OU 3-13 RI/FS (WINCO 1993b; DOE-ID 1997a, 1997b)
CPP-96	Interstitial soil areas within the Tank Farm and subsuming all other known release areas. This site includes the 1986 1,500-gal release in the general vicinity of Borehole A-61 southeast of Tank WM-180.	OU 3-13 RI/FS (DOE-ID 1997a, 1997b)

Table 1-1. (continued).

Site	Description	Past Investigation
INTEC Injection Well		
CPP-23	Site CPP-23 is the INTEC injection well, which was used for the disposal of cooling water and condensate, containing low levels of radioactivity, from 1952 to 1984. The well was used only for emergencies from 1984 to 1986. Sediments contained in the well were contaminated by the materials injected. No releases have occurred to the well since 1986. In late 1989, the injection well was sealed by perforating the casing throughout and pumping in cement. The well was sealed from the basalt silt layer (145 m [475 ft] bgs) to land surface to prevent hydraulic communication between the land surface, perched water, and the SRPA. More complete information about the INTEC injection well is provided in Section 2.3.	OU 3-02 Track 1, OU 3-07 Track 2, and the OU 3-13 RI/FS (WINCO 1992b, 1993d DOE-ID 1997a, 1997b)
Additional sites from OU 3-13		
CPP-61	Site CPP-61 is the location of a polychlorinated biphenyl (PCB) oil spill in the early 1980s within the CPP-718 transformer yard. Approximately 1,510 L (400 gal) of PCB oil was spilled. The PCB concentration in the oil was 179 ppm. Most of the spill was contained; however, some spilled oil contaminated the surrounding soil. In 1985, the spill area (approximately 58 m^2 [625 ft^2]) was cleaned up. Approximately 40 drums of soil and debris were removed. A new transformer and concrete pad have been installed over the site. Three soil borings were drilled and soil samples analyzed for radionuclides. The radionuclides found were below risk-based soil concentrations (WINCO 1992a). The decision to transfer this no further action site to OU 3-14 in the OU 3-13 Record of Decision was based on the uncertain amount of PCB contamination that may remain under the concrete pad.	OU 3-01 Track 1 and the OU 3-13 RI/FS (WINCO 1992a, 1993b; DOE-ID 1997a, 1997b)
CPP-81	Site CPP-81 is an abandoned CPP-637/CPP-601 vessel off-gas (VOG) line from the 30-cm (12-in.) Calciner Pilot Plant. The line, 7.6 VOG-100, was located approximately 0.6 to 0.9 m (2 to 3 ft) bls and contained simulated calcine that became plugged in the line in 1986 following a test run, Run No. 15. During the fall of 1993, the line was cleaned as part of a time-critical removal action. In 1993, a portion of the line was removed, probably about 3 to 4 ft, and both ends have blind flanges on them (DOE-ID 1997; McCray 2000). The rest of the line, under a concrete floor at the south end of the Chemical Engineering Laboratory (CPP-620), was abandoned. The decision to transfer this no further action site from OU 3-13 to OU 3-14 was based on inadequate data used in the OU 3-13 RI/FS to make remediation decisions.	OU 3-12 Track 1 and the OU 3-13 RI/FS (WINCO 1994; DOE-ID 1997a, 1997b)
CPP-82	Abandoned Line 1.5 in. - PLA - 776 West of Beech Street. Site CPP-82 is the location of three wastewater spills (designated Sites A, B, and C) caused by rupturing of previously abandoned underground lines. The lines were ruptured during excavation activities. In the spill associated with Site A, an estimated 9.4 L (2.5 gal) of low-level radioactive waste escaped; the abandoned line and contaminated soil associated with the leak were removed and disposed of. Sites B and C are associated with spills of non-radioactive, nonhazardous wastewater; these spills occurred during the repair activities associated with Site A. The decision to transfer this no further action site from OU 3-13 to OU 3-14 was based on inadequate data used in the OU 3-13 RI/FS to make remediation decisions.	OU 3-12 Track 1 and the OU 3-13 RI/FS (WINCO 1992c; DOE-ID 1997a, 1997b)

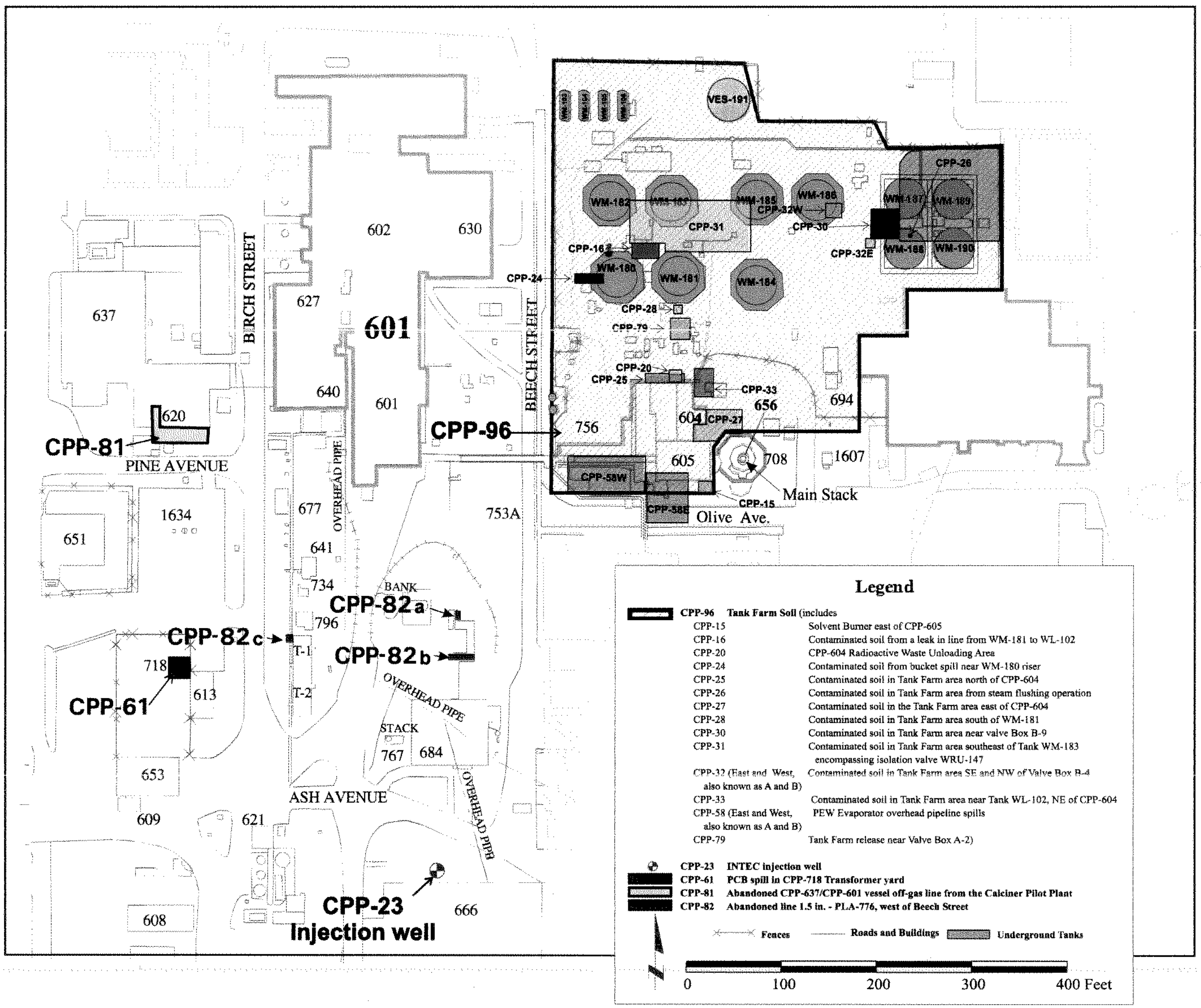


Figure 1-3. Known OU 3-14 contaminant release sites.

With the diminishing need to recover and recycle the fuel, the U.S. Department of Energy (DOE) discontinued the INTEC mission of reprocessing spent nuclear fuel in 1992. The termination of reprocessing shifted the focus of the INTEC to management and storage of spent nuclear fuel, treatment and storage of liquid wastes, such as those generated during past reprocessing campaigns, and treatment and storage of low-level waste generated by other ongoing and future operations and activities at the INEEL.

Currently, the Tank Farm is used for interim waste storage of liquid waste (radioactive and hazardous). The Tank Farm system comprises the following equipment:

- Nine 300,000-gal (WM-182 through WM-190) and two 318,000-gal active stainless steel tanks contained in concrete vaults (WM-180 and WM-181) 13.7 m (45 ft) below grade (throughout this document, with the exception of a few historical descriptions, the 318,000-gal tanks are referred to as they are commonly known: 300,000-gal tanks, and these together with the nine 300,000-gal tanks are known as the eleven 300,000-gal tanks)

- Four inactive 30,000-gal stainless steel tanks (WM-103 through WM-106)

- Eight 18,000-gal process equipment waste (PEW) tanks, including the five main tanks, WL-101, WL-102, WM-100, WM-101, and WM-102; an 18,000-gal feed collection tank (WL-133); a 4,700-gal sedimentation tank (WL-132); and a new tank (WL-111) to replace WL-101 (to be abandoned until facility closure); plus the associated valve boxes, encasements, and piping (LMITCO 1999a, 1998). The PEW system is located in building CPP-604.

Over the next several years, the U.S. Department of Energy will close the eleven 300,000-gal and four 30,000-gal underground tanks within the Tank Farm because (1) reprocessing was terminated, and (2) the tanks do not comply with Resource Conservation and Recovery Act (RCRA) (42 USC § 9601 et seq.) secondary-containment requirements. Several factors, such as the impracticality of lifting the large tanks to install a liner underneath them, led to DOE's decision not to bring the tanks into RCRA compliance. Because PEW operations may continue after the Tank Farm is closed, the PEW tanks will be permitted as part of the PEW system. (The location of these tanks is shown in Figure 2-12.)

In 1990, a Notice of Noncompliance (EPA 1990) was issued for the Tank Farm underground tanks by the U.S. Environmental Protection Agency, based on an inspection performed the previous year by EPA and the Idaho Department of Health and Welfare. The Notice asserted that the eleven 300,000-gal tanks, storing corrosive and radioactive waste, and the associated piping, do not comply with secondary containment in accordance with RCRA in violation of 40 CFR § 265.193 (c) (1). To resolve the violations cited in the Notice of Noncompliance, a Consent Order (DOE-ID 1992) was agreed to in 1992 to between the U.S. Department of Energy, Idaho Operations Office (DOE-ID), and the State of Idaho. Under the terms of the Consent Order, DOE-ID agreed to either stop using the tanks or bring them into compliance with the RCRA secondary containment requirements set forth in the Idaho Administrative Procedures Act (IDAPA) (16.01.05.009; 40 CFR 265.193).

The Second Modification to the Consent Order (DOE-ID 1998) stipulates that DOE must stop using five of the 300,000-gal tanks, WM-182, WM-183, WM-184, WM-185, and WM-186 by June 30, 2003, although the Order allows WM-185 to be used as an emergency spare. The Second Modification requires ceasing use of the remaining six 300,000-gal tanks, WM-180, WM-181, WM-187, WM-188, WM-189, and WM-190, by December 31, 2012. A tank is considered to meet the cease-use requirement if it has been emptied down to its heel. A heel is defined as the liquid volume remaining in the tank after it has been reduced to the greatest degree possible with existing tank transfer equipment

(Rasch 1994). The tanks will be closed in groups to facilitate plant operations until alternate facilities are available. The Second Modification also requires the submittal of a closure plan for one 300,000-gal tank to the State of Idaho by December 31, 2000. Tanks WM-182 and WM-183 will be the first tanks closed.

Radioactive and hazardous contaminants have been released over the past decades as spills and pipeline leaks of radioactive liquids to the environment from plant liquid transfer operations to the Tank Farm. According to the OU 3-13 ROD, contamination from releases within the Tank Farm boundary account for approximately 95% of the known contaminant inventory in total curies of radioactive material at the INTEC (DOE-ID 1999b, Section 4). Other past practices at the INTEC, then recognized as acceptable, included direct disposal of INTEC liquid waste through the former INTEC injection well to the SRPA. During the more than three decades of use of the injection well (from 1952 to 1986), about 11 billion gal of wastewater was discharged to the aquifer with an estimated radioactivity of 22,200 Ci. The major radionuclides of concern discharged in wastewater shipments to the well included H-3, Sr-90, and Cs-137 (DOE-ID 1997a). More complete information about the INTEC injection well is provided in Section 2.3.

Operable Unit 3-14 comprises one overarching site, CPP-96; the former INTEC injection well site, CPP-23; and the three sites carried over from OU 3-13:

- Site CPP-96. This site incorporates Tank Farm soil sites, as defined in the OU 3-14 Scope of Work: CPP-15, CPP-20, CPP-25, CPP-26, CPP-27, CPP-28, CPP-31, CPP-32E and CPP-32W, CPP-33, CPP-58E and CPP-58W, CPP-79, and CPP-96, as well as three Tank Farm soil sites: CPP-16, CPP-24, and CPP-30, which were screened out for further action in the OU 3-13 RI/FS. In the OU 3-14 ROD (DOE-ID 1999b), all Tank Farm soil and CERCLA sites were consolidated into CPP-96 to facilitate selection of remediation alternatives for the entire Tank Farm. The three no further action sites were assigned to OU 3-14 in the OU 3-13 ROD because with the consolidation of all Tank Farm soil and sites within CPP-96, these three sites are subject to the interim action specified for the Tank Farm in the OU 3-13 ROD and OU 3-14 RI/FS activities. The interim action relies on institutional controls with surface water control to reduce surface water infiltration into Tank Farm soil.

- Site CPP-23, the former INTEC injection well. The activities associated with this site also include all contamination in the Snake River Plain Aquifer within the INTEC fence line.

- Sites CPP-61, CPP-81, and CPP-82. These three sites from OU 3-13 also were no further action sites in the OU 3-13 RI/FS. They were assigned to OU 3-14 in the OU 3-13 ROD (DOE-ID 1999b) because DOE-ID, EPA, IDEQ determined that data for the sites, used in the OU 3-13 RI/FS, were inadequate to make remediation decisions, as required by CERCLA.

1.2 OU 3-14 Purpose

Operable Unit 3-14 will investigate (1) Tank Farm soil, (2) the INTEC injection well (Site CPP-23) and the Snake River Plain Aquifer within the INTEC fence line, and (3) three additional sites from OU 3-13 (CPP-61, CPP-81, and CPP-82).

The OU 3-14 Scope of Work (DOE-ID 1999c) defined the OU 3-14 RI/FS investigation as a focused study to provide additional information to select a final remedy for the Tank Farm soil and the INTEC injection well and the aquifer underneath the area within the INTEC fence line. The DOE-ID, the EPA, and the IDEQ determined in the OU 3-13 ROD that Tank Farm soil poses an external exposure risk, and leaching and transporting Tank Farm soil contaminants pose an additional future risk to the aquifer.

The INTEC injection well, Site CPP-23, was the primary means of disposing of service wastewater from 1952 to 1984 and was used only for emergencies from 1984 to 1986. It is believed to be the primary source of contamination in the underlying aquifer at the INTEC. More complete information about the INTEC injection well is provided in Sections 2.3 and 3.1.2. Information from the previous investigations about the nature and extent of the site contamination was incomplete. The aquifer underneath the area within the INTEC fence line will be evaluated in OU 3-14.

1.2.1 Tank Farm Soil

The following items are objectives of the OU 3-14 focused RI/FS for the Tank Farm:

- Evaluate thoroughly process knowledge, facility documentation, and sampling of secondary sources in the environment to develop an estimate of the quantities of contaminants released to the environment through spills, leaks, and the disposal of waste liquids.
- Define the distribution, quantities, and concentrations of contaminants, especially plutonium isotopes, in Tank Farm soil to estimate soil volume and waste types requiring remediation.
- Collect site-specific soil chemistry and soil distribution coefficients (K_ds) for analytes of concern, determined from OU 3-14 field investigation for use in risk analysis and understanding long-term risk reduction needs when evaluating remedial alternatives.
- Collect site-specific data to better bound and estimate the total contaminant mass source term in the soil for the contaminant transport simulations to reduce the uncertainty of release estimates to the environment and the risks calculated for the Tank Farm.
- Define the soil waste types and volumes requiring remediation. Process knowledge indicates that high-level and low-level waste, high-activity waste, mixed waste, including suspected listed hazardous constituents, and transuranic (TRU) waste may be present in Tank Farm soil.
- Provide data to evaluate remedial alternatives for residual contamination waste types, if required, dealing with high-radiation fields during excavation, treatment, storage, and disposal.
- Develop a list of alternatives for remediating Tank Farm soil and evaluate alternatives using the nine CERCLA criteria established for remediation selection.
- Provide a better understanding of moisture migration and the contaminant flux through Tank Farm soil.

1.2.2 Injection Well and Aquifer Underneath the Area Within the INTEC Fence Line

The following items are objectives of the OU 3-14 focused RI/FS:

- Evaluate thoroughly process knowledge, facility documentation, and previous sampling of the aquifer under the area underneath the area within the INTEC fence line to develop an estimate of the quantities of contaminants released to the environment through the injection of waste into the SRPA.
- Define the distribution, quantities, and concentration of contaminants in the INTEC injection well sediment (Site CPP-23) and subsequent secondary sources from the past injection of waste into the SRPA underneath the area within the INTEC fence line to define their contribution of the risk to the groundwater pathway.

- Develop a list of alternatives for remediating the injection well, if it poses an unacceptable risk, and evaluate alternatives using the nine CERCLA criteria established for remediation selection.

1.2.3 Additional Sites from OU 3-13

The following items are objectives of the OU 3-14 focused RI/FS:

- Collect and review existing site-specific data for three no further action sites assigned to OU 3-14 from OU 3-13 in the OU 3-13 ROD: Sites CPP-61, CPP-81, and CPP-82. The DOE-ID, EPA, and IDEQ determined that data for these sites used in the OU 3-13 RI/FS were inadequate to select remediation alternatives for the sites.
- Summarize the information, derived from the data review, in a technical report and obtain reviews form DOE-ID, EPA, and IDEQ.

1.3 OU 3-13 ROD Remediation Goals and Remedies

As mentioned previously, OU 3-14 was assigned to investigate the Tank Farm soil, the INTEC injection well and the SRPA underneath and within the INTEC fence line, and the three additional sites from OU 3-13 by the OU 3-13 ROD. Related to OU 3-14 RI/FS activities, the OU 3-13 ROD selected interim remedies for the Tank Farm soil and SRPA (outside of the Tank Farm fence), and a final remedy for the Perched Water. The OU 3-13 Tank Farm interim action is discussed in Section 1.6.4.

Perched water has been observed beneath the Tank Farm and poses a primary threat as a migration pathway of contaminants to the SRPA (DOE-ID 1999b). The OU 3-13 perched water remediation goals are to (1) reduce recharge to the perched zones, and (2) minimize the migration of contaminants to the SRPA so that SRPA groundwater outside of the current INTEC security fence meets applicable State of Idaho groundwater standards by 2095. The selected OU 3-13 Perched Water remedy is Institutional Controls with Aquifer Recharge Controls and includes the following items:

- Institutional controls that include limiting access, drilling, and using existing wells screened in the perched zones.

- Controlling surface water recharge to the perched water by taking the existing INTEC percolation ponds out of service and minimizing lawn irrigation at INTEC. Additional infiltration controls may include lining the adjacent reach of the Big Lost River, closing and relocating the existing sewage treatment plant lagoons and infiltration galleries, and upgrading INTEC drainage controls, repairing leaking fire water lines, and eliminating steam condensate discharges (DOE-ID 1999b).

The primary threat posed by a contaminated SRPA is ingestion of contaminated groundwater. The OU 3-13 remediation goals for the SRPA outside of the current INTEC security fence are (1) to prevent current onsite workers and non-workers from ingesting contaminated drinking water above the applicable State of Idaho groundwater standards or risk-based groundwater concentration during the institutional control period and (2) to achieve the applicable State of Idaho groundwater standards or risk-based groundwater concentrations in the SRPA plume south of the INTEC security fence by the year 2095. The selected OU 3-13 SRPA interim action is Institutional Controls with Monitoring and Contingent Remediation and consists of three components:

- Existing and additional institutional control maintenance over the surface area above the SRPA contaminant plume to prevent exposure to contaminated groundwater during the time the aquifer is expected to remain above MCLs

- Groundwater monitoring to determine if specific SRPA groundwater contaminant concentrations exceed their action levels and if the impacted portion of the aquifer is capable of producing more than 0.5 gpm, which is considered the minimum drinking water yield necessary for the aquifer to serve as a drinking water supply

- Contingent active pump and treat remediation if contaminant action levels are exceeded and production is greater than 0.5 gpm, such that the modeled aquifer water quality will exceed the MCLs after 2095 in the SRPA outside the current INTEC security fence (DOE-ID 1999b).

1.4 OU 3-14 Scope

The OU 3-14 RI/FS activities will include gathering site data to support the final remedy for the Tank Farm, the former INTEC injection well and aquifer underneath the area within the INTEC fence line, and the three additional soil sites from OU 3-13—Sites CPP-61, CPP-81, and CPP-82—using two characterization investigation phases.

- Phase I will involve (1) collecting field-screening gamma-radiation data and initial characterization data from Tank Farm soil, (2) opening the sealed INTEC injection well by coring and installing aquifer wells around the well, (3) preparing technical papers for OU 3-14, and (4) reevaluating site information for the three soil sites carried over from OU 3-13.

- Phase II activities will depend on the results of the Phase I efforts, but will involve at a minimum more detailed soil characterization of hot spots within Tank Farm soil, soil moisture monitoring in the Tank Farm, and additional groundwater monitoring data from the aquifer wells around the injection well. There are no Phase II activities for the injection well (Site CPP-23).

Treatability studies may be conducted using both cold and hot soil from the Tank Farm. Feasibility studies will be prepared evaluating remedial alternatives on the basis of the new data. Specifically, the following tasks were identified in the OU 3-14 Scope of Work (DOE-ID 1999c):

1.4.1 Tank Farm Soil

The Tank Farm soils have been excavated and backfilled numerous times, and the source or nature of the backfill material used has not fully characterized or documented. This implies that a degree of uncertainty exists with respect to the homogeneity of the Tank Farm soils. This uncertainty will be taken into account when designing a statistical analysis for defining the parameters of a representative soil sample and for defining what the soil characterization data spatially represents.

- The Tank Farm soil from 0 to 3 m (0 to 10 ft) will be characterized to define the type and extent of contamination, contributing to the external exposure risk, which requires remediation to support the final remedy selection.

- The Tank Farm soil from 0 to 13.7 m (0 to 45 ft) will be characterized to help define the type and extent of contamination, contributing to the groundwater ingestion risk, which requires remediation to support the final remedy selection.
- The soil moisture within Tank Farm soil will be characterized to determine the contaminant transport potential of the contaminant sources in Tank Farm soil, the moisture flux rate into basalt, and the impact of soil moisture on selected remedial alternatives.
- The geochemical environment of Tank Farm soil will be characterized to define contaminant mobility for contaminant transport simulations, to predict releases to the environment, and to assess the contribution of Tank Farm contaminants to the groundwater pathway risk.
- The nature and extent of contamination within Tank Farm soil will be characterized to developing and screening remedial alternatives.
- Bench- and pilot-scale tests may be conducted on technologies requiring detailed evaluation for treatment, storage, or disposal of Tank Farm soil and groundwater underneath the area within the INTEC fence line.
- Tank Farm soil will be characterized to define waste types that may be generated for treatment, storage, or disposal during future remediation activities.

1.4.2 Injection Well and Aquifer within the INTEC Fence Line

Site data will be gathered and reviewed to support the final remedy for the injection well and the aquifer inside the INTEC fence:

- Aquifer wells will be used to investigate the INTEC injection well (Site CPP-23) to evaluate the residual source of groundwater contamination contributing to the future groundwater ingestion risk.
- Groundwater samples for analytes of concern from the SRPA will be collected above, within, and below the HI interbed (158.5 to 167.6 m [520 to 550 ft]).
- Contributions of contaminants from Tank Farm soil will be evaluated to determine the future risk to the aquifer within the INTEC fence line.

1.4.3 Additional Sites from OU 3-13

Existing data will be reviewed and investigated for possible contaminant releases at Sites CPP-61, CPP-81, and CPP-82, assigned to OU 3-14 in the OU 3-13 ROD, to determine the remediation options for the sites. The information derived from the data review will be summarized in a technical report for each site and reviewed by DOE-ID, EPA, and IDEQ.

For the OU 3-14 FS, feasible treatment technologies will be identified and screened according to their effectiveness, cost, and implementability. It is anticipated that only limited site risk assessment and groundwater modeling will be required to support the remedy selection. In the OU 3-13 ROD (DOE-ID 1999b), Tank Farm soil was determined to represent a risk by direct radiation exposure and by the leaching and transport of contaminants to the SRPA. Also, the aquifer poses a risk from ingestion to future groundwater users. The specific need and method for completing the risk assessment and groundwater modeling for OU 3-14 will be determined, pending the collection of the Phase I data. The scope of the contaminant transport study, treatability studies, and feasibility study also will be determined following the collection and interpretation of the Phase I data.

1.5 INEEL Background

Originally established in 1949 as the National Reactor Testing Station (NRTS), the INEEL is a DOE-managed reservation devoted to energy research and related activities. The NRTS was redesignated as the Idaho National Engineering Laboratory (INEL) in 1974 to reflect the broad scope of engineering activities taking place at various facilities. More nuclear reactors and a wider variety of reactor types have been built at the INEEL than at any other single location in the world. Currently, only two INEEL reactors are operating. The remaining reactors have been phased out because their missions were completed (Irving 1993; Becker et al. 1998).

The INEL was redesignated the Idaho National Engineering and Environmental Laboratory in 1997 to demonstrate contemporary emphasis on environmental research. Current INEEL activities address challenges presented by spent nuclear fuel management, hazardous and mixed waste management and minimization, cultural resources preservation, and environmental engineering, protection, and remediation (DOE-ID 1996). Current research focuses on environmental restoration and waste management issues (Becker et al. 1998).

The INEEL is located in southeastern Idaho and occupies 2,305 km^2 (890 mi^2) in the northeastern region of the Snake River Plain (see Figure 1-1). Regionally, the INEEL is nearest to the major population centers of Idaho Falls and Pocatello and to U.S. Interstate Highways I-15 and I-86. The INEEL Site is nearly 63 km (39 mi) long from north to south, about 58 km (36 mi) wide in its broadest southern portion, and occupies portions of five southeast Idaho counties: Butte, Bingham, Bonneville, Jefferson, and Clark. Most of the INEEL lies within Butte County. Approximately 95% of the INEEL has been withdrawn from the public domain. The remaining 5% includes public highways (U.S. 20 and 26 and Idaho 22, 28, and 33) and the Experimental Breeder Reactor I, which is a national historic landmark (Irving 1993; Becker et al. 1998).

The surface of the INEEL is a relatively flat, semiarid, sagebrush desert. Predominant relief is manifested either as volcanic buttes jutting up from the desert floor or as unevenly surfaced basalt flows or flow vents and fissures. Elevations on the INEEL range from 1,460 m (4,790 ft) in the south to 1,802 m (5,913 ft) in the northeast, with an average elevation of 1,524 m (5,000 ft) above sea level (Irving 1993).

Bordering the INEEL on the north and west are mountain ranges: the Lost River Range, the Lemhi Range, and the Beaverhead Mountains (see Figure 1-1). The lands that surround the INEEL are managed as rangeland, agricultural lands, U.S. Forest Service lands, and U.S. Bureau of Land Management (BLM) lands. In the western portion of the INEEL, intermittently flowing waters from the Big Lost River flow to the Lost River Sinks in the northwest portion of the INEEL. Water either evaporates or infiltrates into the Snake River Plain Aquifer at the sinks. Normally, water is diverted for irrigation before reaching the INEEL and only flows onto the INEEL Site when sufficient snowpack occurs to provide spring runoff (Becker et al. 1998).

Irrigated farmlands exist adjacent to approximately 25% of the INEEL boundary (Becker et al. 1996). Lands acquired for the NRTS were originally under control of the BLM and were withdrawn through public land orders in 1946, 1949, and 1950. Until these withdrawals, the land was used primarily as rangeland. From 121,410 to 141,645 ha (300,000 to 350,000 acres) within the perimeter of the INEEL has been opened to grazing through permits administered by the BLM. Since 1957, approximately 1,386 km^2 (535 mi^2) in the central portion of the INEEL has been maintained as a grazing exclusion area. Historically, portions of this central core have been used as bombing and gunnery ranges. Currently, the largely undeveloped central portion of the INEEL is reserved for ecological studies of sagebrush-steppe ecosystems (Becker et al 1998).

The INEEL has nine distinct and geographically separate functional facility areas corresponding to nine WAGs. Each area serves or has served a particular programmatic or support activity. As governed by the FFA/CO (DOE-ID 1991), the remedial evaluations for each facility area must address impacts to the aquifer, generated by operations within each of the WAGs, with the remaining portions of the aquifer across the INEEL addressed by WAG 10.

Waste Area Group 3 comprises the INTEC facility and was subdivided into 13 OUs that were investigated for contaminant releases to environmental pathways. During the OU 3-13 comprehensive RI/FS and subsequent remedy development, data gaps were identified. In some cases, the missing data were important enough to prevent selection of final remedies. In particular, data were insufficient to select final remedies for Tank Farm soil, the INTEC injection well and aquifer within the INTEC fence line, and additional soil sites from OU 3-13: CPP-61, CPP-81, and CPP-82. Operable Unit 3-14 was created to gather the additional necessary data to allow selection of final remedies for these areas.

1.6 Regulatory Background

On July 14, 1989, the INEEL was proposed to be added to the EPA National Priorities List (NPL) (54 FR 48184). This listing was proposed using Hazard Ranking System procedures found in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300). The INEEL received a score of 51.91. Data supporting listing the INEEL as an NPL site are found in the Federal Facilities Docket, EPA Headquarters, Washington, D.C. As a federal facility, the INEEL is eligible for the NPL pursuant to the requirements of the NCP (40 CFR 300.66(c)(2)). After considering public input during a 60-day comment period, the INEEL was placed on the NPL and became subject to the provisions of CERCLA (42 USC § 9601 et seq.) on November 15, 1989. Contaminated sites at the INTEC contributed to listing the INEEL on the NPL. As a result of listing on the NPL, the DOE, EPA Region 10, and IDEQ negotiated a Federal Facilities Agreement/Consent Order (FFA/CO) and Action Plan (DOE-ID 1991) to implement the remediation of the INEEL under CERCLA. For management purposes, the FFA/CO divided the INEEL into 10 WAGs. The INTEC was designated as Waste Area Group (WAG)3. WAG 3 is further divided into 14 operable units (DOE-ID 1999b).

The goals of the FFA/CO are to ensure (1) that potential or actual INEEL releases of contaminants to the environment are thoroughly investigated in accordance with the NCP and (2) that appropriate response actions are taken to protect human health and the environment. The FFA/CO established the procedural framework and schedule for developing, prioritizing, implementing, and monitoring response actions at the INEEL in accordance with CERCLA and RCRA (42 USC § 6901 et seq.) legislation and the Idaho Hazardous Waste Management Act (IC § 39-4401). The FFA/CO is consistent with a general approach approved by DOE and the EPA in which agreements with states as full partners would allow site investigation and cleanup to proceed, using a single road map to minimize conflicting requirements, and maximize limited remediation resources.

The Secretary of Energy's policy statement (DOE 1994) on the National Environmental Policy Act (NEPA) (42 USC § 4321 et seq.) stipulates that DOE will rely on the CERCLA process for review of actions to be taken under CERCLA. The policy statement also requires that DOE address NEPA values and public involvement procedures by incorporating NEPA values to the extent practicable in documents and public involvement activities generated under CERCLA.

All known release sites within the INTEC were evaluated in the OU 3-13 Comprehensive RI/FS (DOE-ID 1997a, 1997b). Ninety five release sites were evaluated in the remedial investigation (RI) (DOE-ID 1997a) but only 40 exceeded the soil remedial action objectives (RAOs) in the OU 3-13 FS and thus were further evaluated in the OU 3-13 FS detailed analysis (DOE-1997b). The OU 3-13 RI/FS was finalized in December 1997, but because of greater than anticipated uncertainties associated with source estimation and contaminant mobility, selection of a final remedy for the Tank Farm was deferred until additional data are collected. As a result, in January 1998, a joint decision was made between DOE-ID, EPA, and IDEQ to further investigate this area under a separate operable unit designated as OU 3-14.

1.6.1 HWMA/RCRA Status of the Tank Farm

The Tank Farm is currently operating under Hazardous Waste Management Act (HWMA)/RCRA interim status (LMITCO 1999b). It is DOE's intent that as each tank is successfully closed as a HWMA/RCRA interim status unit, the closed tank system will be evaluated in accordance with OU 3-13 Record of Decision and the agency-approved Operable Unit 3-13 Group 2 Closure Evaluation Criteria and Checklist (CEC&C). Upon closure of units, the new site identification (NSI) process will be instituted, as identified in the CEC&C. This process establishes the process that CERCLA uses to evaluate closures to determine if RAOs and regulatory guides (RGs) are met and if the site needs to be included in the existing WAG 3 OU 3-13 grouping, if they should be added to OU 3-14, or if an additional OU should be designated. The closed tanks will also be evaluated under the CERCLA 5-year review cycle to determine subsequent risk.

1.6.2 Regulatory Integration

The DOE relies on the CERCLA process to address the environmental aspects of CERCLA projects. The CERCLA documents are functionally equivalent to NEPA documents, and NEPA aspects are addressed that could be significantly impacted by the project. The DOE has the responsibility for ensuring that NEPA requirements are incorporated into CERCLA documents.

To ensure that all environmental aspects will be reviewed during the planning phases of this project, an environmental checklist with attachments will be prepared in parallel with and incorporate activities described in this Work Plan. Any significant environmental issues discovered in the environmental checklist review will be addressed in the OU 3-14 RI/FS. The completed environmental checklist with attachments will be submitted as background to and concurrent with the appropriate CERCLA project document.

The Idaho High-Level Waste and Facilities Disposition Draft Environmental Impact Statement (HLW & FD EIS) (DOE 1999) was released in December 1999 for public comment. Some of the facilities addressed in the HLW & FD EIS are located within OU 3-14. The EIS compares alternatives for closing the Tank Farm and estimates the potential risk posed to the aquifer after implementing the various alternatives for facility closure. Modeling conducted in support of the EIS alternative evaluation did not incorporate the contaminated soil in the Tank Farm. It is anticipated that modeling conducted for OU 3-14 will be able to accommodate the Tank Farm soil and tank residuals as a source. The source term, used for the tanks, will be based on the anticipated end state and residual concentrations, as provided in the HLW & FD EIS ROD. Assumptions about content, leak rate, and tank corrosion rate will be obtained from other documents such as the HLW & FD EIS.

The hazardous components stored at the Tank Farm are regulated through the IDEQ. The IDEQ State Waste Management and Remediation Division has closure oversight of RCRA-regulated facilities incorporated by the HWMA.

The HWMA program will close the active tanks and ancillary systems, which will be identified in the HWMA Closure Plan. Releases to the environment and those components that are not assessed under the HWMA closure will be evaluated by CERCLA using the new site identification process. Furthermore, following HWMA closure, the HWMA-closed system will be evaluated by CERCLA, using the new site identification process identified in the CEC&C.

1.6.3 Tank Farm Waste Management and Closure Agreements

The *Settlement Agreement* or "Batt Agreement," signed in 1995 by DOE, the Idaho Department of Health and Welfare, and the U.S. Department of the Navy (DOE 1995), and the *Second Modification to Consent of the Notice of Noncompliance* (DOE-ID 1998) establish enforceable regulatory milestones for the tanks and tank contents at the Tank Farm. The Settlement Agreement requires treatment of the existing liquid sodium-bearing waste and other liquid inventories in the Tank Farm by December 31, 2012, and treatment for long-term storage or disposal of all high-level waste at the INEEL by 2035. The Second Modification, along with the First Modification (DOE-ID 1994), which the Second superseded, revised the Consent Order, entered into in 1992 between the State of Idaho and DOE-ID (DOE-ID 1992). The Consent Order was a resolution of alleged violations contained in a Notice of Noncompliance issued in 1990 by the EPA. The Notice of Noncompliance for the Tank Farm was based on lack of compliance with RCRA requirements for secondary containment of the 300,000-gal tanks and their associated piping. The Consent Order provided schedules for either bringing the Tank Farm into compliance with secondary containment requirements or closing the tanks. The DOE has decided to close the eleven 300,000-gal and four 30,000-gal underground tanks within the Tank Farm because of the termination of reprocessing and several other factors, such as the impracticality of lifting the large tanks to install a liner underneath them, that impede bringing the tanks into compliance.

During the closure, portions of the Tank Farm will remain operational to provide support for INTEC operations until alternative facilities are available. In addition, final closure under HWMA/RCRA must meet DOE radioactive waste management requirements (DOE Order 435) and be integrated with CERCLA (42 USC 9601 et seq.) environmental risk management decisions for contaminated soil surrounding Tank Farm system components (LMITCO 1998). As each tank is closed under HWMA/RCRA, the closed tank and ancillary equipment will be evaluated under CERCLA, using the new site identification process identified in the CEC&C.

The current regulatory deadlines applicable to the closure of the Tank Farm are provided in Table 1-2.

1.6.4 OU 3-13 Tank Farm Interim Action

In October 1999, the Record of Decision was issued for OU 3-13. The OU 3-13 ROD specified an interim action for the Tank Farm soil sites because inadequate data were available to select a final remedy in OU 3-13. The DOE-ID, EPA, and IDEQ determined in the ROD that an interim action was necessary, specifically, because of the uncertainty associated with the contaminant source estimates, potential releases from the Tank Farm soil, contaminant extent, and site risk (DOE-ID 1999b, Sections 4 and 9). The interim action will be in place until the final remedy for these sites is selected and implemented as part of the OU 3-14 RI/FS process.

The interim action is designed to control the principal threats at the site, to control exposure to contaminants in Tank Farm soil, and to minimize moisture that may infiltrate through Tank Farm soil and leach and transport contaminants to the SRPA. According to the OU 3-13 ROD (DOE-ID 1999b), the following items are remediation goals for the Tank Farm Soils interim action:

- Prevent intrusion into soil contaminants by the general public
- Reduce precipitation infiltration by approximately 80% of the average annual precipitation at the site
- Maximize runoff and minimize surface water ponding on the Tank Farm
- Prevent surface water run-on from a one in 25 year, 24-hour storm event

Table 1-2. Current regulatory milestones for closure of the Tank Farm.

Regulation	Source	Comment
Complete calcination of high-level waste (HLW) by June 30, 1998.	*Settlement Agreement*[a]	Calcination of HLW waste was completed ahead of schedule in February 1998.[b]
Submit closure plan for one tank to the Idaho Department of Environmental Quality (DEQ) by December 31, 2000.	*Second Modification to Consent Order to the Notice of Noncompliance*[c]	A draft closure plan will be submitted to the State of Idaho for joint closure of two tanks, WM-182 and WM-183, by December 31, 2000.
Commence calcination of sodium-bearing waste by June 1, 2001.	*Settlement Agreement*	Calcination of sodium-bearing waste commenced ahead of schedule in February 1998.[b]
Cease use of Tanks WM-182 through WM-186; except WM-185, designated as a possible emergency spare, by June 30, 2003.	*Second Modification to Consent Order to the Notice of Noncompliance*	
Submit application to DEQ for RCRA Part B permit for calcined waste treatment by December 1, 2012.	*Settlement Agreement*	The final schedule for sodium-bearing and calcined waste treatment will be determined in the Record of Decision for the Idaho High-Level Waste and Facilities Disposition Environmental Impact Statement (HLW & FD EIS).[d]
Complete calcination of liquid sodium-bearing waste by December 31, 2012.	*Settlement Agreement*	The *Settlement Agreement* allows for negotiation of a modification if necessary.[e] The final schedule for sodium-bearing and calcined waste treatment will be determined in the record of decision for the HLW & FD EIS.[d]
Cease use of Tanks WM-180, WM-181, WM-187, WM-188, WM 189, and WM-190 (in monolithic vaults) by December 31, 2012.	*Second Modification to Consent Order to the Notice of Noncompliance*	The final schedule for sodium-bearing and calcined waste treatment will be determined in the record of decision for the HLW & FD EIS.[d]
Ship all transuranic waste at the INEEL to the Waste Isolation Pilot Plant (or another DOE-designated facility) by a target date of December 31, 2015, and no later than December 31, 2018.	*Settlement Agreement*	
Complete treatment of all calcined waste at the INEEL by a target date of 2035.	*Settlement Agreement*	The final schedule for calcined waste treatment will be determined in the record of decision for the HLW & FD EIS.[d]

a. DOE 1995

b. Hovinga 1998.

c. DOE-ID 1998.

d. The draft HLW & FD EIS was released for public comment in December 1999 (DOE 1999).

e. DOE 1995, Part J, Subpart 4, p. 11.

- Minimize infiltration and subsequent contaminant leaching caused by external building drainage and run-on.

The interim action specified for Tank Farm soil consists of institutional controls with surface water control to reduce surface water infiltration into Tank Farm soil. This reduction should limit leaching and transport of soil contaminants to the aquifer. Institutional controls include warning signs, administrative controls to restrict access, and inspection and maintenance for the duration of the interim action from 2000 to 2008 or until OU 3-14 remedial action begins. Surface water control measures include surface water run-on diversion channels; grading and surface sealing the Tank Farm soil or covering the Tank Farm sufficient to divert 80% of the precipitation falling atop the Tank Farm soil area to direct water away from the contaminated areas so that moisture infiltration is minimized and contaminants are not mobilized. Run-on water will be managed as part of the existing surface water drainage system and runoff water will be collected and managed in a lined evaporation pond to be constructed as part of the interim action. The evaporation pond will be constructed and used as a best management practice to reduce infiltration into the INTEC area. The pond will also contain the Tank Farm runoff in the case of an unplanned spill or release. During the interim action period, INTEC-wide monitoring will be performed to evaluate potential changes in water content and quality in SRPA.

Based on preliminary information, the following strategies may be used to implement this interim action:

- Grading and lining with concrete all existing stormwater collection ditches around the Tank Farm and out to the discharge point.
- Replacing existing culverts around the Tank Farm and out to the discharge point with larger culverts to accommodate the expected increase in stormwater flow.
- Constructing a lift station at the intersection of Beech and Olive avenues to pump stormwater to a location where the water will drain freely to the discharge point.
- Constructing concrete headwalls and end walls as necessary throughout the lined drainage system.
- Constructing a lined evaporation pond to collect stormwater runoff from the Tank Farm and other INTEC areas that currently drain into the CERCLA environmentally controlled area (ECA) 37A. All drainage ditches within the scope of this project would be routed to this basin.
- Constructing two concrete-lined ditches within the Tank Farm to collect and direct precipitation runoff to the surrounding stormwater collection system.
- Constructing a new fence around the evaporation pond.
- Applying a covering over the ground at the Tank Farm to minimize stormwater infiltration into the underlying soil. A geotextile material would be placed on the ground, and a polyurea spray-on liner would be applied over the geotextile material. Before this application, the ground surface would be graded to create a positive drainage (away from the Tank Farm). No excess soil is expected; rather, clean soil may be brought in to create the necessary drainage. The existing 1977 Dupont Polyoletin 3110 membrane will be left in place.

- It is anticipated that OU 3-14 Phase I characterization activities at the Tank Farm will be conducted after the OU 3-13 Group 1 interim action surface coating is in place. Coordination will occur between the OU 3-13 Group 1interim action, construction schedule and the schedule for the OU 3-14 Phase I characterization activities at the Tank Farm. The OU 3-13 Tank Farm Interim action plan specifies that the surface coating will be easily repairable when breached for any reason. It will be the responsibility of OU 3-14 to repair or restore the integrity of the surface coating and sealant on the Tank Farm surface after OU 3-14 RI/FS Tank Farm activities.

The OU 3-13 ROD stated that interim action activities will occur concurrently with OU 3-14 RI/FS activities (DOE-ID 1999b). It is anticipated that OU 3-14 Phase I characterization activities at the Tank Farm will be performed after the OU 3-13 Interim Action of placing a cover and surface seal over the Tank Farm soil. OU 3-13 Group 1 and OU 3-14 will work together to coordinate their schedules, avoiding unnecessary interference with each other's work activities. Restoration of the cover and surface seal will be the responsibility of the OU 3-14 RI/FS, to ensure that the integrity of the surface seal is not jeopardized.

2. OU 3-14 BACKGROUND AND OPERATIONAL HISTORY

Operable Unit (OU) 3-14 is located in the northern portion of the Idaho Nuclear Technology and Engineering Center (INTEC), and OU 3-14 release sites are grouped in three categories (see Figure 2-1):

- Tank Farm soil sites are located within the Tank Farm boundary (DOE-ID 1999a) in the north-central portion of INTEC. All of the soil sites are consolidated into site CPP-96.
- The former INTEC injection well (site CPP-23) is southwest of the Tank Farm..
- Three additional sites from OU 3-13: CPP-61, CPP-81, and CPP-82, are also southwest of the Tank Farm, north and west of site CPP-23. These three sites from OU 3-13 were screened as no further action sites in the OU 3-13 RI/FS. They were assigned to OU 3-14 in the OU 3-13 record of decision (ROD) (DOE-ID 1999b) because the U.S. Department of Energy Idaho Operations Office (DOE-ID), U.S. Environmental Protection Agency (EPA), and Idaho Department of Environmental Quality (IDEQ) determined that data for the sites used in the OU 3-13 RI/FS were inadequate to make remediation decisions, as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Because only a data review of these no further action sites will be conducted as part of Phase I activities (see Section 1.3), these activities will not be addressed further in this section.

2.1 Tank Farm

Essentially all of the high-level waste at the Idaho National Engineering and Environmental Laboratory (INEEL) exists at INTEC, formerly the Idaho Chemical Processing Plant (ICPP) (Palmer et al. 1998). INTEC reprocessing of spent nuclear fuel (SNF) was conducted from 1953 to 1992. Two types of liquid waste have been stored at the Tank Farm; they are high-level liquid waste (HLLW), sometimes termed non-sodium bearing waste, and sodium–bearing waste. The HLLW was generated as a direct result of reprocessing SNF and the sodium–bearing waste was generated from incidental activities, such as decontamination, associated with operation of INTEC. The liquid sodium–bearing waste is stored and treated in the same manner as the HLLW. In April 1992, the U.S. Department of Energy (DOE) announced that SNF would no longer be reprocessed and called for a shutdown of the reprocessing facilities at INTEC. Since that time, no more HLLW has been (or will be) generated. The production of sodium–bearing waste is dependent on how much and what type of work is done at INTEC in the future, especially in the area of decontamination and decommissioning.

From 1953 until INTEC calcination activities began, the high-level liquid waste from fuel dissolution and extraction reprocessing activities accumulated in the Tank Farm underground stainless steel tanks. From 1963 until 1981, the liquid waste was stored temporarily in the Tank Farm and was then transferred to first Waste Calcining Facility (CPP-663). After 1981 until June 2000, Tank Farm waste was shipped to the New Waste Calcining Facility (NWCF; CPP-659). The calciner currently is closed while DOE-ID is deciding whether to reapply for an operations permit or to permanently close the facility and replace it with another waste treatment facility.

Today there is no widespread agreement about what precisely constitutes high-level waste. For example, the U.S. Nuclear Regulatory Commission defines high-level waste as waste resulting from first-cycle extraction activities (10 CFR 61); the DOE defines high-level waste as "the highly radioactive waste material resulting from the reprocessing of SNF, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations and other highly radioactive material that it is determined, consistent with existing law, to require permanent isolation" (DOE Manual 435.1). Using the DOE definition, second- or third-cycle extraction waste and, therefore, sodium–bearing waste could conceivably be considered

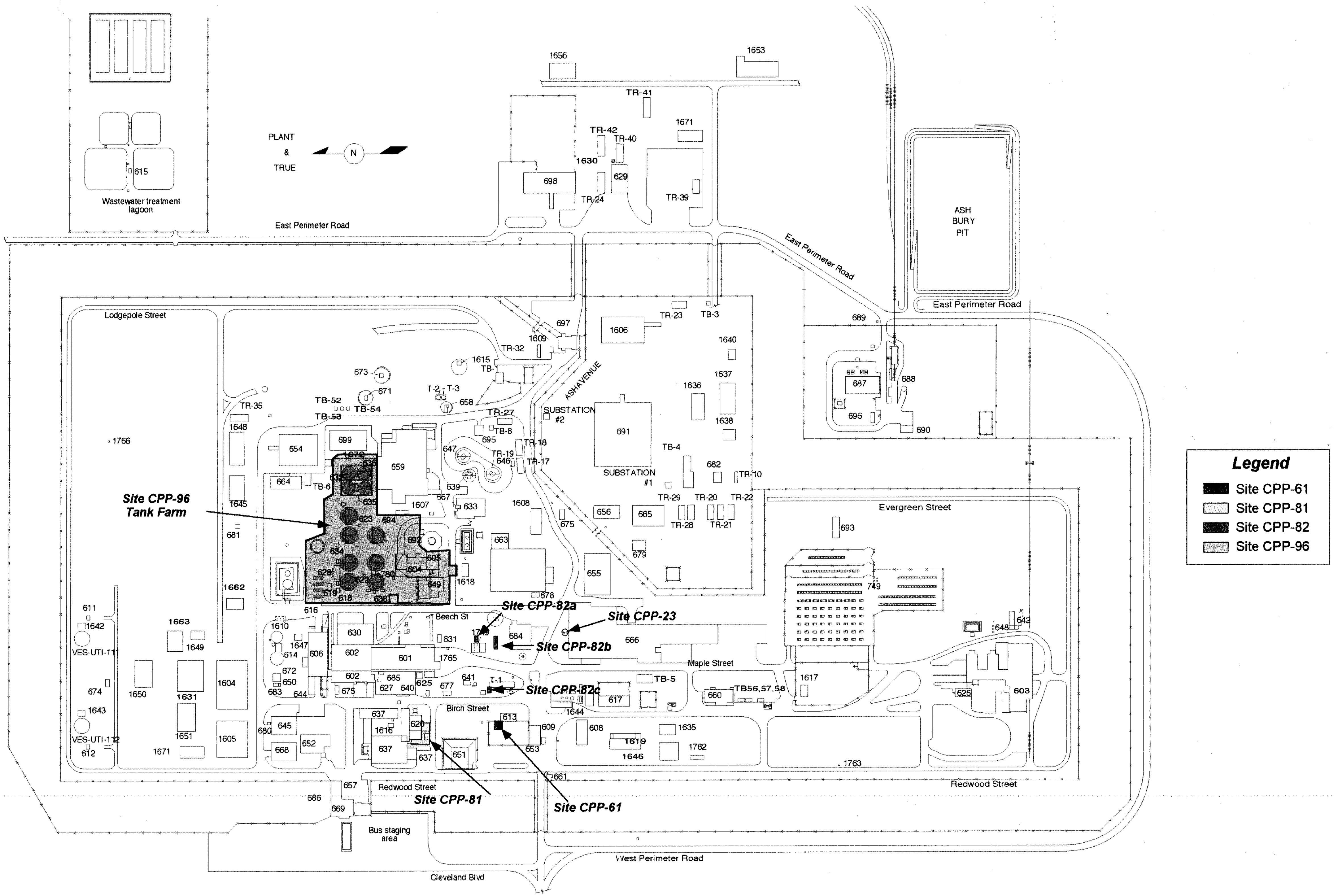


Figure 2-1. Physical layout of the Idaho Nuclear Technology and Engineering Center showing the Tank Farm, the former INTEC injection well, and three additional sites from OU 3-13, Sites CPP-61, CPP-81, and CPP-82.

high-level waste. However, historically at the INTEC, operationally-based definitions were used to describe the types of waste produced at the INTEC fuel processing building (CPP-601) and stored at the Tank Farm:

- **High-level waste**— High-level waste, generated as a direct result from reprocessing SNF during first-cycle extraction (Wichmann, Brooks, and Heiser 1996)
- **Sodium-bearing waste**— or non-high-level waste from second- and third-cycle extraction and from incidental activities, such as decontamination associated with operation of INTEC (Palmer et al. 1998; Wichmann, Brooks, and Heiser 1996). In the past, sodium–bearing waste was called intermediate-level waste. Sodium-bearing waste typically contains no more than about 10% of the radioactivity of high-level waste. Sodium-bearing waste cannot be calcined directly in NWCF because the waste, nearly 100 times higher in sodium content than high-level waste, forms alkali compounds during the calcination process that melt at calcination temperatures and cause the calciner's fluidized bed to agglomerate. The high levels of potassium and manganese in the waste also clogged the calciner. Sodium-bearing waste is first concentrated in the high-level liquid waste evaporator or blended with reprocessing waste or non-radioactive materials, such as aluminum nitrate, before calcination (Palmer et al. 1998; Wichmann, Brooks, and Heiser 1996).

Other radioactive liquid waste was processed through the process equipment waste (PEW) evaporator. Until 1984, the overheads from this waste were sent to the INTEC injection well (Site CPP-23) and then to the percolation ponds until December 31, 1991. After January 1, 1992, the waste was sent to the Liquid Effluent Treatment Disposal Facility and then released to the environment through the main stack (CPP-708).

With the end of the cold war and the diminishing need to recover and recycle SNF, DOE announced the discontinuation of the reprocessing mission at INTEC in April 1992. Since the discontinuation, no more high-level waste has been generated at INTEC. The decontamination and decommissioning of the final second- and third-cycle campaigns, completed in 1994, generated sodium-bearing waste. Since this time, INTEC operations have shifted to continued management and disposition of waste accumulated from previous reprocessing activities. Until 1998, the facility was designated the Idaho Chemical Processing Plant, at which time it was redesignated the Idaho Nuclear Technology and Engineering Center in keeping with the current emphasis of waste management and storage of SNF, high-level waste, and sodium-bearing waste.

The 1995 *Settlement Agreement* (DOE 1995) between DOE, the State of Idaho, and the U.S. Navy required calcination of all the high-level waste at the Tank Farm by June 1998, which was achieved in February 1998 (Hovinga 1998). However, the heel of Tank WM-188 has not been flushed; therefore, it is residual high-level waste. A heel is defined as the liquid volume remaining in the tank after it has been reduced to the greatest degree possible with existing tank transfer equipment (Rasch 1994).

The *Settlement Agreement* requires treatment of all sodium–bearing waste at the Tank Farm by December 31, 2012.

The remaining waste at the Tank Farm is sodium–bearing waste, which has been managed as high-level waste, but is actually mixed transuranic (TRU) waste. Transuranic waste is defined as radioactive waste containing any alpha-emitting radionuclide with an atomic number greater than 92, a half-life longer than 20 years, and a concentration greater than 100 nCi/g at the end of an assumed period of 100 years of institutional control (DOE-ID 1996). However, a waste incidental to reprocessing (WIR) determination is required for the sodium–bearing waste at the Tank Farm to be managed as TRU waste.

The WIR determination is based on guidance in U.S. DOE Order 435.1, DOE Manual 435.1, and DOE Guidance 435.1, which would be the final determination for allowing management of all the Tank Farm waste, including the heels (flushed or not flushed), as incidental waste (LMITCO 1999a). Closure of the tanks cannot commence until DOE approves the WIR determination. The ultimate classification of the waste is important because all high-level waste must be permanently isolated in a geologic repository, such as Yucca Mountain. Management of the waste as TRU waste provides more management options after treatment, such as storage at the Waste Isolation Pilot Plant, at the Hanford Site, or at any other approved TRU waste storage facility.

Low-level liquid waste (10 CFR 61.55) is generated at INTEC by a variety of processes such as off-gas treatment, facility decontamination, laboratory operations, and equipment decontamination, and is sent to the Tank Farm. Currently, the Tank Farm is used for the interim waste storage of liquid mixed waste (radioactive and hazardous) before calcination. Because the Tank Farm stores mixed waste, it is regulated as an interim status tank system (LMITCO 1999b) under the Hazardous Waste Management Act (HWMA) of 1983 (IC § 39-4401) and the Resource Conservation and Recovery Act (RCRA) (42 USC § 6901 et seq.; LMITCO 1998a; Gilbert and Venneman 1999).

The chronological construction and upgrade/improvement/repair history of the Tank Farm and ancillaries is summarized in Appendix F of this Work Plan. In 1977, a 0.02-in.-thick Dupont Polyolefin 3110 membrane was placed over the Tank Farm's graded surface to prevent water ingress from the surface. The membrane at that time was stated to be sandwiched between two 3-in. sand layers. The sand-Polyolefin-sand layers were then covered with 3 in. of gravel. More recent descriptions, from Track 2 reports, indicate that the membrane is sandwiched between two soil layers, that is, 0.6 m (2 ft) of soil beneath the membrane, the 0.5 mm (20-mil) thick membrane liner, and an additional 15 cm (6 in.) of soil to prevent the membrane liner from blowing away. Although the existing Tank Farm membrane's integrity may have been compromised during operational repairs and upgrades, the Group 1 interim action anticipates leaving the existing membrane in place.

The Tank Farm comprises nine 300,000-gal (WM-182 through WM-190) and two 318,000-gal active stainless steel tanks contained in concrete vaults (WM-180 and WM-181) 13.7 m (45 ft) belowgrade, and four inactive 30,000-gal stainless steel tanks (WM-103 through WM-106), also belowgrade. Previously, three 18,000-gal PEW tanks (WM-100, WM-101, and WM-102) and the associated valve boxes, encasements, and piping (LMITCO 1999a, 1998a) were considered as part of the Tank Farm system. However, these tanks, located within the Waste Treatment Building (CPP-604), may continue to operate to support INTEC operations after the Tank Farm is closed. The three PEW tanks, along with five support tanks (WL-101, WL-102, WL-132, WL-133, and a new tank, WL-111) will be permitted as part of the PEW system and, therefore, are no longer considered part of the Tank Farm system.

Over the next several years, DOE will close the eleven 300,000-gal and the four 30,000-gal underground tanks within the Tank Farm because (1) reprocessing has been terminated and (2) the tanks do not comply with RCRA secondary containment requirements, and the high-radiation fields within the Tank Farm greatly impede bringing the tanks into compliance. In addition, because the concrete vaults of the eleven 300,000-gal tanks have no access, they cannot readily be inspected to certify either compliance with RCRA secondary containment requirements or current seismic standards (see Section 2.1.1.3). The tanks have never leaked and their estimated remaining life (970 years) greatly exceeds the length of time of their remaining use (Palmer et al. 1999). All the tanks are scheduled to be closed by 2017 (see Section 2.1.2). An aerial and a conceptual view of the Tank Farm are provided in Figures 2-2 and 2-3, respectively. Because PEW operations may continue after the Tank Farm is closed, the PEW 18,000-gal tanks are not part of the Tank Farm closure and will be permitted as part of the PEW system (LMITCO 1999a). These eight tanks are not discussed further in this Work Plan.

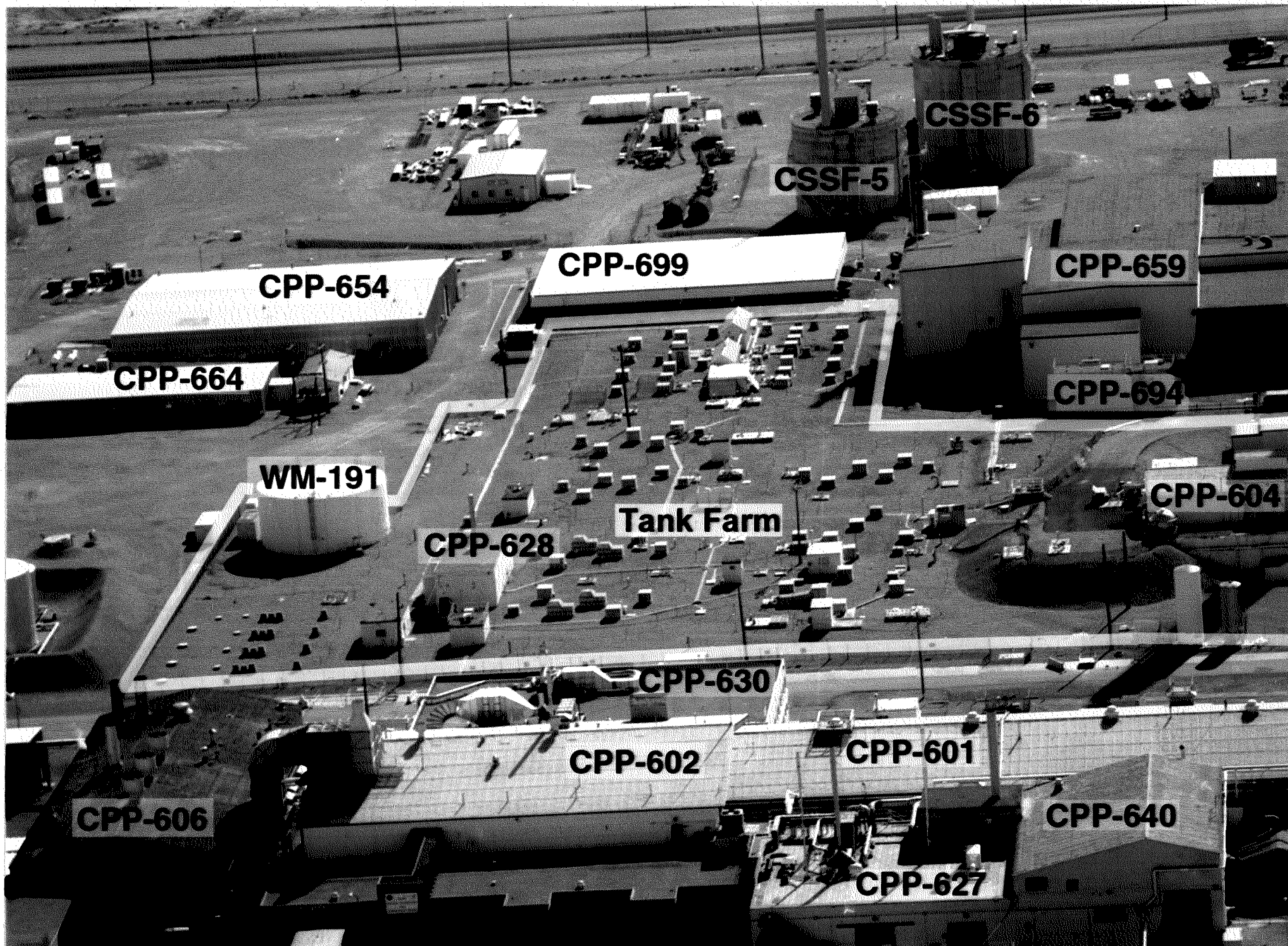


Figure 2-2. Aerial view of the Tank Farm (LMITCO 1998b).

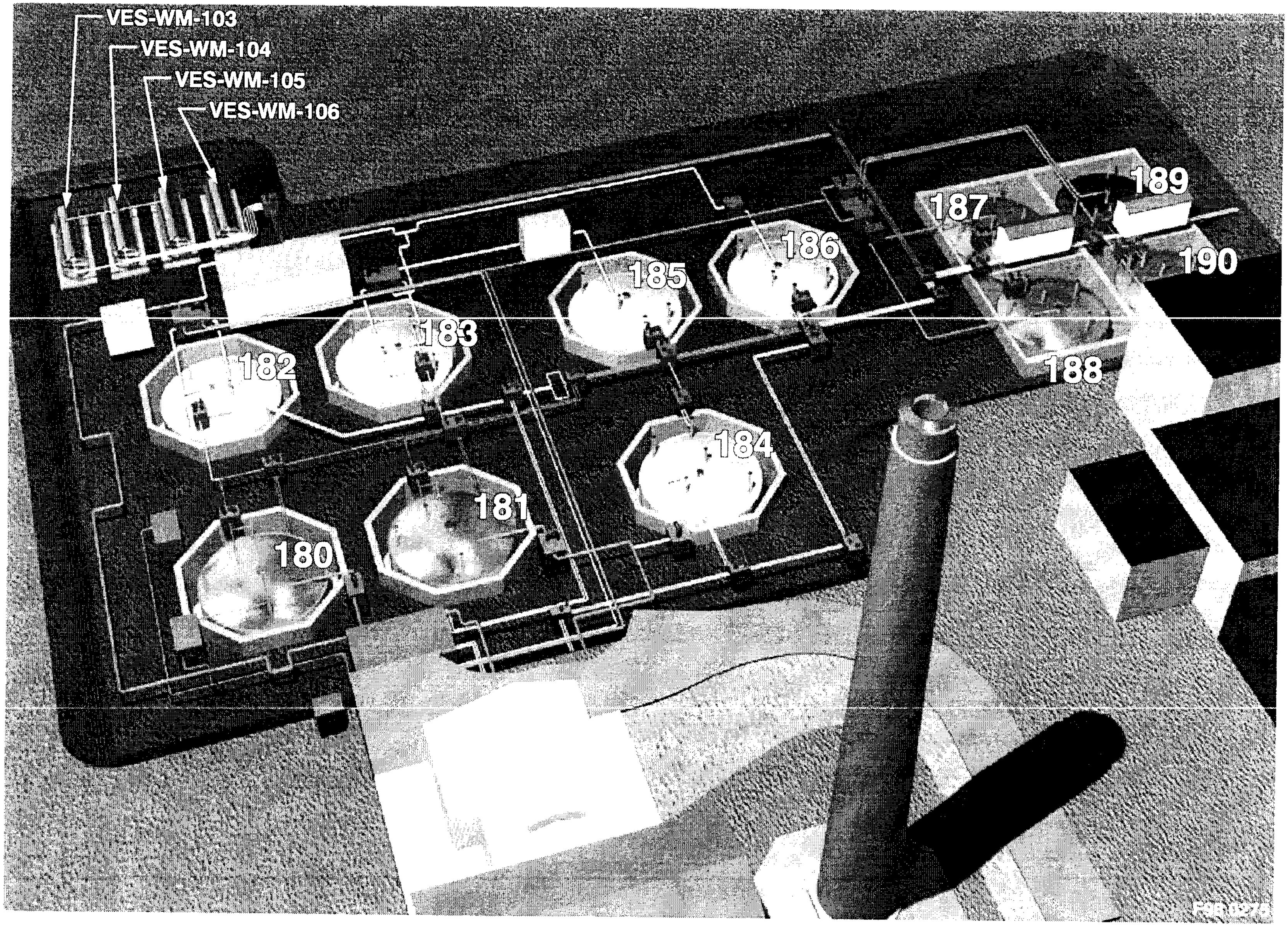


Figure 2-3. Conceptual view of the Tank Farm.

The environmental impacts of storage of the HLLW at INTEC are addressed in the High-Level Waste & Facilities Disposition Environmental Impact Statement (HLW & FD EIS) in accordance with National Environmental Policy Act (NEPA) (42 USC 4321 et seq.) requirements.

2.1.1 Current Operational and Regulatory Status of the Tank Farm

The current DOE mission for INTEC includes management and storage of SNF, and treatment and storage of high-level waste and sodium–bearing waste, generated during past SNF reprocessing, and treatment and storage of low-level waste, generated primarily from decontamination and other operations. The current mission of the Tank Farm is storing waste generated from decontamination and ongoing INTEC operations such as off-gas treatment, laboratory operations, facility decontamination, equipment decontamination, and SNF storage.

The volume of sodium-bearing and newly–generated waste in storage at the Tank Farm is dependent on the quantity and type of work done at INTEC. Sodium–bearing waste is generated primarily from decontamination and from operations associated with laboratories, fuel basins, and closure activities. Recent volumes of the remaining waste in the Tank Farm are shown in Figure 2-4. About 1.3 million gal of waste is stored in the Tank Farm currently (BBWI 2000).

2.1.1.1 Calcination. From 1963 until June 2000, the liquid waste stored at the Tank Farm was solidified using calcination. Calcination is the process of converting liquid radioactive waste to granular solids. The liquid in the radioactive waste (primarily nitric acid) is evaporated and the dissolved metals and fission products are converted to metal salts and oxides. Each granule is about 0.3 to 0.7 mm in size. (Palmer et al. 1998; WINCO 1986a). The solids are then transferred for interim storage to stainless steel bins called the Calcined Solids Storage Facility (CSSF). Calcination typically reduces the volume of high-level radioactive liquid waste 2 to 10 times (Palmer 1998). Calcination reduces the volume of sodium–bearing waste 2 to 4 times. From September1982 until June 2000, calcination at the INEEL was performed at NWCF, which is currently in shutdown status, pending a decision by DOE (in the Idaho HLW & FD EIS and then the ROD) whether to repermit the facility for operation or to close it and use another type of treatment, such as chemical separations or vitrification.

A small amount of liquid waste from the calcination process was then sent to the PEW for evaporation. The overheads from the PEW were sent to the Liquid Effluent Treatment and Disposal Facility (CPP-1618) and released out the INTEC main stack (CPP-708) and the concentrates (or "bottoms") were returned to the Tank Farm or to NWCF for storage to await use in a future calcination campaign. During the most recent operations, NWCF operated at a higher temperature than previously, about 600°C, instead of 500°C. Operation at the higher temperature required smaller quantities of chemical additives, thereby allowing a quicker net reduction of the liquid waste stored at the Tank Farm.

2.1.1.2 Tank Heels. Since the 1998 calcination of all HLLW at the Tank Farm was completed, all waste remaining at the Tank Farm has been considered sodium-bearing waste. Some of the heels have been flushed, with the exception of the 13,600-gal heel in Tank WM-188 (Palmer et al. 1998; BBWI 2000) (see Figure 2-4). The heel of Tank WM-188 is to be flushed with the sodium–bearing waste currently remaining in other 300,000-gal tanks.

The second modification to the consent order (DOE-ID 1998) stipulates that DOE must cease using five of the 300,000-gal tanks (WM-182, WM-183, WM-184, WM-185, and WM-186) by June 30, 2003, although the consent order allows WM-185 to be used as an emergency spare if it can be shown to meet the RCRA requirements and have a PE sign off that the tank is useable. The second modification requires ceasing use of the remaining six 300,000-gal tanks (WM-180, WM-181, WM–187, WM–188, WM-189, and WM–190) by December 31, 2012. A tank is considered to meet the cease-use requirement if it has been emptied down to its heel.

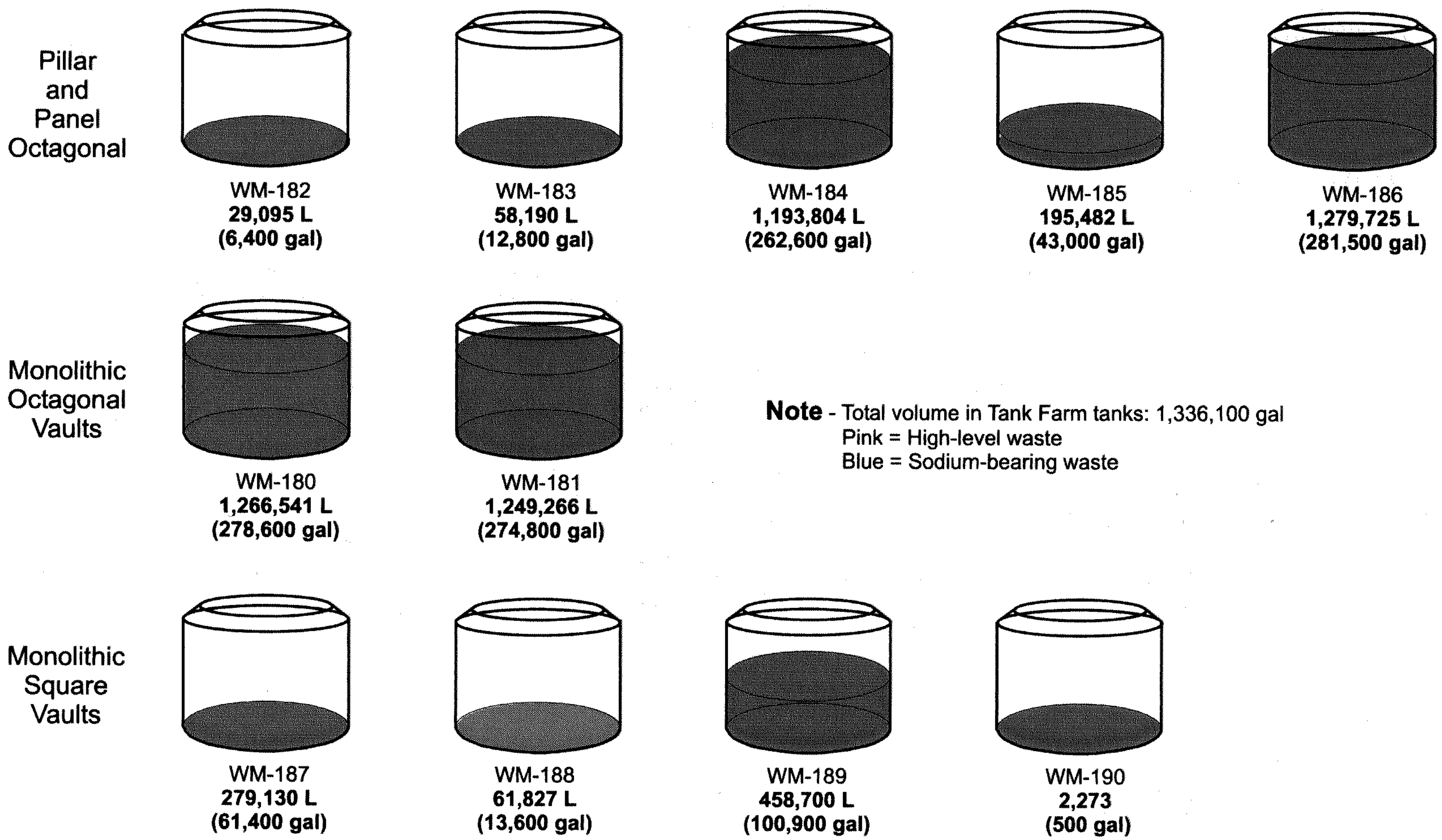


Figure 2-4. Recent Tank Farm volumes (300,000-gal tanks) (BBWI 2000).

A heel is defined as the liquid volume remaining in the tank after it has been reduced to the greatest degree possible with existing tank transfer equipment (Rasch 1994). The tanks are anticipated to be closed in groups to facilitate plant operations until alternate facilities are available. The second modification also requires the submittal of a closure plan for one 300,000-gal tank to the State of Idaho by December 31, 2000. Tanks WM-182 and WM-183 are to be the first tanks closed.

The heels of WM-188 and the first two tanks slated for closure, WM-182 and WM-183, have been physically evaluated for RCRA characteristics using the remote Light Duty Utility Arm (LDUA). The evaluation of the heel of WM-188 was performed in February 1999 and the heels of WM-182 and WM-183 were performed in late 1999 and January 2000. Based on the evaluations, the depth of solids that will be left in the tanks after closure is now estimated to average as much as 4 in. per tank, varying by as much as 3 to 10 in. Previous estimates were that an average of a 1-in. heel would be left in each tank. The total volume of all of the 300,000-gal tank heels, after removal of as much of the precipitated solids as possible with existing technology, is now estimated at 50 tons or 3% of the current volume.[a]

New instrumentation is being evaluated to attempt to further reduce the size of the heels. The use of high-pressure water from a wash ball or similar high-pressure nozzle or nozzle arrangement to wash the tank walls and agitate the tank heels is to be evaluated for the closure of Tanks WM-182 and WM-183. The size of the heel is also expected to vary for cease-use qualification for each tank depending on the conditions of the tank (Quigley 1999). The suction leg of the steam jet, which is the existing equipment used to drain the tank contents, may have varying effectiveness in each tank depending on the tank conditions, and certainly will be set at varying heights depending on the depth of the heel for each tank. The closure plans for each group of tanks will address the specific remaining tank heels (DOE-ID 1998).

2.1.1.3 Composition. All of the liquid waste in the 300,000-gal tanks has been sampled, and the general chemical and radionuclide compositions have been determined (Palmer et al. 1998). However, as stated in Section 2.1.1.2, only WM-182, WM-183, and WM-188 have been sampled for RCRA characteristics. High-level liquid waste was typically 1 to 3 *M* nitric acid-containing fission products, TRU elements, and metals such as mercury and cadmium. The maximum radioactive concentration in the 300,000-gal tanks was in the range of 10 to 20 Ci/L. Recent concentrations of chemicals and radionuclides in each of the 300,000-gal tanks are provided in Table 2-1 and 2-2.

2.1.1.4 Tank Description. The following underground storage tanks at the Tank Farm have been designated with interim status for regulation under the HWMA/RCRA:

- Eleven active tanks with a capacity of about 1,363,828 L (300,000 gal). The tanks include nine 300,000-gal tanks (WM-182 through 190) and two 318,000-gal tanks (WM-180 and 181). These 11 tanks are referred to collectively as the 300,000-gal tanks.

a. Information provided by E. P. Wagner, Jr., to P. A. Tucker in telephone interview, May 25, 2000, Bechtel BWXT Idaho, LLC.

Table 2-1. Estimated chemical properties and concentrations in 300,000-gal tanks (from Palmer et al. 1998).

Analyte or Constituent	Unit	WM-180	WM-181	WM-182	WM-183	WM-184	WM-185	WM-186	WM-187	WM-188	WM-189	WM-190
Density	g/mL	1.28	1.16	1.23	1.24	1.27	1.28	1.18	1.16	1.32	1.31	NR[a]
Acid $[H^+]$	M	1.20	1.89	0.85	2.03	0.45	1.61	1.57	1.98	2.79	2.62	0.02
Nitrate	g/L	298.65	239.98	264.16	342.30	301.99	328.03	190.99	208.97	3.82	401.20	1.24
Aluminum	g/L	17.81	6.21	33.99	17.54	22.93	19.43	9.98	14.57	23.47	28.06	NR
Boron	g/L	0.12	0.17	0.10	0.15	0.08	0.19	0.23	0.14	0.42	0.29	NR
Cadmium	g/L	0.09	0.62	0.023	0.17	0.02	0.22	0.20	0.58	1.07	0.67	NR
Calcium	g/L	1.44	1.84	NR	1.76	0.48	2.85	2.65	1.72	6.25	3.85	NR
Chloride	g/L	1.16	0.57	0.037	0.41	1.61	1.12	0.75	0.08	0.55	0.78	0.01
Chromium	g/L	0.21	0.16	0.05	0.88	0.10	0.26	NR	0.10	0.68	0.31	NR
Fluoride	g/L	0.08	1.79	1.60	1.06	0.80	3.19	0.80	4.41	6.04	6.65	0.13
Iron	g/L	1.06	0.73	1.17	3.41	1.17	1.23	1.06	1.12	3.13	1.95	NR
Lead	g/L	0.31	0.23	NR	0.33	0.25	0.21	NR	NR	0.25	NR	NR
Manganese	g/L	NR	0.77	NR	0.77	0.49	1.10	NR	NR	NR	NR	NR
Mercury	g/L	0.21	0.10	NR	0.56	0.32	0.82	NR	0.16	1.56	0.72	NR
Molybdenum	g/L	NR	0.05	NR	0.07	0.05	0.05	NR	NR	NR	NR	NR
Nickel	g/L	0.10	0.08	NR	0.43	0.08	0.09	NR	NR	0.33	NR	NR
Phosphate	g/L	NR	0.57	NR	NR	2.37	0.28	NR	NR	0.04	NR	NR
Potassium	g/L	7.43	5.87	0.12	3.91	5.47	7.82	6.65	0.78	5.87	5.87	NR
Sodium	g/L	48.51	21.84	0.46	18.62	48.51	33.80	23.22	4.14	17.93	26.21	NR
Sulfate	g/L	3.27	2.40	2.79	6.63	7.20	4.32	3.36	1.06	3.55	2.98	NR
Zirconium	g/L	< 0.11	0.46	1.00	< 0.15	NR	0.91	NR	2.19	2.46	2.92	NR

a. NR means not reported.

Table 2-2. Estimated radionuclide concentrations (Ci/L) in 300,000-gal tanks (Palmer et al. 1998).

Radionuclide	WM-180	WM-181	WM-182	WM-183	WM-184	WM-185	WM-186	WM-187	WM-188	WM-189	WM-190
Am-241	5.59E-04	2.08E-04	5.02E-04	7.48E-04	2.20E-04	5.59E-04	2.10E-04	4.58E-04	1.42E-03	9.14E-04	NR
Ce-144	NR	1.80E-06	2.01E-05	9.26E-07	NR	1.81E-06	1.11E-06	NR	NR	NR	4.52E-11
Co-60	NR	2.61E-04	1.22E-04	1.45E-04	NR	3.79E-05	5.02E-05	4.59E-05	3.52E-04	1.10E-04	NR
Cs-134	9.03E-04	2.33E-04	2.22E-03	3.43E-04	1.66E-06	1.16E-04	1.16E-04	1.72E-04	1.23E-03	5.40E-04	9.80E-07
Cs-137	2.85E-02	2.94E-02	5.67E-01	2.28E-01	2.02E-02	1.08E-01	3.25E-02	7.40E-02	3.74E-01	1.61E-01	1.06E-02
Eu-154	5.59E-05	2.99E-04	4.44E-03	9.26E-04	NR	2.48E-04	1.38E-04	3.66E-04	1.83E-03	7.30E-04	2.94E-05
Eu-155	NR	9.49E-05	1.14E-03	4.29E.04	NR	NR	NR	1.04E-04	6.36E-04	1.30E-04	4.08E-06
H-3	2.35E-05	2.11E-05	7.76E-04	4.82E-04	NR	3.58E-05	NR	NR	NR	NR	NR
I-129	< 1.4E-08	< 3.3E-07	NR	< 1.2E-05	5.72E-06	< 3.9E-05	NR	NR	NR	NR	NR
Ni-63	2.67E-05	6.22E-05	NR	NR	NR	NR	NR	NR	NR	NR	NR
Np-237	4.34E-07	1.93E-07	2.16E-06	7.72E-07	4.60E-07	1.44E-05	2.90E-07	5.67E-07	1.61E-06	1.11E-05	NR
Pu-238	3.47E-04	6.15E-04	2.57E-03	6.59E-04	6.59E-04	8.39E-04	2.32E-04	1.99E-03	3.77E-03	2.82E-03	NR
Pu-239	5.65E-05	1.30E-05	2.85E-04	2.40E-04	8.30E-05	7.52E-05	3.99E-05	1.04E-05	2.39E-04	6.62E-05	NR
Pu-240	1.69E-05	3.65E-06	1.64E-05	1.88E-05	3.40E-05	2.05E-05	9.86E-06	2.34E-06	2.11E-05	1.75E-05	NR
Pu-241	3.18E-04	2.75E-04	6.10E-04	5.61E-04	4.47E-04	9.08E-04	1.75E-04	8.69E-04	1.90E-03	1.63E-03	NR
Pu-242	1.27E-08	8.63E-09	1.94E-08	5.53E-08	1.00E-08	2.44E-08	4.17E-09	5.93E-09	6.05E-08	2.43E-08	NR
Ru-106	NR	5.58E-06	2.81E-05	NR	NR	1.67E-06	2.12E-06	NR	NR	NR	NR
Sb-125	NR	8.96E-05	NR	NR	NR	NR	3.09E-05	NR	NR	NR	NR
Sr-90	2.30E-02	2.82E-02	5.51E-01	1.75E-01	1.56E-02	9.59E-02	3.03E-02	NR	2.84E-01	NR	NR
Tc-99	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
U-234	5.61E-07	8.53E-07	1.98E-06	6.28E-07	8.23E-07	1.31E-06	9.77E-07	3.16E-08	6.39E-07	9.85E-07	NR
U-235	1.54E-08	2.14E-08	5.73E-08	2.65E-08	2.26E-08	2.74E-08	2.27E-08	7.11E-10	2.59E-08	2.07E-08	NR
U-236	7.36E-09	7.56E-08	2.13E-07	2.57E-08	1.43E-08	6.09E-08	5.85E-08	3.18E-09	2.97E-08	4.77E-08	NR
U-238	9.37E-09	2.11E-08	1.08E-09	3.00E-08	9.16E-09	2.47E-08	5.15E-08	2.08E-12	2.77E-08	1.80E-08	NR

a. NR means not reported.

- Four inactive tanks with a capacity of 140,929 L (31,000 gal) (WM-103 through WM-106). As shown in Figure 2-1, the four tanks are located north of WM-182. The four smaller tanks are referred to collectively as the 30,000-gal tanks.

2.1.1.4.1 300,000-gal Tanks—The eleven 300,000-gal tanks are similar in design. Each has a 50-ft diameter, an overall height of about 30 to 32 ft, and is contained in an unlined underground concrete vault. The vault floors are about 45-ft belowgrade. The three basic designs of the vaults are described below:

- Monolithic octagon. The two oldest tanks at the Tank Farm (WM-180 and WM-181) were constructed from 1950 to 1953 and are contained in poured-in-place monolithic octagonal concrete vaults. A photograph of the vault for Tank WM-180 is provided in Figure 2-5.

- Pillar and panel octagon. The five tanks contained in vaults of pillar and panel construction, (WM-182 through 186) were constructed from 1953 to 1957. A photograph of the vault for tank WM-182 is provided in Figure 2-6. A photograph of the vault and dome of tank WM-185, showing the precast concrete beams and concrete risers on top, is provided in Figure 2-7. Also octagonal, the pillar and panel vaults are of prefabricated construction. The pillar and panel design is considered the least structurally sound of the three basic designs and, therefore, are expected to be closed first, with the exception of tank WM-185, which has been designated as an emergency spare.

- Monolithic square. The four tanks contained in reinforced poured-in-place, monolithic square, four-sectioned (or "four-pack") concrete vaults (WM-187 through WM-190) were constructed from 1959 to 1965 (see Figure 2-8).

Each 300,000-gal tank in the Tank Farm has a different waste storage history that has impacted or may impact the removal of the remaining waste. A brief summary of each tank compiled from information contained in two 1998 reports (Palmer 1998; Palmer et al. 1998) is provided below. As stated in Section 2.1.1.2, the waste in all of the tanks, other than the heel of Tank WM-188, has been flushed. However, additional rinsing, flushing, and heel removal may be required during the closure process for each tank.

- Tank WM-180 was put in service in 1954 and stored high-level waste from reprocessing aluminum-clad SNF. The tank has been used only for storing sodium-bearing waste since 1972. The tank currently contains 1,266,541 L (278,600 gal) of sodium-bearing waste (see Figure 2-4). The high-level waste in the tank was calcined during 1966–67. Tanks WM-180 and WM-181 are the two oldest tanks at the Tank Farm.

- Tank WM-181 became operational in 1953 and was used as a service waste diversion tank until 1975. Since then, the tank has been used to store sodium-bearing waste and currently contains 1,249,266 L (274,800 gal) of sodium-bearing waste (see Figure 2-4). It has never been used to store first-cycle raffinate high-level waste.

- Tank WM-182 became operational in1956 to store high-level waste from reprocessing aluminum-and zirconium-clad SNF. The tank contains 29,095 L (6,400 gal) of sodium-bearing waste (see Figure 2-4). The volume comprises the final flush of the 13,366 L (3,600-gal) tank heel. The tank was emptied to heel level in 1993. This tank is the first planned for closure under the HWMA/RCRA by 2004.

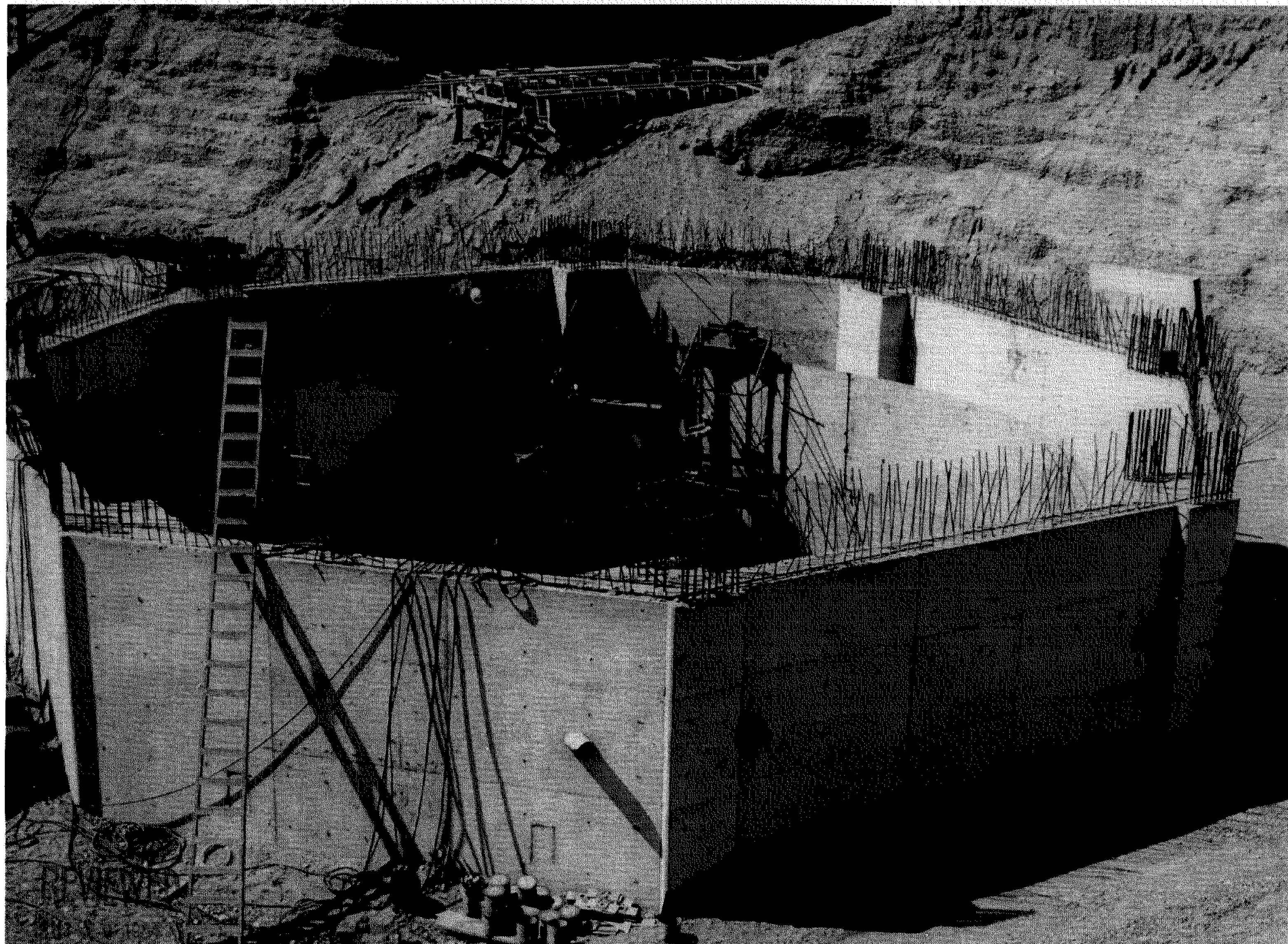


Figure 2-5. Monolithic octagonal vault for Tank WM-180.

Figure 2-6. Pillar and panel octagonal vault for Tank WM-182.

Figure 2-7. Vault and dome of Tank WM-185 showing the concrete beams and concrete risers on top.

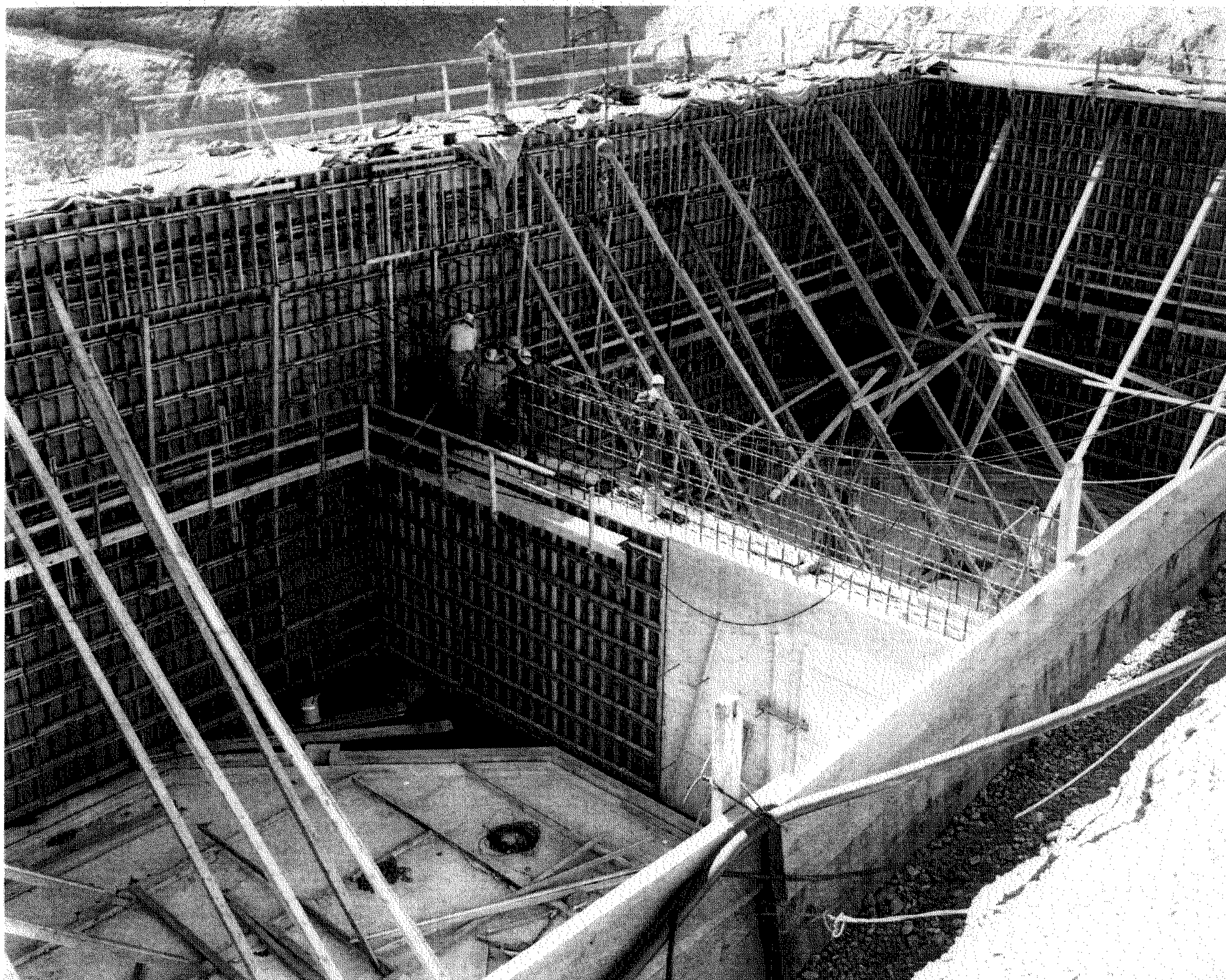


Figure 2-8. Monolithic square vault for Tank WM-190.

- Tank WM-183 became operational in 1958 and was originally used to store high-level waste from reprocessing aluminum- and stainless steel-clad SNF, high-fluoride decontamination solutions, and PEW evaporator and HLLW evaporator bottoms from the Waste Calcining Facility. The tank contains a heel of 58,190 L (12,800 gal) of sodium-bearing waste (see Figure 2-4). High-level waste was transferred from the tank in 1981, after which the tank was filled with sodium-bearing waste. Of all the tanks, WM–183 has contained the greatest variety of waste and its heel will likely have the most precipitated solids.

- Tank WM–184 became operational in 1958 and has contained only sodium-bearing waste composed of PEW Evaporator bottoms. The tank currently contains 1,193,804 L (262,600 gal) of sodium-bearing waste (see Figure 2-4). It has never contained first-cycle raffinate high-level waste.

- Tank WM–185 became operational in 1959 and has stored aluminum and zirconium fuel reprocessing waste, as well as high-fluoride decontamination waste and PEW evaporator bottoms. The tank currently contains about 195,482 L (43,000 gal) of sodium-bearing waste (see Figure 2-4). After it is emptied, the tank is expected to be used as a spare tank for emergency waste storage (LMITCO 1998a; DOE-ID 1998).

- Tank WM–186 was put into service in 1962 and contained high-level waste from reprocessing aluminum-clad SNF until 1967 when the high-level waste was transferred out of the tank. It currently contains 1,279,725 L (281,500 gal) of dilute sodium-bearing waste (see Figure 2-4).

- Tank WM–187 was put into service in 1959 and stored high-level waste from reprocessing of aluminum- and zirconium-clad SNF, high-fluoride decontamination waste, and PEW evaporator bottoms. The tanks currently contains 279,130 L (61,400 gal) of sodium-bearing waste (see Figure 2-4).

- Tank WM-188 became operational in 1963, and has contained zirconium fuel reprocessing waste as well as high-fluoride decontamination waste, and PEW evaporator bottoms. It currently contains approximately a 61,827-L (13,600-gal) heel (BBWI 2000) of high-level waste residue that has not been flushed (see Figure 2-4).

- Tank WM–189 became operational 1964 and contained high-level waste from reprocessing zirconium-clad SNF and waste from decontamination and bed dissolutions at the WCF and NWCF until 1996. The tank currently contains about 458,700 L (100,900 gal) of sodium-bearing waste and a heel of about 22,730 L. (5,000 gal) (see Figure 2-4).

- Tank WM–190 was never placed in service after it was constructed in 1964, but was retained as the designated spare tank for use in emergencies. It contains about 2,273 L (500 gal) of liquid waste (see Figure 2-4) remaining from approximately 31,823 L (7,000 gal) of accumulated meteoric (i.e., rainwater and snowmelt) vault sump water and liquid waste that leaked through closed valves and collected in the tank over time. The waste was pumped from the tank in 1982 using a sump pump that emptied the tank as much as possible without personnel entry.

A summary of the fuel processed and tank usage history is provided in Table 2-3.

Table 2-3. Types of fuel dissolution performed at INTEC (based on Wagner 1999).

Dissolution	Process Description	Facility	Campaign Dates	Comments
Aluminum (batch)	Aluminum-based fuels were dissolved in a nitric acid solution in the presence of a mercuric nitrate catalyst. Hexone was used as the uranium solvent for first-, second-, and third-cycle extraction.	CPP-601	1953–71	The original dissolution performed in C- and D-cells. The equipment was removed in 1984.
Aluminum (continuous)	Aluminum-based fuels were dissolved in a nitric acid solution in the presence of a mercuric nitrate catalyst. Tributyl phosphate (TBP) was used as the solvent for first-cycle extraction, and hexone for second and third cycles.	CPP-601	1957–86	Was being prepared for operation when reprocessing was terminated. Was performed in G-cell.
Zirconium	Zirconium-based fuels were dissolved in hydrofluoric acid. TBP was used for first-cycle extraction, and hexone for second and third cycles.	CPP-601	1957–81	The system was refurbished in 1986, but not used. To reduce the waste volume, the aluminum and zirconium dissolution processes were run together to eliminate the step of adding cold aluminum nitrate to complex fluoride.
Fluorinel (Fluorinel Dissolution Process [FDP])	Newer types of zirconium-based fuels were dissolved in hydrofluoric acid.	CPP-666	1986–88	Before the termination of reprocess, FDP was intended to be the major method of dissolution at INTEC. Cadmium nitrate was used as a nuclear poison to prevent criticality.
Stainless Steel (Submarine Intermediate Reactor [SIR])	Stainless steel fuels were dissolved in sulphuric and nitric acid.	CPP-601	1959–65	
Stainless Steel (Electrical Dissolution Process [EDP])	Stainless steel fuels were dissolved in nitric acid while a direct electrical current passed through fuel.	CPP-640	1973–81	The run was terminated because of equipment failure.
ROVER	Graphite fuels were first burned in oxygen to reduce the graphite. The uranium materials were dissolved in hydrofluoric acid.	CPP-640	1965–84	Uranium-bearing material recovery was completed in the facility in 1998.
Custom	Other fuels, such as cermet-type, were dissolved in specially designed equipment.	CPP-627	1965–91	The final run was terminated because of equipment damage.

2.1.1.4.2 30,000-gal Tanks—The four inactive 30,000-gal tanks (WM-103 through WM-106) were constructed in 1954 and are stainless steel belowground tanks on reinforced concrete pads. The tanks have a diameter of about 3.5 m (11.5 ft) and are 11.6 m (38 ft) long and covered by compacted gravel. Like the 300,000-gal tanks, the 30,000-gal tanks do not have secondary containment that can be certified to meet HWMA/RCRA requirements. Unlike the 300,000-gal tanks, the 30,000-gal tanks do not have vaults. The 30,000-gal tanks were emptied to their heels and taken out of service in 1983. Raw water was added to the tanks in 1990 to provide enough solution to sample for RCRA characteristics and radionuclides. The tanks were tested for pH, metals, and organics. The pH results ranged from 3.4 to 7.9 (WINCO 1990a, 1990b, 1990c, 1990d), the RCRA characteristics were determined to be nonhazardous (Matule 1990), and the radiation readings ranged from 6 to 35 mrem/hour (Machovec 1999, 1990). The tanks were then emptied to their heels, and the contents were used to flush lines from the Tank Farm to the PEW in CPP-604. While the inlets to the tanks were later cut, the outlets are still operational, allowing tank decontamination (see Appendix F for details).

2.1.2 Closure of the Tank Farm System

The Tank Farm is currently operating under HWMA/RCRA interim status (LMITCO 1999b). As stated in Section 1.6.1, it is DOE's intent that as each tank system is successfully closed as a HWMA/RCRA interim status unit, the closed tank system will be evaluated in accordance with the OU 3-13 ROD and the agency-approved OU 3-13 Group 2 Closure Evaluation Criteria and Checklist (CEC&C), and added to OU 3-14.

To maintain plant and Tank Farm operations during the closure process, the tanks are foreseen to be closed in phases involving groups of two or more tanks. It is anticipated that as many as six phases could occur. It is expected that any residual tank contents would be covered with grout and then surrounded by a concrete shell. The void remaining inside the tank would then be filled with material as decided in the HLW & FD EIS ROD, such as either clean grout or low-level radioactive waste grout (Palmer et al. 1998).

2.1.2.1 HWMA/RCRA Closure of the Tank Farm System. The Tank Farm is a HWMA/RCRA-regulated interim status tank system (IDAPA 58.01.05.009 [40 CFR 265]) and will be closed following cessation of operations. In accordance with a signed consent order, a HWMA/RCRA closure plan for one tank must be submitted to the IDEQ by December 31, 2000 (DOE-ID 1998). Current plans call for the tank farm to be closed, using a phased approach with a grouping of two or more tanks in each phase; therefore, a HWMA/RCRA closure plan for closure of two tanks, WM-182 and WM-183, constituting Phase 1 of the Tank Farm closure, will be submitted to IDEQ by December 31, 2000. DOE's draft HWMA/RCRA closure plan recognizes that the contaminated soils in the tank farm are undergoing investigation by the CERCLA program and will not duplicate the efforts of the CERCLA investigation and any follow-on remediation actions for the contaminated soils.

The HWMA/RCRA closure performance standards for closure of the tank system will be identified in the IDEQ-approved HWMA/RCRA closure plan. Idaho Administrative Procedures Act (IDAPA) 58.01.05.009 (40 CFR 265.197) establishes that "at closure of a tank system, the owner or operator must remove or decontaminate all waste residues, contaminated containment system components, contaminated soils, and structures and equipment contaminated with waste, and manage them as hazardous waste..." However, the regulations provide that "if the owner or operator demonstrates that not all contaminated soils can be practicably removed or decontaminated as required...then the owner or operator must close the tank system and perform post-closure care in accordance with the closure and post-closure care requirements that apply to landfills..."

The strategy that DOE has provided to IDEQ has identified the general approach for closure of the tank farm system. The planned approach would begin with removing the waste from the tanks and ancillary system, decontaminating the system components, sampling the residuals and performing a risk assessment on the residuals following waste removal. Upon meeting the performance criteria for waste removal and system decontamination in the approved closure plan, this phase of closure (the first two tanks) would then be completed by isolating the closed system to eliminate any future inflow into the tanks, ancillary equipment, or secondary containment. The current strategy calls for using grout to fill the void spaces. The purpose of this effort is to reduce the amount of contaminants remaining in the system, eliminate future inflows into the system, and reduce the risk to human health and the environment. Upon completing the partial closure (the first two tanks), as specified in the IDEQ-approved closure plan, documentation would be provided to IDEQ certifying the performance of the partial closure. This process would be followed for each phase.

DOE is also responsible for ensuring that the performance of the HWMA/RCRA closure of the tank farm system will also meet the requirements of DOE Order 435.1, "Radioactive Waste Management." This DOE Order requires that systems that have managed a radioactive waste are properly decontaminated and closed, based on their radioactive constituents and associated risks.

2.1.2.2 Phased Closure. A phased approach is foreseen for closure of the Tank Farm. Closure cannot commence until a WIR determination has been approved by DOE-ID. The following criteria were used to determine the phases of the closure:

- Closure of tanks contained in pillar and panel vaults is highest priority because the vaults provide the lowest margin of safety for secondary containment
- History of tank usage and expected composition of heels
- Tank Farm management and operational requirements
- Phased tank closures in groups of two or more for cost-effectiveness and minimization of operational impacts on the Tank Farm
- Accessibility, such as near the edge of the Tank Farm, for continued Tank Farm usage (LMITCO 1998a).

The closure of each 300,000-gal tank is anticipated to require as long as 2 years. However, the closure of each tank will begin at the start of the second half of the closure of the previous tank. The closure of WM-182 and WM-183, the first tanks slated for closure, is expected to begin by 2002. The entire closure process could take as long as 15 years, or the closure could be expedited by several years. According to INTEC waste processing, the closure could be completed by as soon as 2010.

As stated above, tanks WM-182 and WM-183 are anticipated for closure in Phase 1, reflecting the emphasis on closing tanks contained in pillar and panel vaults first. Tanks WM-184 and WM-186 are expected to be closed in Phase 2 because of their pillar and panel vault construction. Tanks WM-180 and WM-181 are presumed for closure in Phase 3 because they are the oldest of the monolithic vaulted tanks and are accessible (see Figure 2-3). The closure of the four 30,000-gal tanks, WM-103 through WM-106, is anticipated for Phase 4. These tanks are no longer used and have been flushed and emptied (Palmer 1998). There is currently no cessation of use or closure agreement in place for the 30,000-gal tanks, which will be closed, as necessary, during the closure of the 300,000-gal tanks to maintain a level workload. Phase 5 of the Tank Farm closure is presumed to include closure of the last tank contained in a pillar and panel vault, WM-185, which has been designated for use as a possible emergency spare, followed by closure of the first two tanks contained in monolithic square vaults, WM-187 and WM-188. The final phase of the Tank Farm closure is expected to comprise the last two tanks contained in monolithic square vaults, WM-189 and WM-190.

2.2 Operational History of the Tank Farm

Historically, the Tank Farm tanks provided interim storage for highly radioactive liquid waste, generated during fuel reprocessing operations, and consisted of the following:

- The eleven 300,000-gal tanks, contained in concrete vaults, provided primary storage of high- level and sodium–bearing liquid waste, except Tank WM-190, which was designated as an emergency spare.

- The four 30,000-gal tanks were normally empty because they have no containment vaults. From 1957 to 1965, the tanks were used to temporarily store specific processing waste such as zirconium and stainless steel waste from the CPP-601 E-cell until compatibility of the waste with that in the 300,000-gal tanks was determined. Since 1965, they have been used on a backup or emergency basis with DOE-ID authorization.

Historical descriptions of the sources of waste stored at the Tank Farm are provided in the subsections below.

2.2.1.1 Fuel Reprocessing. The INTEC facilities were designed to reprocess highly enriched SNF from test and research reactors in the United States and foreign countries, and from U.S. Navy ship propulsion reactors. Fission products would build up in the fuel elements, used in the reactors. The fuel in these elements that was reprocessed typically contained highly radioactive fission products. The elements would sometimes require replacement when only 25% to 35% of the original U-235 was consumed during the reactor process. The remainder could be recovered and recycled. The Tank Farm provided interim storage for highly radioactive liquid waste generated during fuel reprocessing operations. The historical operations information is provided to support data gathering about the contaminant source terms within the Tank Farm. The majority of liquid waste stored in the Tank Farm was generated during progressively more refined processes performed at the fuel processing building (CPP-601) to extract uranium in first-, second-, and third-cycle extractions. The extraction processes typically would remove nearly all of the fission products from the uranium.

2.2.1.1.1 Fuel Dissolution—The primary step in reprocessing SNF at INTEC was fuel dissolution. The objective in all INTEC fuel dissolution processes was to produce a solution of uranyl nitrate for solvent extraction. The different types of fuel dissolution processes, known as "headend" operations, that were performed during INTEC reprocessing are shown in Table 2-3.

Most fuel dissolution processes were housed in one processing complex (i.e., CPP-601, the Remote Analytical Facility building [CPP-627], and the Headend Process Plant [CPP-640]) adjoined and interconnected to the laboratory support facility (CPP-602). Only the fluorinel dissolution process (FDP), which was located in the Fluorinel Dissolution Process and Fuel Storage (FAST) facility (CPP-666), was not housed in the processing complex.

From the FDP, a liquid uranium-bearing product stream was prepared for the solvent extraction processes. The stream would sometimes be prepared as a "feed" by (1) clarification by centrifuge to remove particulate, (2) adjustment of the chemical composition by adding aluminum nitrate to drive the U-235 to the organic phase from the aqueous feed stream, or (3) suppression of emulsions by adding gelatin. Xenon and krypton were completely released during fuel dissolution and were recovered, commensurate with demand (WINCO 1986a).

2.2.1.1.2 Fuel Extraction—By far, the greatest amount of fission-product waste at INTEC was contained in the liquid radioactive waste streams from the extraction processes. Liquid-liquid extraction is the process of separating one component of liquid mixture by contacting the mixture with an immiscible liquid in which the desired component has preferential affinity. In fuel extraction processes at INTEC, either the organic solvent hexone (methyl isobutyl ketone [MIBK]) or tributyl phosphate (TBP) in a kerosene diluent was put in contact with uranium in an aqueous solution of uranyl nitrate. The separation occurred when uranyl nitrate mass-transferred to the organic phase. Traces of fission products were scrubbed from the organic phase with a slightly basic aluminum nitrate solution. Mass transfer back to an aqueous phase was accomplished in a water solution containing less than 0.01 *M* nitrate ion.

Total separation of the uranium from other fission products was achieved in first-, second-, and third-cycle solvent extraction. The uranyl nitrate solution from the third cycle was converted to granular uranium oxide in a fluidized bed denitrator. The uranium oxide was then shipped to other government facilities for return to the nuclear fuel cycle. Because highly radioactive solutions were processed at INTEC, concrete walls up to 1.5 m (5 ft) thick were required for shielding. The total radioactivity of materials within some of the processing cells was routinely as high as 500,000 Ci, equivalent to the radioactivity of more than one-half ton of radium.

During the fuel dissolution and extraction processes, a series of cells from A-cell to Z-cell ("I" was not used as a cell designator), located in CPP-601, were used to extract uranium from the fission products in the SNF. The A- through D-cells were the original cells used in fuel dissolution. During the peak years of fuel reprocessing from 1972 to 1989, E-, F-, G-, and H-cells were used for first-cycle extraction. From the start of INTEC operations until the mid 1980s, product from the H-cell evaporator was sent to N-cell for intercycle storage. After the construction of the M-cell, the H-cell product was sent directly to the M-cell and then to the N-cell. The C-, J-, L-, and S-cells were used for uranium salvage and recycle systems. The H-cell was used to store and treat first-cycle solvent, and the K-cell was used for solvent cleanup. The L-, M-, and N-cells were used for intercycle storage. The O-, P-, Q-, R-, and S-cells were used for second- and third-cycle extraction processes. The T-cell was used for solvent storage for second- and third-cycle extraction, the V-cell housed a health physics office, the W-cell was used for solvent (hexone) collection and sampling for second- and third-cycle extraction, and the X-cell contained a laboratory facility. Final storage of uranyl nitrate was located in the Z-cell in nine tanks, each 133 mm (5-1/4 in.) in diameter by 5.18 m (17 ft) long with a capacity of 14.5 gal (66 L).

After 1965, the contents of only three cells (G-, U-, and Y-cells) were shipped directly to the Tank Farm for storage. Aqueous waste streams, or raffinates, from the second- and third-cycle extraction columns flowed by gravity to the U- and Y-cells, in which the waste was collected. The G-cell contained the waste stream from first-cycle extraction. The contents of the waste stream were either shipped directly to the Tank Farm through a line through U-cell for storage or sent back for further refinement. After a tank was filled, the contents were sampled for uranium content. Generally, based on sampling of the waste tank, if the uranium concentration of the waste stream exceeded 5.0E-02 g/L, the waste was recycled for second- and third-cycle extraction. When the uranium concentration was less than 6.0E-03 g/L, the waste was routed to the Tank Farm.

2.2.1.1.3 Raffinate—In general terms, raffinate refers to the liquid waste from refinement processes. In historical applications at the INTEC reprocessing facility, raffinate refers to the liquid waste products from the refinement of waste involved in first-, second-, and third-cycle reprocessing of SNF. The raffinates were separated into two categories:

- High-level waste from first-cycle extraction
- Sodium–bearing waste from second- and third-cycle extraction, which was blended with concentrated bottoms from the PEW evaporator.

The raffinate waste streams from INTEC reprocessing contained unwanted components after the liquid-liquid solvent extraction of uranium from other fission products in SNF. In liquid-liquid solvent extraction, one or more components are removed from a liquid mixture by intimate contact with a second liquid, which is itself nearly insoluble in the first liquid and dissolves and extracts the component that is to be purified, leaving the impurities in the first liquid (raffinate) (Bosley 1999).

The raffinates were maintained in an acidic state to ensure that all uranium and other salts were in solution. The acidity maintained in the raffinate streams prevented formation of chemical precipitates, which could cause undesirable reactions during interim storage.

2.2.1.1.3.1 First-Cycle Extraction—The first-cycle extraction process was performed by preferentially separating uranium from other fission products, through vigorous contact with the organic solvent hexone or TBP in a kerosene diluent, leaving behind the fission products. The solvent-uranium was brought into contact with a nitrate-deficient aqueous solution, and the uranium transferred into the aqueous solution.

The heart of the extraction process consisted of four pulsed, perforated-plate columns that successively (1) extracted uranyl nitrate from the aqueous to the organic phase; (2) scrubbed the organic phase to reduce carryover of fission products and nitric acid; (3) stripped the uranyl nitrate from the organic phase back to the aqueous phase in the absence of the nitrate ion; and (4) washed the aqueous phase with hydrocarbon diluent to minimize entrainment of TBP in the aqueous phase. In the first-cycle extraction process, the product, or uranium-containing stream, was processed through a series of four pulsed, perforated-plate columns and then through a product evaporator. Traces of the organic solvent were removed before the stream was concentrated in the evaporator. The removal was done in the washing column by a stream of hydrocarbon diluent. The uranium product was then concentrated in the evaporator and sent to M-cell for temporary storage and sampling, and then to N-cell for intercycle storage. Fuel would be processed in the first cycle until the intercycle storage was filled, normally in 6 – 12 months. The first-cycle process was shut down until all the uranium was processed through the second- and third-cycle extraction and converted to uranium trioxide. The uranium product was then packaged for shipment. After the mid-1980s, solvent and hydrocarbon diluent used in first-cycle extraction was decontaminated by steam distillation and the solution was transferred to a storage tank in CPP-694 near NWCF (CPP-659).

The chemical composition of HLLW generated during the first-cycle extraction process varied according to the type of fuels processed. The raffinates included fluoride-bearing waste from zirconium dissolution, from coprocessed zirconium and aluminum dissolution, and from nonfluoride waste from dissolution of stainless steel and aluminum fuel. All first-cycle raffinates were acidic with a hydrogen-ion concentration between 1 and 3 *M*. Typically, the waste was lifted to ground level by airlifts and then gravity fed to the Tank Farm. Liquid waste with significant concentrations of corrosive chemicals, such as sulfates and chlorides from various sources throughout INTEC was routed directly to the Tank Farm. Except for the tanks containing only sodium–bearing waste (WM–181, WM–184, and WM–190; which was designated as the emergency spare), high-level waste and sodium–bearing waste were stored within the same tanks (Staiger 1999).

The primary transfer route for first-cycle waste from the process areas to the Tank Farm was via two 3-in. lines (3"-PUA-2297Y, which was replaced in 1982 by 2"-PUAR-104853, and 3"-PUA-2401Y, which was replaced also in 1982 by 2"-PUAR-104854) to the surge transfer tank, WM-178, for possible transfer to eight of the eleven 300,000-gal storage tanks (Tanks WM-181 and -184 were reserved exclusively for sodium–bearing waste and WM-190, an emergency spare, was never used). Because the airlift for Tank WM-178 would entrain moisture droplets into the off-gas filter system, the raffinate siphon system was installed in the mid 1980s, which allowed bypassing of Tank WM-178. However, the gravity-vacuum system required the addition of wastewater to restart the system when the siphon would shut down. In 1986, the siphon system was replaced by steam jets, still bypassing WM-178. In 1992, the WM-178 tank lines were capped and the tank was abandoned in place because of a lack of secondary containment.

The first-cycle extraction waste streams, relatively high in radioactivity, were analyzed for uranium content. (During the early years of extraction, the waste was then evaporated, if possible, to reduce volume. However, the evaporation step was subsequently eliminated to avoid problems associated with clogging of the raffinate waste.) The concentrate was then transferred to a 300,000-gal storage tank with cooling coils (i.e., WM-180, -182, -183, -185, -187, -188, or -189 [WM-190 also was equipped with cooling coils but was designated as an emergency spare]). Waste from the second- and third-cycle extraction processes was concentrated and generally stored in one of three 300,000-gal tanks without cooling coils (WM-181, -184, and -186, which stored high-level waste only from 1959 to 1967). The waste from second- and third-cycle processing did not require controlled cooling. All HLLW was eventually calcined to a solid and stored in underground stainless steel bins, the CSSFs.

Hexone—From 1953, when reprocessing began, until the early 1960s, hexone, an organic solvent also used as a paint thinner and alcohol denaturant, was used to extract uranium from its fission products during first-cycle extraction. Hexone is flammable and slightly soluble. Slight losses to the raffinate waste streams occurred (about 0.02%) in waste stream shipments to the Tank Farm, the PEW evaporator, or the Tank Farm vessel off-gas system. During peak reprocessing of the second- and third-cycle extractions, two 55-gal barrels of hexone were used weekly. Fresh hexone was added to the system through the hexone solvent storage tank (YBD-106). Hexone was the only solvent used for second- and third-cycle extraction.

Tributyl Phosphate—During the early 1960s, TBP replaced hexone as the organic solvent in first-cycle extraction and was used in a kerosene diluent until reprocessing was terminated in 1992. First-cycle extraction became alternately known as the TBP extraction process. Unlike hexone, TBP meets the RCRA test for nonhazardous flammability and has extremely low solubility (less than 0.002%). Therefore, only small amounts were lost in the raffinate waste streams. In addition to uranium extraction, TBP is also used industrially as an antifoaming agent and a plasticizer.

2.2.1.1.3.2 Second- and Third-Cycle Extraction—In the second- and third-cycle extraction processes, the solvent, hexone, purified the uranium product from first-cycle extraction. The purposes of the second- and third-cycle extraction process were to (1) separate the uranium from residual fission products and TRU elements, such as neptunium and plutonium; (2) recover more than 99.999% of the uranium; and (3) transfer the waste material to storage in the Tank Farm.

Located in the P- and Q-cells, respectively, the second- and third-cycle extractions were two nearly identical extraction cycles. Product from hexone extraction was collected in the Q-cell for transfer to storage. Used hexone was then collected in W-cell (before 1985, also in Y-cell), purified, and recycled for reuse. The aqueous waste streams containing TRU and fission products were collected and transferred to the Tank Farm to await calcination.

Second-cycle raffinates were transferred to the Tank Farm via a 3-in. line (3"-PUA-2297Y, which was replaced in 1982 by 2"-PUAR 104853). Third-cycle raffinates were transferred to the 300,000-gal storage tank via a 3-in. line (3"- PUA-2401Y, which was also replaced in 1982 by 2"- PUAR 104854). After 1986, second- and third-cycle raffinates were mixed in U-cell and transferred to the Tank Farm via the Y-cell route.

Liquid wastes from various INTEC areas were transferred to the Tank Farm through underground stainless steel lines. The buried waste lines constituted two separate systems: one for the transfer of high-level liquid waste and one for sodium-bearing-level liquid waste. In the early 1980s, an electronic register system was developed for material batch transfers to avoid inadvertent transfers. The system provided information, such as the valve lineup and volume availability of a tank to receive a transfer.

2.2.1.2 Waste from Other Sources. While the largest volume of waste originated from fuel reprocessing in CPP-601, waste was shipped to the Tank Farm from several other facilities. The process flow of historical fuel operations at INTEC is illustrated in Figure 2-9. A map showing the facility sources of waste stored at the Tank Farm is provided in Figure 2-10.

Intermediate-level waste and low-level waste were sent to the PEW evaporator, and the PEW bottoms were then shipped to the Tank Farm for storage. The other types of waste shipped to the Tank Farm through the PEW and the facilities from which the waste was generated include the following:

- Fluoride- and cadmium-bearing waste from the FDP (from the FAST facility at CPP-666 through the Fuel Processing Facility CPP-601)
- Waste from the fuel storage basins (in FAST and the Fuel Storage Facility in CPP-603)
- Decontamination waste containing fluoride from the waste calcining process (from the WCF at CPP-633 and later the NWCF at CPP-659)
- Occasional transfers from tanks, WL-104 and WL-105, in the West Side Holdup Facility in CPP-641 and the Pilot Plant in CPP-637 and the Headend Process Plant in CPP-640
- CPP-684, the Remote Analytical Facility (RAF) in CPP-627, and the Analytical Laboratory in CPP-602
- Chlorinated solvents used for degreasing from maintenance operations from the Maintenance Hot Shop in CPP-663
- Non-INTEC waste such as from Test Area North (TAN) or Test Reactor Area (TRA) through the numerous truck unloading stations, such as CPP-1619, at the INTEC
- Decontamination and other incidental waste from the Liquid Effluent Treatment and Disposal Facility in CPP-1618.

Of those facilities, FAST (CPP-666), the Fuel Processing Facility (CPP-601), the WCF (CPP-633), the Pilot Plant (CPP-637), the Headend Process Plant (CPP-640), the RAF (CPP-627), and the Hot Shop (CPP-663) are inactive. These facilities are, or will be, decontaminated, dismantled, and closed.

All hazardous waste was analyzed before it was processed to ensure compatibility with equipment in the raffinate streams. Liquid waste was segregated according to chemical composition and stored in separate vessels. When space was limited, waste was combined if analysis determined an undesirable chemical reaction would not occur.

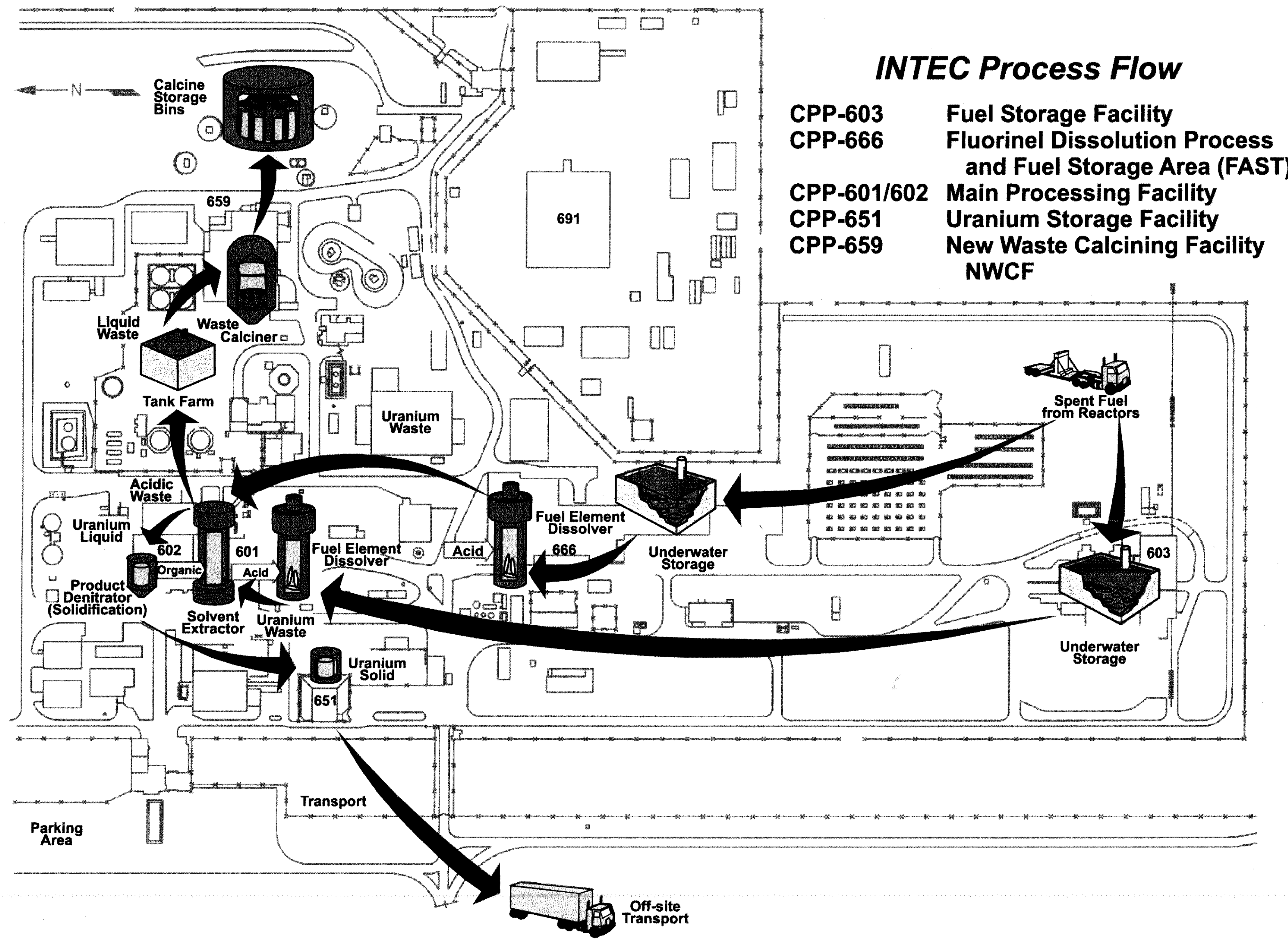


Figure 2-9. The process flow of historical fuel operations at INTEC.

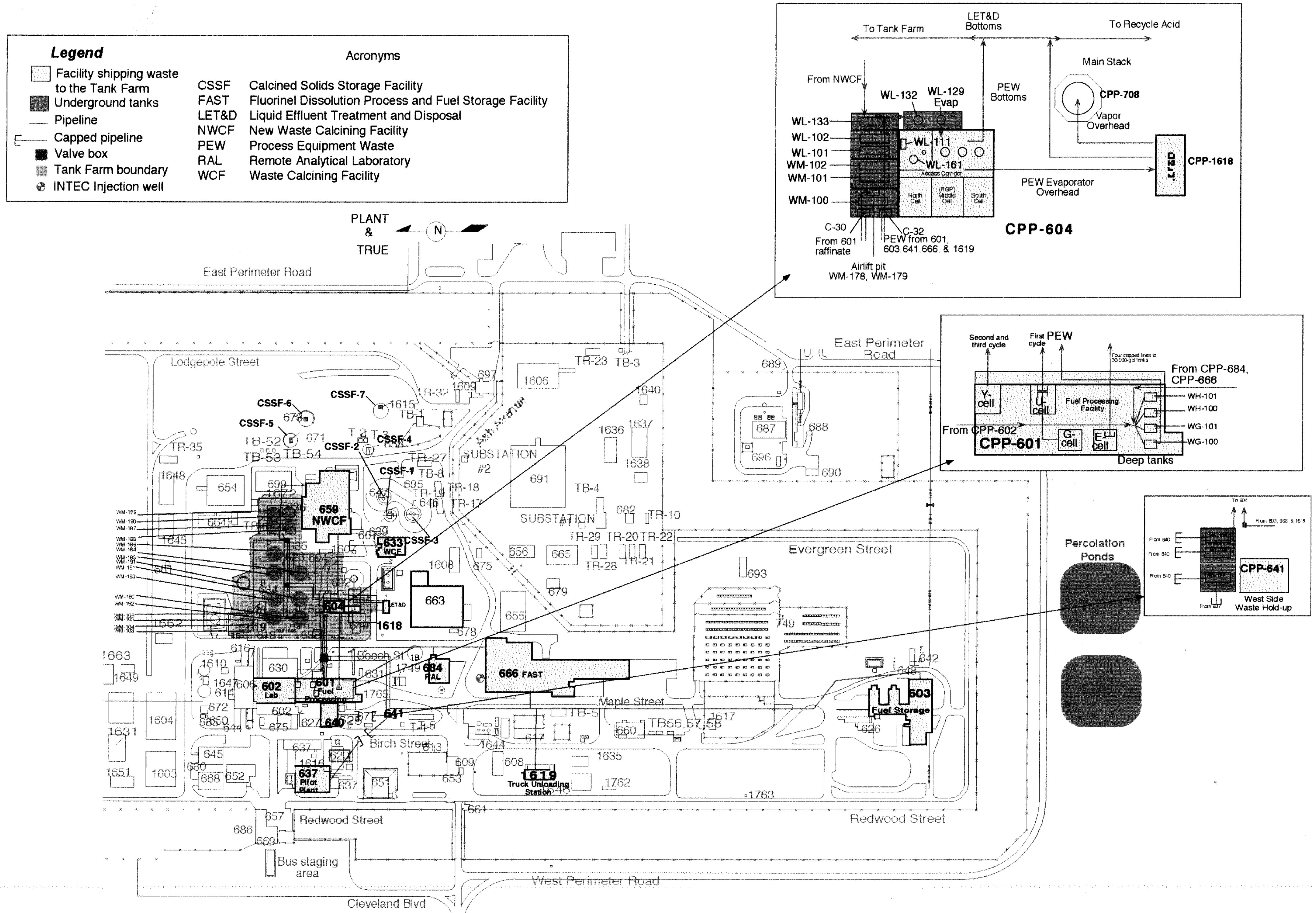


Figure 2-10. Facility sources of waste stored at the Tank Farm.

2.3 INTEC INJECTION WELL

2.3.1 Current Status of the INTEC Injection Well

The former INTEC injection well (site CPP-23) has been sealed since the fall of 1989. The only activities associated with the well are the eight downgradient U.S. Geological Survey (USGS) monitoring wells, which have been used to sample for contaminants in the portion of the Snake River Plain Aquifer (SRPA) inside the INTEC security fence. The operational history of the injection well is discussed at length in Section 2.3.2.

Additional information on contaminants associated with the well is provided in Section 3.1.2. This information is presented to provide information about the well and is not intended to address all that has been documented on the injection well. The following documents provide at length information on the injection well: Track 2 Summary for the CPP-23 Injection Well (WINCO 1993, 1994), OU 3-13 RI/BRA (DOE-ID 1997a), RI/FS (DOE-ID 1997b) and ROD (DOE-ID 1999a).

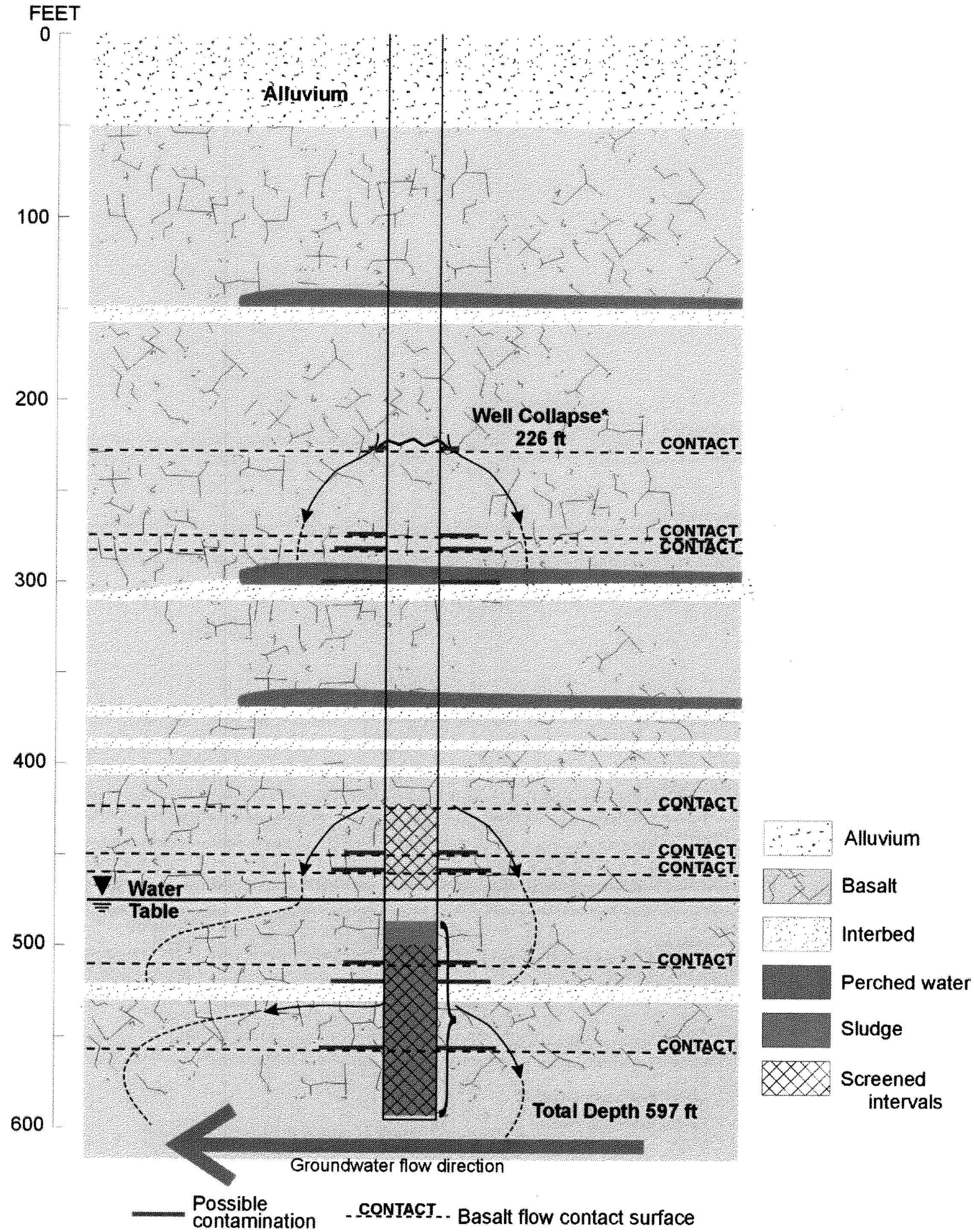
2.3.2 Operational History of the Injection Well

The former INTEC injection well (site CPP-23), located north of the FAST facility (CPP-666) and 500 ft south of the south end of the Fuel Processing Facility (CPP-601) and 100 ft east of the road to the Fuel Storage Basin (CPP-603), was used from 1952 to February 1984 to discharge small quantities of low-level radioactive and chemical waste to the SRPA. Early references to the well identify it as Well MEH-FE-PL-304 or merely Well CPP-304 (WINCO 1990e; ENICO 1981). The well currently is identified as CPP-03 by INEEL hydrogeologic data repository. Throughout the Work Plan, the well will be referred to as site CPP-23, using its CERCLA designation, except occasionally when the well alone (not the site) must be identified; in which case it will be referred to as CPP-03. The INTEC injection well was drilled in 1950 to a depth of 64.6 m (212 ft) and deepened in 1951 to 182 m (597 ft).

According to the Radioactive Waste Management Information System (RWMIS) database, a total of 22,200 Ci is estimated to have been released to the aquifer in 42 billion L (11 billion gal) of water. The database provides a qualitative estimate of the activity and volume of wastewater discharged to the injection well. Based on drinking water standards, the major radionuclides of concern disposed of to the injection well were H-3 and Sr-90. Tritium is estimated to account for 96% of the total radioactivity released to the aquifer. During a 3-month period in 1985, H-3, a major component of waste streams from fuel reprocessing activities, accounted for 99.5% of the total quantity of radioactivity in service waste effluent (WINCO 1986b). A conceptual model of the injection well is provided in Figure 2-11. Plots of the disposal history of H-3 to the INTEC injection well are provided in Figure 2-12.

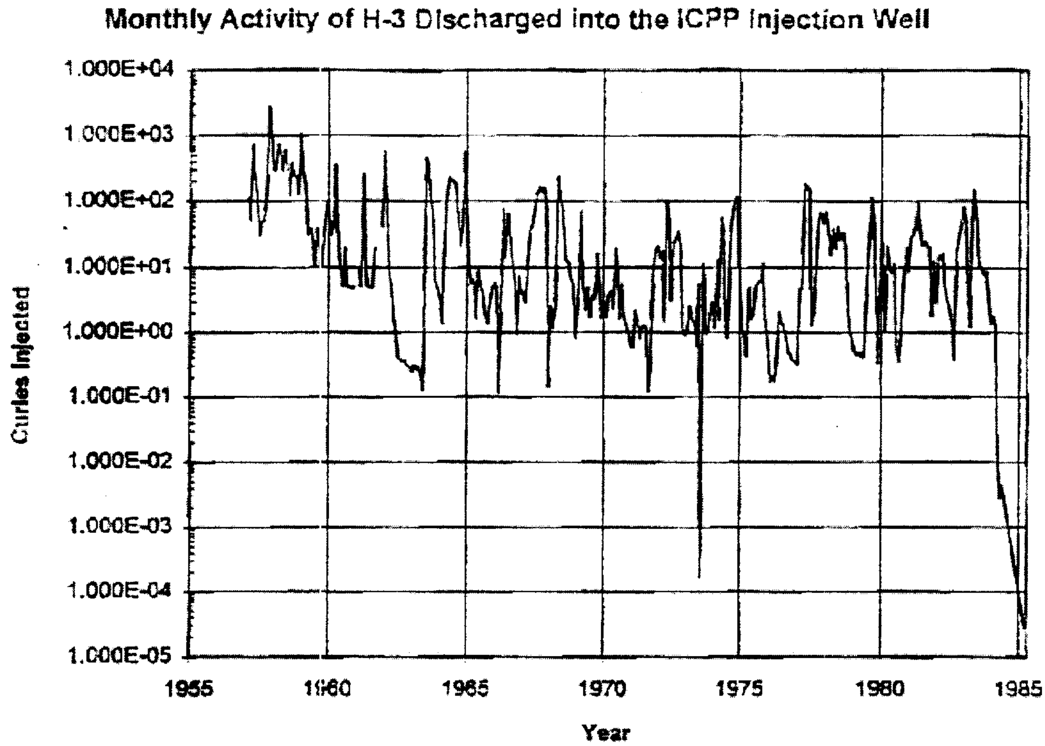
The wastewater also contained low concentrations of various chemicals. A summary of the total curies discharged to the injection well for each radionuclide, including the curies remaining after radioactive decay, is provided in Table 2-4 (DOE-ID 1997a).

The well extends 42.7 m (140 ft) beneath the top of the SRPA. A 61-cm (24-in.) diameter borehole was drilled and cased using 41-cm (16-in.) nominal diameter carbon steel casing. The annular space between the borehole and casing was filled with gravel. The well casing was perforated from 125.6 to 137.8 m (412 to 452 ft) and from 149.4 to 180.7 m (490 to 593 ft) below ground surface (bgs). The well casing is a 300.8 m (12-in.) diameter carbon steel pipe lined with a 10-in. polyvinyl chloride pipe for protection against corrosion effects resulting from exposure to warm water and air. The upper portion of the well is a 2.4–m (8-ft) square diameter concrete chamber surrounding the casing. A 1.2 m (4-ft) diameter manhole rises above ground level above the chamber (ENICO 1981).



* The collapse likely took place in early 1968 and was discovered in June 1970. 900 million gallons may have been released at the 226 ft depth (2½ years X 363 million gal/year) (WINCO 1992).

Figure 2-11. Conceptual model of the INTEC injection well (Site CPP-23).



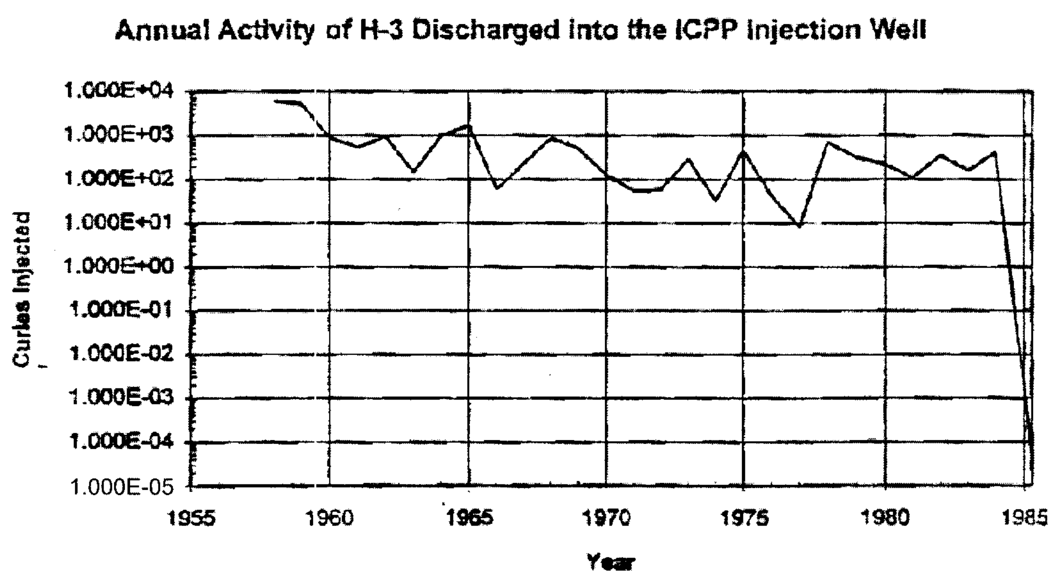


Figure 2-12. Monthly and annual radioactivity of H-3 discharged to the INTEC injection well (DOE-ID 1997).

Table 2-4. Summary of the total curies discharged to the INTEC injection well (Site CPP-23).

Radionuclide	Half-Life (years)	Total Activity Injected (Ci)	Total Activity Remaining[a] (Ci)	Percent of Injected Activity Remaining (after decay)	Percent of the Current Activity
Ag-110m	6.80E-01	8.36E-05	1.34E-12	0.0	0.00
Am-241	4.33E+02	3.17E-04	3.08E-04	97.2	0.00
Ba-140	3.49E-02	5.05E-04	8.86E-156	0.0	0.00
C-14	5.73E+03	1.27E-01	1.27E-01	99.8	0.00
Ce-141	8.90E-02	1.68E-04	3.19E-61	0.0	0.00
Ce-141/144	7.80E-01	1.16E-01	2.42E-14	0.0	0.00
Ce-144	7.80E-01	1.75E+01	2.07E-06	0.0	0.00
Co-57	7.40E-01	6.54E-03	8.91E-09	0.0	0.00
Co-60	5.27E+00	1.49E-01	8.77E-03	5.9	0.00
Cr-51	7.59E-02	5.37E-03	2.91E-67	0.0	0.00
Cs-134	2.06E+00	1.50E+00	2.03E-03	0.1	0.00
Cs-137	3.02E+01	2.05E+01	1.19E+01	57.8	0.30
Cs-138	6.10E-05	2.50E-01	0.00E+00	0.0	0.00
Eu-152	1.36E+01	8.12E-02	4.36E-02	53.7	0.00
Eu-154	8.80E+00	8.38E-02	2.95E-02	35.2	0.00
Eu-155	4.95E+00	2.22E-02	3.43E-03	15.5	0.00
H-3	1.23E+01	2.13E+04	3.89E+03	18.2	99.44
Hg-203	1.28E-01	7.33E-05	3.10E-42	0.0	0.00
I-129	1.70E+07	2.78E-01	2.78E-01	100.0	0.01
I-130	1.41E-03	2.98E+01	4.38E-152	0.0	0.00
K-40	1.28E+09	2.81E-12	2.81E-12	100.0	0.00
La-140	4.60E-03	6.22E-04	0.00E+00	0.0	0.00
Mn-54	8.30E-01	6.55E-03	7.02E-08	0.0	0.00
Nb-95	9.58E-02	4.63E-01	4.17E-35	0.0	0.00
Np-237	2.14E+06	5.48E-03	5.48E-03	100.0	0.00
Pr-144	3.29E-05	4.47E-01	0.00E+00	0.0	0.00
Pu-238	8.77E+01	1.32E-01	1.15E-01	87.1	0.00
Pu-239	2.44E+04	1.05E-02	1.04E-02	99.9	0.00
Pu-239/240	2.44E+04	3.74E-02	3.74E-02	99.9	0.00
Pu-240	6.57E+03	1.14E-03	1.14E-03	99.8	0.00
Rn-106	9.48E-07	4.81E+00	0.00E+00	0.0	0.00
Ru-103	1.10E-01	1.45E-01	4.59E-37	0.0	0.00
Ru-106	1.02E+00	1.70E+01	6.85E-04	0.0	0.00
Sb-124	1.65E-01	2.41E-04	5.02E-36	0.0	0.00

Table 2-4. (continued).

Radionuclide	Half-Life (years)	Total Activity Injected (Ci)	Total Activity Remaining[a] (Ci)	Percent of Injected Activity Remaining (after decay)	Percent of the Current Activity
Sb-125	2.77E-00	1.86E+00	1.22E-02	0.7	0.00
Sr-85	1.73E-01	9.14E-05	1.78E-23	0.0	0.00
Sr-89	1.40E-01	5.59E+00	4.51E-27	0.0	0.00
Sr-89/90	2.91E+01	1.31E+00	6.40E-01	48.8	0.02
Sr-90	2.91E+01	1.60E+01	8.75E+00	54.8	0.22
U-234	2.45E+05	2.28E-02	2.28E-02	100.0	0.00
U-235	7.04E+08	1.94E-03	1.94E-03	100.0	0.00
U-236	2.34E+07	4.09E-04	4.09E-04	100.0	0.00
U-238	4.46E+09	6.81E-03	6.31E-03	100.0	0.00
Y-90	7.31E-03	1.32E+00	0.00E+00	0.0	0.00
Zn-65	6.67E-01	4.65E-04	1.39E-11	0.0	0.00
Zr-95	1.78E-01	2.34E-01	2.53E-23	0.0	0.00
Zr/Nb-95	9.57E-02	2.06E+01	1.38E-43	0.0	0.00
Unidentified Alpha	—	6.36E-01	—	—	—
Unidentified Beta-Gamma	—	5.82E+01	—	—	—
Others[b]	—	6.33E+02	—	—	—
	Total	2.22E+04	3.92E+03	—	100.0

a. Decayed to January 1, 1995.
b. Estimate of radionuclides other than H-3 from 1957 to 1962 assuming 95.5% of the total curies is H-3 (Barraclough 1967).

The well was in service from 1952 to 1984 for the disposal of service wastewater containing small quantities of radioactivity and inorganic contaminants. The well injected the service wastewater to the SRPA through a 254-mm (10-in.) line (ENICO 1981). During routine operation, process solution containing radioactivity concentrations of 850 μCi/gal or higher automatically were diverted to the service waste diversion tank VES-191. The average discharge to the well during this period was about 1.4 billion L/year (363 million gal/year) or about 3.8 million L/day (1 million gal/day). The monthly volume of wastewater that was discharged from 1951 to 1984 to the INTEC injection well is shown in Figure 2-13. The available data for 1953 to 1961 are yearly totals and are plotted by assuming equal volumes discharged every month (DOE-ID 1997a).

In June 1970 when a defective measuring line in the injection well was replaced, the well was found to have collapsed so that it was plugged at a depth of 68.9 m (226 ft). As a result, wastewater was being injected into the unsaturated zone (vadose zone) above 68.9 m (226 ft) (WINCO 1990e). The wastewater discharge to the disposal well was warm (65° to 70°F) and salty (the chloride content averaged approximately 200 to 250 mg/L). The salty, aerated wastewater apparently corroded the casing until it collapsed, allowing the gravel pack and intruding sediment (sludge) to fill the well up to the 68.9-m (2260ft) depth. Only fragmentary corroded pieces of the original 41-cm (16-in.) casing were left, as indicated by caliper logs and first attempts at cleaning the well. Measurements, made in 1966, showed that the well was still intact. Therefore, most of the collapse took place in 1967 or early 1968. Levels of H-3 and Sr-90, measured in Well USGS-50 in 1969 and 1990, are additional evidence supporting this timeframe (DOE-ID 1997a).

In September 1970, a drilling contractor began to redrill and reline the injection well to its original depth. By October, deepening had progressed to about 152.4 m (500 ft) and the water level in the well had resumed its normal depth at about 138.7 m (455 ft). During this period of well rehabilitation, wastewater was disposed of to USGS-50. During or after these well rehabilitation operations, the well is assumed to have collapsed again and was reopened to the water table in late 1982. At this time, a high-density polyethylene line 2.5 cm (1 in.) thick was placed in the well from ground level to the bottom of the well. The liner was perforated from 137 m (450 ft) bgs, approximately 6.1 m (20 ft) above the water table 143.3 m (470 ft) to the bottom of the well (WINCO 1986b). The depth of the HI interbed is 158.5 to 167.6 m (520 to 550 ft) under INTEC and 158.5 to 164.6 m (520 to 540 ft) in the vicinity of the injection well.

On February 7, 1984, the injection well was taken out of routine service and wastewater has been pumped from two parallel collection vaults to percolation ponds 1 and 2. Disposal of wastewater decreased in 1985 and 1986. The injection well also served as an emergency overflow protection for two service waste monitoring stations (CPP-709 and CPP-734) and another service waste building (CPP-797). These three buildings contain the vaults from which the service wastewater is monitored and pumped. The overflow protection was required only on a temporary basis if the operating and standby pumps from one of the parallel streams failed simultaneously. All the lines have been plugged and can no longer be used to route service wastewater overflow from the vaults in the buildings.

In 1986, modifications were made to the injection well entry, which further decreased use of the well, resulting in a decrease to approximately 12,200 L (3,220 gal) to the injection well in 1986. No releases have occurred to the well since 1986 (DOE-ID 1997a).

In October and November 1989, the injection well was sealed by perforating the casing throughout and pumping in cement. The well was sealed from the basalt silt layer (145 m [475 ft] bgs) to land surface to prevent hydraulic communication between the land surface, perched water, and SRPA (DOE-ID 1997a).

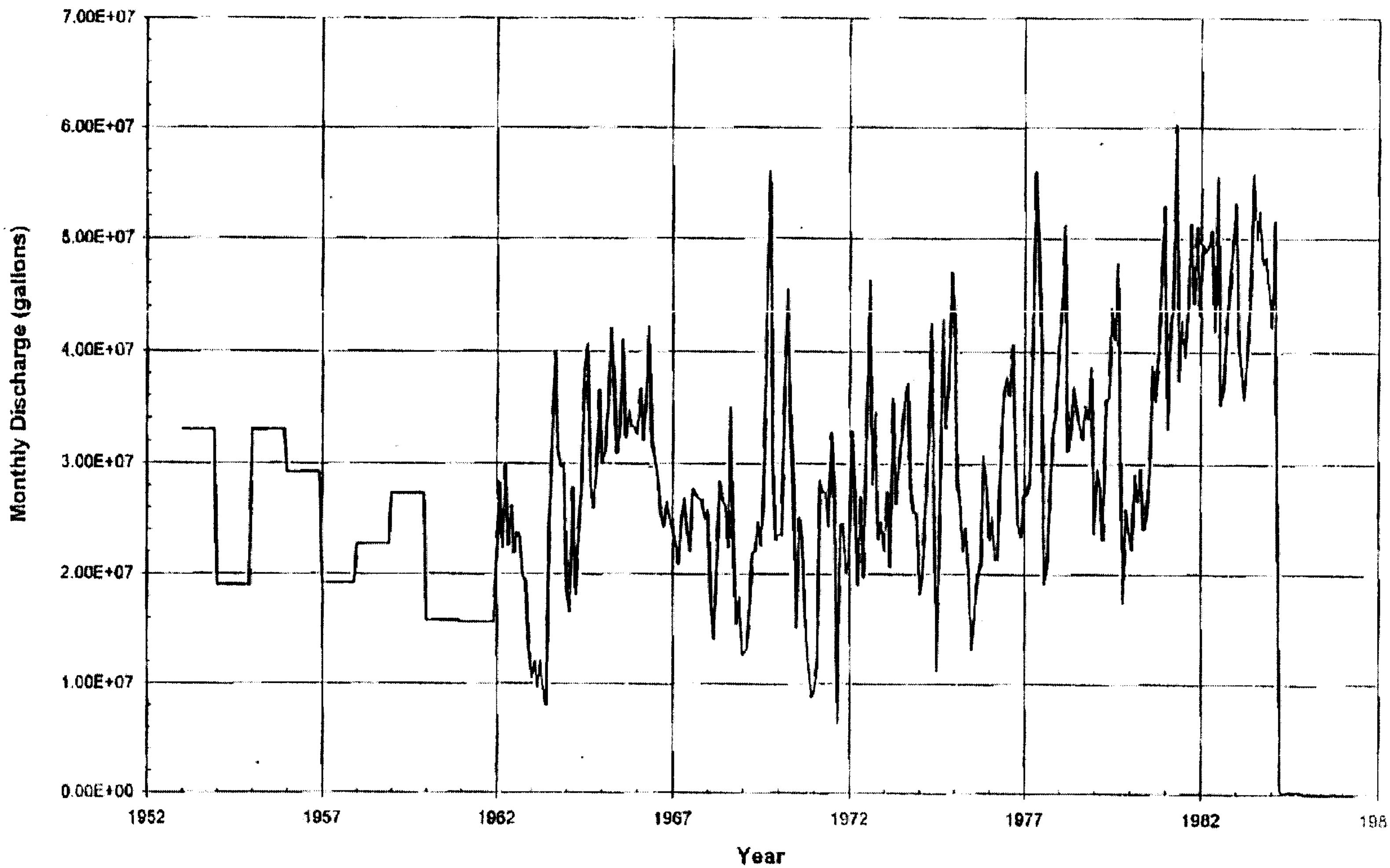


Figure 2-13. Monthly wastewater discharge to the INTEC injection well (DOE-ID 1997).

Since the contamination from the INTEC injection well may be both in the aquifer and in the vadose zone, the impact on the aquifer water quality has been monitored for the past 40 years by the USGS. Existing aquifer monitoring data are not sufficient to demonstrate that this sediment (sludge) or other residuals from injection do not pose a long-term risk to human health.

Well USGS-50 was originally intended to be completed in the aquifer, but ultimately was drilled only to a total depth of 123 m (405 ft) to monitor a deep perched-water zone. This well is located in the north-central portion of the facility to the south of the northern perched-water zone and upgradient from the INTEC injection well. According to the historical water quality data, the highest concentrations of H-3 and Sr-90 occurred in 1969 and 1970. These elevated concentrations were attributed to the failure of the INTEC injection well, causing the wastewater to be injected into the vadose zone rather than directly to the aquifer. Based on the response observed in Well USGS-50 and injection well records, the well apparently failed in mid-1967 and allowed approximately 3.41×10^9 L (9.0×10^8 gal) of wastewater to be injected into the basalt above the 69-m (226-ft) plug (Robertson et al. 1974). The INTEC injection well was repaired by early 1971. It failed again in the 1970s and was repaired in 1982 (DOE-ID 1997a).

Since 1970, H-3 and Sr-90 concentrations have varied little between sampling events, and indicate an overall slight decrease with time. Two periods of slight increase are noted with the first period occurring from the late 1970s until 1982 and the second period from late 1986 to early 1988. The first period of increase (from approximately 1978 to 1982) was probably the result of the injection well failing and injecting wastewater directly into the vadose zone. Exactly when the injection well failed the second time is uncertain; however, it was reportedly repaired by 1982. The second period of increase, from late 1986 to early 1988, is after the injection well was taken out of service. The increase in Sr-90 concentrations during this period suggests either a local, post-disposal well source or a delay in the migration of contamination from a near-surface source. Water from overlying perched water has been observed leaking into the wellbore through the annular space. This mixing of water from two perched water zones places additional uncertainty on the representativeness of the water quality data from USGS-50. The leaky borehole annulus was repaired during the Fiscal Year 1994 field season (DOE-ID 1997a).

From the May 1995 water sampling of USGS-50, the concentrations of all chemical contaminants except nitrate/nitrite were below federal primary or secondary maximum contaminant levels (MCLs). The concentration of nitrate/nitrite was measured at 31.3 mg/L, where as the federal primary MCL is 10 mg/L. Radionuclides in the groundwater that were detected include H-3 (61,900 ± 700 pCi/L), Sr-90 (151 ± 2 pCi/L), and Tc-99 (63 ± 1 pCi/L). The concentrations for H-3 and Sr-90 are within the expected values based on the historical sampling conducted by the USGS (DOE-ID 1997a). At this writing, the MCLs for H-3, Sr-90, and TC-99 are 20,000 pCi/L, 8 pCi/L, and 900 pCi/L, respectively, although changes have been proposed.

2.3.2.1 History of Known Discharges to the Injection Well. During the INTEC operational life, known accidental discharges to the injection well occurred and are described below (WINCO 1992).

July 1953—The contents of a tank discharged to the wastewater flowing to the well. A post-discharge analysis showed that 51 mCi of radioactive contaminants were released in 923,640 L (244,000 gal) of water.

December 1958—About 29 Ci of radioactive contaminants, including 7 Ci of Sr-90, were released to the well.

September 1969—Two separate releases, resulting in 19 Ci of fission products, were released to the well. Releases included Cs-137, Cs-134, Ce-144, and Sb-125 in 12.4×10^6 L (3.28×10^6 gal) of wastewater.

December 1969—Two releases occurred in which the quantity of Sr-90 released was higher than expected. About 1 Ci, including 30% Sr-90, was released.

March 1981—Mercury was detected during routine monitoring of the INTEC service waste system. Mercury in the form of mercuric nitrate was released from the Fuel Processing Building (CPP-601) through the INTEC service waste system to the INTEC injection well. An estimated 0.207 mg/L of mercury was detected in service waste. The RCRA EP toxicity limit for mercury is 0.2 mg/L.

Soluble mercury, as mercuric nitrate, is used as a catalyst in certain INTEC fuel dissolution processes. These operations are the only ones in which significant quantities of soluble mercury have been used at the INTEC. In March 1981, a batch of catalyst was mixed, then found to contain solids. The solution was discarded and it is assumed that it was drained to the waste system. Assuming the worst-case scenario of draining one batch of catalyst, the maximum catalyst lost would be 250 L (66 gal) of solution containing 15 kg (33 lbs) of mercury (DOE-ID 1997a).

2.3.2.2 Monitoring. Eight monitoring wells within 0.40 km (0.25 mi) and downgradient of the injection well have been established by the USGS. Though the dispersion of waste plumes laterally and longitudinally is typical, little vertical dispersion is apparent because of relatively low vertical permeability and apparent lower permeability at depths greater than about 76.2 m (250 ft) below the water table. Analyses of water samples, collected from USGS wells downgradient of INTEC, indicated detectable mercury concentrations (0.2 μg/L) in three USGS wells (USGS-36, USGS-37, and USGS-41). Because heavy metal analysis is not conducted by the USGS on a regular frequency, it is not certain whether these analyses indicate detectable mercury because of the March 1981 injection well release (DOE-ID 1997a).

A sample of the sediment within the injection well was collected on August 31, 1989. The only organic compound detected above method detection limit (MDL) in this sediment sample was polychlorinated biphenyls (PCB) 1260 (Aroclor). However, the sample was collected from the top of the sediment column in the injection well and may not be representative of contaminants and concentrations at deeper intervals of the column. Aroclor was detected at a concentration of 10 μg/kg. The minimum detectable limit is 8.3 μg/kg. Downgradient monitoring wells were sampled and PCB was not indicated. Radionuclide analyses of sediments taken from the injection well indicated beta activity at 150 pCi/g and three radionuclides: Cs-137 at 100 pCi/g, Eu-152 at 3.8 pCi/g, and Eu-154 at 2.5 pCi/g (DOE-ID 1997a).

2.4 Physical Setting

2.4.1 Physiography

The INEEL is located in the Eastern Snake River Plain (ESRP), the largest continuous physiographic feature in southern Idaho. This large topographic depression extends from the Oregon border across Idaho to Yellowstone National Park and northwestern Wyoming. The ESRP, the eastern-most extension of the Columbia River Plateau Province (EG&G 1988), slopes upward from an elevation of about 762 m (2,500 ft) at the Oregon border to more than 1,981 m (6,500 ft) at Henry's Lake near the Montana-Wyoming border (Becker et al. 1998).

The INEEL is located entirely on the northern side of the ESRP and adjoins the Lost River, Lemhi, and Beaverhead mountain ranges to the northwest, which compose the northern boundary of the plain. The portion of the ESRP occupied by the INEEL may be divided into three minor physical provinces: a central trough that extends from southwest to northeast through the INEEL and two flanking slopes that descend to the trough, one from the mountains to the northwest and the other from a broad lava ridge on the plain to the southeast. The slopes on the northwestern flank of the trough are mainly alluvial fans originating from sediments of Birch Creek and the Little Lost River. Also forming these gentle slopes are basalt flows that spread onto the plain. The land formations on the southeast flank of the trough were created by basalt flows that spread from an eruption zone that extends northeastward from Cedar Butte. The lavas that erupted along this zone built up a broad topographic swell directing the Snake River to its current course along the southern and southeastern edges of the plain. This ridge effectively separates the drainage of mountain ranges northwest of the INEEL from the Snake River. Big Southern Butte and the Middle and East buttes are aligned roughly along this zone; however, they were formed by viscous rhyolitic lavas extruded through the basaltic cover and are slightly older than the surface basalts of the plain.

With the exception of the buttes on the southern border of the INEEL, elevations on the INEEL range from 1,460 m (4,790 ft) in the south to 1,802 m (5,913 ft) in the northeast with an average elevation of 1,524 m (5,000 ft) above sea level (EG&G 1988). The East, Middle, and Big Southern buttes have elevations of 2,003 m (6,571 ft), 1,948 m (6,389 ft), and 2,304 m (7,559 ft) above sea level, respectively (VanHorn, Hampton, and Morris 1995).

The central lowland of the INEEL broadens to the northeast and joins the extensive Mud Lake Basin. The Big and Little Lost rivers and Birch Creek drain into this trough from valleys in the mountains to the north and west. The intermittently flowing waters of the Big Lost River have formed a flood plain in this trough, consisting primarily of sands and gravels. The streams intermittently flow to the Lost River Sinks, a system of playa depressions (ephemeral lakes that have water only during parts of the year or once in several years) in the northern portion of the INEEL, east of the town of Howe, Idaho. There, the water evaporates, transpires, or recharges the SRPA. The sinks area covers several hundred acres and is flat, consisting of significant thicknesses of fluvial and lacustrine sediments.

INTEC is located in the south-central portion of the INEEL. Elevation at INTEC is 1,498 m (4,917 ft), and the facility's northwest corner is actually truncated by the current channel of the Big Lost River. Gravelly, medium-to-coarse textured soils derived from alluvial deposits occur in the INTEC vicinity. The underlying basalt is covered with as much as 18.2 m (60 ft) of these soils and the land surface is flat and covered with sagebrush.

2.4.2 Meteorology and Climatology

Meteorological and climatological data for the INEEL and the surrounding region are collected and compiled from several meteorological stations operated by the National Oceanic and Atmospheric Administration (NOAA) field office in Idaho Falls, Idaho. Three stations are located on the INEEL: one at the Central Facilities Area (CFA), one at TAN, and one at the Radioactive Waste Management Complex (RWMC).

2.4.2.1 Precipitation. The location of the INEEL in the ESRP, including altitude above sea level, latitude, and intermountain setting, affects the climate of the site. Air masses crossing the plain have first traversed a mountain barrier and precipitated a large percentage of inherent moisture. Therefore, annual rainfall at the INEEL is light, and the region is classified as arid to semiarid (Clawson, Start, and Ricks 1989). Average annual precipitation at the INEEL is 22.1 cm (8.7 in.). The rates of precipitation are the highest during the months of May and June and the lowest in July. Normal winter snowfall occurs from November through April, though occasional snowstorms occur in May, June, and October. Snowfall at the INEEL ranges from a low of about 17.3 cm (6.8 in.) per year to a high of about 151.6 cm (59.7 in.) per year, and the annual average is 70.1 cm (27.6 in.) (Clawson, Start, and Ricks 1989).

2.4.2.2 Temperature. The moderating influence of the Pacific Ocean produces a climate at the INEEL that is usually warmer in the winter and cooler in summer than is found at locations of similar latitude in the United States to the east of the Continental Divide. The Centennial Mountain Range and Beaverhead Mountains of the Bitterroot Range, both north of the INEEL, act as an effective barrier to the movement of most of the intensely cold winter air masses entering the United States from Canada. Occasionally, however, cold air spills over the mountains and is trapped in the plain. The INEEL then experiences below normal temperatures for periods lasting from seven to 10 days. The relatively dry air and infrequent low clouds permit intense solar heating of the surface during the day and rapid radiant cooling at night. These factors combine to give a large diurnal range of temperature near the ground. The average summer daytime maximum temperature is 28°C (83°F), while the average winter daytime maximum temperature is –0.6°C (31°F). During a 38-year period of meteorological records (1950 through 1988) from CFA, temperature extremes at the INEEL have varied from a low of –44°C (–47°F) in January to a high of 38°C (101°F) in July (Clawson, Start, and Ricks 1989).

2.4.2.3 Humidity. Data collected from 1956 through 1961 indicate that the average relative humidity at the INEEL ranges from a monthly average minimum of 18% during the summer months to a monthly average maximum of 55% in the winter. The relative humidity is directly related to diurnal temperature fluctuations. Relative humidity reaches a maximum just before sunrise (the time of lowest temperature) and a minimum in midafternoon (time of maximum daily temperature) (Clawson, Start, and Ricks 1989).

The potential annual evaporation from saturated ground surface at the INEEL is approximately 109 cm (43 in.) with a range of 102 – 117 cm (40 – 46 in.) (Clawson, Start, and Ricks 1989). About 80% of this evaporation occurs between May and October. During the warmest month (July), the potential daily evaporation rate is approximately 0.63 cm/day (0.25 in./day). During the coldest months (December through February), evaporation is low and may be insignificant. Actual evaporation rates are much lower than potential rates because the ground surface is rarely saturated. Evapotranspiration by the sparse native vegetation of the Snake River Plain is estimated at between 15– 23 cm/year (6–9 in./year) or four to six times less than the potential evapotranspiration. Periods when the greatest quantity of precipitation water is available for infiltration (late winter to spring) coincide with periods of relatively low evapotranspiration rates (EG&G 1981).

2.4.2.4 Wind. Wind patterns at the INEEL can be quite complex. The orientations of the surrounding mountain ranges and the ESRP play an important part in determining the wind regime. The INEEL is in the belt of prevailing westerly winds, which are channeled within the ESRP to produce a west-southwest or southwest wind approximately 40% of the time. Local mountain valley features exhibit a strong influence on the wind flow under other meteorological conditions as well. The average midspring wind speed recorded at the CFA meteorological station at 6 m (20 ft) was 9.3 mph, while the average midwinter wind speed recorded at the same location was 5.1 mph (Irving 1993).

The INEEL is subject to severe weather episodes throughout the year. Thunderstorms are observed mostly during the spring and summer. The tornado risk probability is about 7.8E-05 per year for the INEEL area (Bowman et al. 1984). An average of two to three thunderstorms occur each month from June through August (EG&G 1981). Thunderstorms are often accompanied by strong gusty winds that may produce local dust storms. Precipitation from thunderstorms at the INEEL is generally light. Occasionally, however, rain resulting from a single thunderstorm on the INEEL exceeds the average monthly total precipitation (Bowman et al. 1984).

Dust devils can entrain dust and pebbles and transport them over short distances. Common in the region, dust devils usually occur on warm sunny days with little or no wind. The dust cloud may be several hundred yards in diameter and extend several hundred feet in the air (Clawson, Start, and Ricks 1989).

2.4.3 Geology

2.4.3.1 Surface and Subsurface Geology. The surface of the INEEL is generally covered by Pleistocene and Holocene basalt flows ranging in age from 300,000 to 3 million years (Hackett, Pelton, and Brockway 1986). These basalts erupted mainly from northwest-trending volcanic rift zones, marked by belts of elongated shield volcanoes and small pyroclastic cones, fissure-fed lava flows, and noneruptive fissures or small-displacement faults (Bargelt et al. 1992). A prominent geologic feature of the INEEL is the flood plain of the Big Lost River. Alluvial sediments of Quaternary age occur in a band that extends across the INEEL from the southwest to the northeast. The alluvial deposits grade into lacustrine deposits in the northern portion of the site where the Big Lost River enters a series of playa lakes. Paleozoic sedimentary rocks make up a small area of the INEEL along the northwest boundary. Three large silicic domes (East, Middle, and Big Southern buttes) occur along the southern boundary of the INEEL, and a number of smaller basalt cinder cones occur across the site. Mountains of the Lost River, Lemhi, and Bitterroot ranges that border the northwest portion of the INEEL are Cenozoic fault-block composed of Paleozoic limestones, dolomites, and shales. The fault-block ranges trend northwest-southeast, and the volcanic rifts that parallel the ranges are believed to be surface expressions of extensions of the range-front faults (Bargelt et al. 1992).

Basalt flows in the surface and subsurface at the INEEL were formed by three general methods of plains-style volcanism, which is an intermediate style between the flood basalt volcanism of the Columbia Plateau and the basaltic shield volcanism of the Hawaiian Islands (Bargelt et al. 1992). The methods are flows forming low-relief shield volcanoes, fissure-fed flows, and major tube-fed flows with other minor flow types (Bargelt et al. 1992). The very low shield volcanoes, with slopes of about 1 degree, formed in an overlapping manner. This overlapping and coalescing of flows is characteristic of the low surface relief on the ESRP (Bargelt et al. 1992). Considerable variation in texture occurs within individual basalt flows. In general, the bases of basalt flows are glassy to fine grained and minutely vesicular. The midportions of the basalt flows are typically coarser grained with fewer vesicles than the top or bottom of the flow. The upper portions of flows are fine grained and highly fractured with many vesicles. This pattern is the result of rapid cooling of the upper and lower surfaces with slower cooling of the interior of the basalt flow. The massive interiors of basalt flows are sometimes jointed with vertical joints in a hexagonal pattern formed during cooling (Wood 1989).

During quiescent periods between volcanic eruptions, sediments were deposited on the surface of the basalt flows. These sedimentary deposits display a wide range of grain-size distributions, depending on the mode of deposition (i.e., eolian [windblown silt or sand], lacustrine, or fluvial), source rock, and length of transport. Because of the irregular topography of the basalt flows, sedimentary materials commonly accumulated in isolated depressions.

A number of wells have been drilled within the INEEL to monitor groundwater levels and water quality. Lithologic and geophysical logs were made for most of the wells. From these logs and an understanding of the volcanism of the Snake River Plain, it is possible to develop a reasonably comprehensive picture of subsurface geology. The INEEL is homogeneous in terms of the mode of formation and types of geologic units encountered. The exact distribution of units at any specific site, however, is highly variable.

2.4.3.2 Volcanic Hazard. As discussed above, the INEEL is located in a region of historical volcanic activity, typically of the nonviolent basalt volcanism variety. Five to six million years ago, explosive rhyolite volcanism occurred beneath the INEEL, but the calderas are now dead and buried beneath basalt lava flows. The youngest lava flow in the region immediately surrounding the site erupted about 4,100 years ago from the Hell's Half Acre Lava Flow to the southeast of the INEEL. The most recent lava flows within the site boundary occurred some 300,000 years ago (Hackett, Pelton, and Brockway 1986).

Renewed explosive rhyolite volcanism at the INEEL is very unlikely. Geological and geochronological data indicate an eastward progression of ESRP volcanism. The magmatic plume assumed responsible for the volcanism now is thought to lie beneath Yellowstone National Park, at which explosive rhyolite volcanism is possible. Hazards associated with falling ejecta could impact the INEEL in the remote event that such an explosion occurred at the park, but basalt flows originating at Yellowstone cannot reach the INEEL because of distance and the intervening mountainous terrain (Hackett, Pelton, and Brockway 1986).

According to Hackett, Leussen, and Ferdock (1987), past patterns of volcanism suggest that future volcanism at the INEEL within the next 1,000 to 10,000 years is very improbable. The two most likely sources of future basalt flows are the Arco-Big Southern Butte and the Lava Ridge-Hell's Half Acre rift zones. Lava from these rifts would tend to move south away from the INEEL because of the gentle negative gradient from north to south on the surface of the ESRP (Hackett, Pelton, and Brockway 1986).

2.4.3.3 Surficial Soils. The INEEL soils are derived from Cenozoic felsic volcanic and Paleozoic sedimentary rocks from nearby mountains. The soils in the northern portion of the INEEL are generally composed of fine-grained lacustrine and eolian deposits of unconsolidated clay, silt, and sand. Typically, the soils in the southern INEEL are shallow, consisting of fine-grained eolian soil deposits with some fluvial gravels and gravelly sands (EG&G 1988). Across the site, measured surficial soil thicknesses range from zero at the basalt outcroppings east of INTEC to 95 m (313 ft) near the Big Lost River Sinks southwest of TAN (Anderson, Liszewski, and Ackerman 1996).

Currently, site CPP-26, which is included in site CPP-96, is located in the 100-year flood plain, (Berenbrock and Kjelstrom 1998). To more accurately depict the limits of the 100-year flood plain, DOE is performing additional flood plain analysis that may impact the flood plain boundary in the vicinity of these two sites. In addition, ongoing construction activities as part of the OU 3-13 Tank Farm interim action (see Section 1.5.4) may change the topography and modify the boundary of the 100-year flood plain. These activities and their impact on the two sites with regard to their being in the 100-year flood plain will be reevaluated during the OU 3-14 feasibility study.

2.4.4 Hydrology

2.4.4.1 Surface Hydrology. Surface hydrology at the INEEL includes water from three streams that flow intermittently onto the INEEL and from local runoff caused by precipitation and snowmelt. Most of the INEEL is located in the Pioneer Basin into which three streams drain: the Big Lost River, the Little Lost River, and Birch Creek. These streams receive water from mountain watersheds located to the north and northwest of the INEEL. Stream flows often are depleted before reaching the INEEL by irrigation diversions and infiltration losses along stream channels. The Pioneer Basin has no outlet; thus, when water flows onto the INEEL, it either evaporates or infiltrates the ground (Irving 1993).

The Big Lost River is the major surface water feature on the INEEL. Its waters are impounded and regulated by Mackay Dam, which is located approximately 6 km (4 mi) north of Mackay, Idaho. Upon leaving the dam, waters of the Big Lost River flow southeastward past the town of Arco and onto the ESRP. Flow in the Big Lost River that actually reaches the INEEL is either diverted at the INEEL diversion dam to spreading areas southwest of RWMC or flows northward across the INEEL in a shallow channel to its terminus at the Lost River Sinks at which point the flow is lost to evaporation and infiltration (Irving 1993). Because of above-average mountain snow pack in 1995, water in the Big Lost River was sufficient during the summer of 1995 to flow to the spreading areas and sinks and to the playas south of TAN. Flow during this timeframe ranged from 13.3 m^3/second (469 ft^3/second) near RWMC in mid-July to 0.8 m^3/second (29 ft^3/second) in early August (Becker et al. 1998).

The Little Lost River drains from the slopes of the Lemhi and Lost River mountain ranges. Flow in the Little Lost River is diverted for irrigation north of Howe, Idaho, and does not normally reach the INEEL. Springs below Gilmore Summit in the Beaverhead Mountains, and drainage from the surrounding basin, are the source for Birch Creek. Flowing in a southeasterly direction between the Lemhi and Bitterroot mountain ranges, the water of Birch Creek is diverted north of the INEEL for irrigation and hydropower during the summer months. During the winter months, water not used for irrigation is returned to an anthropogenic channel on the INEEL 6 km (4 mi) north of TAN where the water infiltrates channel gravels, recharging the aquifer (Irving 1993). The surface water features of the INEEL are illustrated in Figure 2-14.

2.4.4.2 Subsurface Hydrology. Subsurface hydrology at the INEEL is discussed as three components: the vadose zone, perched water, and the SRPA. The vadose zone, also referred to as the unsaturated zone, extends from the land surface down to the water table. The water content of the geologic materials in the vadose zone is commonly less than saturation, and water is held under negative pressure. Perched water in the subsurface forms as discontinuous saturated lenses with unsaturated conditions existing both above and below the lenses. Perched water bodies are formed by vertical, and to a lesser extent, lateral migration of water moving away from a source until an impeding sedimentary layer is encountered. The SRPA, also referred to as the saturated zone, occurs at various depths beneath the ESRP. About 9% of the aquifer lies beneath the INEEL (DOE-ID 1996). The depth to the water table ranges from approximately 61 m (200 ft) in the northern part of the INEEL to greater than 274 m (900 ft) in the southern part (Irving 1993). The SRPA, which consists of basalt and sediments and the groundwater stored in these materials, is one of the largest aquifers in the United States (Irving 1993) and was classified as a sole-source aquifer by the EPA in 1991 (56 FR 50634).

The vadose zone is a particularly important component of the INEEL hydraulic system. First, the thick vadose zone affords protection to groundwater by acting as a filter and preventing many contaminants from reaching the SRPA. Second, the vadose zone acts as a buffer by providing storage for large volumes of liquid or dissolved contaminants that have spilled on the ground, have migrated from disposal pits and ponds, or have otherwise been released to the environment. Finally, the vadose zone is important because transport of contaminants through the thick, mostly unsaturated materials can be slow if low infiltration conditions prevail.

An extensive vadose zone exists at the INEEL ranging in thickness from 61 m (200 ft) in the north to greater than 274 m (900 ft) in the south and consists of surficial sediments, relatively thin horizontal basalt flows, and occasional interbedded sediments (Irving 1993). Surface sediments in the vadose zone include clays, silts, sands, and some gravels. Thick surficial deposits of clays and silts are found in the northern part of the INEEL, but the deposits decrease in thickness to the south where some basalt is exposed at the topographic surface. Approximately 90% of the vadose zone comprises thick sequences of interfingering basalt flows. These sequences are characterized by large void spaces resulting from fissures, rubble zones, lava tubes, undulatory basalt-flow surfaces, and fractures. Sedimentary interbeds found in the vadose zone consist of sands, silts, and clays and are generally thin and discontinuous. Sediments may be compacted because of original deposition and subsequent overburden pressures. Under unsaturated conditions with limited water, flow will move preferentially through small openings in sediment or basalt, avoiding large openings.

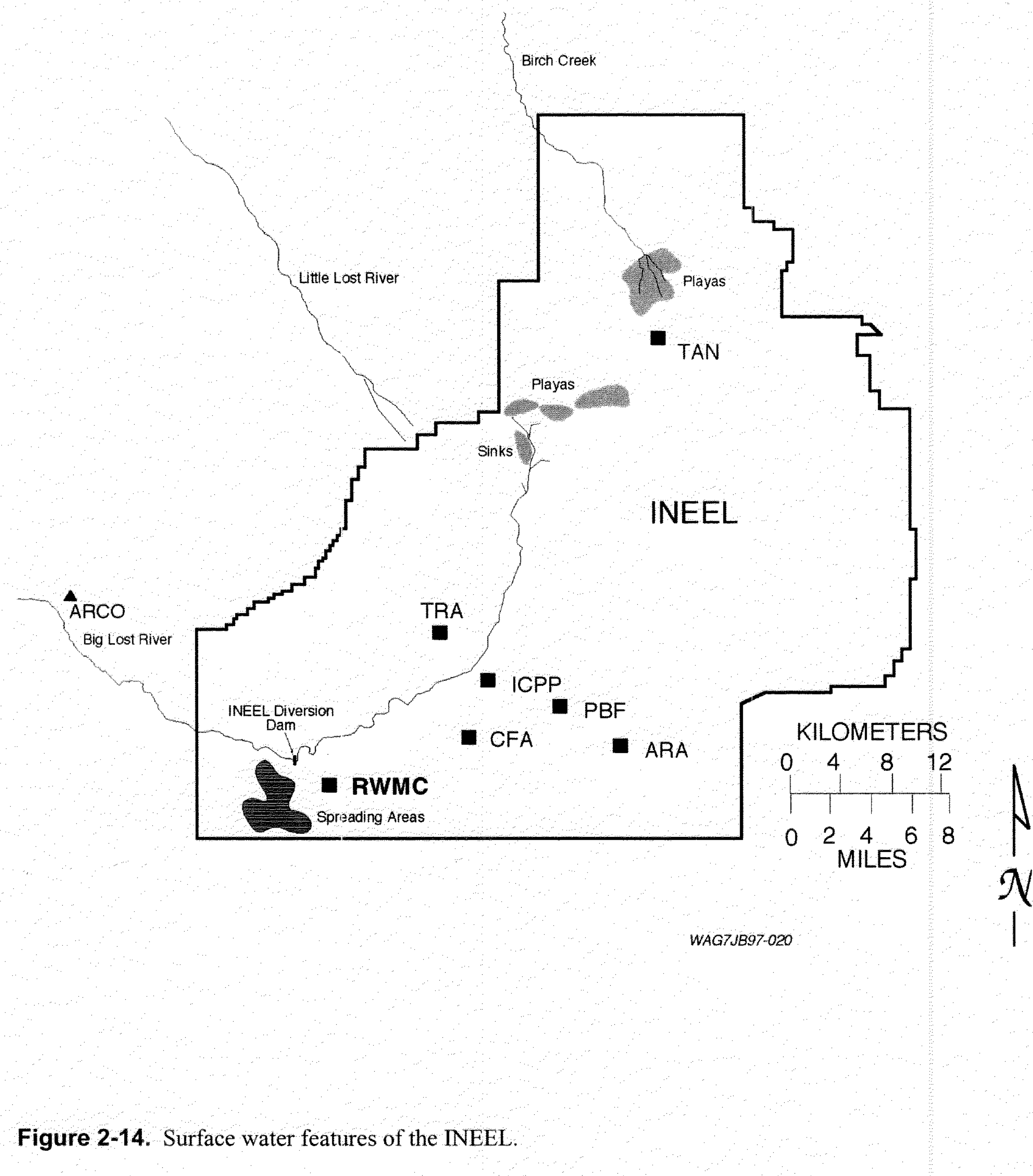


Figure 2-14. Surface water features of the INEEL.

Perched water at the INEEL forms when a layer of dense basalt or fine sedimentary materials occurs with a hydraulic conductivity that is sufficiently low so that vertical movement of the water is restricted. Once perched water develops, lateral movement of the water can occur, perhaps by up to hundreds of meters. When perched water accumulates, the hydraulic pressure head increases and water filters through the less permeable perching layer and continues its generally vertical descent. If another restrictive zone is encountered, perching again may occur. The process can continue, resulting in the formation of several perched water bodies between the land surface and water table. The volume of water contained in perched bodies fluctuates with the amount of recharge available from precipitation, surface water, and anthropogenic sources. Perching behavior tends to slow the downward migration of percolating fluids that may be flowing rapidly under transient, near-saturated conditions through the vadose zone. Historically, perched water has been found beneath INTEC, RWMC, ANL-W, and TRA.

The SRPA is defined as the saturated portion of a series of basalt flows and interlayered pyroclastic and sedimentary materials that underlie the ESRP east of Bliss, Idaho. It extends from Bliss and the Hagerman Valley on the west to Ashton and the Big Bend Ridge on the northeast. Its lateral boundaries are formed at the points of contact of the aquifer with less permeable rocks at the margins of the plain. The SRPA arcs approximately 354 km (220 mi) through the eastern Idaho subsurface and varies in width from approximately 80 to 113 km (50 to 70 mi). The total area of the SRPA is estimated at 24,862 km^2 (9,600 mi^2). The depth to groundwater at the INEEL ranges from approximately 61 m (200 ft) bgs in the north to more than 274 m (900 ft) bgs in the south (Becker et al. 1998). The aquifer contains numerous, relatively thin basalt flows extending to depths of 1,067 m (3,500 ft) bgs. In addition, the SRPA contains sedimentary interbeds that are typically discontinuous. The SRPA has been estimated to hold 2.5E+12 m^3 (8.8E+13 ft^3) of water, which is approximately equivalent to the amount of water contained in Lake Erie, or enough water to cover the entire state of Idaho to a depth of 1.2 m (4 ft) (Hackett, Pelton, and Brockway 1986). Water is pumped from the aquifer primarily for human consumption and irrigation (Irving 1993). Compared to such demands, the INEEL's use of the aquifer is minor. The SRPA was designated as a sole source aquifer by the EPA (56 FR 50634) because it is the only viable source of drinking water for many communities on the ESRP.

Aquifer permeability is controlled by the distribution of highly fractured basalt flow tops, interflow zones, lava tubes, fractures, vesicles, and intergranular pore spaces. The variety and degree of interconnected water-bearing zones complicate the direction of groundwater movement locally throughout the aquifer. The permeability of the aquifer varies considerably over short distances, but generally, a series of basalt flows will include several excellent water-bearing zones.

The SRPA is recharged primarily by infiltration from rain and snowfall that occurs within the drainage basins surrounding the ESRP and from deep percolation of irrigation water. Annual recharge rates depend on precipitation, especially snowfall. Regional groundwater flows to the south-southwest, though locally the flow direction can be affected by recharge from rivers, surface water spreading areas, and heterogeneities in the aquifer. Estimates of flow velocities within the SRPA range from 1.5 to 6.1 m/day (5 to 20 ft/day) (Irving 1993). Flow in the aquifer is primarily through fractures, interflow zones in the basalt, and the highly permeable rubble zones located at flow tops. The SRPA is considered heterogenous and anisotropic (having properties that differ, depending on the direction of measurement) because of the permeability variations within the aquifer that are caused by basalt irregularities, fractures, void spaces, rubble zones, and sedimentary interbeds. The heterogeneity is responsible for the variability in transmissivity (which is a measure of the ability of the aquifer to transmit water) through the SRPA. Transmissivities measured in wells on the INEEL range from 1.0E-01 to 1.1E+06 m^2/day (1.1E+00 to 1.2E+07 ft^2/day) (Wylie et al. 1995). Over the vast majority of the INEEL, no MCLs were exceeded. In general, water quality is preserved because the extensive vadose zone filters chemicals and pollutants from the irrigation and wastewater that pass through the aquifer. Concerns about groundwater contamination from INEEL operations have prompted an extensive monitoring system over all of the INEEL (Irving 1993).

2.4.5 Ecology

Six broad vegetation categories representing nearly 20 distinct habitats have been identified on the INEEL: juniper-woodland, native grassland, shrub-steppe off lava, shrub-steppe on lava, modified, and wetlands. Nearly 90% of the site is covered by shrub-steppe vegetation, which is dominated by big sagebrush, saltbush, rabbitbrush, and native grasses (DOE-ID 1996). In addition to the predominant sagebrush steppe communities, small riparian and wetland regions exist along the Big Lost River and Birch Creek and have been identified as sensitive biological resource areas within the site.

The INEEL serves as a wildlife refuge because a large percentage of the site is undeveloped and human access is restricted. The central part of the site is prohibited from grazing and hunting. Mostly undeveloped, this tract may be the largest undisturbed sagebrush steppe in the Intermountain West outside of the national park lands (DOE-ID 1996). More than 270 vertebrate species including 43 mammals, 210 birds, 11 reptiles, nine fish, and two amphibians have been observed at the site. During some years, hundreds of birds of prey and thousands of pronghorn antelope and sage grouse winter on the INEEL. Mule deer and elk also reside at the site. Observed predators include bobcats, mountain lions, badgers, and coyotes. Bald eagles, classified as a threatened species, are commonly observed on or near the site each winter. Peregrine falcons, which are classified as endangered, also have been observed. In addition, nine candidate species for listing as threatened or endangered may either inhabit or migrate through the area. Of these nine species, the pygmy rabbit, three species of bats, and some species of ants are currently under study at the site. Other candidate species that may frequent the area include ferruginous hawks, Townsend's big-eared bats, burrowing owls, and loggerhead shrikes. This list of species is compiled from a letter from the U.S. Fish and Wildlife Service (2000) for threatened or endangered and sensitive species listed by the Idaho Department of Fish and Game (IDFG) Conservation Data Center (CDC) web site and Radiological Environmental Sciences Laboratory documentation for the INEEL (Reynolds, et al. 1986).

2.4.6 Demography and Land Use

2.4.6.1 Demography. Populations potentially affected by INEEL activities include INEEL employees, ranchers who graze livestock in areas on or near the INEEL, hunters on or near the INEEL, and residential populations in neighboring communities.

2.4.6.1.1 On-Site Populations. Nine separate facilities at the INEEL include a total of approximately 450 buildings and more than 2,000 other support facilities. In January 1996, the INEEL employed 8,616 contractor and government personnel. Approximately 40% of the total work force is located in Idaho Falls, Idaho, and 60% is employed at the INEEL site (DOE-ID 1996).

Approximately 1,162 employees are located at the INTEC. Employee totals at other INEEL locations are approximately 883 at the CFA, 190 employees at the RWMC, 360 at TAN, 470 at TRA, 112 at the Power Burst Facility, 1,300 at the Naval Reactors Facility (NRF), 750 at ANL-W, and 10 within the remaining sitewide areas. In addition, approximately 3,400 INEEL employees occupy numerous offices, research laboratories, and support facilities in Idaho Falls (DOE-ID 1996).

2.4.6.1.2 *Off-Site Populations.* The INEEL site is bordered by five counties: Bingham, Bonneville, Butte, Clark, and Jefferson (Figure 2-15). Major communities include Blackfoot and Shelley in Bingham County, Idaho Falls and Ammon in Bonneville County, Arco in Butte County, and Rigby in Jefferson County. Population estimates for the counties surrounding the INEEL and the largest population centers in these counties are shown in Table 2-5 (Becker et al. 1998). The nearest community to the INEEL is Atomic City, located south of the site border on U.S. Highway 26. Other population centers near the INEEL include Arco, west of the site; Howe, west of the site on U.S. Highway 22/33; and Mud Lake and Terreton on the northeast border of the site.

2.4.6.2 *Land Use.* The primary use of INEEL lands is to support facility operations and act as buffer and safety zones around the facilities. Virtually all of the work at the INEEL is performed within the site's primary facility areas (i.e., CFA, TRA, and INTEC). These areas, however, occupy only about 2% of the total INEEL land area. Other land uses include environmental research, ecological preservation, and socio-cultural preservation. INEEL land is also used for grazing, recreation, and connecting infrastructure, with the remaining land being essentially undisturbed.

Currently, INTEC has a total land area of 200 acres and 106,070 m^2 (1,141,711 ft^2) of facilities. Land at INTEC is used to store SNF and radioactive waste for DOE. Before April 1992, SNF were reprocessed at the plant. With the DOE decision to cease reprocessing operations, however, the need to store greater quantities of these fuels increased.

The Bureau of Land Management (BLM) classified the acreage within the INEEL as industrial and mixed use (DOE 1991). The primary use of INEEL land is to support facility and program operations dedicated to SNF management, hazardous and mixed waste management and minimization, cultural resources preservation, and environmental engineering, protection, and remediation. Large tracts of land are reserved as buffer and safety zones around the boundary of the INEEL. Portions within the central area are reserved for INEEL operations. The remaining land within the core of the reservation, which is largely undeveloped, is used for environmental research, ecological preservation, and sociocultural preservation.

Table 2-5. Population estimates (1990) for selected counties and communities surrounding the INEEL and selected communities (Becker et al. 1998)

Location	Population Estimate
Bingham County	39,613
Blackfoot	9,300
Shelley	3,400
Clark County	798
Bonneville County	77,395
Ammon	4,800
Idaho Falls	42,200
Butte County	2,940
Jefferson County	17,486
Rigby	2,600

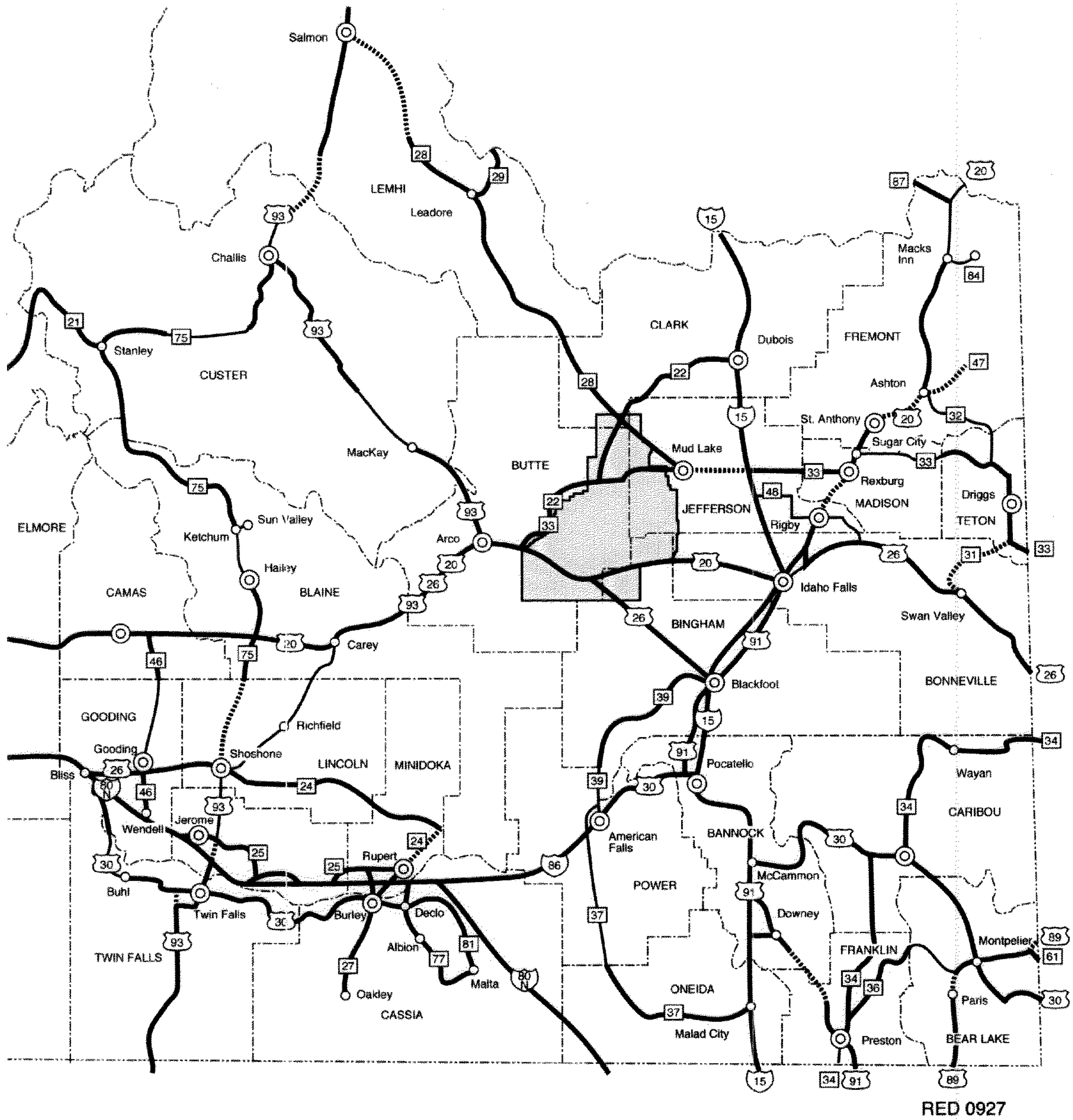


Figure 2-15. Counties adjacent to the INEEL.

The buffer consists of 1,295 km^2 (500 mi^2) of grazing land (DOE 1991) administered by the BLM. Grazing areas at the INEEL, shown in Figure 2-16, support cattle and sheep, especially during dry conditions. Depredation hunts of game animals, managed by the IDFG, are permitted onsite within the buffer zone during selected years. Hunters are allowed access to an area that extends 0.8 km (0.5 mi) inside the INEEL boundary on portions of the northeastern and western borders of the site (Becker et al. 1998).

State Highways 22, 28, and 33 cross the northeastern portion of the site, and U.S. Highways 20 and 26 cross the southern portion (Figure 2-16). One hundred forty-five km (90 mi) of paved highways used by the general public pass through the INEEL (DOE 1991), and 23 km (14 mi) of Union Pacific Railroad tracks traverse the southern portion of the Site. In the counties surrounding the INEEL, approximately 45% of the land is used for agriculture, 45% is open land, and 10% is urban, (DOE 1991). Livestock uses include the production of sheep, cattle, hogs, poultry, and dairy cattle (Bowman et al. 1984). The major crops produced on land surrounding the INEEL include wheat, alfalfa, barley, potatoes, oats, and corn. Sugar beets are grown within about 40 mi of the INEEL in the vicinity of Rockford, Idaho, southeast of the INEEL in central Bingham County.

Most of the land surrounding the INEEL is owned by private individuals or the U.S. government. The BLM administers the government land on the INEEL (Figure 2-16).

2.4.6.3 Future Land Use. Future land use scenarios were established in 1995 in *Long-Term Land Use Future Scenarios for the Idaho National Engineering Laboratory* (DOE-ID 1995) and further addressed in the *Comprehensive Facility and Land Use Plan* (DOE-ID 1996). Because future land-use scenarios are uncertain, assumptions were made in the INEEL future land-use scenarios document for defining factors such as development pressure, advances in research and technology, and ownership patterns. The following assumptions were applied to develop forecasts for land use within the INEEL:

- The INEEL will remain under government ownership and control for at least the next 100 years. The boundary is static. (However, the DOE land-use document [DOE 1994] indicates that the boundaries of the INEEL may shrink.).

- The life expectancy of current and new facilities is expected to range between 30 and 50 years. The decontamination and dismantlement process will commence following closure of each facility if new missions for the facility are not determined.

- No residential development (e.g., housing) will occur within the INEEL boundaries within the institutional control period.

- No new major, private developments (residential or nonresidential) are expected in areas adjacent to the INEEL.

Future land use most likely will remain essentially the same as the current use: a research facility within the INEEL boundaries and agriculture and open land surrounding the INEEL. Other potential, but less likely, land uses within the INEEL include agriculture and the return of the areas onsite to their natural, undeveloped state.

INTEC was one of the facilities that had a future use scenario projected. The scenarios are broken down into the present situation, as well as for the next 25, 50, 75, and 100 years.

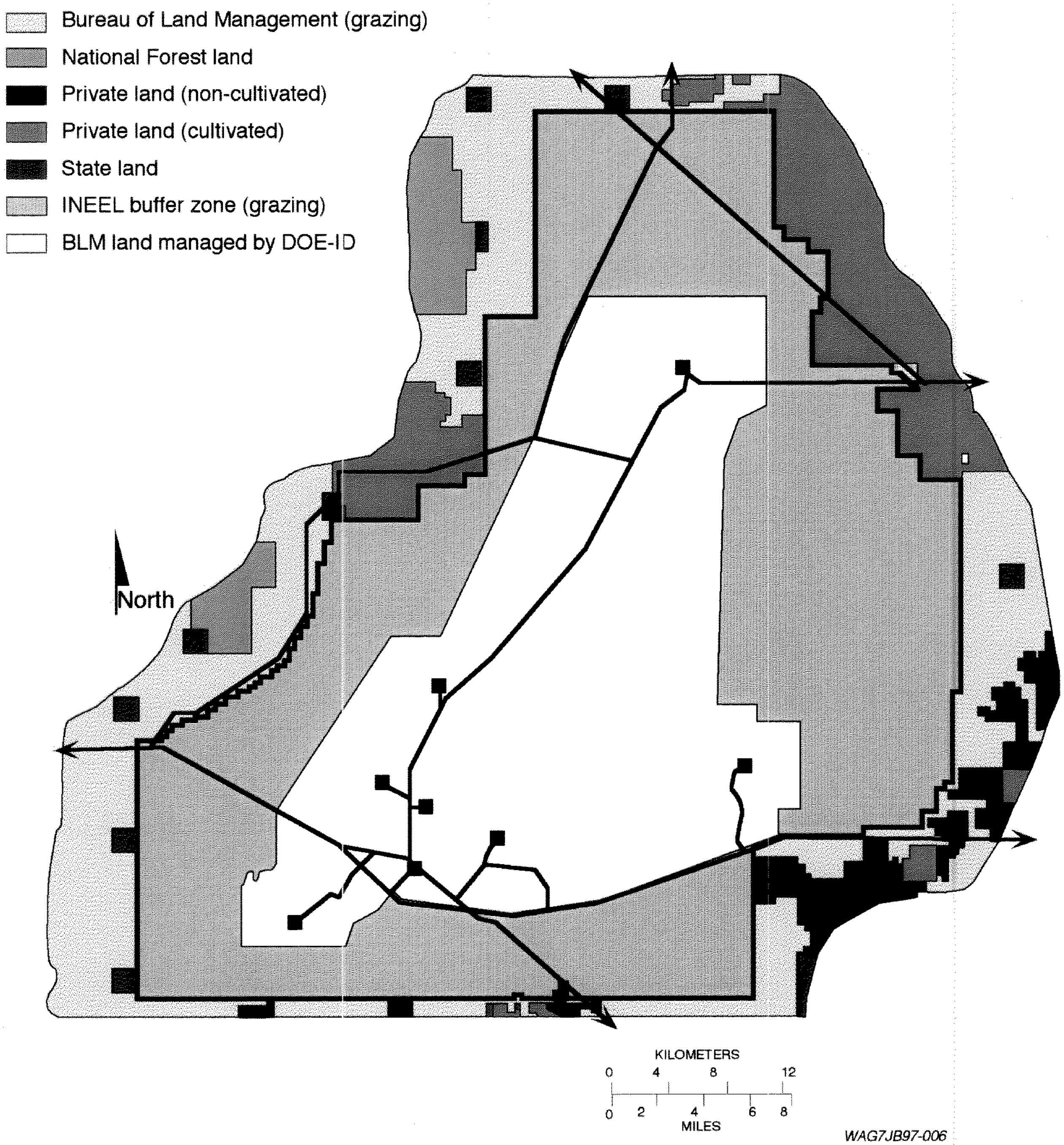


Figure 2-16. Land ownership distribution in the vicinity of the INEEL.

Present: Interim storage of SNFs, disposition of fuels, managing waste and improving waste and water management techniques.

25-Year: Continue use as industrial area, planned new waste treatment facility.

50-Year: Approaching end of useful life if no new mission identified, decontamination and dismantlement with all or selected areas for restricted industrial use.

75-Year: Standby mode for restricted industrial use; reuse permitted, but no new development outside existing fence line.

100-Year: Continuation as a restricted industrial area.

3. INITIAL OU 3-13 EVALUATION

An evaluation of the work performed in the Operable Unit (OU) 3-13 Remedial Investigation/ Feasibility Study (RI/FS) (DOE-ID 1997a) and presented in the OU 3-13 Record of Decision (ROD) (DOE-ID 1999a) is summarized in this section for the sites being addressed under OU 3-14. The information presented here concerning the OU 3-14 release sites is included for informational purposes only. The information summarizes current understanding of the conditions at these sites based on past characterization and process knowledge and provides the foundation for the OU 3-14 Work Plan rationale presented in Section 4. Following additional site characterization, screening of remedial alternatives will be presented in a separate RI/FS that is consistent with the initial phased remedies presented in the OU 3-13 ROD (DOE-ID 1999a).

The operational history of the Tank Farm, the former Idaho Nuclear Technology and Engineering Center (INTEC) injection well, and OU 3-14 background and the physical setting are presented in Section 2. Specific information supporting the history of the Tank Farm is presented in Appendices A through F.

3.1 Description of OU 3-14 Sites

This section covers the description of the OU 3-14 sites, the sources of contamination at each site, and based on past investigations (DOE-ID 1997a), contaminants that are likely to adversely affect human health and the environment through the surface soil or groundwater pathways. These sites were either assigned to OU 3-14 in the OU 3-13 ROD (DOE-ID 1999a) or defined in the OU 3-14 Scope of Work (SOW) (DOE-ID 1999b). OU 3-14 comprises the following sites:

- Tank Farm soil sites, all of which are consolidated in site CPP-96. Specifically, CPP-96 is a consolidation of sites CPP-15, CPP-16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP-30, CPP-31, CPP-32, CP-33, CPP-58, CPP-79, and CPP-96.

- Site CPP-23, the INTEC injection well, and aquifer within the INTEC security fence.

- Additional soil sites from OU 3-13, sites CPP-61, CPP-81, and CPP-82.

Previous investigation into the Waste Area Group (WAG) 3 sites by the OU 3-13 Remedial Investigation/Baseline Risk Assessment (RI/BRA) (DOE-ID 1997a) determined which sites have contamination at levels likely to adversely affect human health and the environment. The OU 3-13 baseline risk assessment (BRA) evaluated the nature and extent of contamination, contaminant fate and transport, and risks associated with available and estimated site-related contamination data for the WAG 3 release sites. The site screening determined which sites to eliminate from further evaluation, based on acceptable levels of residual contamination. Thus, only those sites with contamination above acceptable limits were carried over. Contaminant screening was performed on the carried-over sites (see Table 7-1, DOE 1999a). Table 3-1 presents the results of the OU 3-13 site and chemical screening process for the sites being addressed under OU 3-14. The characterization uncertainties associated with the OU 3-14 sites are summarized in the text and at the end of each site's descriptive summary. The uncertainties drawn from the OU 3-13 RI/BRA (DOE-ID 1997a) are summarized in Section 3.3.

Table 3-1. Results of the OU 3-13 site and chemical screening process. (Adapted from Table 7-1 in the OU 3-13 ROD).

Site Description (OU 3-13 sites being addressed under OU 3-14)	Retained OU 3-13 Contaminants
Tank Farm soil	
CPP-15 Solvent burner east of building CPP-605, radiological contamination	Thallium[a] zirconium[a] Am-241 Cs-137 Eu-154 Np-237 Pu-238 Pu-239/240 Tc-99 U-235
CPP-16 Contaminated soil from leak in line from tank WM-181 to PEW evaporator	Not evaluated[b] Contaminants estimated to be present include Cs-137, Sr-90, U, and Pu isotopes, and some inorganic constituents (WINCO 1991).
CPP-20 Building CPP-604 radioactive waste unloading area	arsenic[c] Am-241 Cs-134 Cs-137 Cobalt-60 Eu-154 Np-237 Pu-238 Sr-90 Tc-99
CPP-24 Bucket spill near tank WM-180 riser	Not evaluated[b] Liquid would have contained mercuric nitrate, nitric acid, and radionuclides (WINCO 1993)
CPP-25 Contaminated soil in the Tank Farm, north of building CPP-604	arsenic[c] Am-241 Cs-134 Cs-137 Co-60 Eu-154 Np-237 Pu-238 Sr-90 Tc-99

Table 3-1. (continued)

Site Description (OU 3-13 sites being addressed under OU 3-14)	Retained OU 3-13 Contaminants
CPP-26 Contaminated soil in the Tank Farm area, steam flushing operation inside the Tank Farm perimeter, near tank WM-188	Am-241 Cs-137 Eu-154 Pu-238 Pu-239 Sr-90 U-234 U-235
CPP-27 Contaminated soil in the Tank Farm area, east of building CPP-604 and site CPP-33	Arsenic[i] chromium[h] Am-241 Cs-137 Eu-154 Np-237 Pu-238 Pu-239/240 Sr-90 U-235
CPP-28 Contaminated soil in the Tank Farm area, south of tank WM-181 by valve box A-6	Ce-144 Cs-134 Cs-137 Co-60 Eu-154 H-3 Np-237 Pu-239 Pu-240 Pu-241 Pu-242 Ru-106 Sr-90 U-234 U-235 U-236
CPP-30 Contaminated soil near valve box B-9 in the vicinity of tanks WM-187 and WM-188	Not evaluated[b]
CPP-31 Contaminated soil in the Tank Farm, south of tank WM-183	Cs-134 Cs-137 Co-60 Eu-154 Pu-239/240 Ru-106 Sr-90 U-235

Table 3-1. (continued)

Site Description (OU 3-13 sites being addressed under OU 3-14)	Retained OU 3-13 Contaminants
CPP-32 West and East Contaminated soil in the Tank Farm in area near tank WM-186 valve box B-4	Cs-137 Eu-154 Sr-90
CPP-33 Contaminated soil in the Tank Farm, northeast of building CPP-604	Arsenic chromium[h] Am-241 Cs-137 Np-237 Pu-238 Pu-239/240 Sr-90 U-235[j]
CPP-58 West and East Subsurface release of contaminants associated with PEW spills and PEW evaporator overhead pipeline spills	Am-241 Cs-137 Eu-154 Pu-238 Pu-239 Sr-90 U-235
CPP-79 Tank Farm release near valve box A-2, south of tank WM-181	Am-241 Cs-137 Pu-238 Pu-239[d] Sr-90 U-234 U-235
CPP-96 Site CPP-96 encompasses all of the above sites	Retained OU 3-13 contaminants listed for above mentioned sites and potentially others
Injection well	
CPP-23 Former injection well, northwest of building CPP-666	Cs-137 Eu-152 Eu-154 Sr-90
Additional soil sites from OU 3-13	
CPP-61 PCB spill in CPP-718 transformer yard, radiological contamination	PCB[e] Cs-137 Sr-90 Tc-99

Table 3-1. (continued)

Site Description (OU 3-13 sites being addressed under OU 3-14)	Retained OU 3-13 Contaminants
CPP-81	
Abandoned VOG line for buildings CPP-637/CPP-601	Not evaluated[f]
CPP-82	Not evaluated[g]
Abandoned underground line (PLA-776) west of Beech Street	

NOTE: Contaminants listed are the retained Ou 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA unless a site was not evaluated, see specific footnote.

a. No toxicity value is available.

b. A Track 2, No further action site (WINCO 1993d; DOE-ID 1997a).

c. The OU 3-13 RI/BRA, Section 10.1.2, includes arsenic as a retained OU 3-13 contaminant.

d. The OU 3-13 RI/BRA, Section 10.7.2, includes Pu-239 as a retained OU 3-13 contaminant.

e. A Track 1 Investigation, No further action site for contaminant PCB (WINCO 1992a; DOE-ID 1997a).

f. A Track 1 Investigation, No further action site (WINCO 1994b; DOE-ID 1997a).

g. A Track 1 Investigation, No further action site (WINCO 1992b; DOE-ID 1997a).

h. Chromium was not included as part of the source estimate for Tank Farm surface soil because it was eliminated in the screening process for OU 3-08 (DOE-ID 1997a, Section 11). Chromium is part of the source estimate for future groundwater usage because given enough time, chromium will reach the SRPA. (DOE-ID 1997a, Sections 16 and 29).

i. The OU 3-13 RI/BRA, Section 11.2.2 includes arsenic as a retained OU 3-13 contaminant.

j. The OU 3-13 RI/BRA, Section 11.2.2 includes U-235 as a retained OU 3-13 contaminant for site CPP-33. However, Table 5-31 of the OU 3-13 RI/BRA does not include U-235 as a retained OU 3-13 contaminant for site CPP-33.

The contaminants identified in the OU 3-13 RI/BRA for the Tank Farm soil and injection well and aquifer within the INTEC security fence were not inclusive of all those potentially present. The inability to sample each site and incomplete evaluation of the collected samples for the full range of potential contaminants (e.g., radionuclides and metals) left uncertainty in the source term for these sites. This source term uncertainty, along with other geophysical uncertainties, was carried forward into (1) the site and contaminant screening process, performed in the OU 3-13 RI/BRA, which generated a list of retained OU 3-13 COPCs (see Table 5-51 in the OU 3-13 RI/BRA) for quantitative evaluation in the OU 3-13 RI/BRA, and (2) the resulting OU 3-13 COCs for the OU 3-13 Tank Farm soil (see Section 3.2.1) and the aquifer beneath INTEC (see Section 3.2.2).

The retained OU 3-13 contaminants listed in Table 3-1 represent the preliminary identification of OU 3-14 analytes of concern. These OU 3-13 COPCs, retained from the chemical screening process performed in the OU 3-13 RI/BRA or as indicated, are the contaminants determined from historical process or environmental release information on a given site. These are only preliminary OU 3-14 analytes of concern to sample for because all of the contaminants have not been identified at the sites.

The OU 3-14 RI/FS provides the means to collect data for the Tank Farm soil, injection well, and aquifer beneath INTEC to determine the complete list of contaminants present, their screening to retained OU 3-14 COPCs, and subsequently, the determination of OU 3-14 COCs. This will fill the data gap identified in the OU 3-13 ROD to enable making a final remediation decision for the OU 3-14 sites. In addition to the retained OU 3-14 COPCs, all analytes detected and soil parameters should be considered in the OU 3-14 FS to the extent they may affect the effectiveness of potential process options.

3.1.1 Tank Farm Soil Contaminant Sources

The Tank Farm known soil contamination sites are shown in Figure 3-1. The individual site descriptions are primarily a composite of the information contained in the OU 3-13 RI/BRA (DOE-ID 1997a), the OU 3-13 Feasibility Study (FS) (DOE-ID 1997b), and the FS Supplement (DOE-ID 1998a). The generating process, release mechanism, and artifacts are discussed to provide a better understanding of the processes that produced the contamination in Tank Farm soil.

The contaminant sources in Tank Farm soil resulted from past spills, leaks, and contaminated backfill. Spills have occurred during waste handling and maintenance operations at the Tank Farm. Spills tend to be better characterized than leaks in terms of timeframe, volume, and characteristics using process knowledge information. Leaks include the sites in which the release occurred in the subsurface over time. Most leaks are from pipes that have become corroded. When the releases began or how much volume was released is not generally known. Contaminated backfill was used during Tank Farm maintenance and contamination removal activities. Typical materials used to backfill Tank Farm excavations consisted of soil contaminated with radioactivity at levels of 3–5 mR/hour. This soil was placed in the bottom of excavated areas and clean soil was placed on top for shielding purposes.

3.1.1.1 Site CPP-15. Site CPP-15 was the location of the solvent burner building (CPP-629) (Figure 3-1). Operation of the facility began in the late 1950s. The facility was dismantled in 1983. The spent organic solvent, either hexone (methyl isobutyl ketone [MIBK]) or tributyl phosphate (TBP) and purified kerosene, burned in the building, came from the uranium solvent extraction processes. Solvent extraction was used to separate uranium from fission products. The solvent was put in contact with uranium, contained in an aqueous solution of uranyl nitrate that was produced in the fuel dissolution process.

The spent solvent was burned in a standard furnace oil burner in a fire-brick lined enclosure, fed by an underground solvent feed tank (LE-102) located below the building. The furnace off-gases were sent unfiltered to the INTEC main stack. During operations, the burner flue routinely leaked combustion products, resulting in contamination in the area east of building CPP-629. A 1977 analysis of soot taken from the flue detected I-129 (6.6.7E-02 pCi/g), Pu-239 (3.85E-00 pCi/g), Am-241 (6.25E-02 pCi/g), Cs-137 (1.32E+01 pCi/g), Ba-137m (2.94E-02 pCi/g) and Ru-106 (3.38E+01 pCi/g).

On March 28, 1974, during maintenance of the solvent burner, liquid was reportedly found on the ground inside and outside the solvent burner building (CPP-629). A leak of the spent solvent was determined to have occurred from the ground surface flange directly above the solvent feed tank. The quantity of spilled liquid is unknown. It was reported that beta and gamma radiation readings as high as 3 R/hour were detected in the contaminated soil outside the building, which was removed and placed in drums. Uncontaminated soil was used to backfill the excavation.

The Solvent Burner Building was demolished in 1983. The demolition included removal of the furnace/burner unit, furnace duct, control shed, piping, valves, and controls within the shed, piping penetrating the shed, the solvent feed tank (LE-102), and contaminated soil in the area. Interviews with personnel involved in the demolition indicated that the soil excavation exceeded 10 ft below grade and was very thorough. No post excavation sampling was performed to confirm the removal of contamination. Site CPP-15 was originally included in OU 3-08, which underwent a Track 2 Investigation (WINCO 1993b). The Track 2 investigation was performed on the basis of information about the demolition and removal activities. No sampling and analysis were performed. Site CPP-15 was recommended for no further action.

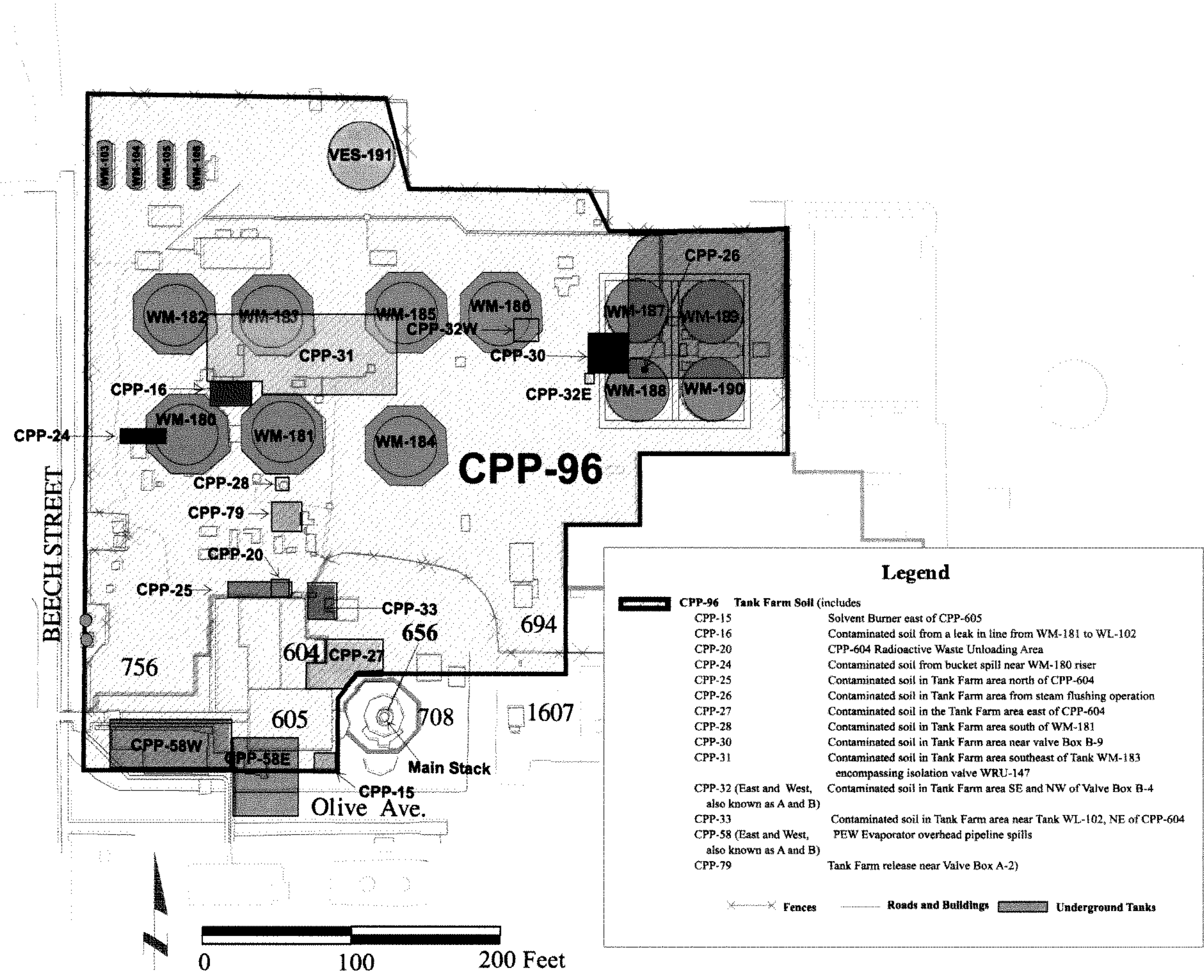


Figure 3-1. Known Tank Farm soil contamination sites.

In September 1995, construction personnel encountered elevated radiological readings while excavating soil in the western portion of the CPP-15 site. The excavation was in support of installation of an electrical duct bank and transformer pad. The contaminated soil was encountered at a depth of 0.6 m (2 ft). Beneath the contaminated soil was a concrete footing with a hot spot reading of 1.5 R/hour. The footing was a remnant of the old stack pre-heater. Six soil samples were collected in the area of the contaminated footing from the following five locations:

- A stockpile of excavated soil in a dump truck (Sample CPP-15-1)
- Soil approximately 0.46 m (1.5 ft) away from the footing, 0.61 m (2 ft) bgs (Sample CPP-15-2)
- Soil directly below the footing (Samples CPP-15-3 and CPP-15-5)
- Soil 1.2 m (4 ft) below the footing (Sample CPP-15-4)
- Soil 2.6 m (8.5 ft) below the footing (Sample CPP-15-6).

3.1.1.1.1 Data Review—The results of the analyses indicate that the highest levels of radionuclide contamination were present in the samples collected 2.6 m (8.5 ft) below the contaminated footer and 3.2 m (10.5 ft) belowgrade. This would suggest that not all of the contaminated soil was removed during the 1983 demolition activities and is consistent with the report that the excavation extended only to 3 m (10 ft) belowgrade. Cesium (Cs)-137 was the only radionuclide detected in the four shallow soil samples during an analysis for gamma-emitting radionuclides. The detected concentrations ranged from 2,350±120 to 43,300±1,800 pCi/g. In addition to gamma spectroscopy analysis, the sample from 3.2 m (10.5 ft) belowgrade was analyzed for a suite of other radionuclides including I-129, Np-237, total strontium, Tc-99, and plutonium and uranium isotopes. The Cs-137 activity in the sample was 586,000±170,000 pCi/g. Other radionuclides detected in the sample were Am-241 at 538±35 pCi/g, Eu-154 at 243±24 pCi/g, Np-237 at 0.63 pCi/g, Pu-238 at 4570±320 pCi/g, Pu-239/240 at 825±63 pCi/g, Tc-99 at 36.7 pCi/g, and U-235 at 0.0203 pCi/g.

All of the soil samples were subjected to analysis for metals, cyanide, sodium, potassium, semivolatile organic compounds (SVOCs), percent solids, and volatile organic compounds (VOCs) as well. Zirconium was detected in all six samples at concentrations ranging from 5.13 to 13.97 mg/kg. Thallium was detected in the sample at 4.85 mg/kg from 3.2 m (10.5 ft) belowgrade. The reported results for all other metals in the samples were consistent with background soil concentrations of the metals at the Idaho National Engineering and Environmental Laboratory (INEEL). In the organic analysis, methylene chloride was detected in all of the samples at very low concentrations (less than 0.01 mg/kg). It also was detected in the method blanks. Trichloroethene was detected in the sample of soil from the dump truck at an estimated concentration of 4.6 μg/kg.

The SVOC analysis of the soil samples indicates the presence of a number of SVOCs that would be expected at the site, given the site history, including tributyl phosphate and some polyaromatic hydrocarbons, which are associated with combustion of kerosene. The detected compounds include tri-n-butyl phosphate, acenaphthene, phenanthrene, anthracene, fluoranthene, benzo(k)fluoranthene, and benzo(b)fluoranthane. The analysis indicated that the compounds are spectrally present but at concentrations below the sample quantitation limit. The "U" flagged sample quantitation limits, called the method detectable limit (MDL) on the data reports, are what was reported for the compound concentrations in the data packages. Also detected in many of the samples were 3-nitroaniline, azobenzene, 2-methylphenol, bis(2-chlorethyl)ether, 2,6-dinitrotoluene, and numerous tentatively identified compounds. A number of other compounds including naphthalene, 2-methylnaphathalene, 2-chloronaphthalene, acenaphthylene, dimethylphthalate, dibenzofuran, fluorene, diethylphthalate, carbazole, di-n-butylphthalate, bis(2-ethylhexyl)phthalate, butylbenzylphthalate, and di-n-octylphthalate were reported present in both the samples and the reagent blank.

3.1.1.1.2 Contaminant Summary—Based on the contaminant screening in the OU 3-13 RI/BRA, the retained OU 3-13 contaminants for this site are thallium, zirconium, Am-241, Cs-137, Eu-154, Np-237, Pu-238, Pu-239/240, Tc-99, and U-235 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil.

3.1.1.1.3 Characterization Uncertainty—The characterization uncertainties with site CPP-15 are listed below:

- Site characterization (western portion is incomplete and eastern portion is uncharacterized)
- Radiation activity levels
- Quantity of spilled liquid
- Spatial extent of contamination
- Source term.

3.1.1.2 Site CPP-16 Description. Site CPP-16 (Figure 3-1) is the site of a leak that occurred January 16, 1976, through an open-bottom valve box during a routine transfer from tank WM-181 to Process Equipment Waste (PEW) tank WL-102. Wastewater steam during the transfer melted the Teflon flange gasket, allowing the leak to occur. The plastic liner to the valve box also melted. The leak of low-level contaminated service wastewater drained out the bottom of the valve box into the soil beneath the valve box, which was at a depth of 1.72 m (5 ft 8 in.) (WINCO 1976, 1991). The volume in Tank WM-181 before the attempted transfer was 337,659 L (89,200 gal) and after was 324,410 L (85,700 gal) (Ward 2000); therefore, no more than 13,249 L (3,500 gal) leaked onto the soil. The valve box was replaced on January 19, 1976, with a concrete bottom valve box and stainless steel liner that extends 2 m (6 ft 9 in.) below ground surface (bgs) as part of the ICPP radioactive waste system project. Specifics of what was encountered during the construction activities—that is, how much soil was removed, or how much remains—are not known. Site CPP-16 was originally included in OU 3-07, which underwent a Track 2 Investigation in 1992 (WINCO 1993d). The Track 2 was performed on the basis of the information available and CPP-16 was recommended for no further action (WINCO 1993d; DOE-ID 1994). Site CPP-16 is being reinvestigated because with the consolidation of all Tank Farm soil and sites within CPP-96, this site is subject to OU 3-14 RI/FS activities.

3.1.1.2.1 Data Review—Soil samples indicate the contamination did not penetrate the soil beneath the valve to depths greater than 0.9 m (3 ft). Therefore, the depth of contamination extends from 1.72 m (5 ft 8 in.) to 2.6 m (8 ft 8 in.). The amount of soil contaminated during the spill is estimated at 25 ft^3 containing 1.2 curies of Cs-137 from the 13,249 L (3,500 gal) released (WINCO 1991).

3.1.1.2.2 Contaminant Summary—From historical information, estimated contaminants are Cs-137, Sr-90, uranium and plutonium isotopes, and some inorganic constituents (WINCO 1991). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites.

3.1.1.2.3 Characterization Uncertainty—The characterization uncertainties with site CPP-16 are listed below:

- Site characterization
- Radiation activity levels
- Spatial extent of contamination
- Source term.

3.1.1.3 Site CPP-20 Description. Site CPP-20 is a location north of building CPP-604 (Figure 3-1) to which acidic (i.e., pH < 2) radioactive liquid waste from INEEL facilities was transported and unloaded via transfer hoses to an underground storage tank. The facility was used for this purpose until 1978. The waste was destined for treatment in the PEW evaporator. Small spills would occasionally occur through holes in the pressurized transfer line as waste was being unloaded, resulting in soil contamination. It has been reported that the spills were cleaned up as they occurred, but no records exist documenting the types, quantities, and locations of the spills or verifying the effectiveness of cleanup activities.

The entire CPP-20 area was excavated down to 12.2.m (40 ft) in 1982 as part of Phase 1 of the fuel processing facility upgrade project. Personnel involved in the project indicate that the first 3 m (10 ft) of the excavation were backfilled with soil contaminated with radionuclides at activities of 5 mR/hour or less. The source of the contaminated soil is unknown, but it is likely that it was from within the Tank Farm. The remaining 9.1 m (30 ft) of the excavation was reportedly backfilled with clean (i.e., not radiologically contaminated) soil. Portions of the area were excavated a second time as part of the fuel processing facility upgrade project in the 1983–84 timeframe. Reportedly the eastern portion of CPP-20 was excavated to a depth of 12.2 m (40 ft). At the location of valve box C-30, contaminated soil was encountered and removed. The first 3 m (10 ft) of the excavation were reportedly backfilled with radiologically contaminated soil with activities of 3 mR/hour or less and the remainder of the excavation backfilled with clean soil from Central Facilities Area (CFA).

Site CPP-20 was originally included in OU 3-07, which underwent a Track 2 investigation in 1992 (WINCO 1993d). On the basis of the information indicating contaminated soil had been removed from the site during the fuel processing facility upgrade project, the site was recommended for no further action, contingent on the evaluation of the contaminated backfill as part of the OU 3-13 BRA (DOE-ID 1997a). The site was evaluated as part of the OU 3-13 BRA, using analytical results obtained from the fuel processing facility upgrade project.

3.1.1.3.1 Data Review—No sampling and analysis of the contaminated backfill, reportedly present between 9.1 and 12.2 m (30 and 40 ft) belowgrade, has been performed. The sampling and analysis of other excavated Tank Farm soil as part of the fuel processing facility upgrade project was used in the OU 3-13 BRA evaluation. The maximum detected concentration of arsenic, 5.9 mg/kg, is just above the background level (5.8 mg/kg) found in INEEL surface soil. The radionuclides detected at the highest activities, Sr-90 and Cs-137, were analyzed at 330 ± 3 pCi/g and 114 ± 1 pCi/g, respectively. Other detected radionuclides had maximum activities no greater than 2.2 pCi/g (WINCO 1993d).

3.1.1.3.2 Contaminant Summary—Based on contaminant screening in the OU 3-13 RI/BRA evaluation, the retained OU 3-13 contaminants for CPP-20 are arsenic, Am-241, Cs-134, Cs-137, Co-60, Eu-154, Np-237, Pu-238, Sr-90, and Tc-99. (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.3.3 Characterization Uncertainty

The characterization uncertainties with site CPP-20 are listed below:

- Site characterization
- Radiation activity levels
- Quantity of spilled liquid
- Spatial extent and location of contamination
- Source term.

3.1.1.4 Site 24 Description. Site CPP-24 is a contaminated soil site in the Tank Farm area resulting from a 1954 accidental dumping of a bucket, approximately 3.8 L (1 gal), of liquid radioactive waste (400 mR/hr) while work was being conducted in the vicinity of a tank WM-180 riser (Figure 3-1) (WINCO 1993d). The spill covered a 0.9 x 1.8-m (3 x 6-ft) area. The liquid would have contained mercuric nitrate, nitric acid, and radionuclides. The contamination from the spill was reportedly cleaned up (logbooks indicate that the spilled material was removed) and documented in a radioactivity incident report. Though the exact location of this spill is not known, radiation surveys in the area revealed no radiation levels above background (WINCO 1993d; DOE-ID 1994).

This site was recommended in a Track 2 investigation as a no further action site because the source was documented as having been removed and any residual contamination would be addressed during the OU 3-13 RI/FS (WINCO 1993d). Site CPP-24 is being reinvestigated because with the consolidation of all Tank Farm soil and sites within CPP-96, this site is subject to OU 3-14 RI/FS activities.

3.1.1.4.1 Data Review— No known sampling has been done at site CPP-24, and based on historical information, the spilled liquid would have contained mercuric nitrate, nitric acid, and radionuclides. The specific contaminants are unknown.

3.1.1.4.2 Contaminant Summary—Based on historical information, the spilled liquid would have contained mercuric nitrate, nitric acid, and radionuclides. Section 3.1.4 summarizes the contaminants at the OU 3-14 sites.

3.1.1.4.3 Characterization Uncertainty—The characterization uncertainties with site CPP-24 are listed below:

- Site characterization
- Radiation activity levels
- Exact spill location
- Spatial extent of contamination (depth is unknown, surface area is historically reportedly as 0.9 × 1.8 m [3 × 6 ft])
- Source term.

3.1.1.5 Site CPP-25 Description. Site CPP-25 is located in the same general area as CPP-20 and overlaps the CPP-20 site on the eastern edge (Figure 3-1). It is the location of a ruptured transfer line that was being used to transfer liquid waste from tank WC-119 to the PEW evaporator feed tank (WL-102) (see Figure 2-15). The rupture resulted in a release of an unknown quantity of liquid waste adjacent to the north side of building CPP-604 in August 1960. Reportedly, at the time of the incident radiation readings in the contaminated soil ranged from 2 to 4 R/hour. Approximately 7 m^3 (9 yd^3) of soil was removed after the spill and the side of the building was washed to remove contamination. No records exist to verify the effectiveness of these cleanup activities.

As described for CPP-20, the area where CPP-25 is located was excavated during the 1981 and 1983–84 fuel processing facility upgrade project. The excavations were reportedly filled with clean fill in the upper 9.1 m (30 ft) and with 3–5 mR soil from 9.1 to 12.2 m (30 to 40 ft). Site CPP-25 underwent a Track 2 investigation in 1992 (WINCO 1993d). On the basis of the information indicating contaminated soil had been removed from the site during the fuel processing facility upgrade project, the site was recommended for no further action, contingent on the evaluation of the contaminated backfill as part of the OU 3-13 RI/FS.

3.1.1.5.1 Data Review—No known sampling has been done at site CPP-25.

3.1.1.5.2 Contaminant Summary—Site CPP-25 was evaluated as part of the OU 3-13 RI/BRA, using site CPP-20 analytical results obtained from the fuel processing facility upgrade project. The retained OU 3-13 contaminants for site CPP-20/CPP-25 from the contaminant screening process in the OU 3-13 RI/BRA are arsenic, Am-241, Cs-134, Cs-137, Co-60, Eu-154, Np-237, Pu-238, Sr-90, and Tc-99 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.5.3 Characterization Uncertainty—The characterization uncertainties with site CPP-25 are listed below:

- Site characterization
- Radiation activity levels
- Quantity of spilled liquid
- Spatial extent of contamination
- Source term.

3.1.1.6 Site CPP-26 Description. Site CPP-26 (Figure 3-1) consists of soil potentially contaminated by radioactive steam that was inadvertently released to the air through a faulty hose coupling on a decontamination header. The header was used for routine preventive maintenance of transfer lines in the Tank Farm. The release occurred in 1964 when a section of the decontamination header was being flushed to allow the addition of new tie-ins to the header. During the flushing process, the facility operator discontinued flushing after steam was observed leaking to the atmosphere from a hose coupling. The weather conditions at the time of the release included high winds, which resulted in a cloud of steam contaminating an estimated 5.3 hectares (13 acres) to the northeast of the release location. Four of the hectares (10 acres) were outside the INTEC security fence present at that time. Currently, only about 0.4 hectare (1 acre) of the original 5.3 hectares (13 acres) is now outside the facility fence. (See Figures 3-2 and 3-3)

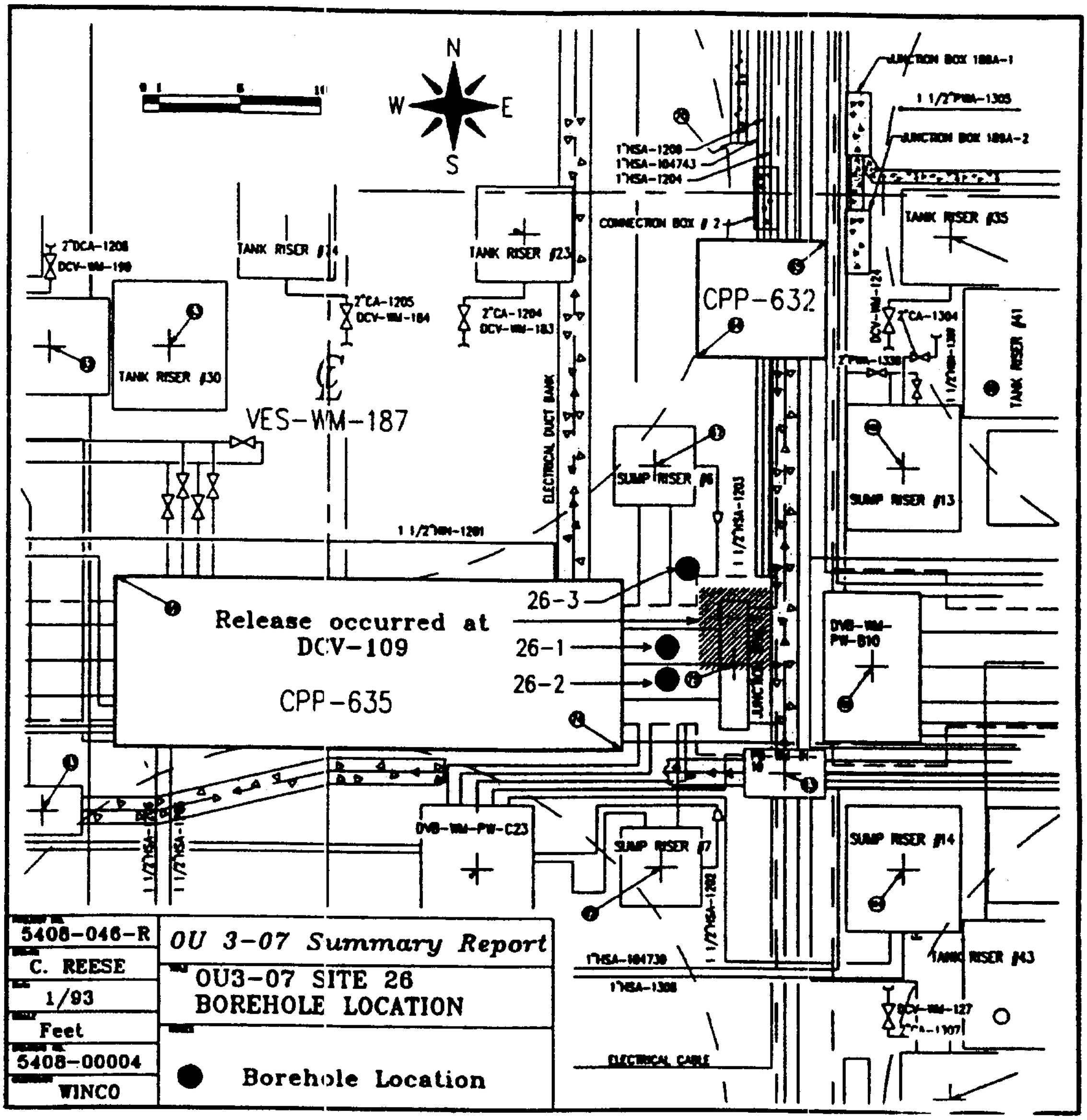


Figure 3-2. Location of the existing boreholes at Site CPP-26.

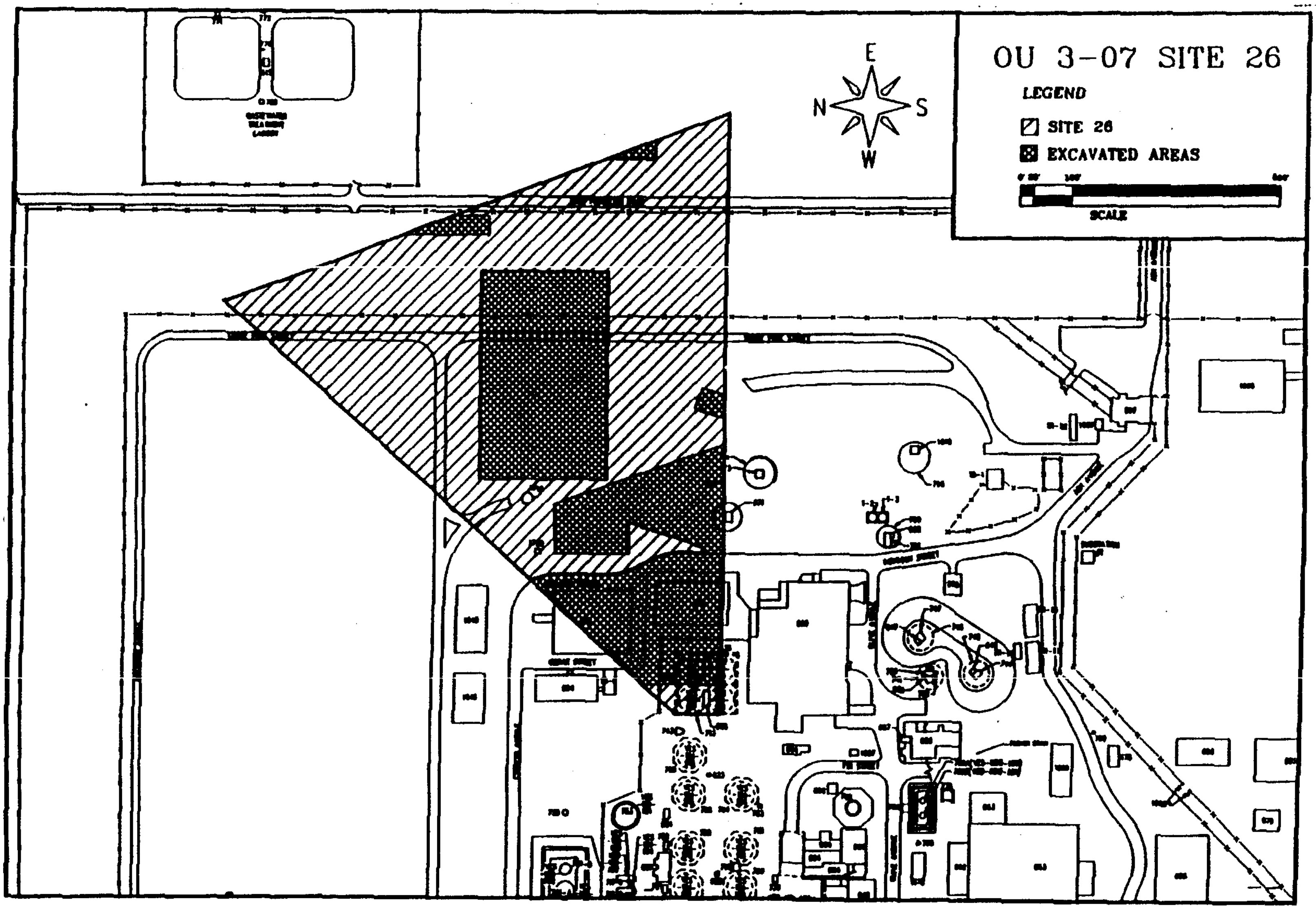


Figure 3-3. Location of the excavated area within site CPP-26.

Following the release, a sample of mud was collected near the decontamination header. It was found to contain 520 pCi/g Cs-137, 3.3 pCi/g Cs-134, 22,400 pCi/g Ce-144, 3,600 pCi/g Ru-106, 810 pCi/g Ru-103, and 0.03 pCi/g Pu-242. Reportedly, the liquid present near the header was cleaned up, solidified, and sent to the Radioactive Waste Management Complex (RWMC) for disposal. A surface radiation survey following the 1964 incident detected between 2 and 10 mR/hour in the soil, with one area as high as 200 mR/hour of gross radiation.

The CPP-26 site has been disturbed extensively since the release. A portion of the release site nearest to the decontamination header was excavated during the construction of buildings CPP-699 and CPP-654, and Calcined Solids Storage Facilities 4, 5, and 6. A portion of the site has been covered by the construction of Hemlock Street. Any remaining contamination from the release that is within the current Tank Farm boundaries has been covered with 0.6 m (2 ft) of soil, a 0.5-mm (20-mil) thick membrane liner, and an additional 15 cm (6 in.) of soil to prevent the liner from blowing away. Therefore, the contamination from the steam release would be expected to be approximately 0.8 m (2.5 ft) bgs in the Tank Farm area.

3.1.1.6.1 Data Review—In 1991, a surface radiation survey of the area was performed. Elevated gamma/beta radiation was not detected on the surface outside the Tank Farm that had not been disturbed since the steam release incident. Site CPP-26 was characterized as part of the OU 3-07 Track 2 investigation in 1992 (WINCO 1993d). A stainless steel hand auger was used to drill three boreholes in the Tank Farm soil near the location of the steam release to determine the nature and extent of residual contamination. (See Figures 3-2, 3-3 and 3-7). These three boreholes were located to the east and northeast of building CPP-635. Two boreholes were drilled to approximately 1.8 m (6 ft) below the Tank Farm liner; the third borehole was abandoned at 1.2 m (4 ft) below the liner because of the presence of concrete. Nine soil samples, including three duplicate samples, were collected from the three boreholes. The selection of the appropriate depths in each borehole from which to collect the soil samples was based on the highest measured radiation reading on soil collected as the borehole was drilled. The collected samples were analyzed for VOCs, selected metals, fluoride, nitrate, nitrite, pH, and radionuclides.

The radionuclides detected in the soil during the Track 2 investigation consist primarily of Sr-90, Cs-137, Eu-154, and lower levels of Pu-238, Pu-239, and Am-241. The highest concentrations (Sr-90 up to 15,800 pCi/g and Cs-137 ranged from 108 ± 9.08 pCi/g to 6460 ± 465 pCi/g) were measured in samples collected between 1.2 to 1.5 m (4 to 5 ft) bgs (WINCO 1993d).

3.1.1.6.2 Contaminant Summary— Site CPP-26 was evaluated as part of the OU 3-13 RI/BRA, using analytical results obtained from the borehole samples and process knowledge. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA are Am-241, Cs-137, Eu-154, Pu-238, Pu-239, Sr-90, U-234, and U-235. (DOE-ID 1997a, Section 5.2). These contaminants include long half-life daughter radionuclides created from decay of the parent radionuclide. Long-life daughter radionuclides contribute to the risk. Parent radionuclides, Pu-238 and Pu-239, decay to U-234 and U-235, respectively. Section 3.1.4 summarizes the contaminants at OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.6.3 Characterization Uncertainty— Whether the contamination detected from the three boreholes is from the CPP-26 steam release is uncertain. The maximum concentration detected for Cs-137 is approximately one order of magnitude higher than would be expected, based on radioactive decay of the most radioactive sample at the time of release in 1964. Furthermore, a significant increase in gross beta-gamma radioactivity was measured at a depth of approximately 1.2 m (4 ft) bgs.

The characterization uncertainties with site CPP-26 are listed below:

- Site characterization (previous samples were collected adjacent to the source)
- Radiation activity levels
- Source of the contamination (boreholes may be located at a different source than the CPP-26 release)
- Source volume released
- Spatial extent of contamination
- Source term.

3.1.1.7 Site CPP-27 and CPP-33 Description. Sites CPP-27 and CPP-33 were determined to be related to releases from the same source and, therefore, are being addressed as a single release site. These sites consist of soil contaminated by a subsurface release of high-level liquid waste from the Tank Farm transfer system near the northeast corner of building CPP-604 (Figure 3-1).

The soil contamination was first discovered in 1974 and determined to be from a broken transfer line (3"-PLA-1011) located 3.7 m (12 ft) bgs. This is the release designated as CPP-27. The amount of high-level waste was estimated at less than 379 L (100 gal) of high-level waste and between 379 and 1,136 L (100 and 300 gal) of low-level radioactive waste, containing approximately 1,000 to 3000 Ci of radioactivity was released. The source of the waste in the vent lines was either the high-level liquid waste (HLLW) tanks or PEW evaporator tank (WL-102). It was suspected that the line had been leaking since approximately 1961. Radiation readings in the soil were reportedly as high as 25 R/hour.

The contaminated soil was excavated and boxed for disposal at RWMC (area labeled 1974 excavation in Figure 3-4). The contamination was found to have spread laterally as far as 6.1 m (20 ft) and vertically to a depth of 8.5 m (28 ft) bgs. A total of approximately 210 m^3 (275 yd^3) of soil was removed from the site. Analysis of samples collected from the site in 1974 indicated Cs-137, Sr-90, Cs-134, Eu-154, Sb-125, Ru-125, and Pu-239/240 were present in the contaminated soil. Cs-137 activities in the four samples collected over nearly a 3-month period ranged from 2.89E+4 pCi/g to 3.03E+6 pCi/g. The Sr-90 activities in three samples ranged from 9.45E+4 to 8.59E+4 pCi/g and Pu-239/240 activities in two samples were 4.59E+2 pCi/g to 2.97E+3 pCi/g. It was estimated that after removal of the contaminated soil, only 25 mCi of radioactivity was left at the site.

In 1983, additional contaminated soil attributed to the corroded line was encountered in the same general area while excavating soil to replace Tank WL-102. This contamination is thought to be the result of a separate release from the same transfer line. The contamination was designated as CPP-33 in the Federal Facility Agreement and Consent Order (FFA/CO) (DOE-ID 1991). Approximately 10,704 m^3 (14,000 yd^3) of soil were removed from the site in 1983 (see the area labeled 1983 excavation in Figure 3-4). Of this total, approximately 1,530 m^3 (2,000 yd^3) exceeding 30 mR/hour of beta-gamma radiation was removed and disposed of at the RWMC. The remaining 9,180 m (12,000 yd^3) were disposed of in trenches located in the northeast corner of INTEC. The excavated area was backfilled and a portion covered by an asphalt road. Reportedly, the residual contamination remained below and to the sides of the excavated and backfilled area (WINCO 1993c).

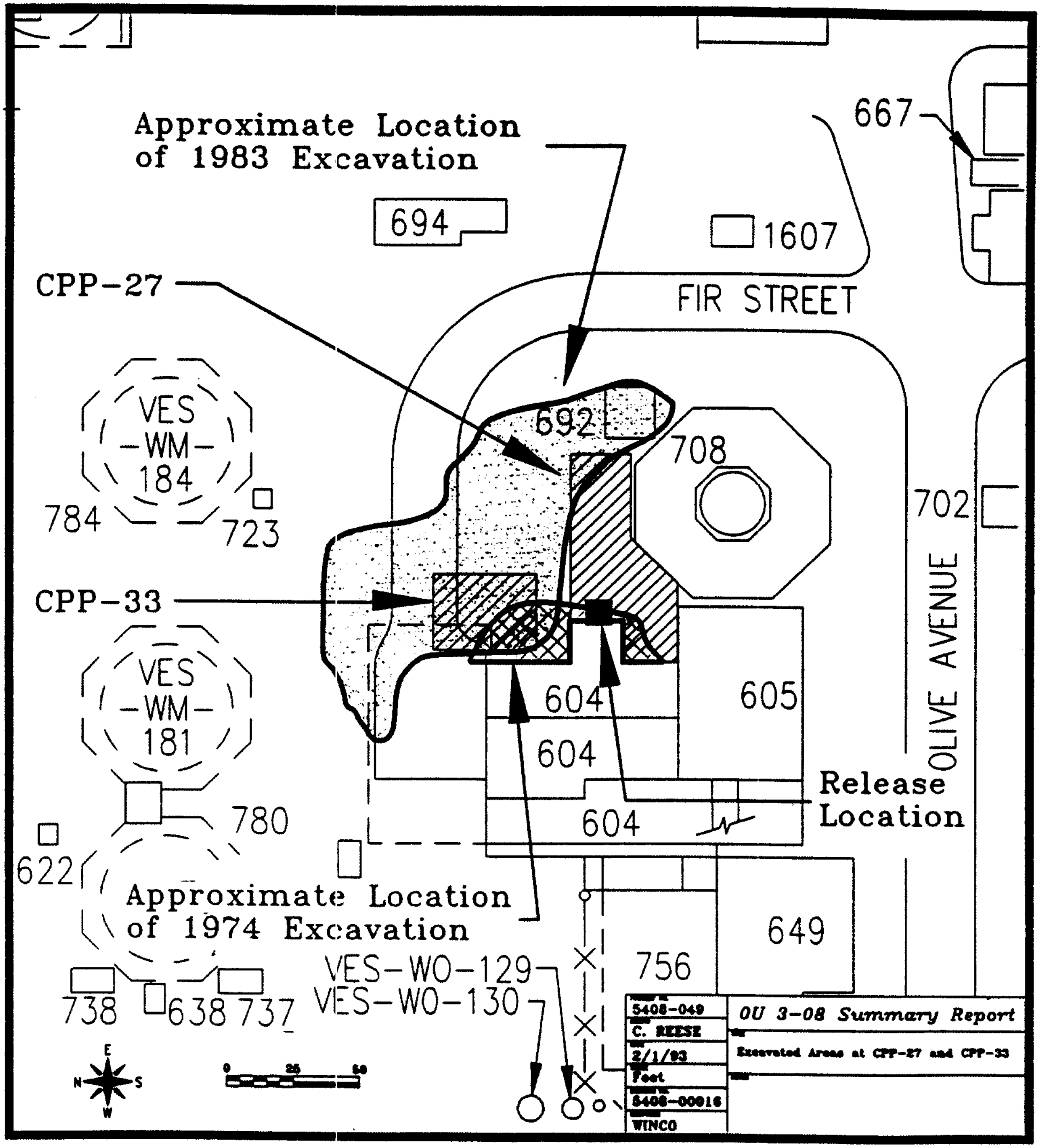


Figure 3-4. Map of sites CPP-27 and CPP-33 showing the boundaries of the sites and the locations of previous excavations.

3.1.1.7.1 Data Review— In 1987, 10 observation boreholes were drilled to the top of basalt in the CPP-27/33 area to determine the extent of contamination (see Figure 3-5). Direct radiation readings were taken in the observation boreholes using field instruments. No samples were collected from the boreholes for laboratory analysis. Information on the total depth of each borehole is also unavailable. Beta/gamma radiation readings in the boreholes ranged from none detected to 50,000 counts per minute (cpm). The location of the boreholes and the radiation reading recorded are shown in Figure 3-5.

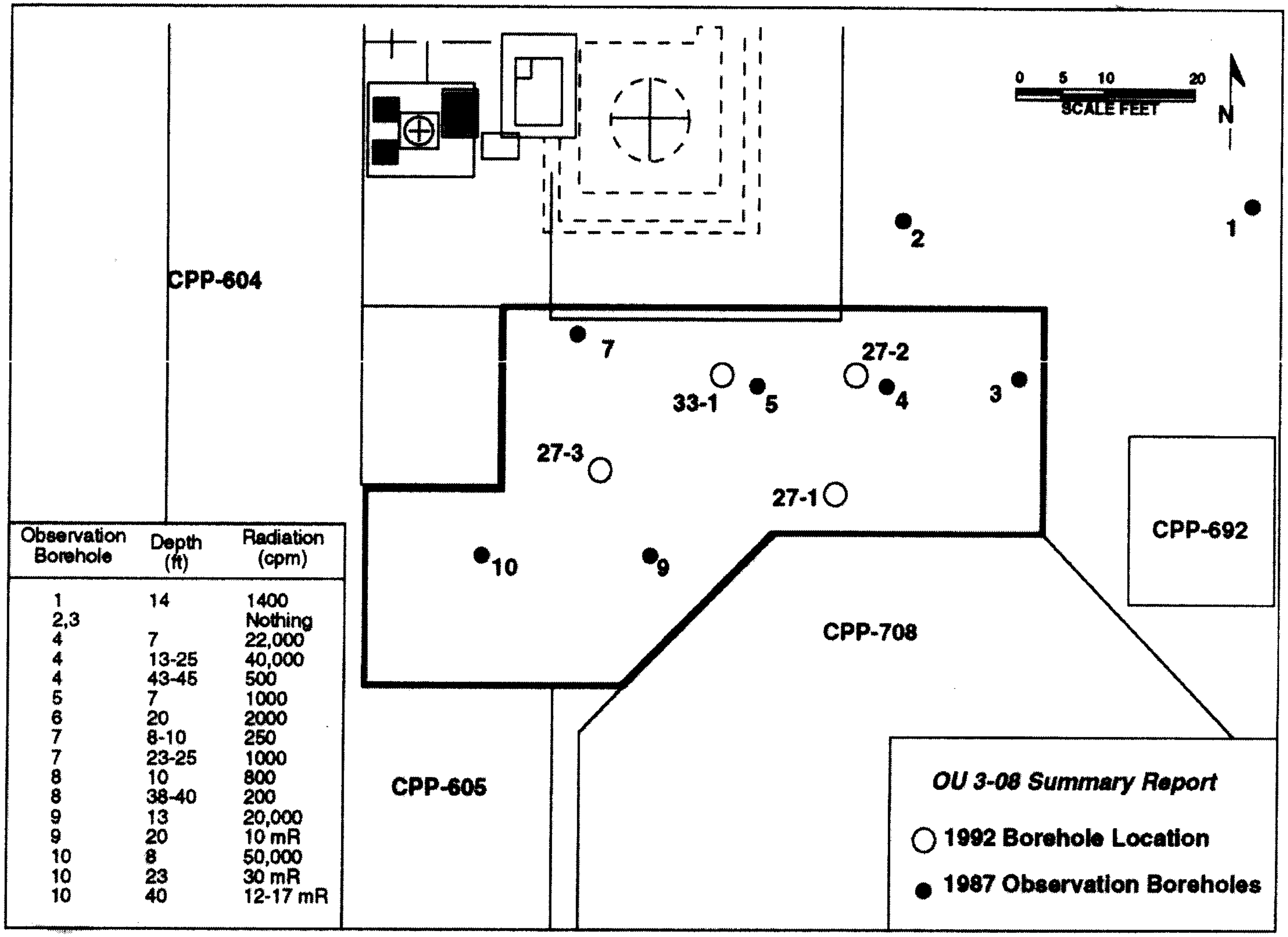
In 1990, a deep borehole was made in the area (completed as Monitoring Well CPP-33-1, see Figure 3-5) and 16 soil samples were collected from the soil above the basalt and two soil samples were collected from the 33.5-m (110-ft) interbed. The samples were analyzed for a full suite of constituents including VOCs, SVOCs, metals, dioxins and furans, cyanide, and radionuclides. The primary contaminants detected in the soil were Cs-137 and Sr-90. The depth of the highest activities found were between 2.1 m (7 ft) and 8.8 m (29 ft) bgs. The maximum activities detected were 608±3 pCi/g and 328±1.8 pCi/g, respectively for Cs-137 and Sr-90.

Sites CPP-27 and CPP-33 were characterized as part of the OU 3-08 Track 2 investigation in 1992 (WINCO 1993b). Three boreholes labeled CPP-27-1, CPP-27-2, and CPP-27-3 were made at the site (see Figure 3-5). Borehole CPP-27-1 was drilled to 14 m (46 ft) bgs and the other two boreholes were drilled to 3.7 m (12 ft) bgs. Twenty soil samples were collected and analyzed for VOCs, metals, selected anions, pH, and radionuclides. The selection of the appropriate depths in each borehole from which to collect the soil samples was based on the highest measured radiation reading on soil collected as the borehole was drilled. Sixteen of 20 samples analyzed by gamma spectroscopy had Cs-137 activities above expected background levels. Elevated Cs-137 were measured in borehole CPP-27-1 at depths from 0.6 m (2 ft) to 6.9 m (22.5 ft) bgs, in borehole CPP-27-2 at depths from 1.2 m (4 ft) to 3 m (10 ft) bgs, and in borehole CPP-27-3 at depths from 1.2 m (4 ft) to 1.8 m (6 ft) bgs. Slightly elevated alpha activities were found in boreholes CPP-27-1 and CPP-27-3 at depths from 1.8 to 4.9 m (6 to 16 ft) bgs and 1.2 to 3.6 m (4 to 12 ft) bgs, respectively.

3.1.1.7.2 Contaminant Summary—This site was evaluated as part of the OU 3-13 RI/BRA, using the analytical results from the borehole samples. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA are arsenic, chromium[a], Am-241, Cs-137, Cs-134, Eu-154, Np-237, Pu-238, Pu-239/240, Sr-90, and U-235 (DOE 1997A, Section 5.2). Section 3.1.4 summarizes the contaminants at OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.7.3 Characterization Uncertainty—Another source of contamination is suspected at site CPP-27 because the contamination found in borehole 27-1 was at a shallower depth than the leaking vent line and the contamination is in an area that has not been disturbed by excavation. The characterization uncertainties with site CPP-27 are summarized below:

[a] Chromium was not included in the source estimate for theTank Farm surface soil, it was eliminated in the screening process for OU 3-08 (DOE 1997A, Section 11). Chromium is part of the source estimate for future groundwater usage, given enough time, chromium will reach the SRPA (DOE 1997A, Sections 16 and 29).



Observation Borehole	Depth (ft)	Radiation (cpm)
1	14	1400
2,3		Nothing
4	7	22,000
4	13-25	40,000
4	43-45	500
5	7	1000
6	20	2000
7	8-10	250
7	23-25	1000
8	10	800
8	38-40	200
9	13	20,000
9	20	10 mR
10	8	50,000
10	23	30 mR
10	40	12-17 mR

Figure 3-5. Map of site CPP-27 showing the locations of previously drilled boreholes.

- Site characterization (potential new source may exist)
- Radiation activity levels
- Source of the contamination (borehole CPP-27-1 may be located at a different source than the initial CPP-27 release)
- Source volume released
- Spatial extent of contamination
- Source term.

3.1.1.8 Site CPP-28 Description. Site CPP-28 is the contaminated soil associated with a subsurface release of liquid waste from a breached transfer line (Figure 3-1). The leak is located south of tank WM-181 near valve box A-6 and extends as far south as borehole CPP-79-1 (see Section 3.1.1.15). The line was used to carry radioactive first-cycle extraction waste solutions from the uranium recovery process to the Tank Farm (see Figure 3-6). The breach, a 0.4-cm (one-eighth-in.) diameter hole drilled into a transfer line (PWA 1005), was discovered in 1974, during installation of a cathodic protection electrode. The breach of the line is suspected to have occurred during installation in 1955. Though the 7.6-cm (3-in.) stainless steel transfer line was enclosed in pipe encasement, deterioration of the encasement allowed liquid to be released through the joints to the surrounding soil. Contaminated soil, encountered at 1.8 m (6 ft) bgs in 1974, reportedly had radiation readings of up to 40 R/hour. At the time, it was estimated that 454 L (120 gal) of liquid waste containing 6,000 Ci of radioactivity was released between 1955 and 1974 (Allied Chemical 1974). This estimate was later shown to be low, as discussed below.

Following the 1974 discovery of contaminated soil, six boreholes were drilled in the area and a soil sample was collected from the bottom of each borehole. The samples were collected from depths that ranged from 2 m (6.5 ft) bgs to 3 m (10 ft) bgs. The samples were screened for radioactivity in the field. The highest activity (40 R/hour) was detected in a sample collected from a depth of 2 m (6.5 ft) bgs. The area around the transfer line was excavated and approximately 43 m^3 (56 yd^3) of contaminated soil having an estimated 3,000 Ci of gross radioactivity was removed. Samples taken from the contaminated soil had the following distribution of radionuclides (by activity): 0.2% Mn-54, 0.5% Co-60, 3.2% Ru/Rh-106,1.4% Cs-134, 12.2% Cs-137, 21.4% Ce-144, 1.3% Eu-154, 0.8% Eu-155, and 59% Sr/Y-90. No contaminated soil below the pipe encasement (approximately 2 m (6.5 ft) bgs) was removed because of the high radiation levels. It was estimated that approximately 4.2 m^3 (4.7 yd^3) of contaminated soil was left in place and the excavation backfilled. Eleven boreholes were installed in the backfilled excavation to measure the radiation levels in the soil. Radiation readings in each of the boreholes were measured to a depth of 3.7 m (12 ft) bgs. Significant subsurface radiation was detected in four of the boreholes and indicated that the contamination extended to a depth of approximately 2.7 m (9 ft) bgs. The horizontal extent of contamination at the site was estimated to be 2.7 m (9 ft) in diameter. The boreholes were supposedly cut off belowgrade and abandoned. An attempt was made to locate and excavate the 1974 observation boreholes during the OU 3-07 Track 2 investigation in 1992 (WINCO 1993d). The investigation failed to locate the boreholes and it is uncertain whether the wells are still present at the site or have been removed.

During the 1993 to 1996 Tank Farm upgrades, portions of sites CPP-28, CPP-25, CPP-20 and CPP-79, were excavated. Excavation depths ranged from 0 to 11 m (0 to 35 ft) bgs, with most being completed at approximately 4.6 m (15 ft) bgs. Field gamma/beta radiation measurements encountered during excavation ranged from 0 to 5 R/hour.

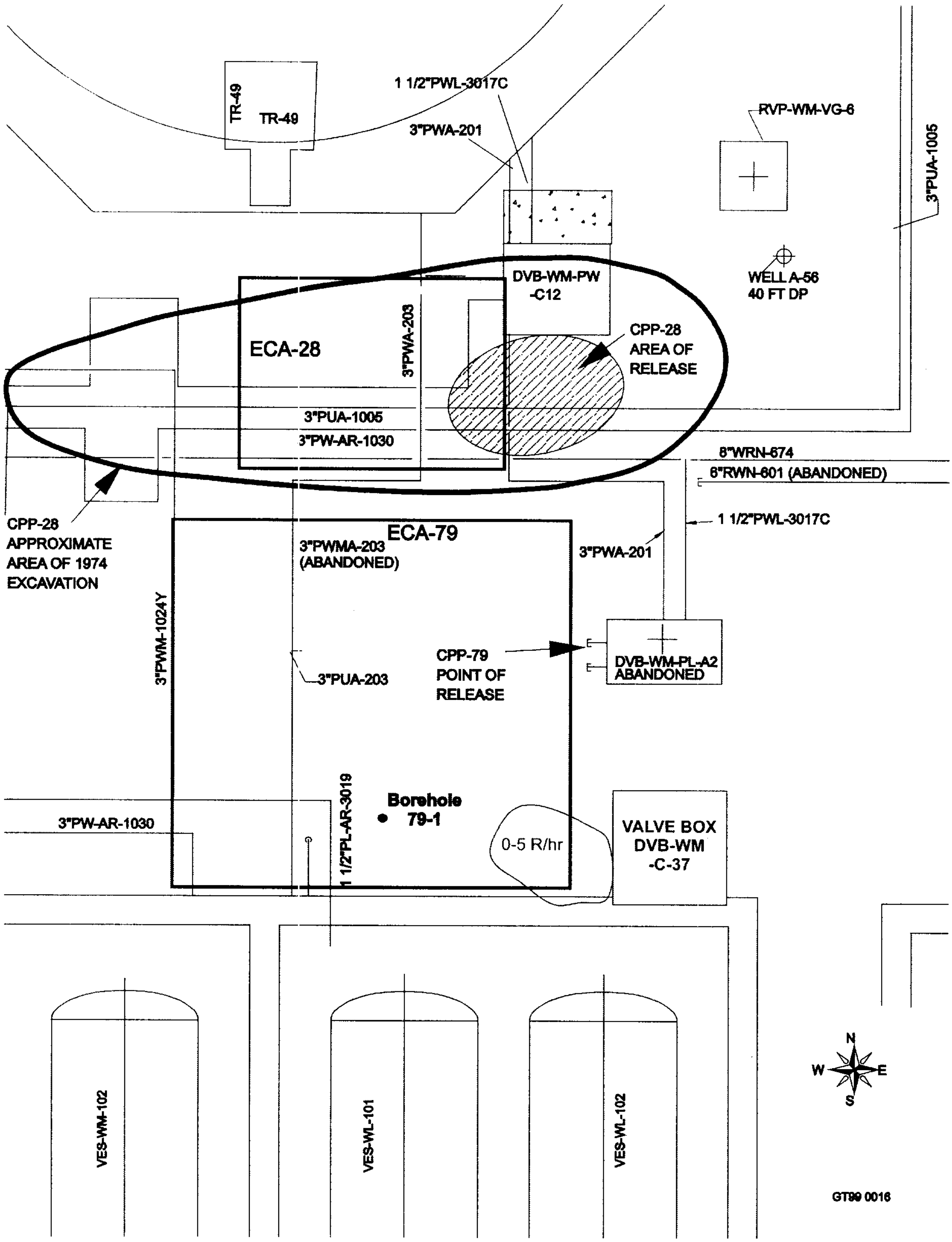


Figure 3-6. Map of an area just north of the building CPP-604 loading dock showing locations of release points for sites CPP-28 and CPP-79.

Information gained during characterization of site CPP-79 led investigators to believe that the depth and extent of contamination at CPP-28 have been underestimated. Soil in borehole CPP-79-1, which is located approximately 9.1 m (30 ft) southeast of the location of the transfer line leak (CPP-28), was found to be contaminated at a depth of 9.1 (30 ft) bgs. Field readings were measured of 90 R/hr at a depth of 2.4 m (8 ft) bgs and of 400 R/hour on a sample at about 9.1 m (30 ft) bgs while borehole CPP-79-1 was being drilled. Samples collected from Borehole CPP-79-1 (Figure 3-7) have significant gross alpha (8.09E5±9.7E4 pCi/g) and beta (1.89E6±1.5E6 pCi/g) activities with high concentrations of Cs-137 (3.37E7±1.1E6 pCi/g), Sr-90 (5.41E6±4.9E3 pCi/g) and Am-241 (1.66E4±2.2E3 pCi/g). The extremely high concentrations of radionuclides strongly suggest that the contamination is related to a leak of first-cycle raffinate such as at site CPP-28. In addition, the preferential migration pathway from CPP-28 to Borehole CPP-79-1 would be the sandy backfill placed in pipeline excavations. The data suggest that contamination at CPP-28 extends from 2 m (6.5 ft) bgs to the soil basalt interface at 12.8 m (42 ft) bgs and south of the original release site because tank WM-181 is immediately north of the site. Based on this and the proximity of the CPP-79-1 borehole to the transfer line leak, the original (1974) estimates of the quantity of waste released to the soil at CPP-28 were reevaluated.

3.1.1.8.1 Data Review—Bounding calculations were conducted to estimate the amount and activity of first-cycle extraction waste that leaked through the hole in the pipeline. Converting conservative radiological field screening readings (400 R/hour) to the concentration of Cs-137 were used to obtain a Cs-137 activity of 34 Ci/L (9 Ci/gal) for the release. Using an estimated amount of liquid waste transferred through the pipeline during its operational lifetime, the total release of 13,627 L (3,600 gal) from the pipeline was on the order of 32,000 Ci. Tank Farm soil containing an estimated 3,000 Ci was reportedly excavated from the area in 1974. Therefore, the estimated release in the vicinity of the pipeline is 29,000 Ci (WINCO 1993d).

Because of the lack of soil sampling data for the release, the OU 3-07 Track 2 investigation (WINCO 1993d) estimated contaminant concentrations in soil based on a release of first-cycle raffinate with a composition from operations during the 1971–74 timeframe and adjusted for 18 years of radioactive decay. These contaminant estimates did not include Pu-238. A value of 276,000 pCi/g measured in nearby borehole CPP-79-1 (Figure 3-7) at about 12 m (40 ft) bgs was added because this contaminant is expected to be present at about 3 m (10 ft) bgs because it has been measured in adjacent areas and is known to be part of the process that led to this release. No attempt was made to estimate metals or organic compounds that may have been released at this site. However, data concerning the concentrations of metals and radionuclides were used to provide a source estimate of the masses of individual metals and radionuclides for the Track 2 investigation (WINCO 1993d).

3.1.1.8.2 Contaminant Summary—This site was evaluated as part of the OU 3-13 RI/BRA. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA are Ce-144, Cs-134, Cs-137, Co-60, Eu-154, Np-237, Pu-239, Pu-240, Pu-241, Pu-242, Ru-106, Sr-90, H-3, U-234, U-235, and U-236. (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.8.3 Characterization Uncertainty—The characterization uncertainties with site CPP-28 are summarized below:

- Site characterization
- Source of release Source volume released

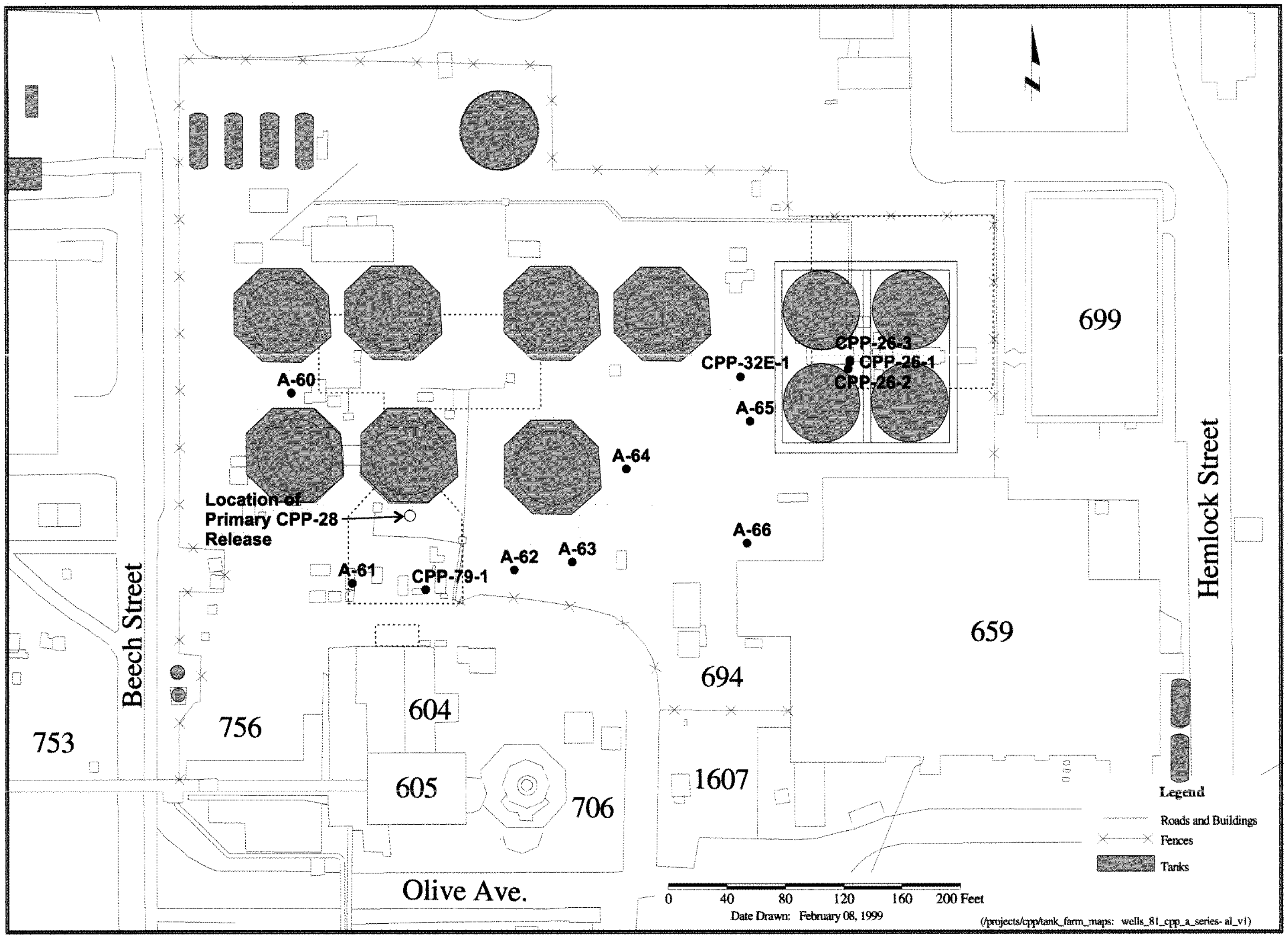


Figure 3-7. Map of the Tank Farm showing locations of boreholes drilled around sites CPP-28 and CPP-79.

- Spatial extent of contamination (The depth and extent may be larger than initially thought. Site CPP-28 contamination may have been found as far southeast as borehole CPP-79-1.)

- Source term.

3.1.1.9 Site CPP-30 Description. Site CPP-30 is an area of radioactively contaminated soil near valve box B-9 that was discovered by maintenance personnel in 1975 (Figure 3-1). The contamination covered an area of 37.2 m^2 (400 ft^2) and produced radiation levels of up to 1 R/hour. The area was contaminated during a one time preventative maintenance activity in which residual decontamination solution from the floor of the value box contaminated personnel clothing and equipment, which were brought to the surface and inadvertently placed on blotter paper that covered the ground surface. The contamination spread to the soil either through handling or tears in the blotter paper. The contaminated soil was removed, placed in 55-gal drums, and disposed of at the RWMC (WINCO 1993d; DOE-ID 1994). Subsequent surface radiation surveys in the area have not shown radiation levels above background.

This site was recommended in a Track 2 investigation as a no further action site because the entire area has been excavated in the past and the contaminated soil was removed (WINCO 1993d). Site CPP-30 is being reinvestigated because with the consolidation of all Tank Farm soil and sites within CPP-96, this site is subject to OU 3-14 RI/FS activities.

3.1.1.9.1 Data Review— No known sampling has been done at site CPP-30.

3.1.1.9.2 Contaminant Summary— No known sampling was performed, and the contaminants are unknown. .Section 3.1.4 summarizes the contaminants at the OU 3-14 sites.

3.1.1.9.3 Characterization Uncertainty— The characterization uncertainties with site CPP-30 are listed below:

- Site characterization

- Quantity of contamination released

- Spatial extent of contamination

- Source term.

3.1.1.10 Site CPP-31 Description. Contamination at site CPP-31 was discovered in 1975 during drilling operations. A monitoring borehole (A-53) was being drilled at a location approximately 4.6 m (15 ft) west of tank WM-183 and 3 m (10 ft) south of the edge of the tank vault (see Figure 3-1). Beta/gamma radiation levels in the soil brought to the surface during the auger drilling, reportedly ranged from 100 R/hour, at 4.6 m (15 ft) bgs to 500 R/hour at 6.7 m (22 ft) bgs.

An investigation into the source of contamination at site CPP-31 revealed that in November 1972, liquid radioactive waste was released to the surrounding soil during a transfer between tanks WM-181 and WM-180. During the transfer, the liquid waste was inadvertently routed through an 8-cm (3-in) diameter carbon steel waste transfer line (WRV-1037). Though not in use, the waste had entered the line, located approximately 1.5 m (5 ft) bgs through a normally closed valve (WRV-1147). The cause of the corrosion and failure of the carbon steel line is speculated to be the highly acidic waste. An estimated 52,996 L (14,000 gal) of waste was released, contaminating approximately 459 – 612 m^3 (600 to 800 yd^3)

of soil. The waste was calculated to contain 28,000 Ci of fission products, primarily Cs-137, Sr-90, and Y-90 (Allied Chemical 1975).

3.1.1.10.1 Data Review— In 1975 following the discovery of the release, the carbon steel line was cut at the valve and capped to prevent any further waste from entering the line. To investigate the release, 33 "observation boreholes" (designated as A53 through A53-31 and A-55) were installed to delineate the extent of contamination in the subsurface (see Figure 3-8). Following installation, direct radiation readings were obtained in the boreholes by lowering a string of thermoluminescent dosimeter (TLD) chips down the pipe for a period of 1 hour. Readings from the boreholes ranged from background levels to 50 R/hour. Based on the readings obtained, the zone of greatest contamination was estimated to be between 4 m (13 ft) and 6 m (20 ft) bgs. Seven boreholes had readings of 10 R/hour or greater at one or more points between 4 m (13 ft) and 6 m (20 ft) bgs. In the general vicinity of valve box A-6, high radiation fields (up to 4 R/hour) were measured at depths of 0.6 to 3 m (2 to 10 ft) bgs. Based on these measurements, the volume of the contaminated soil was estimated to be approximately 150 m^3 (200 yd^3) in the 10 R/hour range and 300 m^3 (400 yd^3) in the 1 R/hour range.

Soil samples were collected in 1975 and analyzed for radionuclides. Using this data, 1992 soil concentrations were calculated based on 18 years of radioactive decay. Estimated 1992 radionuclide concentrations include Cs-137 (at up to 2,190,000 pCi/g), Sr-90 (up to 710,000 pCi/g), Pu-239/Pu-240 (up to 1,500 pCi/g), and U-235 (up to 9,000 pCi/g). Other radionuclides estimated to be present at lesser concentrations are Co-60, Cs-134, and Ru-106.

In the early 1980s, several additional boreholes, designated the 81-series, were installed in the Tank Farm area. As part of the 1992 OU 3-07 Track 2 investigation (WINCO 1993d), radiation readings were collected from 10 of the A53 and 81 series "observation boreholes." Readings ranged from background levels to 22,300 mR/hour. Based on the down-hole gamma radiation readings, a map showing cross sections of the contamination zone at CPP-31 was prepared (Figure 3-9). The available information indicates that most of the soil contamination is concentrated between 3 to 7.6 m (10 to 25 ft) bgs in the area of the HLLW transfer lines PWA-1005 and 1030, with a smaller but shallower source of high soil contamination in the immediate area surrounding valve box A-6.

3.1.1.10.2 Contaminant Summary—This site was evaluated as part of the OU 3-13 RI/BRA. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA are Cs-134, Cs-137, Co-60, Eu-154, Pu-239/240, Ru-106, Sr-90, and U-235. (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at OU 3-14 sites. Section 3.2 summarizes the risk assessment result from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.10.3 Characterization Uncertainty—The characterization uncertainties with site CPP-31 are summarized below:

- Site characterization
- Release characteristics of the source
- Spatial extent of contamination source term
- Source term (the estimated 28,000 Ci represents about 50% of known Tank Farm soil source).

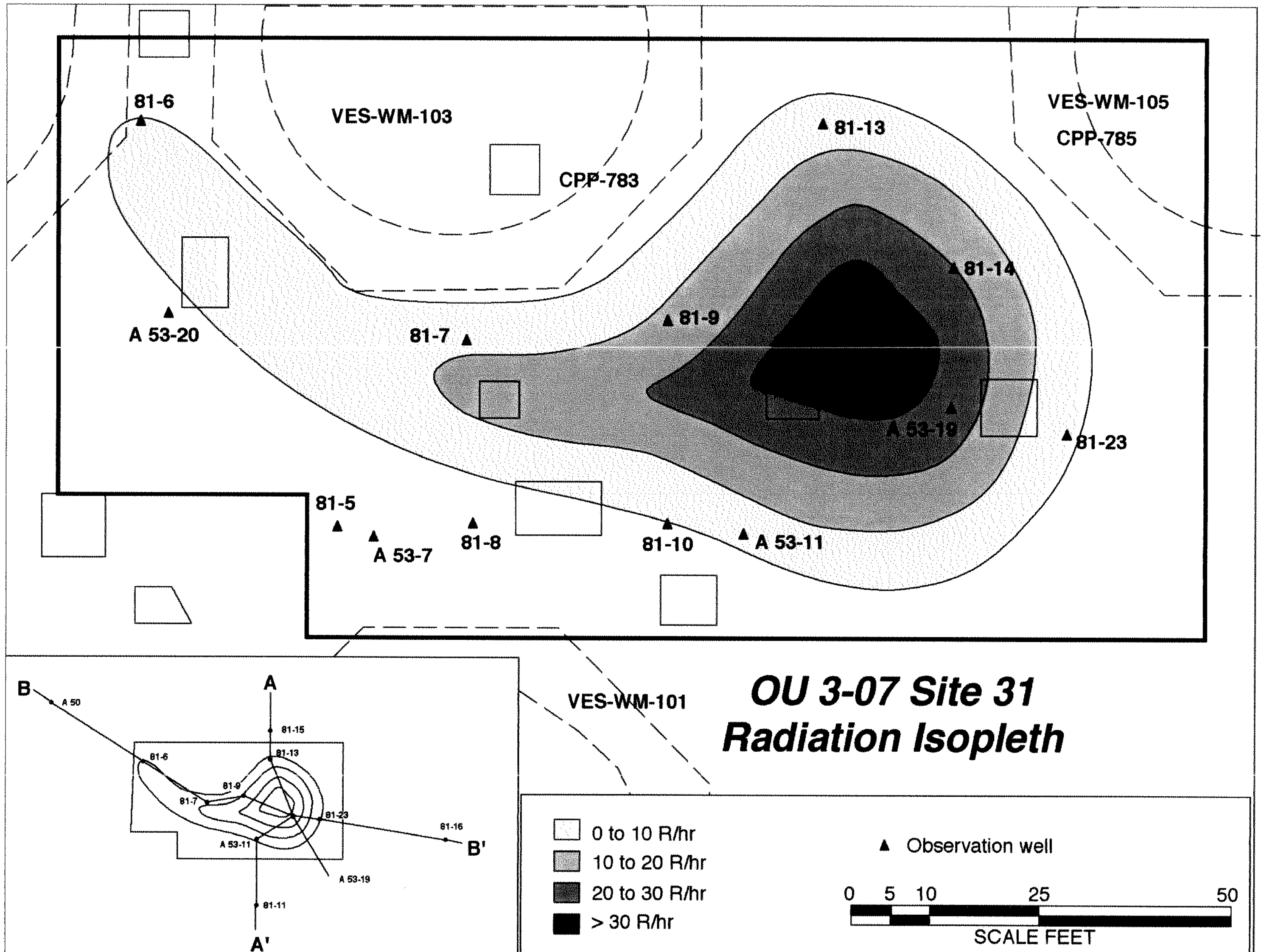


Figure 3-8. Map of Site CPP-31 showing locations of boreholes installed to characterize the extent of contamination in Tank Farm soil.

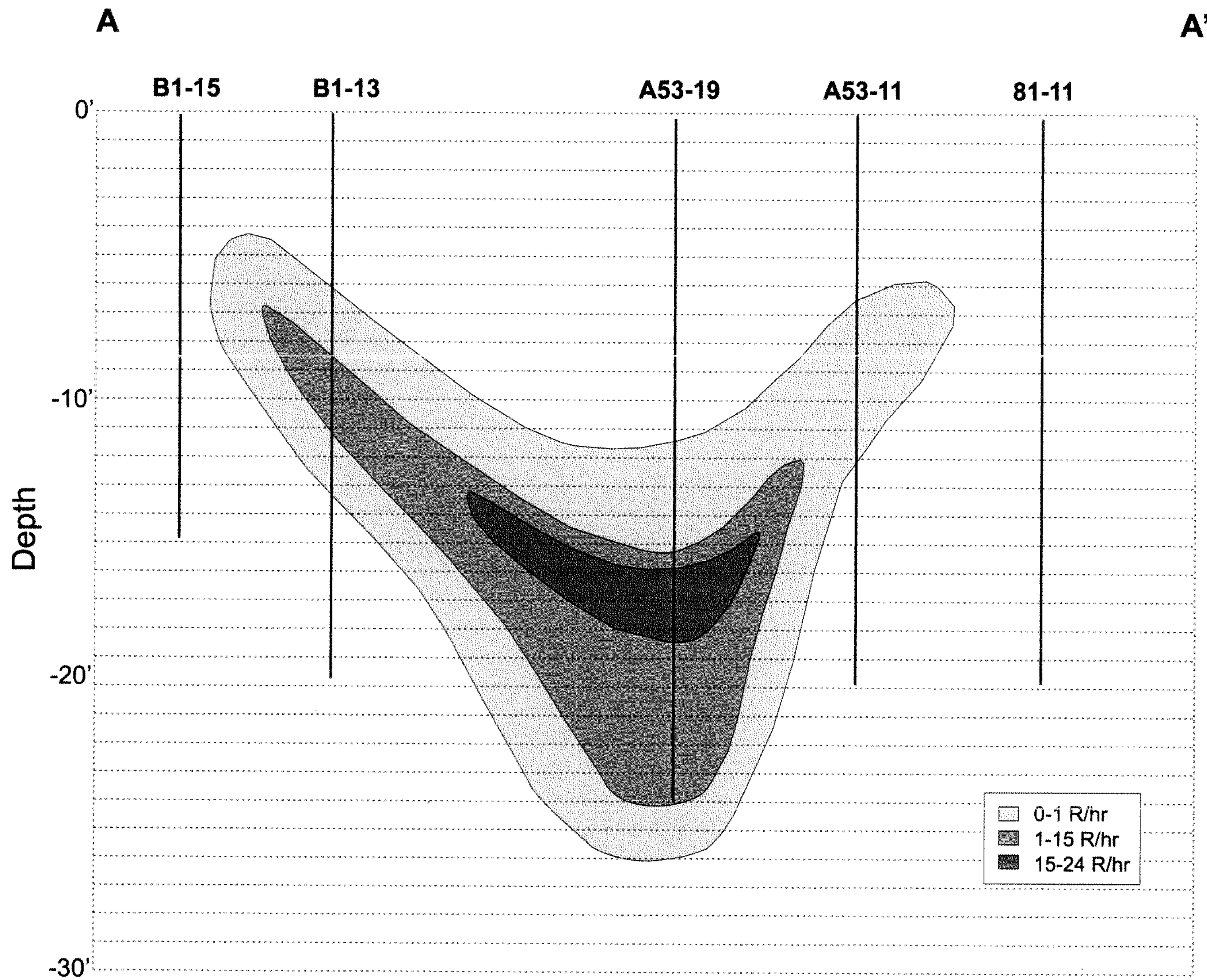


Figure 3-9. Map and cross-section drawing of site CPP-31 showing the estimated lateral extent and vertical distribution of contamination based on gamma logs in boreholes.

3.1.1.11 Site CPP-32 Description. Sites CPP-32E and 32W are two areas of localized contamination near valve box B-4 (Figure 3-1). The contamination at CPP-32E (southwest of valve box B-4) appears to have originated from the condensation of contaminated water vapor in valve box B-4 that was released to the ground surface from the stand pipe (air vent tube and view port pipe) that extends out of the valve box. This area is approximately 0.7 m^2 (8 ft^2) and extends to a depth of about 0.3 m (1 ft) bgs.

Site CPP-32W is approximately 15 m (50 ft) northwest of valve box B-4 and the source of the release is suspected to be a result of a leak of radioactive liquid from a 5.1-cm (2-in.) diameter aboveground transfer line used to pump water from tank sumps to the PEW evaporator. This area is approximately 0.6 m^2 (6 ft^2) and extends to a depth of about 0.3 m (1 ft). Both sites were identified in December 1976 and described as having surface radiation contamination up to 2 R/hour. It is unknown if any cleanup of the sites occurred after they were identified in 1976. Both of these surface releases have since been covered with 0.76 m (2.5 ft) of soil and the Tank Farm membrane, which was installed in 1977.

3.1.1.11.1 Data Review—During the OU 3-07 Track 2 investigation in 1992 (WINCO 1993d), only soil samples from site CPP-32E were collected. Not knowing the exact release location and desiring not to penetrate the Tank Farm membrane unnecessarily, the field team took no samples from CPP-32W. When a soil borehole was drilled adjacent to the vent tube a depth of 1.5 m (5 ft) below the Tank Farm membrane, the concrete valve box was encountered. Therefore, the field team was unable to drill the borehole to the projected depth of 1.8 m (6 ft). The sample results from site CPP-32E are assumed to be representative of the contaminant concentrations at site CPP-32W.

During field screening, the highest beta/gamma radiation reading, 900 cpm above background, was detected between 0.4 to 4 m (1.4 and 2.9 ft) below the membrane about 0.76 m (2.5 ft) below the current ground surface. This depth is roughly equivalent to the ground surface at the time of the release. At the bottom of the borehole, the beta-gamma radiation had decreased to 250 cpm above background. Based on the field radiation measurements, one soil sample was collected at a depth of 0.43 to 0.70 m (1.4 to 2.3 ft) and two soil samples were collected at a depth of 0.67 to 0.88 m (2.2 to 2.9 ft) below the membrane. The samples were analyzed for VOCs, two metals, mercury and cadmium, gamma-emitting radionuclides, gross alpha and gross beta radiation, and Sr-90.

The gross alpha concentrations from the three samples ranged from 14.8 pCi/g to 21.5 pCi/g and were within normal background concentrations. Therefore, no isotopic analysis of the alpha-emitting radionuclides was performed. The gross beta concentrations from the three samples ranged from 350 pCi/g to 724 pCi/g with the subsequent isotopic analysis of Sr-90 ranging from 153 pCi/g to 278 pCi/g. Of the anthropogenic gamma-emitting radionuclides, only Cs-137, at concentrations, ranging from 133 pCi/g to 277 pCi/g, and Eu-154, at concentrations, ranging from 0.456 pCi/g to 0.811 pCi/g, were detected.

3.1.1.11.2 Contaminant Summary—Site CPP-32E/W was evaluated as part of the OU 3-13 RI/BRA. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA are Cs-137, Eu-154, and Sr-90 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.11.3 Characterization Uncertainty—The characterization uncertainties with site CPP-32E and CPP-32W are summarized below:

- Site characterization (CPP-32E and CPP-32W [no previous samples of CPP-32W])

- Exact spill location
- Source volume released
- Spatial extent of contamination
- Source term.

3.1.1.12 Site CPP-33 Description. This site (CPP-33) is addressed under site CPP- 27, (see Section 3.1.1.7).

3.1.1.13 Site CPP-58E Description. Site CPP-58 was partitioned into two separate units (CPP-58E and CPP-58W) for evaluation because it is composed of two separate areas of soil contaminated by leaks of PEW evaporator condensate (Figure 3-1). Site CPP-58W is now located beneath building CPP-649. The presence of the building precluded the collection of soil samples at site CPP-58W (see subsection 1.1.14). Samples from site CPP-58E were used for assessing the nature of contamination at site CPP-58W for the OU 3-13 BRA (DOE-ID 1997a).

Site CPP-58E has contamination resulting from a 1976 subsurface release of PEW evaporator condensate. The PEW evaporator was used to concentrate all dilute low and intermediate-level radioactive liquid waste. The concentrated "bottoms" solution from the PEW evaporator was sent to the Tank Farm as incidental liquid waste and the "overhead" condensate was sent to the service waste system. An estimated 75,700 L (20,000 gal) of condensate was released because a transfer line failed between the PEW evaporator and the service waste diversion system in building CPP-751. The release occurred at a point in the transfer pipe where it makes a 90° turn and the diameter of the line narrows from 8 cm to 5 cm (3in. to 2 in.) The line is buried 1.8 m (6 ft) bgs. An estimated 51 mCi of H-3, 2 mCi of Sr-90, 4 m Ci of u-106, 2 mCi of Cs-137, and 1 m Ci of Ce-144 were released. Though the damaged line was repaired, the contaminated soil was likely left in place and covered with clean soil.

3.1.1.13.1 Data Review—As part of the 1992 Track 2 investigation for OU 3-11 (WINCO 1993a), two boreholes were made at the CPP-58E site. The locations of the boreholes were selected so that underground utilities would not be damaged. One borehole was drilled to a depth of 3.6 m (12 ft) bgs and was located approximately 9.1 m (30 ft) southwest of the release. The other was drilled to a total depth of 14 m (46 ft) bgs and was located within 3.6 m. (12 ft) of the release site. It was planned that samples for laboratory analysis would be collected from intervals exhibiting the highest gamma/beta radiation fields as measured with field instruments. However, no radiation above background was detected in either borehole; therefore, samples that were representative of the entire drilled intervals were collected. Thirteen samples were collected from the two boreholes and analyzed for VOCs, selected metals (mercury and cadmium), fluoride, nitrate, nitrite, pH, and radionuclides.

Sampling and analysis showed gross alpha activity ranged from 3.92±0.67 pCi/g to 24.4±3.28 pCi/g. Only the sample collected from 2.4 to 3.0 m (8 to 10 ft) in borehole CPP-58E-1 exceeded the background activity of 20 pCi/g. Subsequent isotopic analyses for alpha-emitting radionuclides on this sample detected U-234 and U-238 below background concentrations and Pu-238, U-235, Pu-239, and Am-241 above background concentrations.

Sampling and analysis showed Cs-137 and Sr-90 as present above background levels. The gross beta activity ranged from 31.3±2.78 pCi/g to 271±22.1 pCi/g with all samples exceeding background activity of 30 pCi/g. Subsequent isotopic analysis for Sr-90 detected concentrations ranging from 0.877±0.276 pCi/g to 33.4±3.17 pCi/g. In general, lower concentrations of Sr-90 were measured in borehole CPP-58E-2 than in CPP-58E-1. This is consistent with borehole CPP-58E-1 being closer to the location of the release. The results of the gamma analysis detected only Cs-137 and K-40. The concentrations of K-40 are within normal background ranges. Cs-137 activities ranged from 0.269±0.0211 pCi/g to 63.1±4.57 pCi/g with the higher concentrations detected at a depth of less than 6.7 m (22 ft) in borehole CPP-58E-1 and at depths less than 3.0 m (10 ft) in borehole CPP-58E-2.

Below a depth of 1.8 m (6 ft) bgs, the primary contaminants detected were Cs-137 and Sr-90. This is consistent with the waste stream that was reported to have been released. Cs-137 concentrations are generally higher than Sr-90 concentrations above 6.7 m (22 ft) in borehole CPP-58E-1 and above 3.7 m (12 ft) in borehole CPP-58E-2. Below these depths, Sr-90 concentrations are higher than Cs-137 concentrations. This relationship is believed to be the result of the greater mobility of Sr-90 relative to Cs-137, given that these two radionuclides were likely in roughly equal concentrations in the released condensate. The contaminated zone for this site is estimated as being present from 1.8–14.0 m (6–46 ft) bgs. The volume of contaminated soil is estimated as 7,702 m^3 (272,000 ft^3).

3.1.1.13.2 Contaminant Summary—Site CPP-58E was evaluated as part of the OU 3-13 RI/BRA. The retained OU 3-13 contaminants from the contaminant screen process in the OU 3-1 RI/BRA are Am-241, Cs-137, Eu-154, Pu-238, Pu-239, Sr-90, and U-235 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.13.3 Characterization Uncertainty—The characterization uncertainties with site CPP-58E are summarized below:

- Site characterization (to confirm estimated activity released)
- Radiation activity levels
- Spatial extent of contamination.

3.1.1.14 Site CPP-58W Description. Site CPP-58 is composed of two areas of soil contamination associated with the PEW evaporator. Site CPP-58E is soil contamination resulting from a subsurface release of PEW evaporator condensate in 1976 (see Section 3.1.1.13) and site CPP-58W consists of soil affected by a release of PEW evaporator condensate in 1954. The PEW evaporator was used to concentrate all dilute low and intermediate-level radioactive liquid waste. The concentrated bottoms solution from the PEW evaporator was sent to the Tank Farm as incidental liquid waste and the overhead condensate was sent to the service waste system. The condensate leaked from a transfer line buried 1.8 to 2.4 m (6 to 8 ft) bgs, between buildings CPP-604 and CPP-601. No information is available on how often the transfer line was used, how long the pipe leaked, the quantity of condensate released, or the length, width, or depth of contamination. Since the time of the release, building CPP-649 was constructed on top of the area where the spill occurred. If the contaminated soil was not removed during excavation for the building footers, it is believed to be contained below the building.

3.1.1.14.1 Data Review—Because site 58W is located beneath building CPP-649, the presence of the building prevents the collection of soil samples (WINCO 1993a).

3.1.1.14.2 Contaminant Summary—Samples from site CPP-58E were used in the OU 3-13 RI/BRA for evaluating the risk from site CPP-58W. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-1 RI/BRA are Am-241, Cs-137, Eu-154, Pu-238, Pu-239, Sr-90, and U-235 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.14.3 Characterization Uncertainty—The characterization uncertainties with site CPP-58W are summarized below:

- Site characterization (no previous samples of CPP-58W)
- Radiation activity levels
- Source volume released
- Spatial extent of contamination
- Source term.

3.1.1.15 Site CPP-79 Description. South of tank WM-181 are sites CPP-28 and CPP-79 (see Figure 3-6). Site CPP-79 is defined as soil contaminated in July and August of 1986 by the releases of waste solutions due to an obstruction in a transfer line buried about 3.0 m (10 ft) bgs. However, during investigations a second, deeper zone of contamination was discovered beneath this site and is discussed with site CPP-28 (see Section 3.1.1.8).

On July 7, 1986, during a transfer from the Waste Calcining Facility (WCF) sump tank (WCF-119) to the PEW evaporator feed tank (WL-102) and again on August 2, 1986, during a transfer from the New Waste Calcining Facility (NWCF) decontamination area sump tank (NCD-123), the volume of liquid received at tank WL-102 did not match the volume transferred. An investigation revealed that a valve in the transfer line was partially closed, causing waste solutions to backup into valve box A-2. The waste exited valve box A-2 along the secondary tile encasement of two waste transfer lines and drained to the soil through leaks in the tile encasement (Unusual Occurrence Report WIN-86-0034-CPP, included in Appendix E). Approximately 9,463 L (2,500 gal) of liquid waste was released containing radionuclides, heavy metals, and traces of organic compounds. The transferred liquid waste could have been low-level or intermediate-level, low-fluoride waste. It is believed that part of the contaminated soil at this site was removed during the 1994 Tank Farm upgrade project.

3.1.1.15.1 Data Review—During the OU 3-07 Track 2 investigation in 1992 (WINCO 1993d), one soil borehole was drilled in the soil near the release site (borehole CPP-79-1; see Figure 3-7). The borehole location was on a berm approximately 2.4 m (8 ft) above the ground surface in the Tank Farm. As a result, the original land surface elevation corresponds to a depth of 2.4 m (8 ft) bgs in the borehole. In the subsequent discussions, the depths have been adjusted to correspond to the Tank Farm land surface and not that of the berm.

Fifteen split-spoon samples were collected from borehole CPP-70-1 and screened in the field for gross beta-gamma radiation. Seven samples were selected from the zones having the highest radiation for further analysis. Two of the soil samples admitted for analysis were duplicates collected between 7.3 to 8.5 m (24 to 28 ft) bgs[a] and one sample collected from 10 to 10.4 m (33.5 to 34.0 ft) bgs was too radioactive to be transported offsite. The one sample had a contact surface radiation level of 400 R/hour beta-gamma. During drilling at a depth of 9.4 m (31 ft), the drill cuttings yielded a sharp increase in

[a] Depths given are from the Tank Farm ground surface (i.e., 8 ft shallower than reported depths that were from the berm).

radioactivity (more than 10,000 cpm above background). The four remaining samples were analyzed for VOCs, mercury, cadmium, nitrate/nitrite, pH, and radionuclides.

All samples were analyzed for gross alpha- and gross beta-emitting radionuclides, with the exception of the deepest sample, which was too radioactive to analyze. Samples collected above 8.5 m (28 ft) bgs had relatively low activities of radionuclides, consistent with a release of WCF and NWCF decontamination solutions. Gross alpha activity was below background levels in samples collected below 5 m (16 ft) bgs and above 8.5 m (28 ft) bgs. Gross beta and Cs-137 activities remained above background levels from 4 to 6.7 m (14 to 22 ft) bgs. The soil samples collected from 7.3 to 8.5 m (24 to 28 ft) bgs contained radionuclides near or below background levels.

The highest gross alpha, beta, and Cs-137 activities were from the sample collected from 4.3 to 4.9 m (14 to 16 ft) bgs. The Cs-137 concentration in this sample was 20.9±1.5 pCi/g, the Sr-90 activity was 54.4±3.46 pCi/g. This sample also had detectable levels of U-238 and U-235 near background levels and Pu-238 and Pu-239 slightly above background concentrations.

The radionuclide analysis of the sample collected from 9.8 to 9.9 m (32 to 32.5 ft) bgs measured significantly higher gross alpha (8.09E+5±9.71E+4 pCi/g) and beta (1.89E+7±1.52E+6 pCi/g) activities than were measured in sample intervals above 7.3 m (24 ft) bgs. Isotopic analysis of this soil also detected significantly higher concentrations of Cs-137 (3.37E+7±1.06E+6 pCi/g), Sr-90 (5.41E+6±4.91E+3 pCi/g), and Am-241 (1.66E+4±2.18E+3 pCi/g) activities than in shallower sample intervals. The analysis led investigators to conclude that the deeper contamination is not from the reported WCF and NWCF decontamination solutions associated with site CPP-79. The deeper zone of contamination appears to be the result of a release of high-level liquid, possibly contaminant migration from site CPP-28.

Information on the lateral extent of the contamination around borehole CPP-79-1 is provided by the results of samples from boreholes A-61 and A-62 (LMITCO 1995). These boreholes were drilled to the west and east, respectively, of Borehole CPP-79-1 (Figure 3-5). Based on the sample results for boreholes A-61 and A-62, contamination associated with site CPP-79 has extended as far as borehole A-61 on the west.

Boreholes A-61 and A-62 were drilled to the west and east of borehole CPP-79-1, respectively. Soil samples were collected and analyzed from depths of 8.7 to 9.3 m (28.5 to 30.5 ft) and 11.7 to 12.3 m (38.5 to 40.3 ft) in borehole A-61. The highest gross alpha (1,230±20 pCi/g), gross beta (20,500±50 pCi/g), Sr-90 (3,360±30 pCi/g), and Cs-137 (25,000±2,000 pCi/g) concentrations were in the 8.7- to 9.3-m (28.5- to 30.5 ft) sample from borehole A-61. Other radionuclides detected in this sample include Am-241 (46±4 pCi/g), Pu-239/240 (319±10 pCi/g), and U-234 (2.1±0.1 pCi/g). Concentrations of these same constituents in the 11.7- to 12.3-m (38.5- to 40.3-ft) sample were one to four orders of magnitude lower than in the shallower sample.

Samples were obtained from 0.6 to 1.2 m (2.0 to 4.0 ft) and 12.3 to 12.7 m (40.3 to 41.8 ft) in borehole A-62. Concentrations of Sr-90 and Cs-137 in the near surface soil sample from borehole A-62 were 305±3 pCi/g and 730±5 pCi/g, respectively. Concentrations of these radionuclides were below background in the deeper sample from borehole A-62.

Because the spill at site CPP-79 was a spill from a known source, the source term can be bounded based on knowledge of the volume of liquid lost and knowledge of the generating waste stream. The estimated curie content is 42 Ci.

3.1.1.15.2 Contaminant Summary—Site CPP-79 was evaluated in the OU 3-13 RI/BRA. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-1 RI/BRA are Am-241, Cs-137, Pu-238, Pu-239, Sr-90, U-234, and U-235 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.1.15.3 Characterization Uncertainty—Little uncertainty is associated with site CPP-79 because the spill at CPP-79 was a spill from a known source. The source term can be bounded based on knowledge of the volume of liquid lost and knowledge of the generating waste stream. The estimated curie content is 42 Ci.

3.1.1.16 Site CPP-96 Description. Site CPP-96 incorporates Tank Farm soil sites as defined in the OU 3-14 SOW: CPP-15, CPP-20, CPP-25, CPP-26, CPP-27, CPP-28, CPP-31, CPP-32, CPP-33, CPP-58, CPP-79, and CPP-96, as well as three Tank Farm soil sites: CPP-16, CPP-24, and CPP-30 that were screened out for further action in the OU 3-13 RI/FS. In the OU 3-14 ROD, all Tank Farm soils and Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites were consolidated into CPP-96 to facilitate selection of remediation alternatives for the entire Tank Farm. The three no further action sites were assigned to OU 3-14 in the OU 3-13 ROD because with the consolidation of all Tank Farm soil and sites within CPP-96, these three sites are subject to the interim action specified for the Tank Farm in the OU 3-13 ROD and OU 3-14 RI/FS activities. The interim action relies on institutional controls with surface water control to reduce surface water infiltration into Tank Farm soil.

3.1.1.16.1 Data Review—Data on known Tank Farm releases that are incorporated into site CPP-96 are presented in the previous subsections for each site. The backfill soil used throughout the Tank Farm area during maintenance and construction activities has not been characterized for contaminants. Backfill soil typically had an activity level of 3 to 5 mR/hour.

3.1.1.16.2 Contaminant Summary—The contaminant summaries for the sites incorporated into site CPP-96 are presented in the previous subsections for each site. Where the backfill soil has not been sampled, no summary of backfill contaminants is provided.

3.1.1.16.3 Characterization Uncertainty—Further definition of areas of contaminated soil, used as backfill for Tank Farm activities, and of levels of contaminated material are needed for risk assessment and source evaluation. The characterization uncertainties with site CPP-96 are summarized below as a composite of all the uncertainty issues related to the incorporated sites discussed previously:

- Site characterization
- Radiation activity levels
- Release locations
- Source of release
- Quantity of contamination released
- Source volume released

- Spatial extent of contamination
- Source term.

3.1.2 Injection Well and Aquifer within INTEC Security fence Contaminant Sources

3.1.2.1 Service Waste Discharges. The INTEC injection well (site CPP-23), located north of building CPP-666 (see Figure 3-10), was used to discharge INTEC service wastewater, which contained low-level radioactive waste and chemical waste, to the aquifer from 1952 to February 1984 when it was taken out of service. This injected wastewater subsequently contaminated the aquifer within the INTEC security fence and south.

3.1.2.2 Accidental Discharges. During the operational life of the injection well (1952 to 1984), known accidental discharges to the injection well occurred and are described below (WINCO 1994a):

- **July 1953**—The contents of a tank were discharged to the wastewater flowing to the well. A post discharge analysis showed that 51 mCi of radioactive contaminants were released in 923,640 L (244,000 gal.) of water.
- **December 1958**—About 29 Ci of radioactive contaminants, including 7 Ci of Sr-90 were released to the well.
- **September 1969**—Two separate releases resulted in 19 Ci of fission products released to the well. Releases included Cs-137, Cs-134, Ce-144, and Sb-125 in 12.4×10^6 L (3.28×10^6) of wastewater.
- **December 1969**—Two releases occurred in which the quantity of Sr-90 released was higher than expected. About 1 Ci, including 30% Sr-90, was released.
- **March 1981**—Mercury was detected during routine monitoring of the INTEC service waste system. Mercury in the form of mercuric nitrate was released from processing operations in building CPP-601, through the INTEC service waste system to the injection well. An estimated 0.207 mg/L of mercury was detected in service waste. The Resource Conservation and Recovery Act (RCRA) EP toxicity limit for mercury is 0.2 mg/L (40 CFR 61.24, Table 1).

3.1.2.3 Injection Well Contaminants. In 1989, the injection well was sealed by perforating the casing throughout and pumping in cement. Based on a comparison to drinking water standards, the most significant radionuclides in the service wastewater were H-3 and Sr-90. According to the Track 2 investigation (WINCO 1994a), it is estimated that a total of 22,200 Ci, approximately 96% consisting of H-3, has been released in 4.2E+10L (1.1E+10 gal) of water. A complete historical summary of the well is presented in Section 2 of this document. The information in subsequent subheadings summarizes the known contamination (WINCO 1992c, 1994a).

3.1.2.3.1 Data Review—Before the well abandonment, a sediment (sludge) sample was collected in 1989 from the bottom of the open part of the well (about 145 m [475 ft] bgs). Low concentrations of inorganic compounds, radionuclides, and polychlorinated biphenyls (PCBs) were detected. Fourteen inorganic compounds were detected. The concentration of barium (0.26 mg/L) was well below the regulatory threshold of 100 mg/L. The radionuclide analyses of the sediments show that

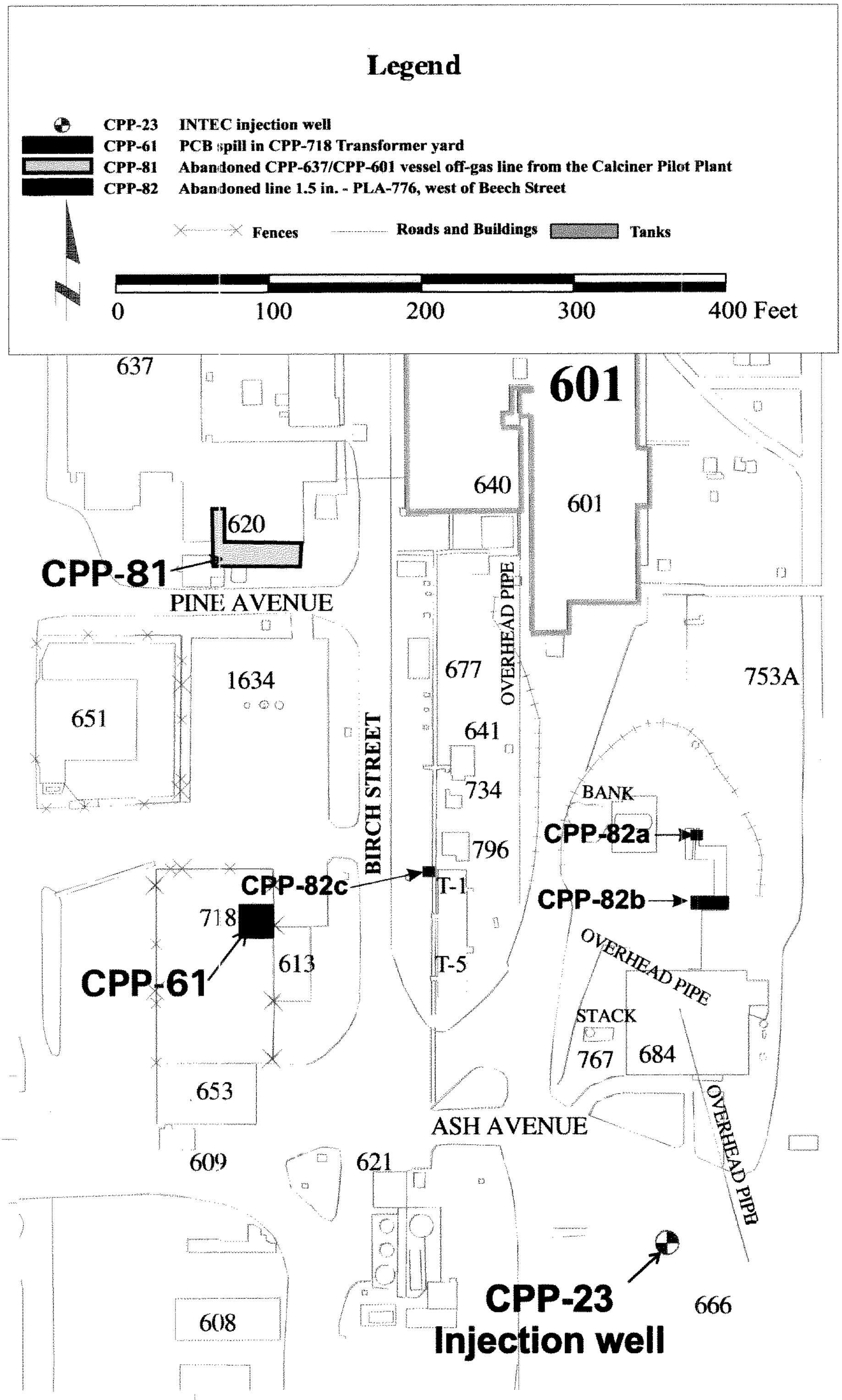


Figure 3-10. Location of INTEC injection well site, CPP-23, and additional soil sites from OU-3-13 (CPP-61, CPP-81, CPP-82).

the gross beta activity was measured at 150 pCi/g. This analysis also measured Cs-137 at 100 pCi/g, Eu-152 at 3.8 pCi/g, and Eu-154 at 2.5 pCi/g. The only organic compound detected above the MDL was Aroclor-1260 at 10 μg/kg (WINCO 1990).

Sampling results in 1993 indicated that the primary contaminants in the aquifer related to the injection well are H-3, Sr-90, and Cs-137. In 1993, Sr-90 concentrations were above the maximum contaminant level (MCL) of 8 pCi/L in an area that extended approximately 2,130 m (7,100 ft) downgradient of the injection well. The plume of H-3 above the MCL of 20,000 pCi/L extended about 2,730 m (9,100 ft) downgradient. Cs-137 concentrations have degreased significantly since the early 1980s. During 1982 to 1985, maximum concentrations in wells U.S. Geological Survey (USGS)-40 and -47 were 237 ± 45 and 200 ± 50 pCi/L, respectively. Between 1986 and 1993, Cs-137 has been detected only one time in each of these wells (WINCO 1994a).

3.1.2.3.2 Contaminant Summary—Where the remaining source of contamination from site CPP-23 is the 120-ft column of sediment remaining in the well (see Figure 2-12), the OU 3-13 RI/BRA assumed that the contaminants detected in the sediment sample at 145 m (475 ft) are representative of the entire vertical interval of the sludge plug. The volume of sludge in the well was estimated at 10.9 m^3 (386 ft^2). The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-13 RI/BRA include osmium, Cs-137, Eu-152, Eu-154, Sr-90 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

3.1.2.3.3 Characterization Uncertainty—Characterization of the residual contamination present in the 120-ft column of sludge inside the well, of residual contamination in SRPA materials, of contamination present in the aquifer as a result of slow-moving plumes of contaminants, and of contamination potentially migrating to the aquifer from other OU 3-13 and 3-14 sources is needed for risk assessment and source evaluation. The characterization uncertainties with site CPP-23 are summarized below:

- Site characterization (sludge, residual SRPA materials, slow-moving contamination plumes, other OU 3-14 sources)
- Radiation activity levels
- Source of releases
- Quantities of contamination released
- Source volumes released
- Spatial extent of contamination
- Source terms.

3.1.3 Additional Sites (CPP-61, CPP-81, and CPP-82) Contaminant Sources

The three sites (CPP-61, CPP-81, and CPP-82) located within the INTEC boundary but outside of the Tank Farm boundary, were screened as no further action sites in the OU 3-13 RI/FS. They were assigned to OU 3-14 ROD because U. S. Department of Energy, Idaho Operations Office (DOE-ID), U.S. Environmental Protection Agency (EPA), and Idaho Department of Environmental Quality (IDEQ) determined that data for the sites, used in the OU 3-13 RI/FS, were inadequate to select remediation alternatives for the sites.

3.1.3.1 Site CPP-61 Description

Site CPP-61 is an area within the CPP-718 transformer yard where a PCB oil spill occurred in the early 1980s (Figure 3-10). The transformer yard is approximately 29 × 47 m (95 × 155 ft) in area and is surrounded by a 2.4 m (8 ft) tall cyclone fence. The spill occurred during the utilities replacement and expansion project (UREP) when the transformer had to operate with a 30–40% voltage overload. As a result of the voltage overload, heat expansion of the transformer oil caused a leak to occur in one of the transformer fittings. Approximately 1,510 L (400 gal) of PCB oil was spilled. The PCB concentration in the oil was 179 ppm. Most of the spill was contained; however, some spilled oil contaminated the surrounding soil (WINCO 1992a).

3.1.3.1.1 Data Review—In July 1985 the spill area was cleaned up. The transformer, contaminated soil, and the pad were removed and shipped to a commercial disposal facility and approximately 40 drums of soil and debris were removed. A new transformer and concrete pad have been installed over the site.

As part of the cleanup, an excavation is reported to have been completed to a depth of 1.8 m (6 ft). The excavation was subsequently backfilled with soil previously removed from portions of the CPP-718 transformer yard. Analysis of the backfill soil showed PCB concentrations up to 10 ppm. In addition, documentation and analytical results suggest that an area of residual surface radioactive contamination remains adjacent to the excavated area.

Before removal of the contaminated soil associated with the PCB release, surface radiological contamination was detected by INTEC radiological control personnel. Nine surface hotspots were surveyed in the area ranging between 400 and 2,500 cpm above a 200-cpm background level, including hotspots of 1,000 and 1,500 cpm near the PCB release. No source for the radiological contamination was identified.

A Track 1 investigation resulted in a no further action recommendation that was approved in January 1993 for the PCB release. This recommendation included further evaluation of the low-level radioactively contaminated soils discovered at the site (WINCO 1992a).

As part of the WAG 3 RI/FS field sampling program, a surface radiation survey was conducted to aid in sample location selection. Hand augered boreholes were completed at the location of the three highest radiation readings obtained during the surface radiation survey. These hand augered boreholes are CPP-61-2, CPP-61-3, and CPP-61-4. Surficial soil samples from a depth interval of 0 to 0.15 m (0 to 0.5 ft) were collected at each borehole, along with samples from the 0.15-m (0.5-ft) increment below the surficial sample that returned the highest radiation reading.

One borehole, designated as location CPP-61-1, was drilled to a depth of 3 m (10 ft). Borehole CPP-61-1 was located as close as possible to the original PCB spill and the locations of the 1,000 and 1,500 cpm readings detected during the 1985 radiation survey. Samples were collected from 0 to 0.15 m (0 to 0.5 ft), 0.6 to 1.2 m (2 to 4 ft), and 2.4 to 3.0 m (8 to 10 ft). The 0.6- to 1.2-m (2- to 4-ft) sample represented the sample in the 0.15- to 1.2-m (0.5- to 4-ft) interval with the highest field radiation reading. The same criteria were used to select the 2.4- to 3.05-m (8- to 10-ft) sample from the 1.2- to 3.0-m (4- to 10-ft) interval.

The radionuclides Cs-137, Sr-90, and Tc-99 ranged from maximum activities of 2.51±0.07, 3.0±0.2, and 1.6±0.5 pCi/g, respectively, to minimum values of 1.69±0.06, 0.9±0.2, and 1.3±0.4 pCi/g, respectively. Radionuclide detections above background in below-surface samples were limited to Cs-137 (1.1±0.5 pCi/g) in the 0.15- to 0.3-m (0.5- to 1.0-ft) sample at borehole CPP-61-3 and Tc-99 at 1.9±0.4 and 1.5±0.4 pCi/g in the 0.6- to 1.5-m (2.0- to 4.0-ft) and 2.4- to 3.0-m (8.0- to 10.0-ft) intervals in the borehole CPP-61-1.

3.1.3.1.2 Contaminant Summary—Site CPP-61 was evaluated in the OU 3-13 RI/BRA. Because of the limited extent of soil with radiation levels above background, site CPP-61 is considered a site of negligible soil contamination. The retained OU 3-13 contaminants from the contaminant screening process in the OU 3-1 RI/BRA are Sr-90, Tc-99, and Cs-137 (DOE-ID 1997a, Section 5.2). Section 3.1.4 summarizes the contaminants at the OU 3-14 sites. Section 3.2 summarizes the risk assessment results from the OU 3-13 RI/BRA that are relevant to the Tank Farm soil and aquifer beneath INTEC.

The decision to carry site CPP-61 over to OU 3-14 for further evaluation was based on the uncertain amount of PCB contamination that may remain under the concrete pad. Therefore, PCB has been added to the list of potential contaminants of potential concern (COPCs) for site CPP-61 (DOE-ID 1999a).

3.1.3.1.3 Characterization Uncertainty—The characterization uncertainties with site CPP-61 are summarized below:

- Site characterization
- Spatial extent of contamination
- Source term.

3.1.3.2 Site CPP-81 Description. Site CPP-81 is an abandoned vessel off-gas (VOG) line (VGA-100; CPP-637/CPP-601 VOG line) from the 30-cm (12-in.) diameter calciner pilot plant (see Figure 3-10). The 7.6-cm (3-in.) line, located approximately 0.6- to 0.9-m (2- to 3-ft) bgs, contained simulated calcine that became plugged in the line following a 1986 test run. A 20.7-m (68-ft) section of the line was abandoned, with most of the line being under a concrete floor at the south end of the chemical engineering laboratory (CPP-620). During the fall of 1993, the line was cleaned as part of a time-critical removal action (WINCO 1994b). The line was flushed with hot acid to remove the simulated calcine. No leaks were observed during the removal action, indicating that no previous release to the environment had occurred. The final water rinse was analyzed and found to not contain contaminants above toxicity characteristic leaching procedure (TCLP) limits. A portion of the line was removed in 1993, probably about 3 to 4 ft, and both remaining pipe ends have blind flanges on them (DOE-ID 1997a; McCray 2000). The rest of the line, under a concrete floor at the south end of CPP-620, was abandoned.

The site was approved as a no further action in the Track 1 investigation and was not evaluated in the OU 3-13 RI/BRA. The DOE-ID, EPA, and IDEQ have determined that Site CPP-81 will be transferred to OU 3-14 for further evaluation because of the lack of sufficient data to make a final remediation decision (DOE-ID 1999a).

3.1.3.2.1 Data Review—No release to the environment is believed to have occurred. No samples were collected (WINCO 1994b).

3.1.3.2.2 Contaminant Summary—The site was approved as a no further action in the Track 1 investigation and was not evaluated in the OU 3-13 RI/BRA (DOE-ID 1997a).

3.1.3.2.3 Characterization Uncertainty—The characterization uncertainties with site CPP- 81 are summarized below:

- Site characterization
- Radiation activity levels
- Quantities of contamination released, if any
- Source volumes released, if any
- Spatial extent of contamination, if it exists
- Source terms.

3.1.3.3 Site CPP-82 Description. Site CPP-82 (see Figure 3-10) is the location of three wastewater spills (designated sites A, B, and C) caused by the rupturing of previously abandoned underground lines. The lines were ruptured during excavation activities. Site A, located east of building CPP-797, is where the abandoned line, 1-1/2"-PLA-776, located west of Beach Street was damaged and released an estimated 9.4 L (2.5 gal) of low-level radioactive waste into the soil. The abandoned line and contaminated soil associated with the leak were removed and disposed of during maintenance repairs. Sites B and C are associated with spills of non-radioactive, nonhazardous wastewater. These spills occurred during the repair activities associated with site A. The contamination was removed after the release. Site B is located south of building CPP-797 and is an area where underground piping was damaged during excavation of PLA-776. It was determined the damaged line did not carry any hazardous materials. Site C is located west of CPP-T1 and is the site of two ruptured plastic lines. It was determined that the line did not carry any hazardous material. Sites B and C are associated with spills of non-radioactive, nonhazardous wastewater. These spills occurred during the repair activities associated with site A. This site was recommended and approved as a no further action site in the Track 1 investigation (WINCO 1992b) and was therefore not retained for the OU 3-13 BRA. The DOE-ID, EPA, and IDEQ have determined that site CPP-82 will be transferred to OU 3-14 for further evaluation because of the lack of sufficient data to make a final remediation decision (DOE-ID 1999a).

3.1.3.3.1 Data Review—At site A, the abandoned line (1-1/2"-PA-776) and contaminated soil associated with the leak were removed and disposed during maintenance repairs. It is not known if samples were collected. At Sites B and C, the spills were stated as non-radioactive and nonhazardous and the contaminated soil was removed after the release. It is not known if samples were collected (WINCO 1992b).

3.1.3.3.2 Contaminant Summary—The site was approved as a no further action in the Track 1 investigation and was not evaluated in the OU 3-13 RI/BRA (DOE-ID 1997a).

3.1.3.3.3 Characterization Uncertainty—The characterization uncertainties with site CPP- 82 are summarized below:

- Site characterization
- Radiation activity levels
- Quantities of contamination released (sites B and C)
- Source volumes released (sites B and C)

- Spatial extent of contamination
- Source terms.

3.1.4 Summary of OU 3-14 Site Contamination Based on the OU 3-13 RI/FS

A curie estimate for the contaminated backfill, used at the Tank Farm and not associated with earlier release sites, has not yet been prepared. This will be part of the OU 3-14 Tank Farm investigation. Based on past characterization, the two sites, CPP-28 and CPP-31, contain 99% of the estimated surface source curie inventory, and CPP-15 contains 1% of the curie inventory.

The contaminants in the column of sludge remaining in the injection well were not fully characterized. The OU 3-13 RI/BRA assumed the sediment sample from 145m (475 ft) would be representative of the contaminants in the sludge. The OU 3-14 investigation involves reopening the injection well to obtain a core sample to determine the contamination in the sludge and in the vicinity surrounding the well where the casings were breached.

Based on historical information and professional judgement, the soil sites outside of the Tank Farm (sites CPP-61, CPP-81, and CPP-82) probably have significantly less than 1% of the curie inventory estimated for the Tank Farm. However, further evaluation of these sites will be performed because of a lack of sufficient data to make a final remediation decision.

The contaminants retained from the OU 3-13 chemical screening process for the sites being addressed under OU 3-14 are presented in Table 3-1. As indicated in the table, some are the contaminants determined from historical process or environmental release information on a given site.

3.2 OU 3-13 Risk Assessment Summary

The OU 3-13 Remedial Investigation (RI) (DOE-ID 1997a) presented the available data for WAG 3 concerning site conditions and the nature and extent of contamination as of 1997. The RI examined 92 of the then known 94 designated release sites (CPP-84 and CPP-94 were not investigated in the RI/BRA) and the windblown area for human health and ecological receptors. Because OU 3-14 concerns the risk assessment results only for the Tank Farm surface soil pathway and the groundwater pathway beneath the INTEC security fence, only those applicable portions of the OU 3-13 RI/BRA are summarized here. The OU 3-13 contaminants of concern (COCs) identified for both the soil and groundwater pathways are derived from the OU 3-13 COPCs developed for each release site.

3.2.1 Summary of the OU 3-13 Tank Farm Surface Soil Pathway

The results of the OU 3-13 RI/BRA indicate that the potential exists for adverse health effects from exposure to the Tank Farm soils contaminated with Cs-137, Eu-154, U-235, and Sr-90. Limited site characterization was conducted at the Tank Farm during the OU 3-13 RI/FS (DOE-ID 1997a, 1997b) primarily because the Tank Farm is an active operational facility. Assumptions about the horizontal and vertical distribution of contaminated soils were made to calculate the area-weighted soil concentrations; however, the boundaries of the release sites are not well known. Assumptions about the concentration in the perched water are of concern because perched water potentially contributes to elevated concentrations in the SRPA.[b] The OU 3-13 FS Supplement (DOE-ID 1998a) presented important characteristics about the Tank Farm soils such as the contaminated area, OU 3-13 COCs, preliminary remedial goals (PRGs), and the required period of performance for each site. The characteristics are summarized in Table 3-2 (DOE-ID 1998a).

As shown in Table 3-2, the primary risk contributors (i.e., the OU 3-13 COCs) identified in the OU 3-13 RI/BRA for the Tank Farm surface soils were Cs-137, Eu-154, Pu-238, Pu-239/240, Pu-241, Sr-90, and U-235. Though plutonium did not present an unacceptable risk, it was added to the OU 3-13 COC list because of the uncertainty in the amount of plutonium released in the Tank Farm area. The uncertainty in the distribution of contaminants in the surface soils stems from the lack of documentation of all of the potential historical contaminant releases that may have occurred at the Tank Farm and limited site characterization during the OU 3-13 field investigation.

3.2.2 Summary of the OU 3-13 Groundwater Pathway Modeling and Risk Assessment

There are two sources of existing or future contamination in the SRPA. These include (1) the historical use of the injection well and (2) the surface soil sources leaching through the vadose zone into the perched water and subsequently into the SRPA. The OU 3-13 BRA simulated the vadose zone-aquifer-groundwater system at the INTEC. Simulations were performed to predict water infiltration and transport through the vadose zone. The predicted water and contaminant mass fluxes from the vadose zone model were then used as input to a separate aquifer model.

Predictions of contaminant transport from land surface to the SRPA and south to the INEEL boundary were focused on obtaining future groundwater concentrations in the year 2095 to support the 100-year risk scenario (DOE-ID 1996) for the WAG 3 comprehensive BRA (DOE-ID 1997a) and evaluating potential health impacts to a hypothetical future resident.

The risks calculated for the SRPA are risks on the INEEL site. No projections of impact off the INEEL site have been completed for downgradient SRPA users. Concentrations were reported as a function of time over a simulation period extending well beyond 2095 until the peak concentrations were identified. In the contaminant transport analysis of groundwater, all Tank Farm release contaminants were assumed to move immediately from the surface soil to the underlying basalt after release from a Tank Farm facility.[c] (The tank farm known releases account for the majority of the contamination to the environment.) This assumption was conservative for the groundwater pathway because it maximizes concentrations and reduces transit time.

b. The OU 3-13 ROD (DOE-ID 1999a), has a selected remedy for the perched water—institutional controls with groundwater recharge control to mitigate further migration of the contaminants to the aquifer.

c. Only the Tank Farm contaminant releases from sites CPP-28 and CPP-31, and a 1986 release were used as surficial sediments in the model sediments. The other soil contamination is assumed to be in the surficial sediments (DOE-ID 1997a).

Table 3-2. Summary of OU 3-13 Tank Farm surface soil release sites, OU 3-13 contaminants of concern, and preliminary remediation goals (DOE-ID 1998a).

Release Site	Area[a] (ft^2)	Major Contaminants of Concern	Preliminary Remediation Goal (pCi/g)	Time Required to Achieve PRG[b] (years)
CPP-15	700	Cs-137	23	443
CPP-20	225	Cs-137	23	173
CPP-25	500	Cs-137	23	173
CPP-26	12,850	Cs-137	11.5	360
		Sr-90	111	120
CPP-27/-33[c]	2,000	Cs-137	23	293
CPP-28/-79[d]	4,950	Cs-137	4.6	781
		Eu-154	1,040	172
		Pu-238	134	880
		Pu-239/240	50	137,000
		Pu-241	11,200	174
		Sr-90	44.5	464
CPP-31	10,550	Cs-137	4.6	575
		Pu-239/240	50	50,800
		Sr-90	44.5	268
		U-235	2.6	6.4 billion
CPP-32[e]	14	Cs-137	23	223
CPP-58[f]	6,800	Cs-137	23	147
CPP-96 (additional soils)[g]	79,696	Unknown	Unknown	Unknown

a. All of the release-site areas were obtained from the OU 3-13 RI/BRA (DOE-ID 1997a, Figures 9-1 and 10-1) except for the contaminated soil stockpile, which was surveyed, and the area of additional soils, which was estimated in the OU 3-13 feasibility study (DOE-ID 1997b).
b. The time required to achieve the PRGs, which are risk-based concentrations (RBCs), was obtained from Burns (1997). This column refers to the amount of time required for the contaminants of concern to decay naturally to an activity less than the 1E-04 RBC. The RBC corresponds to a concentration that yields a 1E-04 incremental lifetime cancer incidence risk.
c. Sites CPP-27 and CPP-33 are considered together because they derived from the same transfer line leak and were considered together in the OU 3-13 RI/BRA and all Track 2 investigations.
d. Sites CPP-28 and CPP-79 are considered together because an area of high concentration is contained within CPP-79 that probably originated from site CPP-28 (see Section 7.3.1.1).
e. This site was formerly designated as CPP-32W. It was combined with a similar site, CPP-32E, and designated as CPP-32.
f. This site is designated as CPP-58E and 58W, which represent the eastern and western portions of the site. The eastern portion originated from a spill and the western portion from a leak, both from the same source.
g. Site CPP-96 refers to surface soils surrounding the Tank Farm vaults that are assumed to be contaminated because of the uncertainty in the Tank Farm site characterization. The volume of additional soils was estimated using the excavation footprint shown in the OU 3-13 FS (DOE-ID 1997a, Figure 5-1) less the volume occupied by the tank vaults and the soil volumes at known release sites. The soils surrounding the tank vaults were assumed to be contaminated to a depth of 12 m (40 ft).

The determination of the OU 3-13 COPCs for the groundwater pathway are discussed in Section 5.2 of Appendix F of the OU 3-13 RI/BRA (DOE-ID 1997a). Table 3-3 presents the OU 3-13 COPCs that were evaluated for the groundwater pathway. These include the three non-radionuclides (arsenic, chromium, and mercury) and the ten radionuclides (Am-241, Co-60, Cs-137, H-3, I-129, Np-237, Sr-90, Tc-99, total Pu, and total U). These originate either at the land surface (current soil inventory), historical waste process water discharge streams (i.e., service waste ponds or percolation ponds), accidental releases, and/or past use of the injection well. The injection well source includes the period during which the well failed and introduced contamination to the vadose zone rather than the SRPA. In addition, because the Test Reactor Area (TRA) and INTEC contaminant plumes could overlap down gradient, the two primary contaminants identified in the TRA RI (Cr and H-3) were included as aquifer source terms.

Concentrations were reported as a function of time over a simulation period extending well beyond 2095 to identify peak concentrations. The OU 3-13 BRA determined a simulation time of 3804 years where the peak total plutonium concentration was identified (in the year 3585). Table 3-4 summarizes the maximum and peak concentrations at various periods in time. Based on the information in this table, the following conclusions can be drawn:

- Arsenic, Co-60, Cs-137, Tc-99, total U and Am-241 have not and are not expected to exceed their MCL and risk-based concentration (RBC) (target risk=1E-04).

- Chromium, tritium, and Np-237, exceed their MCL or the RBC before the year 2095 but not after 2095. Therefore, these contaminant concentrations will not pose an unacceptable risk to future residents.

- Mercury, I-129, Sr-90, and total plutonium exceed their MCL or RBC before 2095 (except total plutonium) and also after 2095. These contaminants are predicted to pose an unacceptable risk to the future residents (see Table 3-5).

Contaminant discharges to the INTEC injection well, site CPP-23, are the primary contributors to the aquifer peak concentrations of mercury, I-129, Sr-90, and total plutonium (see Table 2-5). From an interpretation of the OU 3-13 RI/BRA results (DOE-ID 1997a, Section 6.6), it is possible to identify the source that led to the contaminant plumes of interest that exceed MCLs or the RBC.

- For mercury, interpretation indicates that the INTEC injection well is the main source

- The primary I-129 flux to the aquifer was from direct input of injection well sources into the aquifer

- For Sr-90, the injection well is most of the pre-2095 contribution, but after 2095, the vadose zone contribution is more significant

- For total plutonium, the injection well is the early contributor, but later in time the contribution from the vadose zone becomes most significant.

The I-129 surface sources represent a small contribution (less than 9%) to the OU 3-13 BRA aquifer peak concentration as compared to the injection well sources of I-129. The peak aquifer concentration and the mass flux to the aquifer from surface soil sources do not correlate. This Work Plan should confirm the I-129 concentration levels in the vadose zone resulting from the injection well failure or another source. Once the I-129 concentration levels are known, a decision can be made on whether to further evaluate I-129 as a surface contaminant contributing to the groundwater risk.

Table 3-3. Summary of the identified groundwater COPCs for OU 3-13 (DOE/ID 1999a).

OU 3-13 COPCs Based on Water Samples				
Aquifer Based COPCs	Additional COPCs Based on Perched Water	Additional COPCs Based on Soil Contamination	Additional COPCs Based on Other Considerations	Final List of the COPCs for the Groundwater Pathway
Am-241	None	Arsenic	Cs-137	Arsenic
H-3		Chromium	Mercury	Chromium
I-129		Co-60		Mercury
Np-237		U-235[a]		Am-241
Sr-90		Pu-238[a]		Co-60
Tc-99		Pu-239[a]		Cs-137
U-234[a]		Pu-240[a]		H-3
U-238[a]				I-129
				Np-237
				Total plutonium[a]
				Sr-90
				Tc-99
				Total uranium[a]

a. The isotopes were identified as COPC, but in the OU 3-13 modeling, they were lumped together and simulated as totals.

Stronium-90 currently exists in the perched water from soil sources in levels that greatly exceed both MCLs and risk limits. Perched water is not a potable drinking water source because of the relatively sparse lateral extent of saturated regions existing in low permeability regions, which lead to insufficient deliverability (low flow rates) of water for domestic use. However, the Sr-90 concentration in the perched water is of concern because it potentially contributes to elevated concentrations in the SRPA.

The estimated activity of total plutonium (i.e., Pu-238, Pu-239, Pu-240, and Pu-241) released to the environment was 1,190 Ci. Of this total, 1,180 Ci (99%) was released from the Tank Farm. The transport model conservatively assumed that the entire Tank Farm release of plutonium moved immediately from the Tank Farm soil to the underlying basalts and down to the perched water. This Work Plan should confirm the movement of OU 3-13 COPCs (to be determined after sampling) through the Tank Farm soil to the aquifer. Though plutonium did not present an unacceptable risk to receptors within the 100-year timeframe assessed in the OU 3-13 RI/BRA, the model indicated that plutonium peaks with an aquifer concentration of 36.2 pCi/L in the year 3585, and it would present an unacceptable groundwater ingestion risk of 2E-04. The peak concentration is more than twice as large as the total allowable alpha activity in drinking water of 15 pCi/L (40 CFR 141). Plutonium-241 and Pu-238 are not considered contaminants of potential concern for the aquifer because the radioactive decay half-lives of 14 and 87 years, respectively, occur before the total plutonium peak concentration is reached in 3585. Only Pu-239 and Pu-240 will remain. Because Pu-239 has a long decay half-life (2.41E+04 yrs) and contributes to the vast majority of the mass, the total plutonium by the year 3585 can be assumed to be all Pu-239.

Table 3-4. Summary of the OU 3-13 maximum and peak simulated contaminant concentrations for the entire aquifer domain[a] (DOE-ID 1997a, 1997b)

OU 3-13 COPC	K_d (cm^3/g)	MCL (mg/L or PCi/L)	1E-04 RBC	Maximum Aquifer Concentration at Year 2025 (mg/L or pCi/l)	Maximum Aquifer Concentration at Year 2095 (mg/L or pCi/L)	Peak Aquifer Concentration After the Year 2095 (mg/L or pCi/L)	Peak Aquifer Concentration Through Total Simulation Time (mg/L or pCi/L)
Arsenic[f]	3	0.05[b]	0.006	9.4E-05	1.2E-03	1.95E-03 (2479)[e]	1.95E-03 (2479)[e]
Chromium[f,g]	1.2	0.1[b]	0.18[c]	0.07	0.03	0.03 (2095)	0.9 (1971)
Mercury[f]	100	0.002[b]	0.003[c]	0.006	0.004	**0.004 (2095)**	**0.007 (1984)**
Total U[f] (inorganic)	6	0.02[b]	0.11 [c]	0.003	0.001	0.01(2468)	0.014 (1986)
Co-60	10	100[d]	254	0.03	0.0	0.0 (2095)	25.9 (1986)
Cs-137	500	200[d]	152	32.0	5.9	5.9 (2095)	86.2(1979)
H-3	0	20,000[d]	67,100	4,240.0	89.2	89.2 (2095)	2.6E+06 (1960)
I-129	0	1[d]	26	9.0	4.68	**4.68 (2095)**	**97.1 (1986)**
Np-237	8	<15	16	8.03	3.76	3.76 (2095)	30.5(1986)
Sr-90	12	8[d]	86	35.4	8.08	**16.1 (2172)**	**1,200.0 (1967)**
Tc-99	0.15	900[d]	3,430	55.1	23.9	23.9 (2095)	203.0 (1997)
Am-241[h]	340	<15	15	0.8	0.63	0.63(2095)	0.9 (1986)
Total Pu	22	<15	NA	0.32	0.14	**36.2 (3585)**	**36.2 (3585)**
Total U	6	14	77	2.1	1	7.3 (2468)	10.1 (1986)

a. Entire aquifer domain is area within INTEC and that south of the south security fence.

b. Drinking Water Regulations and Health Advisories, may 1995.

c. Values based on hazard quotient of 1.

d. Water concentration that will result in a dose rate of 4 mrem/yr, if contaminant is only one present, based on an ingestion of 2L/d using ICRP-2 methods.

e. Values in parentheses denotes the year when the peak occurs.

f. Concentrations are provided in mg/L.

g. All peak aquifer concentrations are in and downstream of the TRA area. INTEC area concentrations are significantly lower.

h. Am-241 numbers do not include decay from Pu-241 to Am-241 in this table.

NOTE: Peak aquifer concentrations highlighted in bold text indicate that the value exceeds the respective MCL.

Table 3-5. OU 3-13 groundwater ingestion cancer risk and noncancer hazard quotients in the year 2095 and for the peak concentration if it occurs beyond the year 2095 (DOE-ID 1997a, 1997b, 1998a).

Contaminant	MCL (mg/L or pCi/L)	Predicted Concentration in the Year 2095 (mg/L or pCi/L)	Groundwater Ingestion Cancer Risk or HQ in the Year 2095	Peak Aquifer Concentration If Beyond the Year 2095 (mg/L or pCi/L)	Year of Peak Aquifer Concentration	Peak Aquifer Risk or HQ
Arsenic (mg/L)	5.0E-02	1.25E-03	2E-05 (5E-02)[a]	1.95E-03	2479	3E-05
Chromium[e] (mg/L)	1.0E-01	0.03	0.2[a]	–	–	–
Mercury (mg/L)	2.0E-03	**4.17E-03**	**1.33**[a]	–	–	–
Uranium (inorganic) (mg/L)	2.0E-02	1.31E-03	1E-2[a]	1.0E-02	2468	5.0E-01[a]
Total Am-241[b]	<1.5E+01	8.72E-01	6E-06	–	–	–
Co-60	1.0E+02	0	NA	–	–	–
Cs-137	2.0E+02	5.91E+00	4E-06	–	–	–
H-3	2.0E+04	8.92E+01	1E-07	–	–	–
I-129	1.0E+00	**4.68E+00**[c]	**2E-05**	–	–	–
Np-237	<1.5E+01	3.76E+00	2E-05	–	–	–
Total plutonium	<1.5E+01	1.39E-01	1E-06	**3.62E+01**	3585	**2E-04**
Sr-90	8.0E+00	8.08E+00	9E-06	**1.61E+01**	2172	**2E-05**
Tc-99	9.0E+02	2.39E+01	7E-07	–	–	–
Total uranium	1.4E+01	9.57E-01	1E-06	7.3E+00[d]	2468	7E-06

a. The value given is a hazard quotient.
b. The value includes decay from Pu-241.
c. The value given is based on groundwater modeling assuming a 25-ft open interval for production well. The assumption was made in the OU 3-13 FS Supplement (DOE-ID 1998a) that a 50-ft open interval for the same well resulted in a peak aquifer concentration of 1.41 pCi/L in the year 2106.
d. The value given is for total uranium.

e. All peak aquifer concentrations are in and downstream of the TRA area. The INTEC area concentrations are significantly lower

Note: Peak aquifer concentrations highlighted in bold text indicate that the value exceeds the respective MCL.

Modeling to support the OU 3-13 RI/FS indicated that Tank Farm contaminants released to the soil will cause unacceptable degradation of the SRPA in the future (DOE-ID 1997a, 1997b, 1998a). Specifically, estimated levels of Sr-90 and plutonium in the SRPA were predicted to exceed MCLs in years 2172 and 3585, respectively. Strontium-90 from Tank Farm soils was not expected to reach the aquifer for dozens of years, whereas plutonium isotopes were not expected to reach the aquifer for hundreds of years. The aquifer should not be adversely affected by Tank Farm Sr-90 and plutonium in the timeframe of the OU 3-13 Tank Farm soils interim action (DOE-ID 1999a).

3.3 Contaminant Data Review

3.3.1 Site Screening and Data Compilation

Waste Area Group 3 was initially subdivided into 13 OUs that were investigated for contaminant releases to environmental pathways in accordance with the FFA/CO Action Plan (DOE-ID 1991). During the OU 3-13 RI/FS evaluation (DOE-ID 1997a, 1997b, 1998a) and subsequent remedy development, data gaps were identified and the release sites and OUs were further categorized into seven groups relating to media, similar contamination, or geographic proximity:

- Group 1—Tank Farm soil
- Group 2—Soil Under Buildings and Structures
- Group 3—Other Surface Soils
- Group 4—Perched Water
- Group 5—Snake River Plain Aquifer (SRPA)
- Group 6—Buried Gas Cylinders
- Group 7—SFE-20 Hot Waste Tank System.

Operable Unit 3-14, was created to address those release sites and any other OUs where available information was insufficient to select a final remedy under OU 3-13. Interim actions were developed for implementation in the OU 3-13 ROD with the final remedy relegated to OU 3-14.

Results of the OU 3-13 RI/FS BRA (DOE-ID 1997a) showed that contaminated Tank Farm soil (Group 1) poses an unacceptable risk at the surface pathway. In addition, the Tank Farm soil and the injection well (site CPP-23) (Group 5) were concluded in the OU 3-13 BRA to account for the majority of the contamination potentially threatening the aquifer within the INTEC security fence and future groundwater users.

The Tank Farm soil (Group 1) and SRPA (Group 5) within the INTEC security fence were assigned to OU 3-14 in the OU 3-13 ROD (DOE-ID 1999a) because DOE-ID, EPA, and IDEQ determined that available or collected data from past investigations were inadequate to select remediation alternatives for the sites. Additional INTEC sites consisting of soil sites CPP-61, CPP-81, and CPP-82 also were added to OU 3-14 because not enough data are available to make a risk-based decision to select a final remedial action.

Additional data proposed for collection and analysis during the OU 3-14 remedial investigation include subsurface soil and aquifer contaminant concentrations. The data may be evaluated in an additional assessment to support remedial decisions for OU 3-14. Analysis could include exposure concentrations from external radiation, ingestion of groundwater, incidental ingestion of soil, and ingestion of homegrown produce.

In summary, Tank Farm soil, and the SRPA are interim actions in the OU 3-13 ROD and are included in OU 3-14 for final remedy selection along with additional soil sites, CPP-61, CPP-81, and CPP-82. Table 3-1 lists the OU 3-14 release sites and their descriptions (DOE-ID 1999a).

3.3.2 Risk Assessment Uncertainties

The work scope presented in this Work Plan is based on the uncertainties identified for the Tank Farm soil, the injection well, and the SRPA within the INTEC security fence, groundwater modeling, and the additional three sites from OU 3-13 (sites CPP-61, CPP-81, and CPP-82). This section presents those identified uncertainty issues. The data collection activities presented in Section 4 are designed to address these issues.

3.3.2.1 Tank Farm Soil. The OU 3-13 ROD (DOE-ID 1999a) determined that the Tank Farm soil represents a risk resulting from direct radiation exposure and leaching and transport of contaminants to the aquifer beneath the INTEC security fence. Because of uncertainties (DOE-ID 1997a, 1997b, 1998a) final remedial alternatives for the Tank Farm soil could not be determined in the OU 3-13 RI/FS. The scoping team comprised of DOE-ID, EPA, and IDEQ project managers and others met in 1998 and 1999 and identified additional data needs for the Tank Farm soil. The major issues are summarized below:

- The spatial extent, type, distribution, quantities, and concentrations of contaminants in the Tank Farm soil are inadequately characterized

- The limited characterization performed at the Tank Farm does not provide sufficient data concerning the contaminated soil volumes that require remediation

- Development of site-specific Tank Farm soil distribution coefficients (K_ds) are required for the OU 3-13 COPCs (to be determined after sampling).

- Moisture flux at the Tank Farm is required to assess contaminant mobility.

3.3.2.2 Injection Well and Aquifer Within the INTEC Security Fence. The OU 3-13 ROD (DOE-ID 1999a) determined that the injection well may represent a risk resulting from leaching and transport of contaminants to the aquifer within the INTEC security fence from the remaining sludge and the contaminated residue forced into the vadose zone during periods when the injection well casing failed. Because of a number of uncertainties (DOE-ID 1997a, 1997b, 1998a), final remedial alternatives for the injection well could not be determined in the OU 3-13 RI/FS. The scoping team comprising DOE-ID, EPA, and IDEQ project managers and others met in 1998 and 1999 and identified additional data needs for the aquifer. The major issues are summarized below:

- The spatial extent, type, distribution, quantities, and concentrations of contaminants in the injection well sludge and nearby aquifer are inadequately characterized

- The limited characterization performed does not provide sufficient data concerning the contaminated volumes and leaching potential to the aquifer

- Development of site-specific Tank Farm soil and injection well sludge (K_ds) are required for the OU 3-14 COPCs (to be determined after sampling)

- Determination of moisture flux at the Tank Farm is required to access contaminant mobility to the aquifer.

3.3.2.3 Groundwater Modeling. The OU 3-13 ROD (DOE-ID 1999a) determined that the aquifer within the INTEC security fence may represent a risk to future groundwater users. Operable Unit 3-13 BRA risk estimates (DOE-ID 1997a) associated with predicted concentrations in the aquifer were deemed unacceptable because of insufficient data and modeling uncertainties. Because of these uncertainties (DOE-ID 1997a; 1997b, 1998a), final remedial alternatives for the aquifer beneath the INTEC security fence could not be determined in the OU 3-13 RI/FS. The scoping team comprising DOE-ID, EPA, and IDEQ project managers and others met in 1998 and 1999 and identified additional data needs for the groundwater modeling. The major issues are summarized below:

- Predicted estimates of concentrations of Pu and Sr-90 in the perched water were too high
- Uncertainty in Tank Farm soil transport calibration
- Lack of moisture monitoring data from the Tank Farm soil
- Recharge uncertainty (i.e., with Tank Farm soil and the Big Lost River)
  - Bounding of infiltration from precipitation
  - Quantification of vertical and horizontal moisture flux though the Tank Farm soil from adjacent recharge sources
  - Extent of the influence of infiltration from the Big Lost River on the Tank Farm soil
- Geochemistry
  - Low pH effluent in line leaks
  - Source release issues
  - K_d issues.

The following issues have been identified to resolve the model uncertainties mentioned above:

- Tank Farm soil geochemistry
- Site-specific Tank Farm soil, injection well sludge distribution coefficients (K_ds) for the OU 3-13 COPCs (to be determined after sampling), and the poorly understood contaminant mass source terms are required to assess contaminant mobility
- Calculation of moisture flux at the Tank Farm is required to assess contaminant mobility
- The spatial extent, type, distribution, quantities, and concentrations of contaminants in the Tank Farm soil are not sufficiently characterized to define the risk to the aquifer inside the INTEC security fence
- The spatial extent, type, distribution, quantities, and concentrations of contaminants in the injection well sludge and nearby aquifer are not sufficiently characterized to define the risk to the aquifer inside the INTEC security fence

- The extent of contaminants of potential concern in the HI interbed (at a depth of 158.5 to 167.6 m [520 to 550 ft]) and its ability to migrate from the interbed.

3.3.2.4 Additional Sites CPP-61, CPP-81, and CPP-82. The DOE-ID, EPA, and IDEQ determined in the OU 3-13 ROD (DOE-ID 1999a), that sites CPP-61, CPP-81, and CPP-82 will be further evaluated under OU 3-14 because inadequate data exist to select a final remedy for the sites. The major issues are summarized below:

- The spatial extent, type, distribution, quantities, and concentrations of contaminants remaining at these sites are inadequately documented or characterized

- The documentation or characterization performed at these sites does not provide sufficient data concerning the contamination or contaminated soil volumes that still remain and may require remediation.

- Although these sites require further evaluation, it is anticipated that a final decision can be reached based on documented historical information. These historical documents will be used, if needed, to scope Phase II.

3.3.2.5 Feasibility Studies. Existing information on contaminants and physical parameters is not sufficient to evaluate remedial alternatives. In addition, the uncertainty in the nature and extent of contamination precludes evaluation of worker-protection measures that would be required during remediation. The evaluation of viable treatment technologies and remedial alternatives in the FS requires information about the physical and chemical properties of contaminated media, moisture availability, contaminant mobility, and the associated effect on offsite disposal considerations and transportation issues. More data are needed for complete identification of appropriate technologies in the FS and to facilitate the evaluation of short-term effectiveness, implementability, and cost. Summarized below are the unresolved FS-related issues that contributed to the decision to defer final risk-management decisions to the OU 3-14 RI/FS and ROD process:

- Soil contaminant types, distribution, concentration, depth, and volumes, requiring remediation are unknown. Process knowledge suggests that low- and high-level activity waste, mixed waste (including suspected listed hazardous constituents), and transuranic (TRU) waste may be present in the Tank Farm soil.

- Contaminant mobility must be determined for the OU 3-14 COPCs (to be determined after sampling).

- High-radiation fields from contaminated Tank Farm soil may require remote excavation and treatment.

- The fate of the tank residual contents (i.e., heels) of the 300,000-gal tanks is uncertain. Residual heels can be postulated to act as a major contaminant source at a distant future time. This uncertainty not only affects task prediction, but also affects the FS technology selection and evaluation. The magnitude of the source term from the heels is likely to be far greater than the magnitude of the source term from the contaminated soil.

- Transportation and disposal requirements are uncertain. The availability of appropriate waste disposal facilities on or off the INEEL site, especially for the potential volume of TRU waste soil, may be limited.

- The distribution coefficient (K_d) in modeling fate and transport of contaminants in both the Tank Farm soil and injection well sludge is unknown.

- Moisture flux in the Tank Farm soil must be determined.

- Risk from the aquifer within the INTEC security fence to future groundwater users must be determined.

Once the above uncertainties have been resolved, then potential remedial technologies can be investigated to determine their feasibility as a final remedial action.

4. WORK PLAN RATIONALE

The following sections present the rationale for performing the OU 3-14 RI/FS. Discussed are the assumptions that impact OU 3-14, the major uncertainties that drive project needs, the explanation of OU 3-14 data quality objectives, and the major elements of the field investigations.

4.1 OU 3-13 and OU 3-14 Remedial Investigation/Feasibility Study Assumptions

This section presents the assumptions from the OU 3-13 RI/FS (DOE-ID 1997b) and the FS Supplement (DOE-ID 1998a) that will be incorporated in the OU 3-14 FS. Though some of the principal assumptions remain the same as those made in the OU 3-13 RI/FS, modifications may be necessary because of changes in the project's scope. The purpose of this section is to present the assumptions that will be used in the OU 3-14 FS to bound the range of potential remedial alternatives that will be considered for Tank Farm soil, INTEC injection well and aquifer within the INTEC fence line, and the additional sites from OU 3-13. The assumptions are presented in terms of remedial action objective (RAO) development, integration with parallel programs (i.e., RCRA and NEPA), investigation-derived waste management, operational interfaces, Tank Farm closure, innovative technology considerations, on-site consolidation of contaminated soil, WAG interfaces, transuranic waste considerations, and long-term land use and risk-assessment assumptions.

4.1.1 Assumptions for Preliminary RAO Development

The primary purpose of the FS is to develop, analyze, and compare appropriate remedial responses that will reduce unacceptable risks to human health and the environment. Remedial alternatives are identified and evaluated, in part, based on their ability to meet the RAOs. The RAOs are clear and specific statements that describe the cleanup goals for a remedial action and are expressed on a media- and contaminant-specific basis. The assumptions used to develop the RAOs for the OU 3-13 RI/FS and, where necessary, the recommended changes to those assumptions for use in the OU 3-14 RI/FS are described in this section.

4.1.1.1 OU 3-13 Assumptions Applicable to OU 3-14. These OU 3-13 assumptions are applicable to OU 3-14:

- Any potential risk from radionuclides via the air pathway is associated with remedial actions and those risks will be addressed and mitigated through engineered controls. A conclusion of the OU 3-13 BRA (DOE-ID 1997a) was that no total excess cancer risks exceed 1E-06 for the air pathway. This approach is retained for OU 3-14.

- Remedial action objectives for soil and groundwater media will be developed, by OU 3-14 COC, for the time period before 2095, and additional RAOs for soil and groundwater media will be developed, by OU 3-14 COC, for post-2095. This approach is retained for OU 3-14.

- In the OU 3-13 FS and FS Supplement, the groundwater RAOs were based on achievement of risk-based concentrations or MCLs in the SRPA. This approach is retained for the OU 3-14 FS.

- In the OU 3-13 FS Supplement (DOE-ID 1997a), the groundwater modeling concluded that the I-129 was largely retained in the HI depth interbed at concentrations that exceeded the MCLs. The model theorized that flow of contaminated water from the HI interbed was constrained by the low permeability of the interbed and that a future groundwater user would not be able to extract sufficient water from the interbed alone to sustain a residence. A future groundwater user would have to extract water from the cleaner, more permeable layers above and below the interbed. In the OU 3-14 FS, investigation and sampling of the permeability and other soil properties associated with the HI interbed is included in the OU 3-14 field tasks to assess the viability of the assumption. Groundwater extraction assumptions remain the same: use of a well with a 50-ft screened interval that lies below the top of the water table and delivers water to a receptor at a minimum rate of 0.5 gpm over a 4-hour period.[a]

4.1.2 RCRA/NEPA/CERCLA Integration

The Tank Farm is currently managed under RCRA interim status (LMITCO 1999b). In addition, the draft HLW & FD EIS addresses some of the facilities located within OU 3-14. The EIS compares alternatives for closing the high-level waste facilities and estimates the potential risk posed to the aquifer by implementing the various alternatives for facility closure. While a Tank Farm closure plan has not been finalized and approved at this time, the DOE's intent is to use the following assumptions to help facilitate RCRA/NEPA/CERCLA integration:

- The INTEC Tank Farm is currently under RCRA interim status, and each tank is planned to undergo RCRA closure. The tanks will be included into OU 3-14 as they are closed to ensure a consistent final remedy for the Tank Farm.

- After RCRA closure for the tanks is complete, the impact of the anticipated residuals will be evaluated to the extent they affect cumulative risk. This evaluation of the HWMA/RCRA closed tanks and abandoned piping will occur in accordance with the CEC&C.

- RCRA closure of the Tank Farm is currently expected to include flushing and removing the majority of Tank Farm heels. However, Tank Farm closure could instead include grouting the tank bottom sediment or heels in place, filling the remaining voids in the tanks with either clean or low-level contaminated material and grout, and filling the void space between the tanks and the vaults with either clean or low-level contaminated grout.

- The FS will consider constraints presented by the presence of the Tank Farm vaults, piping, and other components in the soil remediation alternatives. The CERCLA program will not address remediation of the vaults, or tanks, but will address the contaminated and abandoned piping that requires soil excavation prior to removal. The CERCLA program will not address abandoned and contaminated pipes that are in utility corridors that require no or minimal excavation. The RCRA closure program will address contaminated and abandoned piping that is accessible in piping corridors or trenches where excavation is not necessary.

- Capping, containment, in situ treatment, removal, or ex situ treatment of contaminated soil around the Tank Farm cannot be implemented as a final remedy until after the RCRA closure of the Tank Farm has been implemented and deactivation, decontamination, and dismantlement (D&D&D) has removed the adjacent facilities.

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a. See Idaho "Rules for Public Drinking Water Systems," Section 550, "Design Standards for Public Drinking Water Supply Systems," 16.01.05.550.03.d.i.

- All buildings within the Tank Farm fence that support the Tank Farm operations should be removed by the time CERCLA remediation is implemented. Underground structures, including RCRA-closed tanks that are within the footprint of a cap over the Tank Farm are assumed to be stabilized so that they will not cause unacceptable interference or subsidence of the cap.

- The final decision specified in the OU 3-14 ROD will consider RCRA guidelines.

- The HLW & FD EIS compares alternatives for closing the HLW facilities and estimates the potential risk posed to the aquifer after implementing the various alternatives for facility closure. Modeling conducted in support of the EIS alternative evaluation did not incorporate the contaminated soil in the Tank Farm. Modeling conducted for OU 3-14 will accommodate the Tank Farm tank residuals as a source. The source term used for the Tank Farm residuals will be based on the anticipated end state and residual concentrations as provided in the HLW & FD EIS ROD. Assumptions about content, leak rate, and tank corrosion rate will be obtained from other documents such as the EIS or an approved tank closure plan, when one becomes available.

4.1.3 Investigation-derived Waste Management

Investigation-derived waste will be managed in accordance with the OU 3-14 RI/FS Phase I Work Plan and the Staging and Storage Annex Waste Management Plan. Additional guidance is found in the OU 3-13 ROD, sections 11.1 and 12.2.

4.1.4 Operational Interfaces

The operational interface assumptions listed below are the same as those used in the OU 3-13 FS (DOE-ID 1997b).

- Purge water and well water collected as part of the OU 3-14 investigative activities will be treated, stored and disposed of in a like manner as OU 3-13 Group 4 and Group 5 depending upon contaminant concentration. For planning, it is assumed that the PEW will not be available and that the Staging, Storage, Stabilization, and Treatment Facility (SSSTF) will provide interim and long-term storage for investigation derived wastewater, subject to meeting the WAC.

- As long as the Tank Farm is operational, access is required for the following systems: tank risers, sump risers, valve boxes, relief valve pits, condenser pits, cooling water system, and instrument buildings. Coordination with high-level waste operations would be needed for development of initial phased remedies and remedial alternatives that would be implemented while the Tank Farm is operational to ensure that necessary operational access points are maintained and load restrictions are not exceeded.

- All CERCLA remedial actions are required to conform to a safety analysis envelope in accordance with applicable DOE orders.

- Sites currently inaccessible until the facility preventing access has undergone D&D&D, will be coordinated with programs covering RCRA, operations, or D&D&D, as applicable, for implementation of final remediation. The RCRA closure and D&D&D may include entombment of the facility, which would preclude a potential future removal of underlying contaminated soil. For operating facilities, any activity that may disturb a CERCLA site before CERCLA remediation will be controlled by CERCLA site disturbance notification procedures.

- Water disposal in the existing Percolation Ponds will be discontinued by December 31, 2003. Process water currently being discharged will be discharged to an area that will not hydraulically impact perched water migration within the INTEC.

4.1.5 Tank Farm Closure

The DOE must cease use of five of the 300,000-gal tanks by June 30, 2003, and cease use of the remaining six by December 31, 2012, as specified in *the Second Modification to Consent Order to the Notice of Noncompliance* (DOE-ID 1998) (see Table 1-2). If tank space is needed after these dates, it is assumed that new tanks would be used and these new tanks would be located so that they would not constrain CERCLA remediation of the contaminated soil around the existing tank vaults.

4.1.6 Innovative Technologies

Innovative technologies will be evaluated in the OU 3-14 FS only if they have been successfully demonstrated on similar contaminated media, at a pilot scale or greater, and if they can realistically be expected to be implemented on a full-scale basis. Because remediation may occur many years after the completion of the FS, it is quite possible that new remedial technologies may be developed or refined. Use of technologies other than those analyzed in the FS may be deployed following an "explanation of significant difference" that would be supported by appropriate technical evaluation.

4.1.7 On-Site Consolidation of Contaminated Soil

The Idaho CERCLA Disposal Facility (ICDF) is a planned facility that is being designed to accept radioactive and mixed-waste soil from all INEEL WAGs. The planned size of the ICDF includes provisions for accepting up to half the Tank Farm soil inventory, on the basis of the OU 3-13 RI/FS. Furthermore, the waste acceptance criteria for the ICDF may limit the amount of plutonium-contaminated soil that can be accepted. The ICDF design includes provisions for some reserve capacity; however, if remedial action of Tank Farm soil includes excavation and disposal of large volumes of soil or large inventory of plutonium-contaminated soil, expansion of the ICDF must be considered or other provisions must be made.

4.1.8 Waste Area Group Interfaces

Remedies under the OU 3-14 FS will address risks resulting only from INTEC, or WAG 3, sources. The OU 3-14 FS will not evaluate removal, containment, or treatment of sources from groundwater remediation at other WAGs. The OU 3-13 RI groundwater modeling accounted for contaminants from cross-gradient sources (i.e., the Test Reactor Area [TRA]), and these modeling results were used for the OU 3-13 BRA (DOE-ID 1997a). Based on the OU 3-13 RI, only tritium and chromium from cross-gradient sources were found to intermingle with INTEC contamination. The predicted concentrations of chromium and tritium contamination in the SRPA from the INTEC plus the contribution from TRA for post-2095 are less than the MCLs based on the groundwater modeling performed in the OU 3-13 RI/FS (DOE-ID 1997a, 1997b).

Remediation of the WAG 3 release sites and groundwater is intended to reduce contamination and prevent exposures at WAG 3 but not to specifically mitigate potential groundwater risks at other WAGs in which groundwater risks may be increased because of the addition of WAG 3 source contaminants. The cumulative effects from multi-WAG contaminants in the groundwater will be addressed in WAG 10.

4.1.9 Transuranic Waste

The following assumptions about TRU waste have been made for the OU 3-14 FS:

- Soil sample results show that the release designated as Site CPP-28 may have TRU concentrations greater than 100 nCi/g in the soil.

- The volume of TRU contaminated soil is currently estimate at approximately 459 m^3 (600 yd^3). The only alternative for disposal off the INEEL Site is the Waste Isolation Pilot Plant (WIPP), and it will be available for disposal of WAG 3 CERCLA-generated TRU waste. For the purposes of this FS, the WAG 3 TRU waste will meet the WIPP waste acceptance criteria, the waste will be treatable, or temporary storage at the INEEL is available until alternate disposal options become available.

4.1.10 Long-Term Land Use Assumptions

The following land-use assumptions are adapted from the OU 3-13 BRA (DOE-ID 1997a) and the *Long-Term Land Use Future Scenarios for the Idaho National Engineering Laboratory* (DOE-ID 1995). These assumptions are included in the 3-14 FS Work Plan because the screening and evaluation of remediation alternatives is impacted by the land-use assumptions. The land-use assumptions given in this section are for the FS only.

- No residential development will occur within the industrial corridor of the INEEL before the year 2095.

- The "industrial corridor" of the INEEL will remain under government management for at least 100 years from 1995 (DOE-ID 1995).

- The INEEL Long-Term Land-Use document (DOE-ID 1995) 2095 scenario that limits the INTEC site to "restricted industrial use" will be valid. In 2069 (the 75-year forecast), the INTEC will be in standby mode for restricted industrial use. Reuse is permitted, but no new development will occur outside the existing fence. That status changes to restricted industrial use sometime between 2069 and 2095.

4.1.11 Risk Assessment and Groundwater Modeling Assumptions

The OU 3-14 RI/FS is a focused RI/FS to provide data to complete a FS and select a remedial decision. However, it is anticipated that some risk assessment and groundwater modeling will be required as part of the OU 3-14 RI. The risk from the Tank Farm soil and the SRPA beneath the INTEC fence line has already been agreed to in the OU 3-13 ROD. However, the risk from the Tank Farm soil was made on the basis of many assumptions that will be tested as part of the OU 3-14 investigation. The risk at the INTEC injection well site will likely need to be reevaluated on the basis of the new data collected during Phase I of OU 3-14. In addition, the OU 3-13 RD/RA data collection and activities will provide more detailed data to assess the risk to the groundwater within the INTEC fence line. The additional soil sites from OU 3-13 (Sites CPP-61, CPP-81, and CPP-82) will likely require further risk assessment as a result of the new information gathered in OU 3-14.

It is not possible to foresee the exact needs or objectives required for either the risk assessment or groundwater modeling prior to the completion of the OU 3-14 Phase I sampling activities. Therefore, the approach to both the risk assessment and groundwater modeling will be evaluated pending the results of the OU 3-14 Phase I activities, and a subsequent document will be prepared detailing the approaches to both tasks prior to the start of the OU 3-14 RI/FS Phase II activities. If OU 3-14 BRA or groundwater modeling are necessary, it is anticipated that they will be similar in format to the OU 3-13 BRA or subsequent approaches as negotiated by the DOE-ID, EPA, and IDHW in the OU 3-13 RD/RA.

4.1.12 Other Assumptions

The following is a list of additional assumptions that may apply to OU 3-14:

- The impact of flooding of the Big Lost River will be analyzed during the analysis of feasible remedial alternatives. A 100-year flood scenario will be used. In addition, applicable or relevant and appropriate requirements, such as DOE Order 435.1 will be considered.

- All capping technologies will include a biobarrier to inhibit biotic intrusion into the contamination source.

- If tankage is necessary for processing waste resulting from remedial action, existing tanks will be used whenever technically and economically appropriate.

- Any Tank Farm soil evaluated and classified as TRU waste is directly disposable in WIPP or treatable without the need for TRU treatability studies or nonstandard or remote handling or comply with the alternative requirements in 40 CFR 191 as an ARAR.

- The data to be collected for the OU 3-14 RI/FS will be used, in part, to estimate the nature and extent of contamination of the Tank Farm as a whole. The data collected by implementation of this Work Plan will require supplemental sampling if remediation on a site-by-site basis is found to be appropriate.

- Tank Farm soil, though contaminated with high-level waste, is not classified as high-level waste.

- The risk-based and ARAR-compliance-based decisions about the injection well, Site CPP-23, will be predicated on measured concentrations and trends in the aquifer using existing data and data from new wells.

4.2 Unresolved Issues in the OU 3-13 RI/FS

As stated in Section 1, the OU 3-14 RI/FS (DOE-ID 1997a, 1997b) is being conducted because unresolved issues in the OU 3-13 RI/FS prevented the development of a final remediation plan for the Tank Farm soil; CPP-96; the injection well, CPP-23; and the additional sites outside the Tank Farm, CPP-61, CPP-81, and CPP–82. The unresolved issues remaining from OU 3-13 were discussed in Section 3 and are summarized in the following:

4.2.1 Tank Farm Soil Issues

Tank Farm soil unresolved issues are divided into the following general categories and summarized in this section:

- Nature and extent of contamination

- Contaminant fate and transport

- Contaminant source estimation
- Feasibility study issues.

4.2.2 Issues Relating to the INTEC Injection Well and Aquifer Within the INTEC Fence Line

The INTEC injection well and SRPA within the INTEC fence line unresolved issues involve uncertainties associated with the following:

- Nature and extent of contamination
- Contaminant source estimation
- Feasibility study issues.

4.2.3 Additional Soil Sites from OU 3-13 Issues

The unresolved issues for the additional soil sites from OU 3-13, CPP-61, CPP-81, and CPP-82, are the following:

- Nature and extent of contamination
- Site risk.

4.3 OU 3-14 RI/FS Objectives

The OU 3-14 RI/FS is a planned focused investigation to collect data for the development of a final remedy for the Tank Farm soil, the INTEC injection well and aquifer within the INTEC fenceline, and additional soil sites that were added to the OU 3-14 scope (Sites CPP-61, -81, and -82). Because significant uncertainties were identified during the evaluation of the OU 3-13 FS and the negotiations for the OU 3-13 ROD, these sites were added to the newly created OU 3-14. OU 3-14 was tasked with characterizing these sites to resolve the uncertainty and develop remedial alternatives. Remedial alternative selection process will be completed following the site characterization and risk analysis to determine a final remedial action. In addition to the site characterization data being collected as mentioned above, the following specific needs include defining soil waste types and volumes. The primary objective for the characterization of the three areas is to provide data to identify and evaluate appropriate remedial alternatives.

4.3.1 Tank Farm Soil

The OU 3-13 RI/FS identified major risks from the Tank Farm soil to be external exposure to radiation and ingestion of water from the contaminated SRPA (from contaminants that have been leached from the Tank Farm soil to the SRPA) by future groundwater users. The current information about the nature and extent of contamination from the OU 3-13 RI/FS is inadequate to support the selection of a final remedy for the Tank Farm soil. The OU 3–14 RI/FS will further investigate contamination at the Tank Farm soil through two field investigation phases (Phase I and Phase II) and develop alternatives for a final remedy. Efforts will be undertaken to delineate any leaks/spills that occurred at or near tank vaults. Those identified will be scrutinized to determine what volume may have been short circuited to the underlying basalt.

Phase I will involve field screening of specific analytes (identified in the Tank Farm Field Sampling Plan) to identify analytes of concern, hot spot locations, and the potential for contaminants to migrate to the SRPA. These data will serve to focus Phase II sampling activities toward specific areas of interest. Phase II activities will address soil sampling, moisture monitoring, establishing OU 3-14 COPCs, and detailed questions concerning the identity, concentration, and transport characteristics of specific COPCs. The two-phase approach is proposed as a means to focus project resources on the specific contaminated soil areas that are expected to contribute to groundwater contamination, or that could affect selection of a remedy for the Tank Farm. Specific needs for these two phases include the following:

Field Investigation Phase I

- Define the spatial distribution of gamma-ray-emitting radionuclides by surface and subsurface gross-count gamma-ray surveys.

- Define the spatial distribution, quantities, and concentrations of contaminants, especially plutonium isotopes, in the Tank Farm soil, using laboratory analytical results of soil sampling, to estimate soil volume and waste types requiring remediation.

Field Investigation Phase II

- Collect site-specific soil chemistry

- Research K_d values and collect soil distribution coefficients (K_ds), as necessary, for the OU 3-14 Tank Farm COPCs for use in risk analysis and comparison of the long-term risk reduction needs when evaluating remedial alternatives.

- Provide a better understanding of moisture migration and the contaminant flux through the Tank Farm soil.

- Collect site-specific data to better bound and estimate the total contaminant mass source term in the soil for the contaminant transport simulations to reduce the uncertainty of release estimates to the environment and the risks calculated for the Tank Farm.

4.3.2 INTEC Injection Well and Aquifer within the INTEC Fence Line

The final remedy selection for the SRPA inside the INTEC fence line, including the INTEC injection well, will be made under OU 3-14. The main risk is exposure to radionuclides through ingestion by future groundwater users. Specific needs include the following:

- Provide site-specific soil distribution coefficients (K_ds) for the OU 3-14 COPCs, determined from sampling the injection well (Site CPP-23) and better estimates of contaminant mass source terms in the soil for contaminant transport simulations to reduce the uncertainty of release estimates to the groundwater pathway from the Tank Farm.

- Define the extent, type, and concentration of contaminants at the Site CPP-23 injection well and subsequent secondary sources to define the risk to the SRPA.

4.3.3 Additional Soil Sites from OU 3-13

Several miscellaneous sites were transferred to OU 3-14 from OU 3-13 because the DOE-ID, EPA, and IDHW required further assessment before completing their evaluation. Site CPP-61, a PCB spill, requires a better understanding of the amount of PCB contamination remaining at the site. Sites CPP-81 and CPP-82 require further assessment to develop sufficient data for a final decision. Although these sites may require further evaluation, it is anticipated that a final decision can be reached based on documented historical information. These historical documents will be used, if needed, to scope Phase II.

4.4 OU 3-14 Data Quality Objectives

The objective of OU 3-14 RI/FS Work Plan is to clearly outline and aquifer within the INTEC fence line the data collection activities to be conducted for the OU 3-14 Tank Farm soil, the INTEC injection well, and additional soil sites from OU 3-13 investigations. The activities are being performed to sufficiently characterize the soil and sediment, contaminants, contamination levels, extent of contamination, and soil moisture flux from these sites. The goal of the characterization is to understand the Tank Farm, injection well, and additional soil sites sufficiently to develop appropriate remedial actions that mitigate risk associated with contamination to less than 10E-04 and an IH of less than 1 for human health and the environment.

To help with defensible decision-making, the EPA has developed the data quality objective (DQO) process (EPA 1987), which is a systematic planning tool based on the Scientific Method for establishing criteria for data quality and for developing data collection designs. Data quality objectives have been developed to guide characterization of the Tank Farm soil. The process consists of seven iterative steps that yield a set of principal study questions and decision statements that must be answered to address a primary problem statement. The seven steps composing the DQO process are listed below:

Step 1: State the problem.

Step 2: Identify the decision.

Step 3: Identify the inputs to the decision.

Step 4: Define the study boundaries.

Step 5: Develop decision rules.

Step 6: Specify limits on the decision.

Step 7: Optimize the design for obtaining data.

The DQOs that govern the OU 3-14 investigations are presented in the following sections. The DQO process is an iterative process and the following statements will evolve as the DOE, EPA, and the State of Idaho DEQ provide input. DQOs may also change in response to new site data collected during initial investigations and/or change in work scope.

4.4.1 Tank Farm Data Quality Objectives

The Tank Farm Soil DQOs are presented in the following sections and summarized in Table 4-1. (The table follows the Tank Farm soil DQO section.)

4.4.1.1 DQO STEP 1—State the Problem. The Tank Farm soil is known to be contaminated from historical spills and releases. Information from previous investigations about the nature and extent of the Tank Farm soil contamination is incomplete. The size, location, contaminant type, dose rate, source term, and COPC (OU 3-14 Remedial Investigation determination) migration probability from the site need to be clarified for future remedial actions. The moisture content, contaminant flux out of the Tank Farm soil, and physical, hydraulic, and geochemical soil parameters are required. The OU 3-13 COPCs are those contaminants that have been identified as a potential concern through OU 3-13 RI/BRA. Since the OU 3-13 investigations were not complete, the OU 3-14 sampling will include the preliminary list of potential contaminants identified in the Track 2 Summary Reports for Operable Units 3-07 and 3-08 (WINCO 1993d and 1993b, respectively), from which OU 3-14 COPCs will be determined. The preliminary list of potential contaminants is as follows:

Gross Alpha	Uranium-238	Lead
Gross Beta	Neptunium-237	Manganese
Cobalt-60	Plutonium-238	Mercury
Strontium-90	Plutonium-239	Molybdenum
Technetiurn-99	Plutonium-240	Nickel
Iodine-129	Plutonium-242	Nitrate
Cesium-134	Americium-241	Tetrachloroethylene
Cesium-137	Boron	1,1,1-trichloroethane
Cerium-144	Cadmium	1,1,2-trichloroethane
Uranium-234	Chromium (VI)	Trichloroethylene
Uranium-235	Fluoride	

Background—The Tank Farm soil has become contaminated by spills and pipeline leaks of radioactive liquids from plant and transfer operations. In addition to the known highly contaminated areas, low levels of contamination exist at varying locations and depths. Limited knowledge of the extent (both vertically and horizontally) of contamination, volume of spilled material, types of contaminants, and contamination levels is available because many of the spill sites are in operational and highly radioactive sites. The principal threats posed by contaminated Tank Farm soil is external exposure to radiation and leaching and transport of contaminants to the perched water and eventually to the SRPA where future groundwater users could consume contaminated SRPA groundwater.

The Tank Farm soil is defined as the soil that exist from the surface down to the uppermost basalt flow and include release sites in OU 3-06, 3-07, 3-08, and 3-11. These sites are located within the Tank Farm boundary (Sites CPP-15, CPP -16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP -30, CPP-31, CPP-32, CPP-33, CPP-58, and CPP-79), cumulatively known as Site CPP-96. In addition to the contaminants identified during the OU 3-13 RI/BRA, the preliminary COPCs identified during the Track 2 investigations will also be evaluated during the OU 3-14 RI/FS. These contaminants are listed above. These contaminants, combined with the OU 3-13 COPCs, will comprise the complete preliminary OU 3-14 COPCs for this RI/FS.

Radiological OU 3-13 COPCs evaluated in the OU 3-13 ROD and in the OU 3-13 RD/RA include: Am-241, Ce-144,Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Np-237, Pu-238, Pu-239/240, Pu-241, Pu-242, Ru-106, Sr-90, tritium, Tc-99, U-234, U-235, U-236, and zirconium. Known non-radionuclide OU 3-13 COPCs include As, Cr, Hg (mercuric nitrate), nitrate (nitric acid), and thallium. The OU 3-13 ROD showed that Cs-137, Sr-90, and U-235 were a risk to human health (see Section 3.1.4).

Volatile organic compounds and SVOCs were identified as COPCs for release Site CPP-15 during previous OU 3-08 Track 2 investigations (WINCO 1993b), but were screened out as not being a risk concern. Given the type sampling technique being implemented for Phase I Characterization, it is not possible to sample for VOCs and SVOCs at CPP-15 in Phase I. The concern for VOC and SVOC contamination will be addressed as part of the Phase II Characterizations Work Plan. As stated in the Track 2 site evaluation table for Site CPP-15 (WINCO 1993b), "It is known that all radioactively contaminated soil was removed below the solvent tank. Since there was only a possibility for a small amount to have been released to the subsurface and there was not infiltration, due to the building, that should have caused migration, the VOCs would have been removed in association with the radionuclides. Any VOCs which could possibly have remained are not expected to be present due to biodegradation and volatilization of contaminant over the 18-year period since the time of release."

A final CERCLA remedy for the Tank Farm soil release sites has been deferred pending further characterization and coordination of any proposed remedial actions with the Idaho HLW & FDEIS and RCRA closure of the tanks. A separate RI/FS, Proposed Plan, and ROD will be prepared for the Tank Farm soil under OU 3-14. Interim actions were evaluated under the OU 3-13 ROD to provide protection until a final remedy is developed and implemented. The DOE-ID, EPA, and the IDHW have determined that the OU 3-13 interim action will be protective of human health and the environment while the OU 3-14 RI/FS is being performed and a final remedy is selected (DOE-ID 1999a).

For convenience and to facilitate the Tank Farm soil investigations, the soil has been divided into three sections: 0 to 3 m (0 to 10 ft) bgs, 3 to 13.7 m (10 to 45 ft) bgs, and 0 to 13.7 m (0 to 45 ft) bgs. The purposes for the divisions are described below.

- 0 to 3 m (0 to 10 ft) bgs—includes the Tank Farm soil near the surface that poses an external risk and that can reasonably be remediated

- 3 to 13.7 m (10 to 45 ft) bgs—this is the Tank Farm soil that may not be feasible to remediate due to underground tanks and pipes and high radiation levels

- 0 to 13.7 m (0 to 45 ft) bgs—this is the soil that poses a groundwater risk from leaching and from which the total Tank Farm source will be determined.

4.4.1.2 DQO STEP 2—Identify the Decisions. This step of the DQO process lays out the principle study questions, alternative actions, and corresponding decision statements that must be answered to effectively address the above stated problem. The primary decisions involve defining the locations, spacial extent, and concentrations of contaminant releases in the Tank Farm soil, determining contamination mobility, and characterizing the moisture flux moving through the Tank Farm soil. This information is necessary for developing remedial actions that will minimize contamination in the soil from leaching out and eventually being transported to the SRPA.

Principal Study Questions—The purpose of the principal study question (PSQ) is to identify key unknown conditions or unresolved issues that, when answered, provide a solution to the problem being investigated, as stated above. The PSQs for this project are as follows:

PSQ-1a: What is the number and spacial extent of the high contamination zones in the 0 to 3 m (0 to 10 ft) bgs depth range?

PSQ-1b: What is the number and spacial extent of the high contamination zones in the 0 to 13.7 m (0 to 45 ft) bgs depth range? (This is required for the evaluation of groundwater risk and possible remedial alternatives.)

PSQ-2a: What are the radionuclide contaminants in each of the high-contamination zones (from 0 to 13.7 m [0 to 45 ft] bgs)?

PSQ-2b: Are there non-radionuclide contaminants present in the Tank Farm soil from 0 to 13.7 m (0 to 45 ft) bgs (in addition to those currently identified)?

PSQ-3: What is the extent of the mobility of each of the contaminants within each of the identified soil matrices?

PSQ-4a What is the vertical moisture flux moving from the Tank Farm soil into the basalt?

PSQ-4b What is the horizontal moisture flux moving into the Tank Farm soil?

PSQ-5 Based on new data obtained during evaluation of the Tank Farm high contamination zones and soil moisture, what are the best final remedial approaches?

Alternative Actions—Alternative actions (AA) are those actions possible resulting from resolution of the above PSQ's. The types of actions considered will depend on the answers to the PSQ's. Each alternative presents two alternatives (A and B).

AA-1a: A: Data that are needed for evaluation of the external risk and remedial alternatives are available and sufficient to identify affected soil, soil volumes, and concentration levels of contaminated soil for major release sites in the 0 to 3 m (0 to 10 ft) bgs depth at the Tank Farm. Proceed with data collection. (No consequence is associated with this alternative.)

B: Insufficient data or data without high resolution are available and add uncertainty to the identification and quantification of the major Tank Farm high contamination areas. Proceed with gathering more information to make a decision. (The consequence of this alternative is that additional information will be required in order to evaluate remedial technology.)

AA-1b: A: Data that are needed for evaluation of the external risk and remedial alternatives are available and sufficient to identify affected soil, soil volumes, waste types, and concentration levels of contaminated soil for major release sites in the 0 to 13.7 m (0 to 45 ft) bgs depths at the Tank Farm. Calculate a source term for the Tank Farm soil. Proceed with further characterization. (No consequence is associated with this alternative.)

B: Phase I logging data do not have sufficient energy resolution for determining the specific radionuclide(s) generating anomalous gamma radiation. Logging data will only include gross gamma and will not provide speciation. Conduct additional data collection. (The consequence of this alternative is that additional information will be required in order to evaluate remedial technology.)

AA-2a	A: The contaminants currently identified are the only radionuclides that are present in the Tank Farm soil that are above risk based action levels and are a potential threat to the SRPA. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Other radionuclide contamination, in addition to the OU 3-13 COPCs, are present that are above risk based action levels and could potentially pose a threat to the SRPA. Evaluate all OU 3-14 COPCs to determine contaminated soil volumes, waste types, Tank Farm soil source term, etc. and to determine the appropriate remedial actions. (The consequence of this alternative is that all of the OU 3-14 COPCs need to be identified in order for remedial actions to address them.)
AA-2b	A: Mercury, chromium, arsenic, nitrates, and thallium are the only non-radionuclide contaminants in the Tank Farm soil that are above risk based action levels and are identified as OU 3-14 COPCs. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Data suggests that other non-radioactive contaminants may be OU 3-14 COPCs. Evaluate all OU 3-14 COPCs to determine contaminated soil volumes, waste types, Tank Farm soil source term for appropriate remedial actions. (The consequence of this alternative is that all of the OU 3-14 COPCs need to be identified in order for remedial actions to address them.)
AA-3	A: Contaminants are strongly sorbed to the Tank Farm soil. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Contaminants are mobile and are being or potentially can be leached out of the Tank Farm soil. Evaluate threat and possible need of immediate and appropriate remedial actions. (The consequence is that immediate remediation may be required. This is further discussed in DQO Step 4, Section 4.4.1.4.)
A-4a	A: Moisture data indicate there is insignificant flux through the Tank Farm soil to transport contaminants into the basalt, into the perched water and potentially to the SRPA. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Moisture data indicate that there is sufficient flux moving through the Tank Farm to transport contaminants to the perched water and subsequently to the SRPA. Evaluate for possible Stage II actions (see Step 4). (The consequence is that if there is significant contaminant flux, immediate remediation may be required.)
AA-4b	A: Data indicate there is little moisture moving into the Tank Farm soil horizontally. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Moisture data indicate that significant horizontal flux exists in the Tank Farm soil. Evaluate for possible Stage II actions and proceed with investigation. (The consequence is that, if moisture is moving laterally, immediate remedial actions may be required and lateral flux will be a necessary consideration for long-term remedial actions.)

AA-5 A: Data are adequate to characterize the Tank Farm soil, write a RI/FS, and develop appropriate remedial alternatives. Proceed with remedial technology evaluation. (No consequence is associated with this alternative.)

B: There is still too much uncertainty to develop an RI/FS or suggest appropriate remedial actions. Conduct further investigations until there is sufficient understanding to recommend appropriate remedial technology. (The consequence is that more data will be required.)

Decision Statements—The decision statements (DS) combine the PSQ and AA into a concise statement of action. The DS for each of the PSQ's are stated below.

DS-1a: Determine whether the field screening methods have successfully identified all high contamination sites (16 to 23 pCi/g for Cs-137)[a] in the Tank Farm soil (0 to 3 m [0 to 10 ft] bgs) with a volume of ≤ 70 $ft^3$of soil surrounding the probe hole. This information drives the evaluation of remedial action, technology and design.

DS-1b: Determine whether the field-screening methods have successfully identified all high-contamination sites (16 to 23 pCi/g for Cs-137)[a] from 0 to 13.7 m (0 to 45 ft) bgs in the Tank Farm soil with a volume ≤ 70 ft^3 of soil surrounding the probe hole. This information drives the evaluation of remedial technology and design.

DS-2a: Determine whether additional radionuclides in either the soil or soil-pore water are present at concentration levels greater than risk action levels. If so, they will become OU 3-14 COPCs.

DS-2b: Determine whether additional non-radionuclide contaminants are identified in concentrations above risk-based action levels. If so, they will be added to the OU 3-14 COPC list.

DS-3: Determine whether contaminants are being transported out of the Tank Farm soil.

DS-4a: Determine whether the flux out of the soil is stopped by the interim actions. (An additional benefit of moisture characterization may be the identification of major recharge sources.)

DS-4b: Determine whether moisture is moving into the Tank Farm soil (under the temporary cover) from areas outside the Tank Farm.

DS-5: The recommended remedial action will be based on hydraulic, geochemical, and physical drivers, the success of the interim actions, and the comparison of identified requirements, associated technology, and their costs.

4.4.1.3 DQO STEP 3—Identify Inputs to the Decision. This step of the DQO process identifies the informational inputs that are required to answer the decision statements made above.

a. This value, arrived at in the coarse of decision actions taken at other NEEL WAG sites, is the concentration of Cs-137 in soil that after 100 years no longer presents any risk.

Inputs for PSQ-1a—PSQ-1a will be answered through a combination of inputs. Primarily, release records along with the gamma survey data will be used to determine the spatial extent of the Tank Farm soil contamination at the 0 to 3 m (0 to 10 ft) bgs. Because the gamma survey will detect only gamma emitters though other radioactive contamination also is likely to be present, a ratio technique will be developed that will predict concentrations of other radioactive contamination potentially present based upon the gamma survey and process knowledge. The input sources for answering the question are the following:

- Historical records
- Process knowledge
- Gamma survey data
- Neutron survey data
- Nuclear constants
- Ratio estimation
- Soil analytical results.

The best available information will serve as the basis for estimating quantities of Cs-137 and other radionuclides. The results will be presented in relative terms only, i.e., the logging detector will no be quantatively calibrated to measure absolute Cs-137 concentration since Phase I is intended as a screening effort only. Relative amounts of other radionuclides may be scaled relative to Cs-137 using radionuclide ratios obtained from one of the following sources:

- Process knowledge concerning the chemistry of the originating waste stream(s), if this can be determined for the release site being examined
- Sample analysis on vacuum excavated soil from the same or nearby probehole.
- The primary purpose of Phase I is to characterize the spatial distribution of gamma- emitting radionuclides as an indicator for overall contamination distribution. Detailed speciation and sampling will be conducted during Phase II, based on Phase I results.

Inputs for PSQ-1b—Contaminant concentrations and locations in the Tank Farm soil from 0 to 13.7 m (0 to 45 ft) bgs will be determined similarly to PSQ-1a.

The input sources for answering PSQ-1b are the following:

- Historical records
- Process knowledge
- Gamma survey data
- Neutron survey data
- Nuclear constants

- Ratio estimation
- Soil analytical results.

Inputs for PSQ-2a—Identification of the radioactive OU 3-14 COPCs for the Tank Farm soil is required to support numerical modeling and development of remedial actions. Development of the OU 3-14 COPCs will rely primarily on the analytical data, field screening data, and model predictions. Information from the following sources is needed.

Inputs sources for answering PSQ-2a are the following:

- Historical records
- Soil analytical data
- Soil-pore water analytical data
- Field screening data
- Risk analysis results
- Model predictions
- Hydraulic properties
- K_d data.

Inputs for PSQ-2b—Information on any non-radioactive contaminants present in the Tank Farm soil is important for modeling considerations and the evaluation of potential remedial actions. Like the radioactive OU 3-14 COPCs, the non-radioactive OU 3-14 COPCs will be based primarily on soil and water analyses but can include input from the following sources.

The inputs to answer PSQ-2b are the following:

- Historical records
- Process knowledge
- Soil analytical data
- Soil-pore water analytical data
- Field screening data
- Risk analysis results
- Model predictions
- Hydraulic properties
- K_d data.

Inputs for PSQ-3—The mobility of contaminants will be determined through selected soil leach and absorption studies. However, input from all of the following sources will be used to determine the potential for the contaminants to be transported from the Tank Farm soil. Potential contaminant mobility will be considered when evaluating remedial alternatives.

- Analytical concentration data
- Selected soil extractions (leach and absorption studies)
- K_d data
- Site-specific geochemistry data
- Model predictions
- Hydraulic properties

Inputs for PSQ-4a—Potential transport of contaminants is a function of two factors: the mobility (addressed in PSQ-3) and the amount of flux that is available to transport contaminants. Moisture content of the Tank Farm soil is directly related to the flux, which can result from recharge sources located either within or above the Tank Farm soil or that are removed from the Tank Farm area. PSQ-4 is concerned with both vertical and horizontal flux. The inputs to answer PSQ-4a will answer the question regarding vertical flux. Vertical flux will be determined by measuring vertical profiles of moisture content and matric potential at locations within the Tank Farm.

The input sources for answering PSQ-4a are the following:

- Vertical profile moisture data
- Vertical profile matric potential data
- Contaminant concentrations
- Model predictions
- Hydraulic property data
- Recharge sources.

Inputs for PSQ-4b. Horizontal flux results from recharge sources located adjacent to the area that is sealed by the Tank Farm membrane (Interim action, DOE-ID 1999b) that may cause water to move laterally through the Tank Farm soil. A horizontal flux can cause contaminants to redistribute in the soil and can promote contaminant transport into the basalts. The existence of horizontal fluxes will be determined by measuring moisture profiles and hydraulic gradients in horizontally spaced stations.

The inputs for answering PSQ-4b are the following:

- Moisture data
- Matric potential data

- Contaminant concentration data
- Model predictions
- Hydraulic property data
- Recharge source.

Inputs for PSQ-5—A decision on PSQ-5 will require characterization of the Tank Farm soil contamination chemistry and hydrology to a sufficient extent that appropriate remedial actions can be selected. Inputs for this decision will include all of the data previously developed. The input sources for answering PSQ-5 include the following:

- Final OU 3-14 Tank Farm soil COPC list
- Concentration levels
- Contaminant flux
- Number of high contamination zones
- Waste volume
- Tank heels
- Recharge water/sources
- Deep drainage
- Site-specific geochemistry
- Hydraulic properties
- Model predictions
- Waste types (e.g. TRU, RCRA, characteristic, TSCA, and mixed)
- Remedial cost
- Impracticability of technology
- Technical feasibility, maturity, and efficacy of remedial technology
- Source term for the Tank Farm soil
- Source term for the Tank Farm soil and closed tanks combined.

4.4.1.4 DQO STEP 4—Define the Boundaries of the Study. This study focuses on sufficiently characterizing the Tank Farm soil to understand the contamination types, levels, distribution, associated risks, and area hydrology and geochemistry for the purpose of identifying effective remedial actions for the OU3-14 RI/FS, proposed plan, and ROD.

Specifically included in this study is the contamination in the surface soil (from the surface to top of basalt) at the Tank Farm. The physical boundaries of the study are the Tank Farm area known as Site CPP-96. Site CPP-96 includes CPP-15, CPP-16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP-30, CPP-31, CPP-32, CPP-33, CPP-58 and CPP–79. These are all the sites within the Tank Farm or adjacent to the PEW evaporator building. At depth, the boundaries of the study area are from the surface to the top of basalt. This depth varies with location but averages about 13.7 m (45 ft).

The OU 3-14 RI/FS Investigation activities are anticipated to occur over six years, with two field investigations. Boundaries on the stages are shown below:

- Field Investigation Phase I: Gamma Radiation Field Screening and soil sampling
- Field Investigation Phase II: Soil Sampling and Moisture Monitoring
- Contaminant Transport and Treatability Studies
- Risk Assessment and Groundwater Modeling
- RI/FS Report
- OU 3-14 ROD Preparation

The OU 3-14 Post-Record of Decision Tank Farm remedial activities are anticipated to be undertaken in four stages timed to accommodate facility RCRA closure. Boundaries on the stages are shown below:

- Stage I: Moisture monitoring and control
- Stage II: Address immediate threats during Tank Farm operations and RCRA closure of some high level waste tanks
- Stage III: Begin remediation of post-RCRA closure of the high level waste tanks but before D&D&D of the surrounding area and buildings
- Stage IV: Final remedy for the Tank Farm area after all INTEC D&D&D activities are complete.

In addition to the physical and time boundaries, shown above, other boundaries (listed below) could possibly impact the project.

Schedule boundaries: The schedule may be impacted by the budget allotted to the remedial action. Any loss in the budget without adjustment in scope will extend the schedule. That action may adversely impact the mitigation of the transport of contaminants to the SRPA.

Budget boundaries: The budget is anticipated to remain at a constant funding level during the course of the project (1.8 M/year from FY-2001 through FY-2006 for both the Tank Farm soil and the injection well investigations). This will require that remedial actions be optimized not only technically but also financially.

Concentration boundaries: These boundaries result from contaminant concentrations. For radionuclide concentrations the boundaries extend from low concentrations to the risk-based action levels agreed to in the OU 3-13 ROD. A high dose rate could drive remote remedial methods. Other remedial considerations related to concentration levels include upper inventory levels of possible waste disposal facilities. Metals concentration levels should not impact remedial activities. Should high volatile organic compound (VOC) levels be present, some remedial activities could be affected (e.g., grout and thermal processes).

Moisture boundaries: Moisture boundaries with the potential to impact the OU 3-14 investigation and remediation are only on the high side. Saturated moisture conditions mandate immediate action. Conditions probably can not become too dry.

Operational boundaries: The remediation of the Tank Farm soil will occur in remedial stages (shown above) to cooperate and not interfere with operational activities. Activities in each stage could be impacted by ongoing operations.

Treatment evaluation boundaries: The evaluation of remedial technologies may potentially be impacted by a variety of laboratory-related influences including scale, contamination levels, and heterogeneity. It also may be impacted by the maturity of the treatment.

Integration boundaries: Final remediation may be impacted by the integration of any or all of the above boundaries.

4.4.1.5 DQO STEP 5—Develop a Decision Rule. This step of the DQO process brings together the outputs from Steps 1 through 4 into a single statement describing the basis for choosing among the listed alternatives.

- Decision Rule (DR)-1a: If high resolution data are available and sufficient to identify affected soil, soil volumes, and concentration levels of contaminated soil for all major release sites in the 0 to 3 m (0 to 10 ft) bgs depths at the Tank Farm then proceed with AA-1a A. If not, proceed with AA-1a B.

- DR-1b: If high resolution data are available and sufficient to identify affected soil, soil volumes, waste types, and concentration levels of contaminated soil for major release sites in the 0 to 13.7 m (0 to 45 ft) bgs depths at Tank Farm, proceed with AA-1b A. If not, proceed with AA-1b B.

- DR-2a: If OU 3-13 COPCs are the only radionuclides that are present in the Tank Farm soil that are above risk based action levels and are a potential threat to the SRPA and they become OU 3-14 COPCs, proceed with AA-2a A. Otherwise proceed with AA-2a B.

- DR-2b: If Hg, Cr, As, Th, and nitrates are the only non-radionuclide contaminants in the Tank Farm soil that are above risk based action levels and are identified, and they become OU 3-14 COPCs, then proceed with AA-2b A. Otherwise, proceed with AA-2b B.

- DR-3: If contaminants are strongly sorbed to the Tank Farm soil, then proceed with AA-3 A. Otherwise, proceed with AA-3 B.

- DR-4a: If moisture data indicate there is insignificant flux through the Tank Farm soil to transport contaminants down to the perched water and potentially to the SRPA, then proceed with AA-4a A. Otherwise, proceed with AA-4a B.

- DR-4b: If data indicates there is not significant moisture moving into the Tank Farm Soil laterally, then proceed with AA-4b A. Otherwise, proceed with AA-4b B.

- DR-5: If data are adequate to characterize the Tank Farm soil, write a RI/FS, and develop appropriate remedial AAs, then proceed with AA-5 A. Otherwise, proceed with AA-5 B.

4.4.1.6 DQO STEP 6—Specify Tolerable Limits on Decision Errors. This step of the DQO process sets out the acceptable limits on decision errors. These limits are used to establish performance goals for the data collection design.

Data collected to determine whether additional contaminants in the Tank Farm soil are at concentration levels equal to or greater than risk-based action levels (DS-2a and DS-2b) are amenable to statistically based limits on decision errors. Hypothesis testing will be utilized to determine if action levels are exceeded to resolve Principal Study Questions 2a and 2b (PSQ-2a and PSQ-2b). The null hypothesis, H_0, is that the true mean of a contaminant is greater than or equal to the risk-based action level. The alternative is that the true mean is less than the risk-based action level.

- H_0: $\mu \geq$ action level

- H_a: $\mu <$ action level

The hypothesis testing will be performed to a level of significance, α, of 0.05. In other words, with this level of significance, we limit the probability of a Type I error, or of rejecting the null hypothesis when it is true, to 5%. The hypothesis testing is designed to allow us to control the probability or erroneously concluding that action levels are not exceeded when in fact they are exceeded. The null hypothesis was formulated based upon the belief that the harmful consequences of incorrectly concluding that an action level is not exceeded when it actually is exceeded outweigh the consequences of incorrectly concluding that the action level is exceeded when in fact it is not.

Statistically based decision errors are not appropriate for the other decision statements.

4.4.1.7 DQO STEP 7—Optimize the Design. The information necessary to evaluate remedial alternatives and develop the feasibility study will be obtained from the site characterization and, if deemed necessary, treatability and contaminant transport studies. A final decision will be made in the OU 3-14 ROD. It is envisioned that four stages will occur, following the OU 3-14 Tank Farm Field Investigation Phases, I and II, and the OU 3-14 ROD.

Stage I. Activities included in this stage will focus on moisture monitoring and control. It is during this stage that the Phase I characterization activities will occur, in addition to the OU 3-13 Tank Farm Interim Action. Phase I activities include: the surface geophysics/gamma surveys, installation of the probeholes, gamma logging of the probeholes, and direct sampling of selected vacuumed soil stored in drums from the probehole installation activities. Technical papers to be prepared during Phase I include: Phase I data summary report and a remedial alternative screening report.

Stage II. During this stage immediate threats during Tank Farm operations and RCRA closure of some high level waste tanks will be addressed. During this stage, Phase II characterization will be implemented, along with continuing the OU 3-13 Tank Farm Interim Action. Phase II involves conducting a more detailed soil gamma survey, and potentially collecting soil samples from specific areas, i.e., hot spots, to characterize contaminants, waste types, and source terms. This would involve the installation of large-diameter probe holes and moisture monitoring stations, initiation of moisture monitoring, and contaminant mobility studies. If deemed necessary, treatability studies may also be initiated during this phase, which would evaluate in situ stabilization, grouting, and other technologies that are under consideration. Technical papers to be prepared during Phase II include: Phase II data summary report, contaminant transport study report, risk assessment strategy, groundwater strategy, conceptual model report, RI/BRA report, treatability study report (if treatability studies are performed), and a feasibility study report.

Stage III. During this stage remediation of post-RCRA closure of the high-level waste-tanks will began, in addition to continuing the OU 3-13 Tank Farm Interim Action. This stage will occur before D&D&D of the surrounding area and buildings.

Stage IV. Activities in this stage include the final remedy (compatible with the OU 3-13 Tank Farm Interim Action) for the Tank Farm area after all INTEC D&D&D activities are complete.

4.4.2 INTEC Injection Well and Aquifer Within the INTEC Fence Line

The following sections discuss the DQOs developed to govern the injection well investigation. The DQOs developed for the INTEC injection well are summarized in Table 4-2 (The table follows the DQO section).

4.4.2.1 DQO STEP 1—State the Problem. The potential problem involving the SRPA inside the INTEC fence line, the injection well and involves uncertainty in characterizing the residual contamination resulting from its use. The injection well is known to have injected contaminated fluids into the SRPA. A 37-m (120-ft) sediment column has built up inside casing. The sediment is thought to be either an accumulation of materials that were suspended in the wastewater or sediment that caved in from the well sides during periods of well repair. The volume of residual contamination is not well characterized, as are the specific contaminants, their amounts, concentrations, and mobility. There is also uncertainty regarding the potential for residual contamination in the sediment and SRPA materials to become a secondary source of contamination to the SRPA.

The Track 2 Summary Report for CPP-23 CPP Injection Well (1994), Comprehensive RI/FS for OU 3-13 at the INEEL – Part A, RI/BRA Report (DOE-ID 1997) and the OU 3-13 Record of Decision (DOE-ID 1999) identified several contaminants that may have been discharged to the injection well. Based on these reports, the contaminants of potential concern (COPCs) for the injection well include I-129, Sr-90, Pu-isotopes, H-3, Am-241, Tc-99, Cs-137, Co-60, Eu-152/-154, arsenic, chromium, mercury, nitrate/nitrite, and osmium. In addition, the injection well has completed RCRA closure as described in the Final Closure Plan for LDU CPP-23 Injection Well (MAH-FE-PL-304) (DOE-ID 1990). In Section 2.1 of this closure plan, it states that "The only known contaminant release to the well identified as a RCRA concern is the mercury release which occurred in March 1981."

As part of the closure effort, a sediment sample was collected from the injection well by the USGS on August 31, 1989 and analyzed for 40 CFR 261 Appendix VIII hazardous constituents, for which EPA-approved methods exist. Analyses of the sediment sample detected traces of metals, radioactivity, and PCBs. No organic compounds, other than PCBs, were detected in the sediment sample from the injection well. The closure plan also required the collection and Appendix VIII analysis groundwater samples from the adjacent wells (USGS-40 and USGS-47) and the production well (Production Well #1). Theses results also did not detect organic compounds in the groundwater.

Table 4-1. OU 3-14 Tank Farm soil DQOs.

1: State the Problem	2: Identify the Decision			3: Identify Inputs to the Decision	4: Define the Study Boundaries
Background: The Tank Farm soil has become contaminated by spills and pipeline leaks of radioactive liquids from plant and transfer operations. In addition to the known highly contaminated areas, low levels of contamination exist at varying locations and depths. Limited knowledge of the extent (both vertically and horizontally) of contamination, volume of spilled material, types of contaminants, and contamination levels is available because many of the spill sites are in operational and highly radioactive sites. The principal threats posed by contaminated Tank Farm soil is external exposure to radiation and leaching and transport of contaminants to the perched water SRPA where future groundwater users could consume contaminated SRPA groundwater. The Tank Farm soil are defined as the soil that exist from the surface down to the uppermost basalt flow and include release sites in OU 3-06, 3-07, 3-08, and 3-11. These sites are located within the Tank Farm boundary (Sites CPP-15, CPP -16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP -30, CPP-31, CPP-32, CPP-33, CPP-58, and CPP–79), cumulatively known as Site CPP-96. Contaminants of potential concern (OU 3-13 COPCs) evaluated in the OU 3-13 ROD or in the OU 3-13 RD/RA include: Am-241,Ce-144, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Np-237, Pu-238, Pu-239/240 , Pu-241, Pu-242, Ru-106, Sr-90, tritium, Tc-99, U-234, U-235, U-236, and zirconium. Known non-radionuclide contaminants include As, Cr, Hg (mercuric nitrate), nitrate (nitric acid), and thallium. The OU 3-13 ROD showed that Cs-137, Sr-90, and U-235 were a risk to human health. Volatile organic compounds and SVOCs were identified as COPCs for release Site CPP-15 during previous OU 3-08 Track 2 investigations (WINCO 1993b), but were screened out as not being a risk concern. Given the type of sampling technique being implemented for Phase I Characterization, it is not possible to sample for VOCs and SVOCs at CPP-15 in Phase I. The concern for VOC and SVOC contamination will be addressed as part of the Phase II Characterization Work Plan. A final CERCLA remedy for the Tank Farm soil release sites has been deferred pending further characterization and coordination of any proposed remedial actions with the Idaho HLW & FD EIS and RCRA closure of the tanks. A separate RI/FS, Proposed Plan, and ROD will be prepared for the Tank Farm soil under OU 3-14. Interim actions were evaluated under the OU 3-13 ROD to provide protection until a final remedy is developed and implemented. The DOE-ID, EPA, and the IDHW have determined that the OU 3-13 interim action will be protective of human health and the environment while the WAG 3 OU3-14 RI/FS is being performed and a final remedy is selected (DOE-ID 1999b). For convenience and to facilitate the Tank Farm soil investigations, the soil have been divided into three sections: 0 to 3 m (0 to 10 ft bgs), 3 to 13.7 m (10 to 45 ft bgs), and 0 to 13.7 m (0 to 45 ft bgs). The purpose for the divisions are described below. .3 m (0 to 10 ft bgs)—includes the Tank Farm soil near the surface that can reasonably be remediated 3 to 13.7 m (10 to 45 ft bgs)—these are the Tank Farm soil that may not be feasible to remediate due to underground tanks and pipes and high radiation levels 3–13.7 m (0 to 45 ft bgs)—these are the soil from which the total Tank Farm source will be determined. Because the Tank Farm is an operational facility, future leaks and spills are possible.	Success at meeting the remedial action objective will be determined by obtaining sufficient characterization data to develop a RI/FS, proposed plan, and ROD from which a remedial action can be selected that will prevent contaminants in the Tank Farm soil from being leached down to the perched water and possibly contaminating the SRPA.				This study focuses on sufficiently characterizing the Tank Farm soil to understand the contamination types, levels, and distribution and the risks associated with the contamination, the areal hydrology, and the geochemistry for the purpose of identifying effective remedial actions for the OU3-14 RI/FS, proposed plan, and ROD. Specifically included in this study is the contamination in the surface soil (from the surface to top of basalt) at the Tank Farm. The physical boundaries of the study are the Tank Farm area known as Site CPP-96. Site CPP-96 includes CPP-15, CPP-16, CPP-20, CPP-24, CPP-25, CPP-26, CPP-27, CPP-28, CPP-30, CPP-31, CPP-32, CPP-33, CPP-58 and CPP–79. These are all the sites within the Tank Farm or adjacent to the PEW evaporator building. The boundary is defined in the OU 3-14 Scope of Work (DOE-ID 1999a). At depth, the boundaries of the study area are from the surface to the top of basalt. This depth varies with location but averages about 13.7 m (45 ft). OU 3-14 Characterization Investigation activities: • Field Investigation Phase I • Field Investigation Phase II • Contaminant Transport and Treatability Studies • Risk Assessment and Groundwater Modeling • RI/FS Report • OU 3-14 ROD Preparation The Post-ROD OU 3-14 Tank Farm remedial activities are anticipated to be undertaken in four stages timed to accommodate facility RCRA closure. Boundaries on the stages are shown below. • Stage I: Moisture monitoring and control • Stage II: Address immediate threats during Tank Farm operations and RCRA closure of some high level waste tanks • Stage III: Begin remediation of post-RCRA closure of the high level waste tanks but before D&D&D of the surrounding area and buildings • Stage IV: Final remedy for the Tank Farm area after all INTEC D&D&D activities are complete. Site characterization is anticipated to be initiated in two phases. In addition to the physical and time boundaries, shown above, other boundaries (listed below) could possibly impact the project. *Schedule boundaries*: The schedule may be impacted by the budget allotted for the remedial action. Any loss in the budget without adjustment in scope will extend the schedule. That action may adversely impact the mitigation of the transport of contaminants to the SRPA. *Budget boundaries:* The budget is anticipated to remain at a constant funding level during the course of the investigation. This will require that remedial actions be optimized not only technically but also financially.
	Principal Study Questions	Alternative Actions	Decision Statement		
	PSQ-1a: What is the number and spatial extent of the high contamination zones in the 0 to 3 m (0 to 10-ft) depth range? (This is required for evaluation of the residential and external risk and possible remedial alternatives.)	A: High-resolution data that are needed for evaluation of the external risk and remedial alternatives are available and sufficient to identify affected soil, soil volumes, and concentration levels of contaminated soil for major release sites in the 0 to 10-ft depth at the Tank Farm. Proceed with data collection. (No consequence is associated with this alternative.) B: Insufficient data or data without high resolution are available and add uncertainty to the identification and quantification of the major Tank Farm high-contamination areas. Proceed with gathering more information to make decision. (The consequence of this alternative is that additional information will be required in order to evaluate remedial technology.)	DS-1a: Determine whether the field screening methods have successfully identified all high contamination sites (16 to 23 pCi/g for Cs-137) in the Tank Farm soil 0 to 3 m (0 to 10 ft bgs) with a volume of $\leq$ 70 ft^{3}of soil surrounding the probe hole. This information drives the evaluation of remedial technology and design.	Inputs to the PSQ-1a decision include: Historical records Process knowledge Gamma survey data Neutron survey data Nuclear constants Ratio estimation Soil analytical results	
	PSQ-1b: What is the number and spatial extent of the high contamination zones in the 0 to 13.7 m (0 to 45-ft) depth range? (This is required for the evaluation of groundwater risk and possible remedial alternatives.)	A: High resolution data that are needed for evaluation of the external risk and remedial alternatives are available and sufficient to identify affected soil, soil volumes, waste types, and concentration levels of contaminated soil for major release sites in the 0 to 45 ft depths at the Tank Farm. Calculate a source term for the Tank Farm soil. Proceed with further characterization. (No consequence is associated with this alternative.) B: Insufficient data or data without high resolution are available and add uncertainty to the identification and quantification of the major Tank Farm high contamination areas. Conduct additional data collection. (The consequence of this alternative is that additional information will be required in order to evaluate remedial technology.)	DS-1b: Determine whether the field-screening methods have successfully identified all high-contamination sites (16 to 23 pCi/g for Cs-137) from 0 to 13.7 m (0 to 45 ft bgs) in the Tank Farm soil with a volume $\leq$ 70 ft^3 of soil surrounding the probe hole. This information drives the evaluation of remedial technology and design.	Inputs to the PSQ-1b decision include: Historical records Process knowledge Gamma survey data Neutron survey data Nuclear constants Ratio estimation Soil analytical results	
	PSQ-2a: What are the radionuclide contaminants in each of the high contamination zones (from 0 to 13.7 m [0 to 45 ft bgs])?	A: The contaminants currently identified are the only radionuclides that are present in the Tank Farm soil that are above risk based action levels (OU 3-13 COPCs) and are a potential threat to the SRPA. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Other radionuclide contamination, in addition to the OU 3-13 COPCs, are present that are above risk based action levels and could potentially pose a threat to the SRPA. Evaluate all OU 3-14 COPCs to determine contaminated soil volumes, waste types, Tank Farm soil source term, etc. and to determine the appropriate remedial actions. (The consequence of this alternative is that all of the OU 3-14 COPCs need to be identified in order for remedial actions to address them.)	DS-2a: Determine whether additional radionuclides in either the soil or soil-pore water are present at concentration levels greater than risk action levels. If so, they will become OU 3-14 COPCs.	Inputs to the PSQ-2a decision include Historical records Soil analytical data Soil-pore water analytical data Field screening data Risk analysis results Model predictions Hydraulic properties K_d data	
	PSQ-2b: Are there non-radionuclide contaminants present in the Tank Farm soil from 0 to 45 ft bgs (in addition to those currently identified)?	A: Mercury, chromium, arsenic, thallium, and nitrates are the only non-radionuclide contaminants in the Tank Farm soil that are above risk based action levels and are identified as OU 3-14 COPCs. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Data suggests that other non-radioactive contaminants may become OU 3-14 COPCs. Evaluate all OU 3-14 COPCs to determine contaminated soil volumes, waste types, Tank Farm soil source term, etc. and for appropriate remedial actions. (The consequence of this alternative is that all of the OU 3-14 COPCs need to be identified in order for remedial actions to address them.)	DS-2b: Determine whether additional non-radionuclide contaminants are identified in concentrations above risk-based action levels. If so, they will be added to the OU 3-14 COPC list for the Tank Farm soil.	Inputs to the PSQ-2b include Historical records Process knowledge Soil analytical data Soil-pore water analytical data Field screening data Risk analysis results Model predictions Hydraulic properties K_d data	
	PSQ-3: What is the extent of the mobility of each of the contaminants within each of the identified soil matrices??	A: Contaminants are strongly sorbed to the Tank Farm soil. Proceed with remedial investigation. (No consequence.) B: Contaminants are mobile and are being or potentially can be leached out of the Tank Farm soil. Evaluate the threat and possible need of immediate and appropriate remedial actions. (The consequence is that immediate remediation may be required.)	DS-3: Determine whether contaminants are being transported out of the Tank Farm soil.	Inputs to the PSQ-3 decision include: Analytical concentration data Selected soil extractions (leach and absorption studies) K_d data Site-specific geochemistry Model predictions Hydraulic properties	
	PSQ-4a: What is the vertical moisture flux moving from the Tank Farm soil into the basalt?	A: Moisture data indicate there is insignificant flux through the Tank Farm soil to transport contaminants into the basalt, into the perched water and potentially to the SRPA. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Moisture data indicate that there is enough flux moving through the Tank Farm soil to transport contaminants to the perched water and potentially to the SRPA. Evaluate for possible Stage II actions. (The consequence is that if there is significant OU 3-14 COPC flux, immediate remediation may be required.).	DS-4a: Determine whether the flux out of the soil is stopped by the interim actions. (An additional benefit of moisture characterization may be the identification of major recharge sources.)	Inputs to the PSQ-4a decision include: Moisture data Matric potential data Contaminant concentrations Model predictions Hydraulic property data Recharge sources	
	PSQ-4b: What is the horizontal moisture flux into the Tank Farm soil?	A: Data indicate there is little moisture moving into the Tank Farm soil horizontally. Proceed with remedial investigation. (No consequence is associated with this alternative.) B: Moisture data indicates that a significant lateral flux exists in the Tank Farm soil. Evaluate for possible Stage II actions and proceed with investigation. (The consequence is that if moisture is moving laterally, immediate remedial actions may be required and lateral flux will be a necessary consideration for long-term remedial actions.).	DS-4b: Determine whether moisture is moving into the Tank Farm soil (under the temporary cover) from areas outside the Tank Farm.	Inputs to the PSQ-4b decision include: Moisture data Matric potential data Contaminant concentration data Model predictions Hydraulic property data Recharge source K_d data	

Table 4-1. (continued).

1: State the Problem	2: Identify the Decision			3: Identify Inputs to the Decision	4: Define the Study Boundaries
Problem Statement: The Tank Farm soil is known to be contaminated from historical spills and releases. Information from previous investigations about the nature and extent of the Tank Farm soil contamination is incomplete. The size, location, contaminant type, dose rate, source term, and OU 3-14 COPC (OU 3-14 Remedial Investigation determination) migration probability from the site need to be clarified for future remedial actions. The moisture content, contaminant flux out of the Tank Farm soil, and physical, hydraulic, and geochemical soil parameters are required.	PSQ-5 Based upon new data obtained during evaluation of the Tank Farm high contamination zones and soil moisture, what are the best final remedial approaches?	A: Data are sufficient to characterize the Tank Farm soil, write a RI/FS, and develop appropriate remedial alternatives. Proceed with remedial technology evaluation. (No consequence.) B: There is still too much uncertainty to develop an RI/FS or suggest appropriate remedial actions. Conduct further investigations until understanding is sufficient to recommend appropriate remedial technology. (The consequence is that more data will be required.)	DS-5: The recommended remedial action will be based on hydraulic, geochemical, and physical drivers; the success of the interim actions; and the comparison of the identified requirements, associated technologies, and their cost.	Inputs to the PSQ-5 decision include: Final OU 3-14 Tank Farm soil COPC list Concentration levels Contaminant flux Number of high contamination zones Waste volume Tank heels Recharge water/sources Site-specific geochemistry data Deep drainage Hydraulic properties Model predictions Waste types (TRU, RCRA, characteristic, TSCA, mixed, etc.) Remedial cost Impracticability of technology Technical feasibility of remediation technology Maturity of technology Efficacy of technology Source term for Tank Farm soil Source term for Tank Farm soil and closed tanks	*Moisture boundaries:* Moisture boundaries with the potential to impact the OU 3-14 investigation and remediation are only on the high side. Saturated moisture conditions mandate immediate action. The soil cannot become too dry. *Concentration boundaries:* These boundaries result from contaminant concentrations. For radionuclide concentrations the boundaries extend from low concentrations to the risk-based action levels agreed to in the OU 3-13 ROD. A high dose rate could drive remote remedial methods. Other remedial considerations related to concentration levels include upper inventory levels of possible waste disposal facilities. Metals concentration levels should not impact remedial activities. Should high VOC levels be present, some remedial activities could be affected, e.g., grout and thermal processes. *Operational boundaries:* The remediation of the Tank Farm soil will occur in stages (shown above) to cooperate and not interfere with operational activities. Activities in each stage of remediation could be impacted by ongoing operations. *Treatment evaluation boundaries:* The evaluation of remedial technologies may potentially be impacted by a variety of laboratory-related influences including scale, contamination levels, and heterogeneity. It may also be impacted by the implementability of the treatment. *Integration boundaries:* Final remediation may be impacted by the integration of any or all of the above boundaries.

Table 4-1. (continued).

<table>
<tr><th>5: Develop a Decision Rule</th><th>6: Specify Tolerable Limits on Decision Errors</th><th>7: Optimize the Design</th></tr>
<tr><td>DR-1a: If high resolution data are available and sufficient to identify affected soil, soil volumes, and concentration levels of contaminated soil for all major release sites in the 0 to 3 m (0 to 10-ft) depths at the Tank Farm then proceed with Alternative A. If not, proceed with Alternative B.</td>
<td rowspan="8">Data collected to determine whether additional contaminants in the Tank Farm soil are at concentration levels equal to or greater than risk-based action levels (DS-2a and DS-2b) are amenable to statistically based limits on decision errors. Hypothesis testing will be utilized to determine if action levels are exceeded to resolve Principal Study Questions 2a and 2b (PSQ-2a and PSQ-2b).

The null hypothesis, H_0, is that the true mean of a contaminant is greater than or equal to the risk-based action level. The alternative is that the true mean is less than the risk-based action level.

H_0: $\mu \geq$ action level
H_a: $\mu <$ action level

The hypothesis testing will be performed to a level of significance, α, of 0.05. In other words, with this level of significance, we limit the probability of a Type I error, or of rejecting the null hypothesis when it is true, to 5%. The hypothesis testing is designed to allow us to control the probability or erroneously concluding that action levels are not exceeded when in fact they are exceeded. The null hypothesis was formulated based upon the belief that the harmful consequences of incorrectly concluding that an action level is not exceeded when it actually is exceeded outweigh the consequences of incorrectly concluding that the action level is exceeded when in fact it is not.

Statistically based decision errors are not appropriate for the other decision statements.</td>
<td rowspan="8">The information necessary to evaluate remedial alternatives and develop the feasibility study will be obtained from the site characterization and, if deemed necessary, treatability and contaminant transport studies. A final decision will be made in the OU 3-14 ROD. It is envisioned that four stages of Post-OU 3-14 ROD remedial activities will occur.

Stage I. Activities included in Stage I will focus on moisture monitoring and control. It is during this stage that the Phase I characterization activities will occur, in addition to the OU 3-13 Tank Farm Interim Action. Phase I activities include: the surface geophysics/gamma surveys, installation of the probeholes, gamma logging of the probeholes, and direct sampling of selected vacuumed soil stored in drums from the probehole installation activities. Technical papers to be prepared during Phase I include: Phase I data summary report and a remedial alternative screening report.

Stage II. During Stage II immediate threats during Tank Farm operations and RCRA closure of some high level waste tanks will be addressed. During this stage, Phase II characterization will be implemented, along with continuing the OU 3-13 Tank Farm Interim Action. Phase II involves conducting a more detailed soil gamma survey, and potentially collecting soil samples from specific areas, i.e., hot spots, to characterize contaminants, waste types, and source terms. This would involve the installation of large-diameter probe holes and moisture monitoring stations, initiation of moisture monitoring, and contaminant mobility studies. If deemed necessary, treatability studies may also be initiated during this phase, which would evaluate in situ stabilization, grouting, and other technologies that are under consideration. Technical papers to be prepared during Phase II include: Phase II data summary report, contaminant transport study report, risk assessment strategy, groundwater strategy, conceptual model report, RI/BRA report, treatability study report (if treatability studies are performed), and a feasibility study report.

Stage III. During Stage III, remediation of post-RCRA closure of the high-level waste-tanks will began, in addition to continuing the OU 3-13 Tank Farm Interim Action. This stage will occur before D&D&D of the surrounding area and buildings.

Stage IV. Activities in Stage IV include the final remedy (compatible with the OU 3-13 Tank Farm Interim Action) for the Tank Farm area after all INTEC D&D&D activities are complete.</td></tr>
<tr><td>DR-1b: If high resolution data are available and sufficient to identify affected soil, soil volumes, waste types, and concentration levels of contaminated soil for major release sites in the 0 to 13.7 m (0 to 45-ft) depths at Tank Farm, proceed with Alternative A. If not, proceed with Alternative B.</td></tr>
<tr><td>DR-2a: If contaminants currently identified are the only radionuclides that are present in the Tank Farm soil that are above risk based action levels and are a potential threat to the SRPA, proceed with Alternative A. Otherwise proceed with Alternative B.</td></tr>
<tr><td>DR-2b: If Hg, Cr, As, and nitrates are the only non-radionculide contaminants in the Tank Farm soil that are above risk based action levels and are identified as OU 3-14 COPCs, then proceed with Alternative A. Otherwise, proceed with Alternative B.</td></tr>
<tr><td>DR-3: If contaminants are strongly sorbed to the Tank Farm soil, then proceed with Alternative A. Otherwise, proceed with Alternative B.</td></tr>
<tr><td>DR-4a: If moisture data indicate there is insignificant flux through the Tank Farm soil to transport contaminants down to the perched water and potentially to the SRPA, then proceed with Alternative A. Otherwise, proceed with Alternative B.</td></tr>
<tr><td>DR-4b: If data indicates there is not significant moisture moving into the Tank Farm soil laterally, then proceed with Alternative A. Otherwise, proceed with Alternative B.</td></tr>
<tr><td>DR-5: If there is enough data to characterize the Tank Farm soil, write a RI/FS, and develop appropriate remedial alternatives, then proceed with Alternative A. Otherwise, proceed with Alternative B.</td></tr>
</table>

Based upon these results, it appears that the COPCs for the injection well consist of radionuclides, metals, and PCBs. For completeness and to address possible uncertainities, the sediments from the injection well will also be sampled for the nine listed waste constituents previously identified at INTEC (benzene, carbon disulfide, carbon tetrachloride, hydrogen fluoride, pyridine, tetrachlorethylene, toluene, 1,1,1-trichloroethane, and trichloroethylene). In addition, the following constituents (acetone, cyclohexane, cyclohexanone, ethyl acetate, methanol, methyl isobutyl ketone, and xylene) were identified to be present in INTEC waste streams (INEEL/EXT-98-01212, revision 1, February 1999).

Background Summary—A brief summary of the injection well also known as (Site-23) background is presented. The history of the Chemical Processing Plant (CPP)-23, the former INTEC injection well, was initially drilled in 1950 to a depth of 65 m (212 ft) bgs and abandoned. In 1952, the borehole was cleaned out and deepened to a depth of 182 m (598 ft) bgs. The 61 cm (24-in.) diameter hole was cased with 0.8 cm (5/16-in.) carbon steel casing and perforated from 149 to 180 m (489 to 592 ft) bgs. A second set of perforations, above the water table and spanning 126 to 138 m (412 to 452) bgs, was added after well development to "provide air outlets". The well had a total of 1.5 m^2 (16 ft^2) of perforations below the water table and 0.5 m^2 (6 ft^2) above the water table (Fromm 1995).

The INTEC injection well was the primary source for liquid waste disposal from 1952 through February 1984 and used intermittently for emergency situations until 1986. The average discharge to the well during this period was approximately 1.4 B L/year (363 M gal/year) or about 3.8 M L/day (1 M gal/day) (DOE-ID 1997b). An estimated total of 22,000 Ci of radioactive contaminants have been released in 4.2×10^{10} L (1.1×10^{10} gal) of water (WINCO 1994). The majority of the radioactivity is attributed to H-3 (approximately 96%). Wastewater may have been injected at several depths depending on the well perforations (Fromm 1995).

The Track 2 Summary Report for CPP-23 Injection Well (1994), Comprehensive RI/FS for OU 3-13 at the INEEL – Part A, RI/BRA Report (DOE-ID 1997) and the OU 3-13 Record of Decision (DOE-ID 1999) identified several contaminants that may have been discharged to the injection well. Based on these reports, the contaminants of potential concern (COPCs) for the injection well include I-129, Sr-90, Pu-isotopes, H-3, Am-241, TC-00, Cs-137, Co-60, Eu-152/-154, arsenic, chromium, mercury, nitrate/nitrite, and osmium. In addition, the injection well has completed RCRA closures as described in the Final Closure Plan for LDU CPP-23 Injection Well (MAH-FE-PL-304) (DOE-ID 1990). In Section 2.1 of this closure plan, it states that "The only known contaminant release to the well identified as a RCRA concern is the mercury release which occurred in March 1981."

As part of the closure effect, a sediment sample was collected from the injection well by the USGS on August 31, 1989 and analyzed for 40 CFR 261 Appendix VIII hazardous constituents, for which EPA-approved methods exist. Analyses of the sediment sample detected traces of metals, radioactivity, and PCBs. No organic compounds, other that PCBs, were detected in the sediment sample form the injection well. The closure plan also required the collections and Appendix VIII analysis of groundwater samples from the adjacent well (USGS-40 and USGS-47) and the production well (Production Well #1). The results also did not detect organic compounds in the groundwater.

Based upon these results, it appears that the COPCs for the injection well consist of radionuclides, metals, and PCBs. For completeness and to address possible uncertainities, the sediments from the injection well will also be sampled for the nine listed waste constituents previously identified at INTEC (benzene, carbon disulfide, carbon tetrachloride, hydrogen fluoride, pyridine, tetrachloroethylene, toluene, 1,1,1-trichloroethane, and trichloroethylene). In addition, the following constituents (acetone, cyclohexane, cyclohexanone, ethyl acetate, methanol, methyl isobutyl, keton, and xylene) were identified to be present in INTEC waste streams (INEEL/EXT-98-01212, revision 1, February 1999) and will be sampled.

Casing disintegration occurred twice (1967 or 1968 and 1981) and was repaired in1971 and 1982. During periods when the injection well was plugged, the waste was discharged directly into the vadose zone resulting in a thick zone of contamination underlying INTEC. This zone may serve as a possible source of contamination to the deep perched water zone and complicates any interpretation of contamination in the subsurface. During repair periods, the waste was injected into USGS-50, a well completed to a depth of 123 m (405 ft) bgs (Fromm 1995).

In October and November 1989, the injection well was sealed by perforating the casing throughout and pumping in cement. The well was sealed from the basalt silt layer (145m [475 ft] bgs) to land surface to prevent hydraulic communication between the land surface, perched water, and SRPA.

Before the well abandonment, a sediment sample was collected from the bottom of the open part of the well (about 145 m [475 ft] bgs). Analysis of the sediment sample detected low concentrations of inorganics, radionuclides, and polychlorinated biphenyls (PCBs). Fourteen inorganics were detected. The concentration of barium (0.26 mg/L) was well below the regulatory threshold of 100 mg/L. The radionculide analyses of the sediments show that the gross beta activity was measured at 150 pCi/g. This analysis also measured Cs-137 at 100 pCi/g, Eu-152 at 3.8 pCi/g, and Eu-154 at 2.5 pCi/g. The only organic compound detected above the method detection limit was Aroclor-1260 at 10 μg/kg (DOE-ID 1997b).

Uncertainty associated with the contaminant source estimates and potential releases from the soil and perched water around the injection well prevented a final remedial action for the SRPA inside the INTEC fence line. This is now part of the OU 3-14 scope, and the final action for the SRPA will be included in the OU3-14 RI/FS, proposed project plan, and ROD.

4.4.2.2 DQO STEP 2—Identify the Decisions. This step of the DQO process lays out the principle study questions, alternative actions, and corresponding decision statements that must be answered to effectively address the above stated problem.

Principal Study Questions—The purpose of the principal study question (PSQ) is to identify key unknown conditions or unresolved issues that, when answered, provide a solution to the problem being investigated, as stated above. The PSQs for this project are as follows:

PSQ-1: Are there any unresolved issues pertaining to the Aquifer quality from the OU 3-13 Group 5 interim action and Group 4 final action? (More information may be obtained by consulting the OU 3-13 ROD [DOE-ID 1999b]).

PSQ-2a: What are the residual contaminants and their concentrations in the sediment inside CPP-3 and in SRPA materials near the well (Site CPP-23)? This analysis includes radionuclides as well as non-radionuclide contaminants.

PSQ-2b: What is the vertical and horizontal extent of the contaminants in the sediment inside the injection well and contaminated sediments near the injection well?

PSQ-2c: If contaminants are present above risk action levels in the sediment and contaminated aquifer materials near the injection well, can they be mobilized and released to the SRPA as a secondary source?

PSQ-3: What are the residual contaminant concentrations in the aquifer near Site CPP-23 of radionuclides and non-radionuclides?

PSQ-4 Do localized hot spots (e.g., iodine-129 at the HI interbed) exceed risk-based action levels in the SRPA?

PSQ-5 Based upon new data obtained during the evaluation of the injection well, sediment in the well, and contaminated aquifer materials near the well, will remedial action be required and what are the best remedial approaches?

Alternative Actions—Alternative actions (AA) are those actions possible resulting from resolution of the above PSQs. The types of actions considered will depend on the answers to the PSQs.

AA-1: A: There are no issues. Proceed. (No consequence is associated with this alternative.)

B: There are issues. Resolve the issues. (Consequences are that additional principal study questions may be added and additional data other than the data listed below may be required. This may have impact on both the schedule and budget.)

AA-2a: A: Analytical results indicate the sediment is free of residual contamination that might pose a risk to the SRPA. Proceed with RI/FS characterization. (No consequence is associated with this alternative.)

B: Analytical results of the soil cores collected from the SRPA indicate that contaminants are present in the material that could potentially be a risk to the SRPA. Characterize the contamination (e.g., waste types, volumes, and secondary source potential). (The consequence is that the contamination will require remediation.)

AA-2b A: Sufficient data exist to determine the contaminant stratification in the sediment and in the contaminated SRPA materials near the injection well to evaluate risk and determine volume concentrations. Proceed with the RI/FS characterization. (No consequence.)

B: Additional data are needed to characterize contaminants in the sediment in the injection well and in the sediments near the injection well. Collect additional data. (The consequence is that additional data will be required to assess risk and determine effective remedial techniques, should they be necessary.)

AA-2c A: Contaminants are strongly sorbed to the sediment and contaminated sediments near the injection well. Proceed with characterization. (No consequence is associated with this alternative.)

B: Contaminants are mobile and are being or potentially can be leached out of the sediment and contaminated SRPA materials. This has implications for possible remedial actions as well as risk considerations. Evaluate the need for Stage II actions. Proceed with characterization. (The final remedial action will be required to minimize contaminant mobility either by removing the contaminants and/or immobilizing them.)

AA-3 A: The radionuclides identified as OU 3-13 COPCs are the only contaminants that are potential threats to the SRPA. Proceed with characterization. (The consequence is that the remedial action will be required to address all known compounds that fulfill OU 3-14 COPC criteria.)

B: Other contamination, in addition to the OU 3-13 COPCs, is present above risk based action levels and could potentially pose a threat to the SRPA. (The consequence is that the remedial action will be required to address all OU 3-14 COPCs.)

AA-4 A: Hot spots do not exist. (The consequence is that additional modeling will be required.)

B: Hot spots exist. Collect more information on hot spots. Rerun the SRPA model. (The consequence requires a remedial action to remove or control the contaminant.)

AA-5 A: Data are adequate to characterize risk and the possible contaminants associated with the former injection well to write an RI/FS, and develop appropriate remedial alternatives, select remedies, and write a ROD. (No consequence is associated with this alternative.)

B: There is still too much uncertainty to write an RI/FS, develop appropriate remedial alternatives, select remedies, and write a ROD. (The consequence is that more data will be required.)

Decision Statements—The decision statements (DS) combine the PSQ and AA into a concise statement of action. The DS for each of the PSQs are stated below.

DS-1: Determine whether there are unresolved issues from the OU 3-13 Groups 4 and 5 final and interim actions (see OU 3-13 ROD [DOE-ID 1999b]).

DS-2a: Determine whether the sampling and analytical results have successfully identified all possible OU 3-14 COPCs in the sediment inside the injection well and SRPA materials near Site CPP-23.

DS-2b: Determine whether the stratification of radionuclide and non-radionuclide contaminants in the sediment inside the injection well are sufficiently characterized to evaluate risk, contaminants, and propose effective remedial actions, if required.

DS-2c: Determine whether contaminants are easily released from the SRPA materials and sediment. If so, remedial actions may be required. High mobility also increases the opportunity for leaching to occur and contaminants becoming a secondary source.

DS-3: Determine whether analytical results and/or risk analysis identifies contaminants in the SPRA water at concentration levels equal to or greater than MCLs.

DS-4 Determine whether hot spots exist in the SRPA with the potential to exceed action levels.

DS-5: The recommended remedial action will be based on the hydraulic, geochemical, and physical drivers, the success of interim actions, and the comparison of identified requirements, associated technology, and their costs.

4.4.2.3 DQO STEP 3—Identify Inputs to the Decision. This step of the DQO process identifies the informational inputs that are required to answer the decision statements made above.

Inputs for PSQ-1—PSQ-1 will be answered through information obtained from WAG-3 OU 3-13 Group 4 and Group 5 investigations. Group 4 will be implementing the OU 3-13 ROD (DOE-ID 1999b) specified remedial actions for the INTEC perched water, while Group 5 will be implementing the ROD-directed interim actions for the SRPA.

- OU 3-13 Group 5 interim action information
- OU 3-13 Group 4 final action information.

Inputs for PSQ-2a—Contaminants of potential concern for the injection well will be identified primarily through the collection and analysis of sediment and water samples collected during drilling activities. Because the well was abandoned and cemented shut in 1989, the cement inside the casing will be drilled out. Continuous core collected from immediately below the cement to a point below the well where injection well effects are no longer visible (this is estimated to be about 15 m (50 ft) below the original bottom of the well) and field screening and visual analysis indicates no contamination is present. Coring will continue 1.5 m (5-ft) below the depth where no contamination was observed. Total input, however, to obtain the OU 3-14 COPCs will be taken from the following list of sources. Throughout the rest of this section, OU 3-14 COPCs refers to the injection well (Site CPP-23) COPCs. Refer to Tables 5-1 and 5-2 of the Injection Well Field Sampling Plan (DOE-ID 2000a) for a complete list of analytes.

The inputs to answer PSQ-2a are the following:

- Core analytical data (radionuclides and non radionuclides)
- USGS downhole geophysical logging
- Historical records
- Process knowledge.

Inputs for PSQ-2b—Vertical extent of contamination in the injection well will be determined by opening the original well by coring (see Inputs for PSQ-2a), and analyzing samples. The OU 3-14 COPCs will be determined from risk and groundwater modeling. To determine the vertical and horizontal extent of the contamination in the sediment near the injection well, a second well will be drilled close to the injection well. Continuous core will be collected of the material below the lower interbed (about 122 m [400 ft] bgs) to the bottom of the well. This well will also be drilled to a point where the injection well effects are no longer apparent (about 198 m [650 ft] bgs). The core will be sampled and analyzed for the analytes of concern (see the Injection Well Field Sampling Plan).

Inputs to answer PSQ-2b are the following:

- Historical records
- Process knowledge
- Analytical data (radionuclides and non radionuclides)
- Risk analysis
- Model predictions

- K_d data
- Hydraulic property data of sediment and SRPA materials.

Inputs for PSQ-2c—To determine whether contaminants in the sediment in and near the injection well can be mobilized, leach and absorption studies will be conducted. Soil used in these extractions will be sampled sediment material collected during the drilling will be used for the leach and absorption studies.

The inputs to answer PSQ-2c are the following:

- Analytical concentration data (radionuclides and non radionuclides)
- Selected soil extractions
- K_d data
- Model predictions
- Hydraulic properties
- Risk analysis.

Inputs for PSQ-3—Residual groundwater concentrations will be primarily determined through sampling the groundwater and the subsequent analytical results. The OU 3-14 COPCs will be determined from the risk and groundwater modeling. Data needed to make a decision for PSQ-3 will come from the sources listed below.

- Historical records
- SRPA analytical data
- Risk analysis results
- Model predictions
- K_d data
- Hydraulic properties
- OU 3-13 Group 5 interim action data
- OU 3-13 Group 4 final action data.

Inputs for PSQ-4—To determine whether the iodine-129 hot spot in the HI interbed exceeds risk based action levels, a third well will be drilled about 91 m (300 ft) down gradient from the injection well. This well will be screened across the HI interbed. Water samples will be collected and analyzed for iodine-129.

The inputs to answer PSQ-4 are the following:

- Historical records

- Core analytical data
- Water analytical data
- Field screening data
- Risk analysis results
- K_d data
- Model predictions
- Hydraulic properties
- OU 3-13 Group 5 interim action data

Inputs for PSQ-5—All data collected to characterize the injection well effects (sediment and SRPA materials) will be used to develop remedial actions, should they be necessary.

The inputs for PSQ-5 are:

- Final OU 3-14 injection well (Site CPP-23) COPC list
- Concentration levels (e.g., in the SRPA, sediment, and SRPA materials)
- Contaminant mobility
- Secondary source information
- OU 3-13 Group 5 interim action data
- OU 3-13 Group 4 final action data
- Hydraulic properties
- K_d data
- Model predictions
- Waste types
- Remedial cost
- Practicability of technology
- Feasibility, maturity, and efficacy of technology.

4.4.2.4 DQO STEP 4—Define the Boundaries of the Study. This study focuses on sufficiently characterizing the injection well (Site CPP-23) to understand the contamination types, levels, distribution, and source term; the risks associated with the contamination; and the hydrology and geochemistry for the purpose of identifying effective remedial actions for the WAG 3 OU3-14 RI/FS, proposed plan, and ROD.

The physical boundaries of the investigation include Site CPP-23 from the ground surface down to and including the SRPA. The SRPA under the entire INTEC is included in the physical boundary of this investigation.

Additional boundaries that could possibly impact the project include:

Schedule boundaries: The schedule may be impacted by the budget allotted for the remedial action. Any loss in the budget without adjustment in scope will extend the schedule. That action may adversely impact the mitigation of the transport of contaminants to the SRPA.

Budget boundaries: The budget is anticipated to remain at a constant funding level during the course of the investigation. This will require that remedial actions be optimized not only technically but also financially.

Concentration boundaries: These boundaries result from contaminant concentrations. For radionuclide concentrations the boundaries extend from low concentrations to the risk-based action levels agreed to in the OU 3-13 ROD. A high dose rate could drive remote remedial methods. Other remedial considerations related to concentration levels include upper inventory levels of possible waste disposal facilities. Metals concentration levels should not impact remedial activities. Should high VOC levels be present, some remedial activities could be affected, e.g., grout and thermal processes.

Operational boundaries: The investigation of the Injection Well could be impacted by ongoing INTEC operations.

Treatment evaluation boundaries: The evaluation of remedial technologies may potentially be impacted by a variety of laboratory-related influences including scale, contamination levels, and heterogeneity. It may also be impacted by the implementability of the treatment.

Integration boundaries: Final remediation may be impacted by the integration of any or all of the above boundaries.

4.4.2.5 DQO STEP 5—Develop a Decision Rule. This step of the DQO process brings together the outputs from steps 1 through 3 into a single statement describing the basis for choosing among the listed alternatives.

- Decision Rule (DR)-1: If there are no unresolved issues from OU 3-13 Group 4 and 5, then proceed with AA-1 A, otherwise proceed with AA-1 B.
- DR-2a: If there is no residual contamination in the sediment or contaminated SRPA materials, then proceed with AA-2a A, otherwise proceed with AA-2a B.
- DR-2b: If there is sufficient data to determine contaminant stratification in the sediment, then proceed with AA-2b A, otherwise proceed with AA-2b B.
- DR-2c: If contaminants are strongly sorbed to the sediment and/or contaminated SRPA materials, then proceed with AA-2c A, otherwise proceed with AA-2c B.

- DR-3: If OU 3-13 COPCs specified in the OU 3-13 ROD are the only contaminants that exceed risk based action levels, then proceed with AA-3 A, otherwise proceed with AA-3 B.

- DR-4: If "hot spots" do not exist, then proceed with AA-4 A, otherwise proceed with AA-4 B.

- DR-5: If sufficient data to characterize the risk and the contaminants associated with the former injection well exist to write a RI/FS, develop appropriate remedial actions and write a ROD, then proceed with AA-5 A, otherwise proceed with AA-5 B.

4.4.2.6 DQO STEP 6—Specify Tolerable Limits on Decision Errors. This step of the DQO process sets out the acceptable limits on decision error. These limits are used to establish performance goals for the data collection design.

Data collected to determine whether contaminants in the SRPA water are at concentration levels equal to or greater than MCLs (DS-3) are amenable to statistically based limits on decision errors. Hypothesis testing will be utilized to determine if an action level (MCL) is exceeded to resolve Principal Study Question 3 (PSQ-3).

The null hypothesis, H_0, is that the true mean of a contaminant is greater than or equal to the MCL. The alternative is that the true mean is less than the MCL.

- H_0: $\mu \geq$ MCL

- H_a: $\mu <$ MCL

The hypothesis testing will be performed to a level of significance, α, of 0.05. In other words, with this level of significance, we limit the probability of a Type I error, or of rejecting the null hypothesis when it is true, to 5%. The hypothesis testing is designed to allow us to control the probability or erroneously concluding that MCLs are not exceeded when in fact they are exceeded. The null hypothesis was formulated based upon the belief that the harmful consequences of incorrectly concluding that a MCL is not exceeded when it actually is exceeded outweigh the consequences of incorrectly concluding that the MCL is exceeded when in fact it is not.

Statistically based decision errors are not appropriate for the other decision statements.

4.4.2.7 DQO STEP 7—Optimize the Design. In addition, the former injection well will be redrilled and the sediment build-up inside the casing cored and sampled. A total of 2 wells will be drilled to the approximate depth of (185.9 m to 198.1 m (610 to 650 ft) below ground surface (bgs). One well will be drilled as close to the former injection well as possible. The wells will be cored to permit the collection of sediments, basalts, and injection well sediment, if it exists outside the original well backhole. The vadose zone cores from the well adjacent to the INTEC injection well will be handled and archived for possible future analysis by OU 3-14. If analytical results indicate contaminant concentrations are not above MCLs or risk based action levels (for any of the contaminants), the RI/BRA will be completed. If concentrations are above MCLs, an RI/FS that includes leachability studies may be performed, in accordance with Section 5.5.2. The final well will be located about 300 ft downgradient from the former injection well. This well is expected to be drilled using an aquifer rotary rig. These wells will be completed as monitoring wells and screened with a 50-ft screen across the HI interbed. Both wells will be sampled quarterly to develop the final OU 3-14 COPC list.

4.4.3 Additional Soil Sites from OU 3-13

Data quality objectives have not been developed for these sites. If the initial evaluation indicates that the sites may require further characterization and eventual remedial actions, then DQOs for these sites will be prepared.

4.5 Model Prediction Accuracy

The accuracy of model predictions is ultimately dependent upon 1) the ability of the code to replicate the modeled system and 2) a good understanding of the system that is being modeled. Remedial designs are often based on simulated future behaviors. If these predictions are to replicate a system, the model-input parameters must reflect a well-understood system. Knowledge of a system is gained through site characterization. When there is uncertainty in assigning values to model parameters, error is introduced leading the model to predict different behaviors than the actual behavior the system exhibits. The degree of error depends on the degree of uncertainty. Uncertainty and the subsequent error can be reduced by collecting actual field data to increase understanding and more accurately define the required model parameters.

As discussed in Section 3.2, the modeling for the OU 3-13 RI resulted in too much uncertainty for remedial decision making. OU 3-14 was created to allow for further characterization of the Tank Farm soil, the INTEC injection well and the SRPA within the INTEC fenceline, and the additional sites from OU 3-13 outside the Tank Farm. The model needs discussed below are the drivers for the development of the specific DQOs and the proposed field investigations.

Table 4-2. OU 3-14 injection well (Site CPP-23) DQOs.

1: State the Problem	2: Identify the Decision			3: Identify Inputs to the Decision	4: Define the Study Boundaries
Background Statement: The former injection well, CPP-3, also known as Site CPP-23 was the primary source for liquid waste disposal from 1952 through February 1984 and used intermittently for emergency situations until 1986. The average discharge to the well during this period was approximately 1.4 B L/yr (363 M gal/year) or about 3.8 M L/day (1 M gal/day) (DOE-ID 1997b). It has been estimated that a total of 22,000 Ci of radioactive contaminants have been released in 4.2×10^{10} L (1.1×10^{10} gal) of water (WINCO 1994). The majority of the radioactivity is attributed to H-3 (approximately 96% of the total curies). The Track 2 Summary Report for CPP-23 Injection Well (1994), Comprehensive RI/FS for OU 3-13 at the INEEL – Part A, RI/BRA Report (DOE-ID 1997) and the OU 3-13 Record of Decision (DOE-ID 1999) identified several contaminants that may have been discharged to the injection well. Based on these reports, the contaminants of potential concern (COPCs) for the injection well include I-129, Sr-90, Pu-isotopes, H-3, Am-241, TC-00, Cs-137, Co-60, Eu-152/-154, arsenic, chromium, mercury, nitrate/nitrite, and osmium. In addition, the injection well has completed RCRA closures as described in the Final Closure Plan for LDU CPP-23 Injection Well (MAH-FE-PL-304) (DOE-ID 1990). In Section 2.1 of this closure plan, it states that "The only known contaminant release to the well identified as a RCRA concern is the mercury release which occurred in March 1981." As part of the closure effect, a sediment sample was collected from the injection well by the USGS on August 31, 1989 and analyzed for 40 CFR 261 Appendix VIII hazardous constituents, for which EPA-approved methods exist. Analyses of the sediment sample detected traces of metals, radioactivity, and PCBs. No organic compounds, other that PCBs, were detected in the sediment sample form the injection well. The closure plan also required the collections and Appendix VIII analysis of groundwater samples from the adjacent well (USGS-40 and USGS-47) and the production well (Production Well #1). The results also did not detect organic compounds in the groundwater. Based upon these results, it appears that the COPCs for the injection well consist of radionuclides, metals, and PCBs. For completeness and to address possible uncertainities, the sediments from the injection well will also be sampled for the nine listed waste constituents previously identified at INTEC (benzene, carbon disulfide, carbon tetrachloride, hydrogen fluoride, pyridine, tetrachloroethylene, toluene, 1,1,1-trichloroethane, and trichloroethylene). In addition, the following constituents (acetone, cyclohexane, cyclohexanone, ethyl acetate, methanol, methyl isobutyl, keton, and xylene) were identified to present in INEEL waste streams (INEEL/EXT-98-01212, revision 1, February 1999) and will be sampled. The well was initially drilled in 1950 to a depth of 65 m (212 ft) bgs and abandoned. In 1952 the borehole was cleaned out and deepened to a depth of 182 m (598 ft) bgs. The 61 cm (24-in.) diameter hole was cased with 0.8 cm (5/16-in.) carbon steel casing and perforated from 149 to 180 m (489 to 592 ft) bgs. A second set of perforations, above the water table and spanning 126 to 138 m (412 to 452) bgs, was added after well development to "provide air outlets". The well had a total of 1.5 m^2 (16 ft^2) of perforations below the water table and 0.5 m^2 (6 ft^2) above the water table. The "injection effect" of CPP-3 created high ground water velocities immediately around the release point, as much as 1,524 m (5,000 ft) per day. This effect became insignificant at distances greater than 305 m (1,000 ft) from the disposal well. Water initially moved radially out around the well for some distance, overriding the regional flow direction. Wastewater may have been injected at several depths depending on the well perforations. There are two intervals of casing disintegration (1967 or 1968 and 1981) and repair (1971 and 1982). During periods when the injection well was plugged, the waste were discharged directly into the vadose zone resulting in a thick zone of contamination underlying INTEC. This zone may serve as a possible source of contamination to the deep perched water zone and complicates any interpretation of contamination in the subsurface. During repair periods, the waste were also injected into USGS-50, a well completed at 123 m (405 ft) bgs. In October and November 1989, the injection well was sealed by perforating the casing throughout and pumping in cement. The well was sealed from the basalt silt layer (145m [475 ft] bgs) to land surface to prevent hydraulic communication between the land surface, perched water, and SRPA. Before the well abandonment, a sediment sample was collected from the bottom of the open part of the well (about 145 m [475 ft] bgs). Analysis of the sediment sample detected low concentrations of inorganics, radionuclides, and polychlorinated biphenyls (PCBs). Fourteen inorganics were detected. The concentration of barium (0.26 mg/L) was well below the regulatory threshold of 100 mg/L. The radionculide analyses of the sediments show that the gross beta activity was measured at 150 pCi/g. This analysis also measured Cs-137 at 100 pCi/g, Eu-152 at 3.8 pCi/g, and Eu-154 at 2.5 pCi/g. The only organic compound detected above the method detection limit was Aroclor-1260 at 10 μg/kg (DOE-ID 1997a). Due to the uncertainty associated with the contaminant source estimates and potential releases from the soil and perched water around the injection well, the final remedial action for the SRPA inside the INTEC fence line is part of the OU 3-14 scope and will be included in the OU3-14 RI/FS, project plan, and ROD. **Problem Statement**: The potential problem involving the SRPA is two-fold. First, the injection well is known to have injected contaminated fluids into the SRPA. A 36.6-m (120-ft) sediment column has built-up inside the casing. The volume of residual contamination is not well characterized, nor are the specific contaminants, their amounts, concentrations, and mobility. Second, there is uncertainty resulting from contaminant source estimates and potential releases from the vadose zone in the vicinity of the injection well.	Success at meeting the remedial action objective will be determined by obtaining sufficient characterization data to develop a RI/FS, proposed plan, and ROD from which a remedial action can be implemented that will prevent contaminants associated with the injection well (CPP-3) from adversely impacting the SRPA under INTEC.				This study focuses on sufficiently characterizing the injection well (Site CPP-23) to understand the contamination types, levels, distribution, and source term; the risks associated with the contamination; and the hydrology and geochemistry for the purpose of identifying effective remedial actions for the WAG 3 OU3-14 RI/FS, proposed plan, and ROD. The physical boundaries of the investigation include Site CPP-23 from the ground surface down to and including the SRPA. The SRPA under the entire INTEC is included in the physical boundary of this investigation. Additional boundaries that could possibly impact the project include: *Schedule boundaries*: The schedule may be impacted by the budget allotted for the remedial action. Any loss in the budget without adjustment in scope will extend the schedule. That action may adversely impact the mitigation of the transport of contaminants to the SRPA. *Budget boundaries*: The budget is anticipated to remain at a constant funding level during the course of the investigation. This will require that remedial actions be optimized not only technically but also financially. *Concentration boundaries:* These boundaries result from contaminant concentrations. For radionuclide concentrations the boundaries extend from low concentrations to the risk-based action levels agreed to in the OU 3-13 ROD. A high dose rate could drive remote remedial methods. Other remedial considerations related to concentration levels include upper inventory levels of possible waste disposal facilities. Metals concentration levels should not impact remedial activities. Should high VOC levels be present, some remedial activities could be affected, e.g., grout and thermal processes. *Operational boundaries:* The investigation of the Injection Well could be impacted by ongoing INTEC operations. *Treatment evaluation boundaries:* The evaluation of remedial technologies may potentially be impacted by a variety of laboratory-related influences including scale, contamination levels, and heterogeneity. It may also be impacted by the implementability of the treatment. *Integration boundaries:* Final remediation may be impacted by the integration of any or all of the above boundaries.
	Principal Study Questions	Alternative Actions	Decision Statement		
	PSQ-1: Are there any unresolved issues pertaining to the Aquifer quality from the OU 3-13 Group 5 interim action and Group 4 final action? (More information may be obtained by consulting the OU 3-13 ROD [DOE-ID 1999b]).	A: There are no issues. Proceed. (No consequence.) B: There are issues. Resolve the issues. (Consequences are that additional principal study questions may be added and additional data other than what is listed below may be required. This may have impact on both the schedule and budget.)	DS-1: Determine whether there are unresolved issues from the OU 3-13 Groups 4 and 5 final and interim actions.	Inputs to the PSQ-1 decision include: OU 3-13 Group 5 interim action information OU 3-13 Group 4 final action information	
	PSQ-2a: What are the residual contaminants and their concentrations in the sediment inside CPP-3 and in SRPA materials near the well (Site CPP-23)? This analysis includes radionuclides as well as non-radionuclide contaminants.	A: Analytical results indicate the sediment is free of residual contamination that might pose a risk to the SRPA. Proceed with RI/FS characterization. (No consequence is associated with this alternative.) B: Analytical results of the sample cores collected from the wells indicate that there are contaminants present in the material that could potentially be a risk to the SRPA. Determine waste types, volumes, secondary source potential, etc. (The consequence is that the contamination will require remediation.)	DS-2a: Determine whether the sampling and analytical results have successfully identified all contaminants in the sediment in and near CPP-3.	Inputs to the PSQ-2a decision include: Core analytical data (rad and non rad) USGS downhole geophysical logging Historical records Process knowledge and risk analysis	
	PSQ-2b What is the vertical and horizontal extent of the contaminants in the sediment inside the injection well and contaminated aquifer materials near the injection well?	A: Sufficient data exist to determine the contaminant stratification in the sediment and in the contaminated SRPA materials near the injection well to evaluate risk and determine volume concentrations. Proceed with the RI/FS characterization. (No consequence is associated with this alternative.) B: Additional data are needed to characterize contaminants in the sediment in the injection well and in the sediments near the injection well. Collect additional data. (The consequence is that additional data will be required to assess risk and determine effective remedial techniques, should they be necessary.)	DS-2b: Determine whether radionuclide and non-radionuclide contaminants in the sediment inside the injection well and in SRPA materials near the injection are sufficiently characterized to evaluate risk, contaminants, and propose effective remedial actions, if required.	Inputs to the PSQ-2b decision include: Historical records Process knowledge Analytical data (rad and non rad) Risk analysis Model predictions K_d data Hydraulic property data	
	PSQ-2c: If contaminants are present above risk action levels in the sediment and contaminated aquifer materials near the injection well, can they be mobilized and released to the SRPA as a secondary source?	A: Contaminants are strongly sorbed to the sediment and contaminated sediments near the Injection well. Proceed with characterization. (No consequence is associated with this alternative.) B: Contaminants are mobile and are being or potentially can be leached out of the sediment and contaminated SRPA materials. This has implications for possible remedial actions as well as risk considerations. Evaluate need for Stage II actions. Proceed with characterization. (The final remedial action will be required to minimize contaminant mobility either by removing the contaminants and/or immobilizing them.)	DS-2c: Determine whether contaminants are easily released from the soil and sediment. If so, remedial actions such as sediment and contaminated sediments removal, for example, may be required. High mobility also increases the opportunity for leaching to occur and contaminants becoming a secondary source.	Inputs to the PSQ-2c decision include: Analytical concentration data (rad and non rad) Selected soil extractions K_d data Model predictions Hydraulic properties Risk analysis	
	PSQ-3: What are the residual contaminant concentrations in the Aquifer near Site CPP-23 of radionuclides and non-radionuclides?	A: The radionuclides identified as OU 3-13 COPCs are the only contaminants that are potential threats to the SRPA. Proceed with characterization. (The consequence is that the remedial action will be required to address all known compounds that fulfill OU 3-14 COPC criteria.) B: Other contaminants, in addition to the OU 3-13 COPCs, are present above risk based action levels and could potentially pose a threat to the SRPA. (The consequence is that the remedial action will be required to address all OU 3-14 COPCs.)	DS-3: Determine whether analytical results and/or risk analysis identifies contaminants in the SPRA water at concentration levels equal to or greater than MCLs.	Inputs to the PSQ-3 decision include Historical records SRPA analytical data Risk analysis results Model predictions K_d data Hydraulic properties OU 3-13 Group 5 interim action data OU 3-13 Group 4 final action data	
	PSQ-4: Do localized hot spots (e.g., iodine-129 at the HI interbed) exceed risk-based action levels in the SRPA?	A.: Hot spots do not exist. (The consequence is that additional modeling will be required.). B: Hot spots exist, e.g., I-129 is found in the HI interbed at levels that exceed risk based action levels. Collect more information on hot spots. Rerun the SRPA model. (The consequence requires a remedial action to remove or control the contaminant.)	DS-4: Determine whether hot spots exist in the SRPA with the potential to exceed action levels.	Inputs to the PSQ-4 include Historical records Core analytical data Pore water analytical data Field screening data Risk analysis results K_d data Model predictions Hydraulic properties OU 3-13 Group 5 interim action data	

Table 4-2. (continued).

	PSQ-5 Based upon new data obtained during the evaluation of the injection well, sediment in the well, and contaminated aquifer materials near the well, will remedial action be required and what are the best remedial approaches?	A: There is enough data to characterize risk and the possible contaminants associated with the former injection well and Tank Farm soil to write a RI/FS, ROD, and develop appropriate remedial alternatives. (No consequence.) B: There is still too much uncertainty to develop an RI/FS, ROD, or suggest appropriate remedial actions. (The consequence is that more data will be required.)	DS-5: The recommended remedial action will be based on the hydraulic, geochemical, and physical drivers; the success of the interim actions; and the comparison of identified requirements, associated technology, and their costs.	Inputs to the PSQ-5 decision include: Final OU 3-14 injection well (Site CPP-23) COPC list Concentration levels (SRPA, sediment, and SRPA materials) Contaminant mobility Secondary source information OU 3-13 Group 4 and 5 data Hydraulic properties K_d data Model predictions Waste types Remedial cost Practicability, feasibility, and maturity technology	

Table 4-2. (continued).

5: Develop a Decision Rule	6: Specify Tolerable Limits on Decision Errors	7: Optimize the Design
DS-1: If there are no unresolved issues from OU 3-13 Group 4 and 5, then proceed with Alternative A, otherwise proceed with Alternative B.	Data collected to determine whether contaminants in the SRPA water are at concentration levels equal to or greater than MCLs (DS-3) are amenable to statistically based limits on decision errors. Hypothesis testing will be utilized to determine if an action level (MCL) is exceeded to resolve Principal Study Question 3 (PSQ-3).	A total of 3 wells will be drilled to the approximate depth of 198 m (650 ft) below ground surface (bgs). One of the wells will be placed directly inside the former injection well. A second well will be drilled as close to the former injection well as possible. Both of these wells will be cored to permit the collection of sediments, basalts, and injection well sediment. The vadose zone cores from the well adjacent to the INTEC injection well will be handled and archived for possible future analysis by OU 3-14. Samples will be analyzed for the analytes of concern identified in the injection well field sampling plan. If analytical results indicate contaminant concentrations are not above MCLs or risk based action levels (for any of the contaminants), the RI/BRA will be completed. If concentrations are above MCLs, an RI/FS that includes leachability studies may be performed. The second well will be completed as a monitoring well.
DS-2a: If there are no residual contamination in the sediment or contaminated SRPA materials, then proceed with Alternative A, otherwise proceed with Alternative B.	The null hypothesis, H_0, is that the true mean of a contaminant is greater than or equal to the MCL. The alternative is that the true mean is less than the MCL.	The third well will be located about 91.4 m (300 ft) down gradient from the former injection well. This well will also be cored and samples collected for possible future analyses. This well will be completed as a monitoring well and screened with a 15.2 m (50-ft) screen across the HI interbed.
DS-2b: If there is sufficient data to determine contaminant stratification in the sediment, then proceed with Alternative A, otherwise proceed with Alternative B.	H_0: $\mu \geq$ MCL0 H_a: $\mu <$ MCL	The two monitoring wells will be sampled quarterly for to develop the final OU 3-14 COPC list.
DS-2c: If contaminants are strongly sorbed to the sediment and/or contaminated SRPA materials, then proceed with Alternative A, otherwise proceed with Alternative B.	The hypothesis testing will be performed to a level of significance, α, of 0.05. In other words, with this level of significance, we limit the probability of a Type I error, or of rejecting the null hypothesis when it is true, to 5%. The hypothesis testing is designed to allow us to control the probability or erroneously concluding that MCLs are not exceeded when in fact they are exceeded. The null hypothesis was formulated based upon the belief that the harmful consequences of incorrectly concluding that a MCL is not exceeded when it actually is exceeded outweigh the consequences of incorrectly concluding that the MCL is exceeded when in fact it is not.	
DS-3: If OU 3-13 COPCs specified in the OU 3-13 RODs are the only contaminants that exceed risk based action levels, then proceed with Alternative A, otherwise proceed with Alternative B.		
DS-4: If "hot spots" do not exist, then proceed with Alternative A, otherwise proceed with Alternative B.	Statistically based decision errors are not appropriate for the other decision statements.	
DS-5: If sufficient data to characterize the risk and the contaminants associated with the former injection well to write a RI/FS, ROD, and develop appropriate remedial actions exist, then proceed with Alternative A, otherwise proceed with Alternative B	Add new information under 4.4.2.8.	

In the following sections, model uncertainty and data requirements for each model will be discussed. The model needs presented in the following subsections resulted from the WAG 3 OU 3-13 RI/BRA modeling and outlined in the RI/BRA report (DOE-ID 1997a). They have also been presented (in greater detail) in section 3.2 of this document.

4.5.1 OU 3-13 Model Uncertainty Summary

An assessment of the uncertainty associated with the OU3-13 RI/BRA modeling was detailed in the RI/BRA Report (DOE-ID 1997a).

The following is a brief discussion of OU 3-13 model components that introduced uncertainty into the OU 3-13 RI/BRA modeling.

- **Conceptual Model**—Conceptual model uncertainty involves the ability of the vadose zone and aquifer conceptual models to represent hydraulic conditions and contaminants transport. The OU 3-13 RI/BRA modeling indicated that there were insufficient field measurements available to calibrate Sr-90 transport through the Tank Farm soil, as a result of dispersive flux. Therefore, it was not possible to calculate the uncertainty associated with the Sr-90 predicted aquifer concentrations from discharges at the Tank Farm.

- **K_d Values**—The OU 3-13 RI/BRA modeling was particularity sensitive to the K_d values for Sr-90 and Plutonium, meaning that small changes in this parameter resulted in widely differing results. The uncertainty associated with this parameter alone had the potential to introduce large error into the predicted behavior. Further, K_d values for most of the OU 3-13 COPCs modeled were not based on INEEL field calibrated modeling, but rather were taken from literature or other sources.

- **Contaminant Source**—The levels of uncertainty associated with the source term used for modeling depends on the specific source. Two of the primary source components are a) the chemical composition of the spill site, and b) the temporal discharge history of a given contaminant. Further, the injection well releases, Tank Farm releases, and contaminated soil were determined to be the most significant contributors to the total INTEC OU 3-13 COPC inventory.

- ***Tank Farm Soil***—Contaminants have generally been released to the Tank Farm soil by spills and leaks. Knowledge of the spill volumes and contaminants has been developed from process knowledge. This information is believed to be fairly accurate. However, the same information is needed for leaks. Characterization of the leaks has been more difficult with more uncertainty. The following is a summary of the uncertainty associated with the source term at the Tank Farm. Locations for the following sites are shown on Figure 3-1.

  - **CPP-26:** Contamination at this site resulted from a 1964 spill. There is a high level of uncertainty in the estimated source volume, but the total activity is likely to be small relative to the total activity in the Tank Farm soil. The uncertainty should have minimal impact on assessing groundwater pathway.

  - **CPP-31:** This spill was discovered in 1975 and represents about 50% of the known source term for the Tank Farm soil. Because this is such a significant source, additional confirmation sampling would reduce the level of uncertainty associated with the source. Concentrations of specific isotopes are not well defined. Release characteristics are unknown. Depth-profile sampling is needed to evaluate the depth of penetration of the spill.

- **CPP-32:** This spill represents two areas of soil contamination near a valve box. Limited field investigations of the two spills were performed. It is known that OU 3-13 COPCs at this site include Cs-137, Eu-154, and Sr-90. Recent characterization of this site has been prevented by uncertainty associated with spill location.

- **CPP-58E:** This is a spill that is composed of two areas of soil contamination associated with the PEW Evaporator. Little known about extent of contamination, but the volume of the release and the activity involved are known.

- **CPP-79:** Approximately 9.5 m^3 (2,500 gallons) of waste containing radionuclides, heavy metals, and tracer of organic compounds was spilled in 1986 near the WCF Sump Tank (WCF-119). The release estimated at 42 Ci. This release overlies a much greater zone of contamination at depth. The deeper zone of contamination is believed to result from a CPP-28 release.

- **CPP-15:** The 1974 leak resulted from solvent burner operations. The quantity of spilled liquid is unknown. Subsequent soil analysis indicated the presence of suite of radionuclides. However, the characterization of the site is incomplete and inadequate.

- **CPP-27 and CPP-33:** These sites consist of soil contaminated by a subsurface leak of high-level waste from the Tank Farm transfer system near the northeast corner of building CPP-604. Nature and extent of contamination east of CPP-27 is not well defined.

- **CPP-28**: This is the contaminated soil associated with a subsurface leak discovered in 1974 of high-level liquid waste from a breached transfer line. This is a major known release; lateral extent not well defined; volume of release roughly estimated and uncertain; high radionuclide concentrations (first cycle raffinate); small uncertainties in release volume translate into large model uncertainties. The release may have migrated to basalt and may not be possible to determine the extent of the release and source concentrations; sampling needed to provide vertical profile.

- **CPP-58W**: CPP-58W is composed of two areas of contamination associated with the PEW Evaporator. The CPP-58W site is affected by a 1954 leak from a transfer pipe. There is no information on how often the transfer line was used, how long the pipe leaked, or the quantity of condensate released.

- **CPP-96:** Further definition of areas where contaminated soil was used as backfill for Tank Farm activities, and levels of contamination in the material are needed for risk assessment and source evaluation.

- **CPP-20**: Site CPP-20 is a location north of building CPP-604. Small spills of radioactive liquid waste occurred as waste was being unloaded. It has been reported that the spills were cleaned up as they occurred, but no records exist documenting the types, quantities, and locations of the spills.

- **CPP-25:** CPP-25 is located in the same general area as CPP-20. It is the location of a ruptured transfer line that was being used to transfer liquid waste. An unknown quantity of radioactive liquid was released.

- **INTEC Injection Well and Aquifer within the INTEC Fence Line**—The source term for the injection well resulting from residual contamination that may be present in the 37-m (120-ft) column of sediment inside the well, residual contamination in SRPA materials, and contamination that may be present in the groundwater as result of slow-moving plumes of contaminants is uncharacterized. Much is known about the discharge history for some of the OU 3-13 COPCs (H-3, Sr-90, and Cs-137) but not for the OU 3-13 COPCs Am-241, Np-237, and Tc-99. As a result, the uncertainty for those contaminants is higher, and virtually impossible to quantify without more temporal data.

- **Additional Soil Sites From OU 3-13**—There is uncertainty that a source term exists in these sites. If it does, it has not been characterized.

- **Contaminant Specific Uncertainty**—Each OU 3-13 COPC is subject to different levels of uncertainty. In addition, the relative importance of quantifying the uncertainty associated with each OU 3-13 COPC varies depending on the ultimate prediction of risk.

- **Moisture Content**—This is a parameter for the vadose zone model. The RI/BRA modeling used values that were developed at another INEEL site with dissimilar geology. Site-specific measurements are needed to quantify the flux through the Tank Farm soil.

4.5.2 Tank Farm Soil—Tank Farm Soil Model Needs and DQOs

Model needs associated with the Tank Farm and corresponding to the Tank Farm DQOs are discussed in the following subsections.

DQO questions PSQ-1a, -1b, -2a, and -2b (Section 4.4) are designed to address the uncertainties discussed above. Questions 1a and 1b are designed to locate both known and unknown (if they exist) sources in the Tank Farm soil. These questions will be answered by performing the gamma survey and limited soil sampling. The gamma survey probe holes, will initially be placed at 50-ft centers with additional probe holes placed in known significant spill areas (e.g., Sites CPP-28/79 and CPP-31) and in areas (e.g., valve piping) where the potential exists that spills and leaks may have occurred.

Question PQS-2a and 2b are designed to determine activities and concentrations of the analytes of concern (see Tank Farm Field Sampling Plan) from which a OU 3-14 Tank Farm soil COPC list will be developed. Answering this question will require information from the gamma survey and soil and soil pore water sampling and analyses.

Accurately answering these questions will greatly reduce the uncertainty associated with the source term model predictions and lead to the selection of appropriate remedial actions.

Tank Farm Soil Model. As explained earlier, the Tank Farm soil model will incorporate the source term model. The vertical boundaries on the Tank Farm Soil model will extend from the Tank Farm surface down to the sediment/basalt interface (about 14 m [45 ft]). The Tank Farm soil fate and transport model requires input from selected parameters. The parameters can be adjusted to calibrate the model, causing it to match the observed system. The parameters with the greatest degree of uncertainty other than selecting the appropriate conceptual model include quantifying the source term and the flux through the system.

Flux through the Tank Farm soil is a combination of several inputs. These include volume of recharge, recharge sources, moisture content, and hydraulic gradient. The DQO questions that correspond to these needs are PSQ-4a and 4b. The questions will be answered by monitoring moisture and matric potential at the sampling stations to be installed in and near the Tank Farm during Phase II.

DQO question PSQ-3 requires information about contaminant mobility. During the gamma survey samples of Tank Farm soil will be collected. Some of the material will be used in leach and absorption studies. Specific contaminants to be tested in the extraction studies will be determined after PSQ-2a and –2b are answered. Additional sample material will be used to determine site-specific geochemistry that will include but not necessarily be limited to: pH, redox potential, K_ds, and carbon dioxide.

Uncertainty in the Tank Farm soil model will be further reduced by collecting information that will serve as inputs to DQO questions PSQ-2a, -2b, -3, -4a, -4b, and -5. Additional sample material will be used to determine inputs to the DQOs. These include hydraulic property data, to include field scale moisture characteristic curves. Table 4-3 summarizes the Tank Farm soil model needs correlated with various steps in the DQO process.

4.5.3 INTEC Injection Well and Aquifer Within the INTEC Fence Line—Model Needs and DQOs

Some of the contaminants in the process wastewater pumped down the injection well are fairly well characterized. Others are not increasing the uncertainty associated with the model predictions. Uncertainty also arises with the residual contamination. Contaminants and concentrations that may have sorbed to aquifer materials or otherwise remain in the injection well area are unknown. One hundred-twenty feet of sediment is estimated to have collected inside the injection well casing. Contaminants and concentrations in the sediment are not characterized. Also, contaminant concentrations in the Aquifer near the injection well are not characterized. The potential release rate for the contaminants from the sediment or contaminated aquifer materials is not understood.

Injection well DQO questions PSQ-2a, -2b, and –3 have been designed to assess source term issues. The remedial design (DQO Step 7) provides for drilling two SRPA wells and coring out the INTEC injection well. The SRPA wells will be drilled to the same depth as the injection well. The injection well core will be sampled and analyzed for the analytes of concern identified in the injection well field sampling plan to determine the OU 3-14 COPCs. The former INTEC injection well will be cored from the cement to the bottom of the well. Both the injection well and the SRPA well near the injection well will be cored to a depth below the former injection wells' depth to a point where effects from the injected wastewater is not visible or detectable with a field screen.

If significant residual contaminant concentrations are found in and around the injection well, the mobility of the contaminants will be needed for the source term model. Contaminant mobility will be assessed by performing leach and absorption studies on the cored material. The results from these studies will provide an answer to the DQO question PSQ-2c.

The OU 3-13 model predicted that an I-129 hot spot existed in the HI interbed (580 to 600 ft.) down gradient from the injection well. The remedial design calls for drilling the third well in the hot spot area and screening the well across the HI interbed. Water samples will be collected and analyzed to verify I-129 concentrations and model predictions. The model will be used to determine whether I-129 concentrations detected in the HI interbed can become secondary contamination sources to the SRPA. If they can, the I-129 information will need to be incorporated into the SRPA source term model. This information will be used to answer DQO question PSQ-4.

Table 4-4 summarizes the injection well model needs correlated with various steps in the DQO process.

Table 4-3. Tank Farm soil models needs and data gaps.

DQO Principal Study Question (DQO Step 2)	Model Needs	Inputs (DQO Step 3)	How Characterization will meet Model Requirement (from DQO Step 7)	Characterization will Provide
PSQ-1a: What is the number and spacial extent of the high contamination zones in the 0 to 3m (0 to 10 ft) depth range? (This is required for evaluation of the external risk and possible remedial alternatives.)	Qualification of Source Term	• Historical record • Process knowledge • Gamma survey data • Neutron survey data • Nuclear constants • Ratio estimation • Soil analytical results • Pore-water analytical result • K_d data	Gamma screen at 15.2 m (50-ft) centers • Will provide nature and extent information on known releases and screen for potential unknown releases Additional sampling at known release sites and at potential release sites • Help define nature and extent for Tank Farm releases Soil sampling and analysis • Quantify source terms • Identify potential metal and VOC contaminants Soil-pore water sampling and analysis • Quantify radionuclide source terms • Identify potential metal and VOC contaminants • Information on contaminant transport	Reduce uncertainty related to release size, location, migration, activity, dose rate, concentration, and contaminants.
PSQ-1b: What is the number and spatial extent of the high contamination zones in the 0 to 13.7 m (0 to 45-ft) depth range? (This is required for possible remedial alternatives.)	Qualification of Source Term	• Historical records • Process knowledge • Gamma survey data • Neutron survey data • Nuclear constants • Ratio estimation • Soil analytical results • Pore-water analytical result • K_d datas	Gamma screen at 15.2 m (50-ft) centers in Tank Farm soil • Will provide nature and extent information on known releases and screen for potential unknown releases Additional sampling at known release sites and at potential release sites • Help define nature and extent for Tank Farm releases Soil sampling and analysis • Quantify source terms • Identify potential metal and VOC contaminants Soil-pore water sampling and analysis • Quantify radionuclide source terms • Identify potential metal and VOC contaminants • Information on contaminant transport	Reduce uncertainty related to release size, location, migration, activity, dose rate, concentration, and contaminants.

Table 4-3. (continued).

DQO Principal Study Question (DQO Step 2)	Model Needs	Inputs (DQO Step 3)	How Characterization will meet Model Requirement (from DQO Step 7)	Characterization will Provide
PSQ-2a: What are the radionuclide contaminants in each of the high contamination zones (from 0 to 13.7 m [0 to 45 ft bgs])?	Identification of Source Term	• Historical records • Soil analytical data • Soil-pore water analytical data • Field screening data • Risk analysis results • Model predictions • Hydraulic properties • K_d data	Gamma screen at 50-ft centers in Tank Farm soil • Will provide contaminant type information on known releases and potential unknown releases Additional sampling at known release sites and at potential release sites • Help identify contaminant types for Tank Farm releases Soil sampling and analysis • Identify radionuclide contaminants • Soil-pore water sampling and analysis • Identify radionuclide contaminants • Information on contaminant transport	Reduce uncertainty related to radionuclide contaminants.
PSQ-2b: Are there non-radionuclide contaminants present in the Tank Farm soil from 0 to 13.7 m (0 to 45 ft bgs) (in addition to those currently identified)?	Identification of Source Term	• Historical records • Process knowledge • Soil analytical data • Soil-pore water analytical data • Field screening data • Risk analysis results • Model predictions • Hydraulic properties • K_d data	Additional sampling at known release sites and at potential release sites • Help identify contaminant types for Tank Farm releases Soil sampling and analysis • Identify potential metal and VOC contaminants Soil-pore water sampling and analysis • Identify potential metal and VOC contaminants Information on contaminant transport	Reduce uncertainty related to non-radionuclide contaminants.
PSQ-3: Are any of the contaminants mobile so that they can be leached from the soil?	Vadose zone OU 3-14 COPC mobility	• Analytical concentration data • Selected soil extractions (leach and absorption studies) • K_d data • Site-specific geochemistry • Model predictions • Hydraulic properties	Additional sampling at known release sites and at potential release sites • Help identify contaminant types for Tank Farm releases Soil-pore water sampling and analysis • Identify OU 3-14 COPCs Tank Farm soil sampling • Sample material for leach and absorption studies • Sample material for site-specific geochemistry studies • Hydraulic property analysis	Reduce errors in model calibration and contaminant transport.
PSQ-4a: Is there a vertical moisture flux moving from the Tank Farm soil into the basalt?	Tank Farm vertical flux	• Moisture data • Matric potential data • Contaminant concentrations • Model predictions • Hydraulic property data • Recharge sources • K_d data	Tank Farm soil sampling • Hydraulic property analysis • Site-specific geochemistry Moisture monitoring • Vertical moisture and hydraulic gradient profiles • Recharge sources	Reduce uncertainty associated with infiltration and deep drainage and consequent contaminant transport

Table 4-3. (continued).

DQO Principal Study Question (DQO Step 2)	Model Needs	Inputs (DQO Step 3)	How Characterization will meet Model Requirement (from DQO Step 7)	Characterization will Provide
PSQ-4b: Is there a horizontal moisture flux into the Tank Farm soil?	Tank Farm horizontal flux	• Moisture data • Matric potential data • Contaminant concentration data • Model predictions • Hydraulic property data • Recharge source • K_d data	Tank Farm soil sampling • Hydraulic property analysis • Site-specific geochemistry Moisture monitoring • Horizontal moisture and hydraulic gradient profiles • Recharge sources	Reduce uncertainty associated with infiltration and deep drainage and consequent contaminant transport
PSQ-5 Based on new data obtained during evaluation of the Tank Farm high contamination zones and soil moisture, what are the best final remedial approaches	Risk to the SRPA	• Compile the final OU 3-14 Tank Farm soil COPC list • Concentration levels • Contaminant flux • Number of high contamination zones • Waste volume • Tank heels • Recharge water/sources • Site-specific geochemistry data • Deep drainage • Hydraulic properties • Model predictions • Waste types (TRU, RCRA, characteristic, TSCA, mixed, etc.) • Remedial cost • Impracticability of technology • Technical feasibility of remediation technology • Maturity of technology • Efficacy of technology Source term for soil Source term for soil and closed tanks	Gamma screen at 50-ft centers • Will provide nature and extent information on known releases and screen for potential unknown releases Additional sampling at known release sites and at potential release sites • Help define nature and extent for Tank Farm releases Soil sampling and analysis • Quantify source terms • Identify potential metal and VOC contaminants Soil-pore water sampling and analysis • Quantify radionuclide source terms • Identify potential metal and VOC contaminants • Information on contaminant transport Tank Farm soil sampling • Hydraulic property analysis • Site-specific geochemistry Moisture monitoring • Vertical and horizontal moisture and hydraulic gradient profiles • Recharge sources	Reduce uncertainty associated with selected remedial alternatives and potential risk to receptors in the SRPA.

Table 4-4. Injection well model needs and data gaps.

DQO Principal Study Question (DQO Step 2)	Model Needs	Inputs (DQO Step 3)	How Characterization will meet Model Requirement (from DQO Step 7)	Characterization will Provide
PSQ-2a: What are the residual contaminants and their concentrations in the basalt and sediments near Site CPP-23 and in the sediment inside and near the well? This includes radionuclides as well as non-radionuclide contaminants	Qualification of Source Term	• Core analytical data (rad and non rad) • USGS downhole geophysical logging • Historical records • Process knowledge	Drill out the injection well; core sediment in of well; core material beneath the well to depth where injection well affects not detectable • Sample core, analyze for analytes of concern Drill well near injection well. • core beneath 122 m (400 –ft) interbed. • Sample core and analyze for analytes of concern Perform gamma survey	Reduce uncertainty related to release size, location, migration, activity, dose rate, concentration, and contaminants.
PSQ-2b What is the vertical and horizontal extent of the contaminants in the sediment inside the injection well and contaminated sediments near the injection well?	Qualification of Source Term	• Historical records • Process knowledge • Analytical data (rad and non rad) • Risk analysis • Model predictions • K_d data • Hydraulic property data	Drill out the injection well; core sediment in well; core material beneath well to depth where injection well affects are not detectable. • Sample core, analyze for analytes of concern Drill well near injection well. • Core beneath 122 m (400 –ft) interbed. • Sample core and analyze for analytes of concern Perform gamma survey	Reduce uncertainty related to release size, location, migration, activity, dose rate, concentration, and contaminants.
PSQ-2c: If contaminants are present above risk action levels in the sediment and contaminated sediments near the injection well, can they be mobilized and released to the SRPA as a secondary source?	SRPA COPC mobility	• Analytical concentration data (rad and non rad) • Selected soil extractions • K_d data • Model predictions • Hydraulic properties • Risk analysis	Sample core collected from injection well and nearby well • Use sample material for leach and absorption studies • Use sample material for site-specific geochemical studies • Sample and analyze Aquifer for analytes of concern • Hydraulic property analysis • Sample water in the two SRPA monitoring wells drilled to investigate I-129 hot spot. Collect water from screened interval across HI interbed.	Reduce uncertainty related to radionuclide contaminants.
PSQ-3: What are the residual contaminant concentrations in the Aquifer near Site CPP-23 of radionuclides and non-radionuclides?	Identification of Source Term	• Historical records • SRPA analytical data • Risk analysis results • Model predictions • K_d s • Hydraulic properties • OU 3-13 Group 5 interim action data	Sample Aquifer in wells drilled to investigate the injection well affects and nearby wells.	Reduce uncertainty related to non-radionuclide contaminants.

Table 4-4. (continued).

DQO Principal Study Question (DQO Step 2)	Model Needs	Inputs (DQO Step 3)	How Characterization will meet Model Requirement (from DQO Step 7)	Characterization will Provide
PSQ-4: Do localized hot spots, e.g., iodine-129 at the HI interbed, that exceed risk action levels exist in the SRPA?	COPC mobility	• Historical records • Soil analytical data • Soil-pore water analytical data • Field screening data • Risk analysis results • K_d data • Model predictions • Hydraulic properties • OU 3-13 Group 5 interim action data • OU 3-13 Group 4 data	Sample 3rd well drilled to investigate I-129 hot spot. Collect water from screened interval across HI interbed	Reduce errors in model calibration and contaminant transport.
PSQ-5 Based on new data obtained during the evaluation of the injection well, soil, and contaminated sediments near the well, will remedial action be required and what are the best remedial approaches?	Risk to the receptor in SRPA	• Final OU 3-14 injection well (Site CPP-23) COPC list • Concentration levels (water, sediment, sediments) • Contaminant mobility • Secondary source information • OU 3-13 Group 4 final action data • OU 3-13 Group 5 interim action data • Hydraulic properties • K_d data • Model predictions • Waste types • Remedial cost • Impracticability of technology • Feasibility, maturity, and ~~efficacy of technology of~~ technology	Drill out the injection well; core sediment within well; core material beneath well, 1.5 m (5-ft) past evidence of contamination Drill well near injection well. • core beneath 400 -ft interbed. • Sample core and analyze for contaminants Perform gamma survey Sample core collected from injection well and nearby well • Use sample material for leach and absorption studies • Use sample material for site-specific geochemical studies • Sample and analyze Aquifer for contaminants • Hydraulic property analysis Sample 3rd well drilled to investigate I-129 hot spot. Collect water from screened interval across HI interbed.	Reduce uncertainty associated with selected remedial alternatives and potential risk to receptors in the SRPA

4.5.4 Additional Soil Sites From OU 3-13

Model needs and corresponding DQOs have not been developed for these sites. Further characterization is required to determine whether modeling and development of DQOs will be required for these sites.

4.6 OU 3-14 Characterization Investigations

The OU 3-14 field investigations include those associated with Tank Farm soil, those involving the former INTEC injection well (Site CPP-23) and SRPA within the INTEC fenceline, and those involving the additional soil sites, CPP-61, CPP-81, and CPP-82. The investigations are independent of each other and both will be implemented over two phases simultaneously. The phases for the two investigations are discussed in the following sections.

4.6.1 OU 3-14 Phase I Field Investigation

The OU 3-14 Phase I investigation will include tasks for the Tank Farm soil, the Injection Well and SRPA within the INTEC fenceline, and the additional OU 3-13 soil sites. Tank Farm Soil investigation has several tasks: a surface gamma survey, an in situ gamma survey, and soil sampling of excavated soil. These tasks will be performed in a cold demonstration prior to the actual Tank Farm investigation. The Injection Well investigation will include re-opening and coring the injection well, drilling two new aquifer wells and collecting one round of groundwater samples. The OU 3-13 Additional Soil sites will require a technical paper evaluating the existing site information. All Phase I work will result in scoping meetings with the DOE-ID, EPA, and IDHW to plan the Phase II investigation and other OU 3-14 work.

4.6.1.1 Phase I Tank Farm Soil Cold Demonstration. A cold demonstration of the Tank Farm soil investigation tasks is planned to demonstrate activities and to gather operational data for the Phase I investigation at the Tank Farm. The demonstration will evaluate the methods used and potential risks associated with drilling in the OU 3-14 Tank Farm soil. The activities to be conducted during the demonstration includes: (1) surface gamma-ray mapping; (2) installation of the probehole casing using both vacuum extraction and the direct push drilling; and (3) downhole gamma-ray logging of the newly installed probehole casing.

The demonstration is expected to be conducted near the southeast corner of INTEC Building 691 (see Figure 4-1). The alluvial deposits overlying the basalt bedrock are similar to those found within the Tank Farm. Although the demonstration will be conducted in an area anticipated to be free of radiological contamination, all radiological control and other necessary precautions will be taken and surface and downhole gamma-ray logging will be performed. These procedures will be conducted in order to demonstrate that all operations can be conducted successfully and properly in contaminated areas.

The engineering survey team will survey the location for a proposed probehole similar to those in the Tank Farm Field Sampling Plan, using appropriate survey equipment. The exercise will also serve to demonstrate the process of surveying the locations of existing boreholes, however no existing boreholes are in the demonstration area.

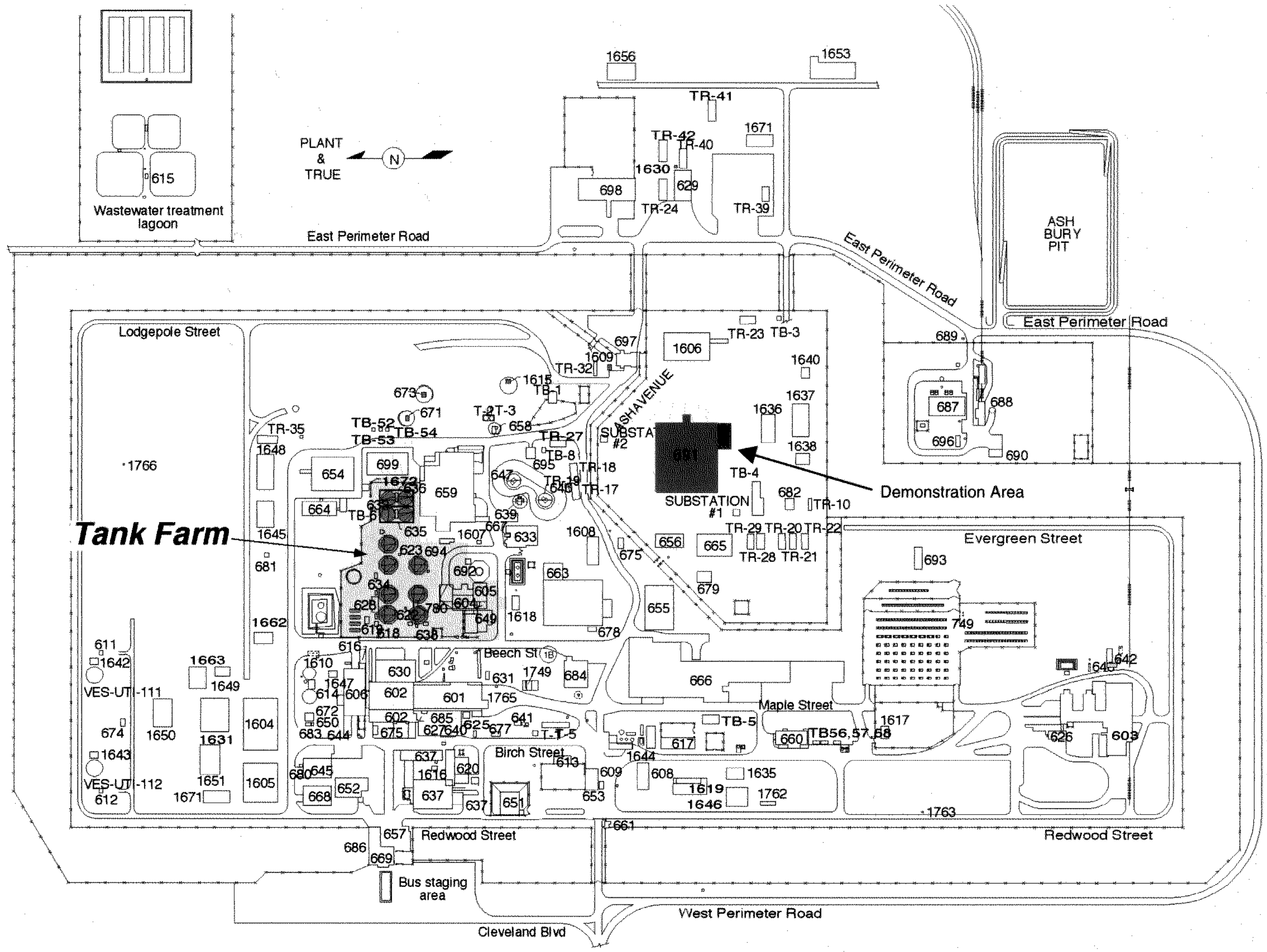

Figure 4-1 Location of the Tank Farm and Building CPP-691 testing locations within the INTEC.

A surface radiation survey of the demonstration area will be conducted using the same type of detector (e.g., a cart-mounted plastic scintillation detector). The detector will be operated at approximately 7.62 cm (3 in.) above ground surface to provide a specified area of investigation while still permitting adequate ground clearance. During the demonstration only the procedures used in the deployment of the instrument will be demonstrated. Measurements from the detector will not be required. The demonstration will validate the deployment capabilities of the instrument.

A 6.35 cm (2.5 in.) diameter steel probehole casing will be installed with a combination of vacuum extraction and direct-push drilling. A vacuum extraction unit will be used to excavate a pilot hole 12.7 to 17.78 cm (5 to 7 in.) in diameter to a depth of 4.6 m (15 ft) bgs. Excavation of the pilot hole will occur in 1.52 m (5 ft) increments. Vacuum extraction is being used in the upper 4.6 m (15 ft) to minimize the potential for damage to subsurface structures in the Tank Farm area. Vacuum extraction will be conducted using a closed loop system, with the soil finally placed in three 35- or 55-gal drums (each holding 5 foot intervals of soil). Soil will temporarily be contained in the drum(s), and then be labeled according to hole position and depth as a demonstration of the procedures for the Phase I RI/FS investigation.

Radiation surveys will be conducted during the vacuuming to simulate Tank Farm conditions. The drums will also be radiologically surveyed.

Once the pilot hole has been advanced to 4.6 m (15 ft), the drummed soil will then be backfilled around the probehole casing, unless radiological contamination is detected by the RCTs, in which case clean soil or bentonite will be used instead. The remainder of the probehole casing will be installed in 1.22 m (4 ft) sections using the direct push drill rig, to a depth of approximately 13.7 m (45 ft) bgs or to the basalt contact.

Upon completion of the probehole, the direct-push drill rig will be detached from the probehole casing at the lowest possible point above ground. The probehole casing will then be capped with an all-weather cap to preclude the inadvertent entry of unwanted material.

The installed probehole will be uncapped and logged using the downhole gamma-ray technique. Gamma-ray logging measurements will be conducted at intervals of 0.15m (0.5 ft), beginning at the lowest obtainable depth in the borehole and continuing upward to within 1 ft of the ground surface. The technique will also serve as a demonstration of logging the existing boreholes.

It is anticipated that the demonstration test and Tank Farm investigation will use a logging system with a 4.45 cm (1-1.75 in.) outer diameter and 0.662 MeV sensitivity, allowing for the detection of Cs-137. The gamma-ray logging tool will be operated in a counts/sec mode to detect and record gross gamma radiation flux with depth. During the demonstration, only the procedures used in the deployment of this instrument will be demonstrated. Logging measurements will not be obtained, as the area is expected to be free from radioactive materials. The gamma-ray logging tool is deployed using a portable winch system that provides electronic output of the detector reading and tool depth. The demonstration will validate that the winching system is accurate and that the gamma-ray logger can travel the length of the probehole casing. Under Tank Farm conditions the logging data will be acquired using a field laptop computer and graphical results showing gross gamma-ray flux will be shown in real time.

4.6.1.2 Phase I Tank Farm Soil Investigation Activities. The Phase I Tank Farm Soil Investigation will focus primarily on providing field-screening and limited soil data. The data will assist in evaluating the horizontal and vertical extent of gamma-emitting radiation (mainly Cs-137) at the site. The rationale is that all the waste streams at the Tank Farm contained Cs-137, and all the known spill and inventory data show Cs-137 as a main OU 3-13 COPC, so its presence can be used to delineate hot spots and the extent of contamination. Limited characterization will also be completed on any soils excavated during the vertical gamma screening. The Phase I data will be used to define future Phase II sampling activities.

Gamma Survey—A surface soil gamma survey across the entire Tank Farm is planned to assess the site for shallow radioactive sources and delineate radioactive subsurface structures. A mobile plastic scintillation detector will be used to determine if a residual gamma field exists at the surface for Sites CPP-24, CPP-26, CPP-30, CPP-32E, and CPP-32W, and Sites CPP-16, CPP-20, and CPP-25; identify any unknown surface gamma sources within the interstitial soil (Site CPP-96); and provide site-wide surface data for the risk assessment and feasibility study. The new data will be evaluated together with past site radiation surveys to define the shallow soil sources from 0 to 3 m (0 to 10 ft.). This information will answer DQO PSQ-1a. Magnetic, electromagnetic and ground penetrating radar surveys are being considered to help locate subsurface structures and piping prior to drilling. For details, see the OU 3-14 Tank Farm FSP (DOE-ID, 2000b).

In Situ Gamma Radiation Field Screen—An in situ gamma radiation field screening is proposed to assess the soil within the entire Tank Farm area to define the vertical and horizontal extent of the contamination throughout CPP-96, (interstitial soil), and within several specific hot spots, CPP-27/33, CPP-28/79 and CPP-31. The in situ survey will require the installation of steel casing probe holes and utilize several different detectors to log the probe holes. Refer to the Tank Farm FSP (DOE-ID 2000b) for Phase I detailed information regarding the installation of the probe holes.

For CPP-96, probe casing holes will be spaced on a grid with 15-m (50-ft) centers to evaluate the entire Tank Farm site. The grid pattern will also encompass high probability spill and leak areas such as around the tanks and piping corridors. These areas are not known to have had leaks, but their potential as source areas for contamination needs to be investigated. The probe holes will be 2 + inches in diameter and will be driven into the soil using a push technology until refusal at the soil/basalt interface. The probes will be driven to the soil/basalt to evaluate if contamination exists there and whether it is migrating horizontally beneath the Tank Farm.

For the known, hot spot sites, CPP-27/33, CPP-28/79, and CPP-31, the number of probe holes will be increased to provide better resolution of the nature and extent of the soil contamination. The spacing of probe holes needs to delineate the hot spot, the edge or limit of contamination and provide useful information to assist the DOE-ID, EPA, and IDEQ in scoping where additional Phase II soil data will be collected.

Probes will also be installed at sites CPP-16, CPP-20, CPP-25 CPP-58E, CPP-58W, and CPP-15 to provide some initial site data. These probes will also be driven to bedrock to evaluate the vertical extent of the sites. Figure 4-2 shows the proposed locations for the probe holes. This information is required to answer DQO PSQ-1b and to help plan Phase II to answer PSQ-2a, -2b, -3, -4a, and -4b.

The 85 probeholes, arranged in a 50-foot grid, located in the presumed uncontaminated locations within the Tank Farm fence will be used to investigate whether that region is contaminated. For this statistical analysis, it is assumed that an undocumented or undiscovered release is the size of the probehole—a conservative assumption.

- If some of the probeholes reveal contamination, the data will be used to estimate the extent of previously unrecognized contamination, and to infer problem locations. Phase II will follow up on any such findings.

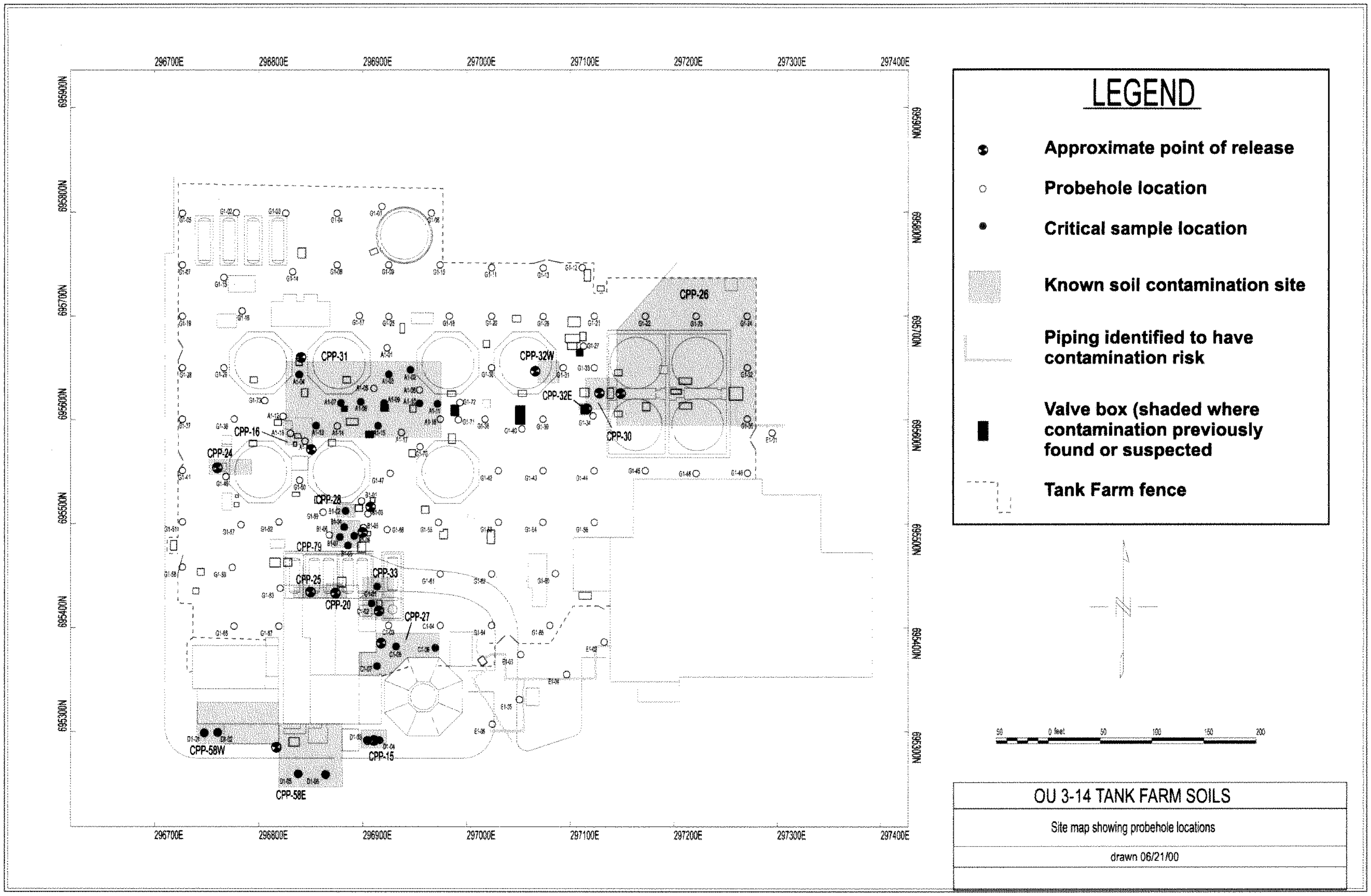

Figure 4-2. Map showing the in situ gamma radiation field survey probe hole locations.

- If, instead, the 85 probeholes find no hot spots, we can conclude with 90% confidence that at least 97.3% of the nominally uncontaminated region is truly uncontaminated. Other confidence statements are also possible. For example, with 95% confidence, at least 96.55% of the region is truly uncontaminated. The equation used is:

$$(\text{fraction of land uncontaminated})^{85} = 1 - \text{Confidence Level}$$

It is impossible to guarantee that no undiscovered hot spots exist, except by excavating the entire site. However, if the nominally clean area is sampled and 85 samples find no hot spots, confidence statements like those above can be made regarding the limits of possible contamination. Such limits can be used in later risk calculations.

Limited Tank Farm Soil Sampling—The installation of the probes at the Tank Farm will require positive assurance that the tank operations and underground utilities (waste piping, coolant pipes, cathodic protection, hydraulic lines, power, etc.) will not be damaged. A vacuum excavator will be used to excavate soil to a depth of 5 m (15 ft) bgs to ensure the hole is deeper than any known utilities, then place the pipe past any utilities and backfill the hole. Then the probes will be driven or pushed to refusal or bedrock. A safety analysis and demonstration needs to be completed to ensure the activity of driving or pushing the probes will not exceed the seismic limit for the Tank Farm or result in any excessive vibrations.

The vacuum excavator will be able to make a 7 – 13 cm (3 –5 in.) diameter hole and deposit the excavated soil into a drum. The soil will be excavated in 1.5 m (5-ft) increments and temporarily stored inside of the INTEC Tank Farm site. If the excavated soil is below 5 mR, it will be returned to the excavation, if possible. If the soil cannot fit down the annular space between the probe casing and excavated hole, then clean sand will be used to fill the annular void space. Excavated soil that exceeds 5 mR will not be returned to the hole because of ALARA concerns and to avoid unnecessary exposures.

The use of the vacuum excavator allows an opportunity to investigate and collect soil samples across the Tank Farm. The soil will be surveyed as it is excavated to provide a general field screening. The excavated soil and the excavation will be examined for physical features such as soil type, wetness, color, staining, gravel content etc. Limited soil samples will be collected for full radiological analyses and CLP metals from 0 – 1.5 m (0 – 5-ft), 1.5 – 3.0 m (5– 10-ft), and 3 – 4 m (10 – 15 ft). Soil samples will be collected from the following areas;

- Site CPP-96 –Composite soil samples will be collected from each 1.5 m increment from 20% of the planned probe hole locations.

- Site CPP-31, Site CPP-28/79, and Site CPP-27/33 – Soil is planned to be drummed from every location at these sites and stored on site for characterization and feed material for contaminant transport and treatability studies. It is planned that soil samples will be collected from each increment in at least 5 probeholes from Site CPP-31, 3-5 probeholes from Site CPP-28/79, and 3-5 probeholes from Site CPP-27/33. The final estimate and location of samples will be determined, pending DOE-ID, EPA, and IDEQ review of the in situ gamma radiation field screening data. These analyses do not need to be done immediately since the drums will be stored and there are no holding times associated with the contaminants.

- Soil will be collected and analyzed from any other site if it exceeds the 5 mR/hr limit and can not be returned to the excavation.

Soil that is less than 5 mR/hr will be composited over the full 1.5 m (5-ft) length and sampled. Soil that exceeds the 5 mR/hr limit will be drummed, and stored until a decision is made as to what sampling is required. The drummed soil will be stored either beneath the INTEC Tank Farm site or an approved CERCLA storage area within INTEC as Investigation Derived Waste. Then the drums will be transferred to the INTEC Radiological Analysis Laboratory (RAL). The RAL will conduct the sampling and analysis of the soil within a hot cell environment. Preliminary sampling strategies and analytical requirements are presented in detail in the attached Phase I Tank Farm FSP. This IDW may be used for additional sampling as part of Phase II, the Contaminant Transport Study, or the Treatability Studies.

4.6.1.3 Phase I Injection Well/Aquifer Investigation Activities. The aquifer well drilling program focuses on contamination associated with the former ICCP injection well (Site CPP-23). The concerns to be addressed are (1) whether a source of contamination is present in the sediment emaining inside the injection well below the grout seal, (2) whether contamination exists in the SRPA adjacent to the injection well, (3) whether any slow moving contaminants are present in the aquifer in the vicinity of the injection well, and (4) whether I-129 contamination exists in the HI interbed.

One boring will be attempted through the grout seal and sediment within the former injection well with the intent to collect a continuous core sample of the sediment remaining in the well. The approach is to drill the grout seal, and core the sediment remaining within the former injection well to the original well depth of 183 m (600 ft). The sediment core will be composite-sampled for COPCs identified in Table 5-1 of the Injection Well FSP (DOE-ID 2000a) over the following 3-m (10-ft) intervals: 137 to 140 m, 146 to 149 m, 156 to 159 m, 165 to 168 m, 174 to 177 m, 183 to 186 m, and 192 to 195 m (450 to 460 ft, 480 to 490 ft, 510 to 520 ft, 540 to 550 ft, 570 to 580 ft, 600 to 610 ft, and 630 to 640 ft, respectively). In addition, discrete samples will be collected from those portions of the sediment core that contain contamination based on radiological field screening or visual observation. The coring will continue in 1.5-m (5-ft) increments past the bottom of the injection well until radiological field screening or visual observations indicate that the vertical extent of contamination has been reached. Coring will continue 1.5 m (5-ft) below the depth where contamination was last observed. It is anticipated that the final depth of the well will be approximately 198 m (650 ft) bgs. If this boring breaches the existing casing before the target depth is reached, one attempt will be made to re-center the boring, continue drilling and coring within the existing well structure, and complete the task. The sampling and drilling procedures are presented and discussed in detail in the Injection Well Field Sampling Plan (DOE-ID 2000a).

Two additional aquifer wells will be drilled to investigate the SRPA groundwater quality within the INTEC fence line. The aquifer wells will be completed to the aquifer, penetrating the HI interbed to a depth of approximately 174 m (570 ft) bgs. The final depth of these aquifer wells will depend on the final depth of coring in the abandoned injection well. The proposed well locations are: one aquifer well located adjacent to the site CPP-23 Injection Well and one aquifer well located down gradient of site CPP-23 to investigate the potential for residual contamination in the aquifer from the use of the injection well. The entire vadose zone in the aquifer well adjacent to the injection well will be cored. The core will be maintained by OU 3-14. Figure 4-3 shows the proposed locations where the wells will be installed. Figure 4-4 is a cross section showing the HI interbed in the vicinity where the proposed well will be drilled. The wells will be screened across the HI interbed.

4.6.1.4 OU 3-13 Additional Soil Sites. The OU 3-13 Additional Soil sites, CPP-61, CPP-81, and CPP-82, will be re-evaluated in Phase I. The re-evaluation will address the DOE-ID, EPA, and IDEQ uncertainties with each site using existing historical information. Technical papers will be submitted for DOE-ID, EPA, and IDEQ review, and if a risk or uncertainty is determined for a site, then scoping meeting will be held to determine data needs for Phase II sampling.

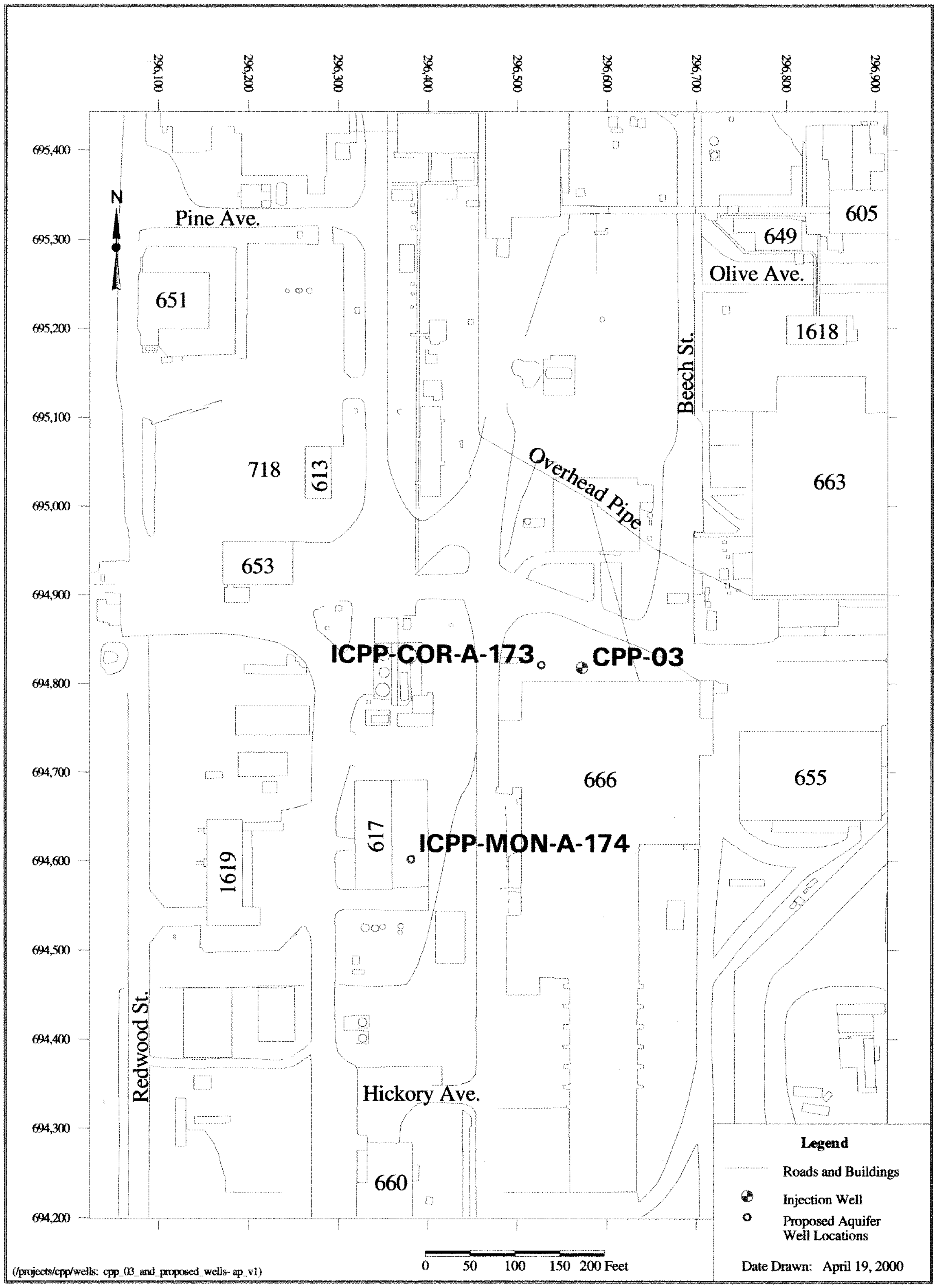

Figure 4-3. Map showing locations of three proposed aquifer wells.

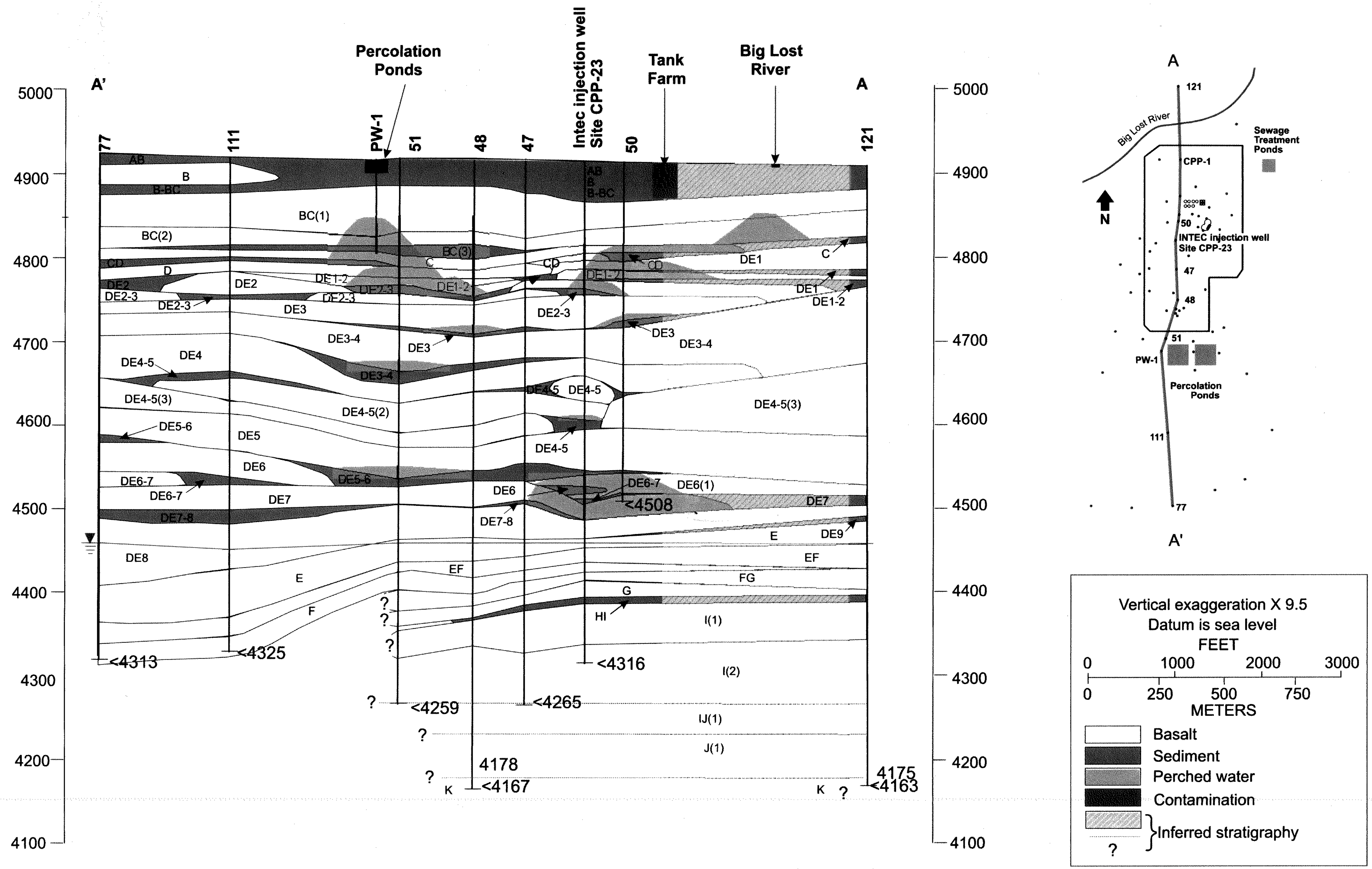

Figure 4-4. Cross-section running north to south showing HI interbed.

4.6.1.5 Scoping Meetings. Periodic and timely scoping meetings will be held with the DOE-ID, EPA, and IDEQ for updates on the field investigations and review the Phase I data. As data are collected they will be analyzed and provided to the DOE-ID, EPA, and IDEQ in letter reports for their review prior to any scoping meeting. Key topics for DOE-ID, EPA, and IDEQ input that can be projected for Phase I are the following:

- Results of the Surface Gamma Survey to plan additional Deep Probe locations
- Results of the In Situ Gamma Survey to plan additional Deep Probe locations
- Results of limited characterization of excavated soil
- Results of the Technical Review of the OU 3-13 Additional Soil sites
- Results of the Injection Well Coring
- Results of the Aquifer Monitor Well Drilling
- Results of the 1st Groundwater Sampling from the two Aquifer monitoring wells
- Planning Phase II Sampling and Analysis Plan Objectives for the Tank Farm soil and two monitoring wells
- Review of the Risk Assessment and Groundwater Strategy Papers
- Review of the Contaminant Transport Study and Treatability Study Proposals
- Review of the OU 3-14 RI/FS Scoping of Remedial Alternatives and Data Needs

4.6.2 OU 3-14 Phase II Field Investigation

The OU 3-14 Phase II Field Investigation will occur in future years and consists of collecting additional sampling data to satisfy the OU 3-14 DQOs (see Section 4.4). The results of the Phase I Field Investigation will be reviewed with the DOE-ID, EPA, and IDEQ and the specific site data necessary to evaluate remedial alternatives for OU 3-14 will be defined in a Characterization Work Plan (CWP). It is anticipated that Phase II Field Investigation will include: additional soil data collection from the Tank Farm Soil site, groundwater sampling at the two monitoring well sites, collecting any needed data from the OU 3-13 Additional Soil sites, finalizing the strategy for the OU 3-14 risk assessment and groundwater modeling, and starting the Contaminant Transport and Treatability Studies. Groundwater sampling and analyses, and sampling frequency, will be determined after evaluating Phase I results.

4.6.2.1 Phase II Tank Farm Soil Investigation Activities. The results of the Phase I Surface Gamma Survey and In Situ Gamma Survey will delineate the presence of any gamma-emitting hot spots. These results will be reviewed together with the historical site information to plan additional soil sampling needs. It is anticipated that there will be surface spill hot spots (CPP-24, CPP-26, CPP-30, and CPP-32 E and W) and deep hot spots (CPP-15 and CPP-58 E and W) to further investigate. The surface spill sites are anticipated to be low activity contamination and are planned to be sampled with conventional sampling techniques. The number, location, and type of sampling will be defined in the Phase II CWP.

Radiation Sampling. The deeper hot spots will likely include Sites CPP-16, CPP-20, CPP-25, CPP-15, CPP-58E & W, CPP-27/CPP-33, CPP-28/CPP-79, CPP-31 or in the interstitial soil (CPP-96). Additional soil data will be collected from these sites using either conventional drilling and sampling methods and/or remote, In Situ methods. Conventional methods will likely be used if the Phase I data indicate that radiation levels at these deeper sites do not pose an unreasonable exposure hazard. At deep hot spot sites where an unreasonable exposure hazard exists, it is planned that radiological data will be collected from the hot spot using In Situ methods and other soil data will be collected adjacent to, above and/or beneath the hot spot.

Plans call for collecting the in situ radiological data using large diameter 10 to 12.7 cm (4 to 5 inches) probe holes. These larger diameter probes will be able to utilize various radiation detectors and logging devices to speciate different radionuclides. The exact detectors, target radiological analytes, and sampling and analytical methods will be adopted with DOE-ID, EPA, and IDEQ involvement and presented in the Phase II Characterization Work Plan. For budgetary planning purposes, up to eight instrumented probe (assuming there are four hot spots requiring two probes each) will be installed to speciate the radionuclides and provide a vertical profile (surface to soil/basalt contact) through the areas of concern.

Soil Sampling. Soil samples will be collected for contaminant characterization, treatability studies, hydraulic property determination, and feasibility study parameters. The location, number and typed of samples required will be defined during DOE-ID, EPA, and IDEQ scoping meetings following the submittal and review of the Feasibility Study, Treatability Study, and Contaminant Transport Study Technical papers.

Soil Moisture Monitoring Activities. Soil moisture stations will also be installed. It is anticipated that three background stations and eight contaminant source stations inside the Tank Farm will be required. Each station will likely include several probe holes instrumented with a neutron-probe access tube, tensiometers, moisture sensors, thermocouples, and suction lysimeters. All electronic information will be collected in data loggers and remotely down loaded to a computer. Associated data loggers and radios to transmit data will be installed at each station. The final locations, instruments, and sampling and analysis methods will be defined in the Phase II Characterization Work Plan.

Several instruments are planned for use. The neutron-probe and Cone Penetrometer Test (CPT)/Resistivity probes, will permit collection of moisture content both vertically (depth) and horizontally (lateral). The neutron probe will provide a continuous moisture profile with depth for the Tank Farm soil, while the CPTs provides the capability to collect automated point-source volumetric moisture content data. Both are required to develop accurate infiltration estimates for the calculation of flux rates. Tensiometers will be used to determine hydraulic gradient for moisture movement in the soil. Suction lysimeters will be used to collect soil pore water samples for contaminant analyses from within and below each hot spot. The information collected from the moisture stations will enable determination of vertical and horizontal flux rates through the Tank Farm soil and yield information about contaminant mobility and transport (DQO PSQ-3, -4a, and -4b).

The soil moisture will be monitored in two background locations outside the Tank Farm area and one within the Tank Farm but in an area that is considered "cold". Eight monitoring stations will be within the Tank Farm hot spots. The planned background locations are (1) outside the INTEC fence and adjacent to the Big Lost River; (2) outside the INTEC fence and south of the Tank Farm; (3) inside the Tank Farm and adjacent to the New Waste Calciner Facility (see Figure 2-10). Each background location will have an auger hole drilled to collect site-specific soil data to calibrate the neutron moisture logging technique. In addition, samples for soil chemistry, moisture, physical properties, and contaminant leaching/absorption tests will be collected.

4.6.2.2 *Phase II Aquifer Investigation Activities.* Groundwater samples may be collected for up to four years from the two new aquifer wells installed at INTEC. The types and frequencies of analyses required will be determined after the results of Phase I are evaluated. Other long-term activities that may be required are the need for additional aquifer wells. These activities will be decided on once the Phase I data have been reviewed. There are no Phase II activities for the injection well (Site CPP-23).

4.6.2.3 *Phase II OU 3-13 Additional Soil Sites Activities.* Additional soil samples may be necessary from sites CPP-61, CPP-81, and/or CPP-82 pending the review and evaluation of the technical papers by the DOE-ID, EPA, and IDEQ. The types and numbers of samples required, sampling locations, and sampling and analysis methods will be determined after the technical papers have been reviewed and evaluated by the DOE-ID, EPA, and IDEQ.

4.6.2.4 *Contaminant Transport Studies.* The anticipated scope of a Contaminant Transport Study for the Tank Farm is to experimentally determine site-specific adsorption and desorption coefficients for OU 3-14 Tank Farm soil COPCs on Tank Farm geological materials. The Contaminant Transport Study provides the background and technical approach for quantifying the sorptive behavior of the COPCs in the OU 3-14 Tank Farm soil.

There are three pieces of information needed for the Tank Farm soil. These are (a) the release of contaminants from sources in the Tank Farm soil, (b) the vertical profile of retardation capabilities, and (c) the spatial variability of retardation capabilities. Source-release information will be gathered by performing leach tests on Tank Farm soil. Retardation capabilities would be carried out on Tank Farm soil samples for OU 3-14 COPCs identified for the Tank Farm soil. Decision on where samples should be collected, and at what depths can be determined as more information is gleaned from characterization of the Tank Farm soil. If collected the contaminant transport data will be used in the fate and transport model to assess remedial alternatives.

4.6.2.5 *Treatability Studies.* Tank Farm treatability studies are foreseen for two areas: 1) the encapsulation and immobilization of OU 3-14 Tank Farm soil COPCs (both residuals in the Tanks and spills/leaks in the soil), and 2) removal of specific hot spots, ex situ treatment (if needed) and disposal. The encapsulation and immobilization of the COPCs could entail treatability studies using polymer injection, reactive barriers, and an engineered cap.

Injection well treatability studies are predicated upon the depth of the source terms of interest. The efforts directed toward treatability studies could include (1) grout/polymer injection, (2) bioclogging, (3) adsorption, and (4) investigation of the efficacy of plume interception by pump-and-treat methods.

4.6.2.6 *Baseline Risk Assessment.* A baseline Risk Assessment (BRA) will be performed for the Injection Wells portion of the project only, since the Tank Farm soil is already assumed to pose a risk. If a risk assessment is necessary for the Tank Farm soil, then the level of assessment will be negotiated with DOE-ID, EPA, and IDEQ. A technical paper will be developed and presented to DOE-ID, EPA, and IDEQ.

5. REMEDIAL INVESTIGATION/FEASIBILITY STUDY TASKS

The OU 3-14 RI/FS includes a variety of tasks related to scoping, implementation, and decision making under the FFA/CO. Standard RI/FS tasks have been identified by EPA (1988a) to provide consistent reporting and to allow more effective monitoring of RI/FS projects. Proposed activities in each task that will be performed as part of the OU 3-14 RI/FS are discussed below. Specific details of proposed field activities are described in two FSPs, which are attachments to the Work Plan (see Section 5.1.1 below). The following is a review of the specific required elements of the RI/FS.

5.1 Project Plan and Scope

This Work Plan is a part of the project planning and scoping task which involves activities necessary to initiate the OU 3-14 RI/FS (DOE-ID 1999). Project planning is intended to identify the proper sequence of site activities to accomplish the investigation. The following subsections describe the plans developed as part of the planning and scoping process. These plans are prepared in accordance with the EPA document entitled *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA* (EPA 1988).

5.1.1 Field Sampling Plans and Quality Assurance Project Plan

Two FSPs have been prepared for the OU 3-14 RI/FS activities and are attachments to the Work Plan. The FSP directing Tank Farm soil field sampling activities contains detailed procedures for collecting and analyzing data for the Tank Farm (DOE-ID 2000c). The FSP directing INTEC injection well field sampling activities contains detailed procedures for collecting and analyzing data for the INTEC injection well (DOE-ID 2000b). The procedures also contain the sampling objectives, sample locations and frequency, sample designation, sampling equipment, and sample handling and analysis for the Tank Farm and the INTEC injection well.

The QAPjP (DOE-ID 2000a) includes procedures designed to ensure the integrity of samples collected, the precision and accuracy of the analytical results, and the representativeness and completeness of environmental measurements collected for OU 3-14. The QAPjP is an attachment to this Work Plan. The QAPjP, written in accordance with RI/FS guidance, discusses the following elements:

- INEEL Environmental Restoration description
- Project organization and responsibility, including the names of individuals responsible for ensuring that the environmental data collected are valid
- Quality assurance objectives for data, including required data precision, accuracy, representativeness, completeness, and allowed usage of the data
- Sample custody procedures and documentation
- Calibration procedures and frequency
- Analytical procedures with references to applicable standard operating procedures
- Data reduction, validation, and reporting procedures
- Internal quality control procedure description or reference

- Performance and system audits
- Preventive maintenance procedures
- Specific routine procedures used to assess data accuracy, precision, and completeness
- Corrective action procedures
- Quality assurance reports, including results of system and performance audits and assessments of data accuracy, precision, and completeness.

5.1.2 Health and Safety Plans

Two health and safety plans for the OU 3-14 RI/FS activities are attachments to the Work Plan: one for the Tank Farm soil remedial investigation (BBWI 2000c) and another for the INTEC injection well drilling and sampling project (BBWI 2000b). The health and safety plans, which are both attachments to the Work Plan, establish the procedures and requirements that will be used to eliminate or minimize health and safety risks to persons performing tasks for the OU 3-14 Tank Farm soil remedial investigation and the INTEC injection well drilling and sampling project. The two health and safety plans have been prepared in accordance with the Occupational Safety and Health Administration standard (29 CFR 1910.120/1926.65). The two plans contain information about the hazards involved in performing the work, as well as the specific actions and equipment that will be used to protect persons while working at the task site. Project activities and hazards have been evaluated and are within the INTEC safety authorization basis (DOE 2000, 1999), as defined by the U.S. Department of Energy Order 5480.23, "Nuclear Safety Analysis Reports."

The health and safety plans also contain the safety, health, and radiological hazards assessments for executing all OU 3-14 Tank Farm soil remedial investigation tasks and INTEC injection well drilling and sampling project tasks. The intent of the documents is to identify known hazards and serve as plans for mitigating them.

5.1.3 Waste Management Plan

The Waste Management Plan for the Phase I investigation for OU 3-14 RI/FS is an attachment to the Work Plan (BBWI 2000d). The plan identifies the potential waste types and quantities expected to be generated during the implementation of the RI/FS. The plan addresses the various waste stream sources and classifications and provides for the disposition of the waste streams generated to support the RI/FS. The Waste Management Plan is written in accordance with applicable federal and state regulations. The specific federal and state requirements for waste characterization, storage, and disposition are discussed in the plan.

5.1.4 Data Management Plan

The Data Management Plan for INEEL Environmental Restoration and Deactivation, Decontamination and Dismantlement (D&D&D) Programs (BBWI 2000a) specifies the process for data management of all D&D&D INEEL Environmental Restoration programs.

5.2 Quality Assurance and Quality Control

The Quality Assurance Project Plan for WAGs 1, 2, 3, 4, 5, 6, 7, 10, and Inactive Sites (QAPjP) (DOE-ID 2000a) is an attachment to the Work Plan. This plan pertains to quality assurance (QA) and quality control for all environmental, geotechnical, geophysical, and radiological testing, analysis, and data review. This section details the field elements of the QAPjP to support field operations during sampling and monitoring.

5.2.1 Project Quality Objectives

The QA objectives specify which measurements must be met to produce acceptable data for a project. The technical and statistical qualities of these measurements must be properly documented. Precision, accuracy, and completeness are quantitative parameters that must be specified for physical or chemical measurements. Representativeness and comparability are qualitative parameters.

The QA objectives for this project will be met through a combination of field and laboratory checks. Field checks will consist of collecting field duplicates, equipment blanks, and field blanks. Laboratory checks consist of initial and continuing calibration samples, laboratory control samples, matrix spikes, and matrix spike duplicates. Laboratory QA is detailed in the QAPjP (DOE-ID 2000a).

5.2.2 Field Precision

Field precision is a measure of the variability not caused by laboratory or analytical methods. The three types of field variability or heterogeneity are spatially within a data population, between individual samples, and within an individual sample. Though the heterogeneity between and within samples can be evaluated using duplicate samples or sample splits, overall field precision will be calculated as the relative percent difference (RPD) between two measurements or the relative standard deviation (RSD) between three or more measurements. The RPD or RSD will be calculated as indicated in the QAPjP for duplicate samples during the data validation process. Precision goals have been established for inorganic Contract Laboratory Program (CLP) methods by the EPA (EPA 1993) and for radiological analyses in the Sample Management Office (SMO) Technical Procedure (TPR)-80, "Radiological Data Validation."

5.2.3 Field Accuracy

Cross-contamination of samples during collection or shipping could yield incorrect analytical results. To assess the occurrence of any cross-contamination events, field blanks will be collected to evaluate any potential impacts. The goal of the sampling program is to eliminate any cross-contamination associated with sample collection or shipping (DOE-ID 2000b, 2000c).

Accuracy of field instrumentation can be maintained by calibrating all instruments used to collect data and cross checking with other independently collected data.

5.2.4 Completeness

Field completeness will be assessed by comparing the number of samples collected to the number of samples planned. Field sampling completeness is affected by factors such as equipment and instrument malfunctions and insufficient sample recovery. Completeness can be assessed following data validation and reduction. The completeness goal for this project is 100% for critical activities and 90% for noncritical activities. Well installations are considered critical activities, while the collection of individual samples is noncritical.

5.2.5 Representativeness

Representativeness is evaluated by assessing the accuracy and precision of the sampling program and expressing the degree to which samples represent actual site conditions. In essence, representativeness is a qualitative parameter that addresses whether the sampling program was properly designed to meet the DQOs. The representativeness criterion is best satisfied by confirming that sampling locations are selected properly and a sufficient number of samples are collected to meet the requirements stated in the DQOs (see Section 4.4 for a list of the DQOs.)

5.2.6 Comparability

Comparability is a qualitative measure of the confidence with which one data set can be compared to another. These data sets include data generated by different laboratories performing this work, data generated by laboratories in previous studies, data generated by the same laboratory over a period of several years, or data obtained using different sampling techniques or analytical protocols. For field aspects of this program, data comparability will be achieved using standard methods of sample collection and handling. Procedures identified to standardize the sample collection and handling include SOP-11.8, "Groundwater Sampling," and MCP-244, "Chain of Custody, Sample Handling, and Packaging for CERCLA Activities."

Data collection frequency and long-term trends will ensure comparability of monitoring data.

5.2.7 Field Data Reduction

The reduction of field data is an important task to ensure that errors in sample labeling and documentation have not been made. This includes cross referencing the SAP table presented in Appendix A of both FSPs with sample labels, logbooks, and chain of custody forms. Prior to sample shipment to the laboratory, field personnel will ensure that all information is properly documented.

5.2.8 Data Validation

All laboratory-generated data will be validated to Level A. Data validation will be performed in accordance with TPR-79, "Levels of Analytical Method Data Validation." Field-generated data (e.g., matric potential, moisture measurements, and water levels) will be validated through the use of properly calibrated instrumentation, comparing and cross checking data with independently gathered data, and recording data collection activities in a bound field logbook.

5.2.9 Quality Assurance Objectives for Measurement

The QA objectives are specifications that the monitoring and sampling measurements identified in the QAPjP must meet to produce acceptable data for the project. The technical and statistical quality of these measurements must be properly documented. Precision, accuracy, method detection limits, and completeness must be specified for hydraulic and chemical measurements. Specific QA objectives are specified in the QAPjP (DOE-ID 2000a).

5.3 Data Management and Evaluation

Two types of data are being collected under this Work Plan (from the Tank Farm soil and the INTEC injection well investigations), and the two data sets will be managed and evaluated differently. Analytical data that results from the aquifer sampling will be evaluated and validated by the SMO and managed and maintained by the Integrated Environmental Data Management System (IEDMS). Field data (e.g., gamma survey and moisture data) will be electrically collected and initially maintained and managed by the TL for the specific data set. The Hydrogeologic Data Repository (HDR) will supply long-term management for all field data. This section discusses the approach to managing the two data types and evaluation of data.

5.3.1 Data Management

The following discussion presents the various processes associated with managing the data collected as part of the operations and maintenance monitoring. The two types of data discussed above require different management techniques. Management for data collected from the Tank Farm soil and INTEC injection well investigations will follow guidelines specified in the INEEL Environmental Restoration Data Management Plan (BBWI 2000a) and in following subsections.

5.3.2 Laboratory Analytical Data

Analytical data are managed and maintained in the IEDMS. The components that make up IEDMS provide an efficient and accurate means of sample and data tracking.

The IEDMS performs sample tracking throughout all phases of a sampling project beginning with the assignment of unique sample identification numbers using the SAP Application Program. The SAP Application Program produces a SAP table that contains a list of sample identification numbers, sample demographics (e.g., area, location, and depth), and the planned analyses. Once the SAP table is finalized, it is used as input to automatically produce sample labels and tags (with or without barcode identification). In addition, sampling guidance forms can be produced for the field sampling team that provide information such as sampling location, requested analysis, container types, and preservative.

When the analytical data package (sample delivery group) is received, it is logged into the IEDMS journaling system, an integrated subsystem of the sample tracking system, which tracks the SDG from data receipt to the Environmental Restoration Information System (ERIS). Cursory technical reviews on the data packages are performed to assess the completeness and technical compliance with respect to the project's analysis-specific task order statement of work (SOW). Any deficiencies, resubmittal actions, or special instructions to the validator are recorded on the Cursory Subcontractual Compliance Review (CSCR) form using the Laboratory Performance Indicator Management System. This form is sent to the validator with the data package (when required).

Errors in the data package are resolved among all pertinent SMO chemists, the originating laboratory, and the IEDMS staff. Data validity is ensured by the validator through the assignment of method validation flags. The validator generates a limitations and validation report, which gives detailed information on the assignment of data qualifier flags. A copy of the form accompanies the report with the assigned data qualifier flags and any changes to the data, which are entered into the IEDMS database. From this database, a summary table (a result table) is generated. The result table summarizes the sample identification numbers, sample logistics, analytes, and results for each particular type of analysis (e.g., inorganic, radiological, and organic) from the sampling effort.

5.3.3 Field Data

Field data include all data that are nonchemical analytical data generated in support of OU 3-14. This data will be managed in accordance with the requirements specified in the INEEL Environmental Restoration Data Management Plan (BBWI 2000a). Final field data will reside in the HDR for long-term management.

Field data will be analyzed using methods that are appropriate for the data types and specific field conditions. Analysis will include recognized methods and techniques that are used with the specific data types and may include statistical processes.

5.3.4 Data Evaluation

Data evaluation will depend on the type of data (e.g., laboratory or field), and will follow specified procedures.

5.3.5 Laboratory Analytical Data

Analytical data will be validated and analyzed by the SMO in accordance with MCP-227, "Sampling and Analysis Process for CERCLA and D&D Activities."

The validated data will be used to determine concentrations of contaminants in the soil, pore water, and SRPA water.

5.4 Risk Evaluation and Methodology

This section provides a summary of the baseline risk assessment (BRA) and methodology that will be performed for OU 3-14 RI/BRA. This risk evaluation will use the OU 3-13 RI/BRA risk approach; however, modifications or changes may be instituted, as dictated by unique situations that may exist at OU 3-14.

The purpose of the BRA is to determine potential adverse human health effects posed by contaminants of potential concern (COPCs) identified at OU 3-14 under the No Action alternative (DOE-ID 1991). Typically, BRAs are composed of two parts: a human health evaluation and an ecological evaluation. The OU 3-14 BRA will focus solely on the human health evaluation because an ecological evaluation has previously been performed for the OU 3-13 Comprehensive RI/FS (DOE-ID 1997). The results of the ecological evaluation suggest that a significant decline in the health or diversity of INEEL-wide ecological communities is considered very low.

The procedures used in the BRA are consistent with those described in the following guidance documents:

- Risk Assessment Guidance For Superfund, Volume I: Human Health Evaluation Manual (RAGS) (EPA 1989a)
- Supplemental Guidance for Superfund Risk Assessments in Region 10 (EPA 1991)
- Guidance Protocol for the Performance of Cumulative Risk Assessments at the INEL (LMITCO 1995).

The OU 3-14 BRA will be similar in format to the OU 3-13 BRA (DOE-ID 1997) and will draw from the results of that evaluation. As a result of the large uncertainty in the Tank Farm contaminant inventories and the groundwater flow and transport model parameters used in the OU 3-13 RI/FS, Tank Farm contaminant inventories will be evaluated as part of the OU 3-14 RI/FS. The evaluation will be achieved primarily through additional sample collection, the goals of which are to reduce uncertainty related to the exposure point concentration and refine understanding of contaminant concentrations that will potentially migrate to the SRPA. In addition, the risk assessment will calculate the cumulative groundwater risk for the INTEC Tank Farm area to update the OU 3-13 risk calculations.

The human health BRA for OU 3-14 will include the following components:

- **Conceptual Site Model**. The conceptual site model for OU 3-14 will provide a current understanding of the sources of contamination, physical setting, current and future land use, and beneficial use of groundwater to identify potentially complete exposure pathways. Information generated during the RI has been incorporated into this conceptual site model to identify potential exposure scenarios.

- **Data Evaluation and Contaminants of Potential Concern (COPCs).** This section presents a summary of the data collected for OU 3-13 and OU 3-14, and a description of the screening evaluation, for the purpose of identification and selection of contaminants at the site that are of greatest potential health concern.

- **Exposure Assessment.** An exposure assessment is conducted to estimate the magnitude of potential human exposures, the frequency and duration of these exposures, and the pathways through which humans are potentially exposed to COPCs detected at the site. The exposure assessment involves evaluating chemical releases from the site, identifying potentially exposed populations and pathways of exposure, estimating exposure point concentrations for specific pathways, and estimating chemical intake rates in humans.

- **Toxicity Assessment.** The toxicity assessment will involve the characterization of the toxicological properties and health effects of COPCs with special emphasis on defining their dose-response relationships. From these dose-response relationships, toxicity values are derived that can be used to evaluate the potential occurrence of adverse health effects at different levels of exposure.

- **Risk Characterization.** This section will combine the results of the exposure assessment and toxicity assessment to characterize risk to human health, both in numerical expressions and qualitative statements.

- **Uncertainty Analysis.** The uncertainties in the risk assessment process and how these uncertainties influence the characterization of health risks will be qualitatively analyzed.

5.5 OU 3-14 Additional Investigations

The following investigations are in addition to the field work discussed in Section 4. These investigations will be conducted for the Tank Farm soil, INTEC injection well, and groundwater for sites and contaminants retained after the screening process for the OU 3-14 COPCs. The results of the investigations will be used to support the BRA and evaluation of remedial alternatives.

5.5.1 Contaminant Transport Study

The contaminant transport study data requirements and objectives will be negotiated during scoping meetings with the agencies. A draft contaminant transport study work plan will be developed and reviewed by DOE-ID, EPA, and IDEQ.

The anticipated scope of a contaminant transport study for the Tank Farm soil is to experimentally determine site-specific adsorption and desorption coefficients for the OU 3-14 Tank Farm soil COPCs on Tank Farm geological materials. The contaminant transport study provides the background and technical approach for quantifying the sorptive behavior of the COPCs in the INTEC OU 3-14 Tank Farm soil.

Three pieces of information are needed for Tank Farm soil. These are (1) the release of contaminants from sources in the Tank Farm soil, (2) the vertical profile of retardation capabilities, and

(3) the spatial variability of retardation capabilities. Source-release information will be gathered on Tank Farm soil by evaluating K_ds, assessing the neutralization capability of the soil, and leach tests. Decision on where and which depths samples will be collected will be determined as more information is gleaned from characterization of the Tank Farm soil. The contaminant transport data will be used in the fate and transport model to assess remedial alternatives.

5.5.2 Treatability Studies

The treatability study data requirements and objectives will be negotiated during scoping meetings with the agencies. If a treatability study work plan is developed, it would be reviewed by the DOE-ID, EPA and IDEQ.

Tank Farm treatability studies may be necessary in two areas: (1) the encapsulation and immobilization of OU 3-14 COPCs, and (2) removal of specific hot spots, ex situ treatment (if needed), and disposal. The encapsulation and immobilization of OU 3-14 COPCs could entail treatability studies using polymer injection, reactive barriers, or an engineered cap.

INTEC injection well treatability studies may be performed if deemed necessary. It is anticipated that they would be predicated on the depth of the source terms of interest. The efforts directed toward treatability studies would include (1) grout/polymer injection, (2) adsorption, and (3) investigation of the efficacy of plume interception by pump and treat.

Contaminants of potential concern for sites CPP-61, CPP-81, and CPP-82 have not yet been determined. Once a determination has been made, treatability studies may be necessary to address these COPCs.

5.5.3 Risk Assessment and Groundwater Strategy Report

The Risk Assessment and Groundwater Strategy Report will be prepared to identify the conceptual site model that will be used to address the physical and contaminant releases from the Tank Farm and the INTEC injection well. This report will identify the approach for the risk assessment and exposure modeling. In addition, the groundwater strategy will be developed to delineate the computer code and input requirements for the SRPA under INTEC.

5.5.4 Baseline Risk Assessment (scheduled)

A BRA is currently intended for the INTEC injection well portion of the project only because the Tank Farm soil is assumed to pose an unacceptable risk. If a risk assessment is necessary for the Tank Farm soil, then the level of assessment will be negotiated with DOE-ID, EPA, and IDEQ. A technical paper will be developed and presented to DOE-ID, EPA, and IDEQ.

5.6 Remedial Alternatives Screening for OU 3-14

The FS will address residual risk or regulatory needs at the Tank Farm soil, INTEC injection well, and the additional sites assigned from OU 3-13 sites CPP-61, CPP-81, and CPP-82. The FS will document the procedure to develop, screen, and analyze remedial alternatives. A site-specific statement of purpose for a response (i.e., an evaluation of remedial alternatives through the FS process) will be prepared based on the results of the RI and the cumulative and comprehensive risk assessment. This statement will identify the actual or potential contamination sources and exposure pathways to be addressed by the remedial action alternatives. The following section addresses this for all sites. Where there are differences between the sites in the remedial alternative screening, these differences will be noted in the text.

5.6.1 Remedial Action Objectives and General Response Actions

Remedial action objectives are media- and OU-specific for protecting human health and the environment. The RAOs will be based on the results of an initial analysis of ARARs and a thorough evaluation of risks as indicated in the BRA. The RAOs will focus on protecting human health and the environment and will address the need to achieve specific contaminant concentrations or eliminate contaminant migration pathways.

General response actions will be developed to satisfy the site-specific RAOs. General response actions for OU 3-14 may include no action, institutional controls, containment, in situ treatment, ex situ treatment, excavation or disposal on the INEEL site, and excavation or disposal off the INEEL site. Like RAOs, general response actions are media-specific. General response actions that might be used at a site are initially defined during scoping and are refined throughout the comprehensive RI/FS as site conditions become better understood and action-specific ARARs are identified. A range of remedial alternatives will eventually be identified and developed to satisfy the established RAOs.

For the INTEC injection well, the FS, will address residual risk or regulatory needs. The FS will document the procedure to develop, screen, and analyze remedial alternatives. A site-specific statement of purpose for a response (i.e., an evaluation of remedial alternatives through the FS process) will be prepared based on the results of the RI and the cumulative and comprehensive risk assessment. This statement will identify the actual or potential contamination sources and exposure pathways to be addressed by the remedial action alternatives.

5.6.2 Preliminary Remedial Process Options

5.6.2.1 Appropriate Process Options. The FS process will include a screening of appropriate process options available to address residual contamination that poses unacceptable risks at OU 3-14. Process options can be categorized into various technology types. The process options are grouped into the following general response actions.

For Tank Farm soil, if necessary, the additional soil sites from OU 3-13, and sites CPP-61, CPP-81, and CPP-82:

- ***Institutional Controls***—Institutional controls include actions that prevent or limit access to contaminated areas through the period of time that DOE controls the INTEC facility. Institutional controls also may extend beyond the period in which DOE maintains control at INTEC; however, another agency such as the Bureau of Land Management (BLM) may take over the administration of institutional controls. Institutional controls may include monitoring, access restriction (fences or other barriers, signs, and security), soil moisture management, administrative procedures, and deed restrictions. Past INEEL remedial action decisions that employ only institutional controls are referred to as limited action decisions.

- ***Containment***—Containment, often the preferred method of dealing with sites where treatment is impractical, may reduce the risk to acceptable levels without removing contaminants from the site. Containment includes process options such as capping, grout curtains, or sheet pilings designed to isolate contaminants and prevent their migration beyond the containment boundaries. Experience and data collected from other contaminated sites will help guide the development and evaluation of alternatives that include the general response action of containment.

- ***In Situ Treatment***—In situ treatment process options include treatment technologies such as solidification. The in situ treatment options would be integrated into alternatives that focus on reducing the toxicity, mobility, or volume of contaminants without removal.

- ***Ex Situ Treatment***—Ex situ treatment process options require removing contaminants from their current location and treating them to reduce their toxicity, mobility, or volume. Ex situ treatment options could include processes such as soil washing, physical separation, and ex-situ vitrification. Treated materials can either be returned to their original location or transported to a new location.

- ***Excavation/Disposal On- or Off-Site***—This general response action includes process options for removing contaminated media in the Tank Farm and sites CPP-61, CPP-81, and CPP-82, if necessary. Once removed, materials would be packaged for disposal in an engineered facility located either on or off the INEEL Site, possibly after the appropriate ex situ treatment.

For the INTEC injection well:

- ***Institutional Controls***—Institutional controls include actions that prevent or limit access to contaminated areas through the period of time that DOE controls the INTEC facility. Institutional controls also may extend beyond the period in which DOE maintains control of INTEC; however, another agency such as the BLM, may take over the administration of institutional controls. Institutional controls may include monitoring, aquifer recategorization, access restriction (fences or other barriers, signs, and security), administrative procedures, and deed restrictions. Past INEEL remedial action decisions that employ only institutional controls are referred to as limited action decisions.

- ***Containment***—Containment, often the preferred method of dealing with sites where treatment is impractical, may reduce the risk to acceptable levels without removing contaminants from the site. Containment includes process options such as capping, migration barriers designed to isolate contaminants and prevent their migration into the SRPA, vertical barriers, and chemical or physical treatments such as adsorption or solidification. Experience and data collected from other contaminated sites will help guide the development and evaluation of alternatives that include the general response action of containment.

- ***In Situ Treatment***—In situ treatment process options include treatment technologies such as barriers and physical and chemical treatments. The in situ treatment options would be integrated into alternatives that focus on reducing the toxicity, mobility, or volume of contaminants without removal.

- ***Ex Situ Treatment***—Ex situ treatment process options require removing contaminants from their current location and treating them to reduce their toxicity, mobility, or volume. Ex situ treatment options could include processes such as a physical or chemical treatment such as reverse osmosis or ion exchange, evaporation, and ex situ solidification. Treated materials can either be returned to their original location or transported to a new location.

- ***Groundwater Removal for Disposal On or Off the INEEL Site***—This general response action includes process options for removing (pumping) contaminated groundwater. Once removed and treated, materials would be packaged for disposal in an engineered facility located either on or off the INEEL Site.

The general response action of no action would be considered a baseline against which developed alternatives would be compared. No action at the INEEL generally includes the institutional action of long-term monitoring.

5.6.2.2 Screening of Process Options. The master list of preliminary process options supporting the selected general response actions for OU 3-14 will be screened to eliminate clearly unsuitable process options. This process option screening will be based on effectiveness, implementability, and cost.

Specific process options will be evaluated with regard to their effectiveness in achieving the RAOs. This evaluation will focus on the following:

- The potential effectiveness of process options in handling the estimated volumes of contaminants in specific environmental media and meeting the remediation goals identified in the RAOs

- The potential impacts to human health and the environment during the construction and implementation phase

- The reliability of the process with respect to remediation of the contaminants and site conditions.

Implementability encompasses both the technical and administrative feasibility of implementing a process option. Technical implementability is used as an initial screen of process options to eliminate those that are clearly ineffective or unworkable at a site. Although administrative aspects of implementability are evaluated primarily during the detailed analysis of alternatives, these factors, such as the availability of treatment, storage, and disposal services, including capacity, and the availability of necessary equipment and skilled workers to implement the process option, are considered as well.

Cost is a factor in the screening of process options. Relative capital and operating and maintenance costs are used rather than detailed estimates. At this stage of process option screening, cost analysis is based on engineering judgment and past experience, and the cost (high, low, or medium) of each process is evaluated relative to other process options of the same technology type.

Elimination of any process option during screening will be fully documented in the final FS report.

5.6.3 Development of Alternatives

Alternatives will be developed that protect human health and the environment by eliminating, reducing, or controlling risks posed by the site. General response actions and the process options chosen to represent the various technology types for each medium are combined to form alternatives for the Tank Farm soil as a whole. Often, more than one general response action will be applied to each medium.

5.6.4 Threshold and Balancing Criteria

Alternatives will be screened on the basis of the short- and long-term aspects of their effectiveness, implementability, and cost. To the extent practical, a wide range of alternatives will be preserved.

5.6.4.1 Effectiveness. A key aspect of the screening evaluation is the effectiveness of each alternative in protecting human health and the environment. Each alternative developed will be evaluated for effectiveness in providing protection and reduction of toxicity, mobility, or volume. Both short- and long-term components of effectiveness will be evaluated. Short-term effectiveness refers to the period until the remedial action is complete. Long-term effectiveness refers to controls that may be required to manage the risk posed by treatment residuals, untreated water, and any contamination left at the site. Reduction of toxicity, mobility, or volume refers to changes in one or more characteristics of the radiological or chemical compounds or contaminated media resulting from a treatment that decreases the inherent threats or risks associated with the contamination.

5.6.4.2 Implementability. Implementability is a measure of both the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. Technical feasibility is the ability to construct, reliably operate, and meet technology-specific regulations for process options. Administrative feasibility refers to the ability to obtain approvals from DOE-ID, EPA, and IDEQ; availability of treatment, storage, and disposal services (and capacity); and the requirements for and availability of specific equipment and technical specialists.

5.6.4.3 Cost. A cost estimate for each alternative will be prepared. The estimate of capital and operations and maintenance costs will be considered, where appropriate, during the screening of alternatives. The evaluation will include those operating and maintenance costs that will be incurred for as long as necessary, even after the initial remedial action is complete. In addition, potential future remedial action costs will be considered during alternative screening to the extent that they can be defined. Present worth analyses will be used during alternative screening to evaluate expenditures that occur over different time periods.

5.6.4.4 Selection of Alternatives for Detailed Analysis. The list of candidate alternatives will be narrowed to those that reduce risk to the public and the environment and are technically feasible. The identified process options will then be evaluated and screened based on effectiveness, implementability, and cost.

The results of the screening process will be reviewed by DOE, EPA, and the IDEQ. This review will result in an agreed-upon set of alternatives that will undergo detailed analysis.

5.7 Detailed Analysis of Alternatives for OU 3-14

A range of remedial alternatives that represent distinct, viable approaches to addressing residual risks of the Tank Farm soil will be developed. A no action alternative also will be developed and will serve as a baseline against which the action alternatives are compared. Alternatives remaining after the screening process will be thoroughly analyzed. The detailed analysis will consist of an assessment of individual alternatives compared to the nine evaluation criteria discussed below. A comparative analysis will then focus on the relative performance of each alternative against the criteria.

The nine evaluation criteria (discussed below) are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria. The first two criteria, overall protection of human health and the environment and compliance with ARARs, are the threshold criteria that must be met in order for an alternative to be eligible for selection. The third to seventh criteria are the primary balancing criteria that compare the relative tradeoffs among the alternatives. The last two criteria are the modifying criteria and will be addressed in the ROD following public comment on the comprehensive RI/FS report and proposed plan.

5.7.1 Overall Protection of Human Health and the Environment

Alternatives will be assessed to determine whether they can adequately protect human health and the environment by eliminating, reducing, or controlling risks.

5.7.2 Compliance with ARARs

The alternatives will be assessed to determine whether they meet ARARs. The FS will acknowledge those alternatives that would require an ARARs waiver under 40 CFR 300.430 (f)(1)(ii)(C) to be the proposed remedial alternative.

5.7.3 Long-Term Effectiveness and Permanence

Alternatives will be assessed to determine the long-term effectiveness and permanence that they afford, along with the degree of certainty that each alternative will prove successful. Factors affecting long-term permanence and effectiveness include the following:

- A residual risk assessment for each alternative to evaluate the cumulative effects of both long-term and short-term risks associated with the implementation of the remedial alternative
- The type, degree, and adequacy of long-term management required including engineering controls, institutional controls, monitoring, operation, and maintenance
- Long-term reliability of controls, including uncertainties associated with land disposal of untreated hazardous waste and treatment residuals
- The potential need for replacement of the remedy.

5.7.4 Reduction of Toxicity, Mobility, and Volume

The degree to which alternatives employ treatments that reduce toxicity, mobility, or volume will be assessed. Factors affecting toxicity, mobility, or volume that will be considered include the following:

- The type of process options employed in an alternative and what materials they will treat
- Amount of contamination that will be destroyed or treated
- The degree of expected reduction in toxicity, mobility, or volume
- The degree to which the treatment is irreversible
- Residuals that will remain and by-products that will be created following treatment.

5.7.5 Short-Term Effectiveness

Assessment of short-term effectiveness of alternatives will consider the following:

- Possible short-term risks to the community during implementation of an alternative
- Potential impacts on workers conducting remedial actions and the effectiveness and reliability of protective measures
- Potential environmental impacts of remedial actions and the effectiveness and reliability of mitigative measures during implementation
- The time until protection is achieved.

5.7.6 Implementability

Assessment of the ease or difficulty of implementing the alternatives will consider the following:

- Degree of difficulty or uncertainty associated with construction and operation of the technology
- Expected operational reliability and the ability to undertake additional action, if required
- Ability and time required to obtain necessary approvals and permits from the agencies
- Availability of necessary equipment and specialists
- Available capacity and location of needed treatment, storage, and disposal services
- Timing of the availability of prospective technologies that may be under development.

5.7.7 Costs

Costs will be estimated, including capital and operation and maintenance costs based on present value. The costs will be developed with an accuracy of +50 to -30% (EPA 1988a), unless otherwise stated in the FS.

5.7.8 State of Idaho Acceptance

Concerns identified by the IDEQ during its reviews of the comprehensive RI/FS Work Plan, RI/FS, proposed plan, and ROD will be assessed. The reviews will consider the proposed use of waivers, the selection process used to evaluate alternatives, and other actions. Comments received from the State of Idaho will be incorporated into the remedial evaluation.

5.7.9 Community Acceptance

Community response to the alternatives will be assessed. Similar to the IDEQ acceptance criteria, complete assessment will not be possible until comments on the proposed action have been received. The process for public involvement is discussed in detail in Section 5.12.2.

5.8 Remedial Investigation/Feasibility Study Report

A draft RI/FS report will summarize previous field investigation results, treatability studies, ARAR analyses, comprehensive and cumulative risk assessments, and remedial alternatives. The RI/FS report is defined as a primary document in the FFA/CO Action Plan (DOE-ID 1991). The RI/FS report will serve as a basis for consolidating information that has been obtained and will document the rationale used to screen and develop remedial actions for OU 3-14. The RI/FS report will contain information that the decision makers need to select an appropriate remedy for OU 3-14. The elements of the RI/FS report will follow the basic format presented in EPA 1989c. Supporting data, information, and calculations will be included in the appendices to the report. The document will be revised in accordance with comments received and submitted to DOE-ID, EPA, and IDEQ for review. Written comments on the draft RI/FS from EPA and IDEQ will be addressed in the final RI/FS report.

5.9 Proposed Plan and Record of Decision

The OU 3-14 RI/FS activities include preparation of a proposed plan and ROD. The proposed plan, a secondary document, as defined in the FFA/CO Action Plan (DOE-ID 1991), will be prepared to facilitate public participation in the remedy selection process. After the RI/FS report is complete, the proposed plan for OU 3-14 will be presented to the public. This plan will outline the proposed remediation plans developed and supported by the RI/FS activities. The proposed plan will be written in accordance with the format recommended in EPA guidance (EPA 1989b). Any issues raised during the public comment period will be addressed in the ROD responsiveness summary.

Public involvement in the decision process is vital to the successful implementation of a remedial alternative. Public participation in the decision process will be conducted according to the Community Relations Plan (DOE-ID 1995) and EPA guidance (EPA 1989b).

After DOE-ID, EPA, IDEQ, and public comments on the RI/FS report and proposed plan are received, a remedy for OU 3-14 will be selected and documented in the ROD, which will be signed by the parties specified in the FFA/CO. The ROD will be prepared in accordance with EPA guidance (EPA 1989b). The ROD will serve the following four functions:

- Certify that the remedy selection process was carried out in accordance with the FFA/CO (DOE-ID 1991) and, to the extent practicable, with the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 CFR 300)
- Describe the technical parameters of the remedy, specifying the treatment, engineering, and institutional components as well as remediation goals
- Provide the public with a consolidated source of information about the site and the chosen remedy, including the rationale behind the selection
- Delineate post-ROD activities such as scoping the remediation, remedial action plan development, and monitoring.

5.10 Preliminary Remedial Action Alternatives

Preliminary remedial action alternatives are based on site conditions, previous experience, engineering judgement, and guidelines set forth in the NCP. In general, a remedial action alternative should protect human health and the environment. The overall objective of an alternative is to mitigate the potential adverse effects of OU 3-14 contaminants. Most of the remedial action alternative applicable to OU 3-14 sites, including the no action alternative, can and will include groundwater monitoring.

Preliminary remedial action alternatives considered for OU 3-14 sites include the following:

- *No action*

- *No action with groundwater monitoring*—Monitoring is used to detect potential future releases to SRPA

- *Access restriction*—This is intended to prevent or reduce exposure to onsite contamination. This may be accomplished through fencing to physically limit access to sites and through deed restrictions to notify any potential purchase of property with potential risks

- *Containment*—Containment refers to technologies that isolate contaminants and mitigate offsite migration by using engineering controls. A cover or cap that may consist of a native soil cover, a single barrier, or a composite barrier plus a feasible membrane liner may be considered. This alternative also could include encapsulation or grouting (e.g., a bentonite slurry or polymer injection) of contaminated areas

- *Hotspot removal followed by treatment or disposal*—Removal of contaminated soil that represents discrete accessible locations within OU 3-14 where a waste type or mixture of waste presents a potential threat to human health or the environment

- *Surface controls*—Surface control technologies are designed to control and direct site runoff and to prevent off-site surface water from running onto the site. Examples of surface controls include grading, which modifies topography to promote positive drainage and control the flow of surface water, and establishing vegetation to stabilize the soil surface and promote evapotranspiration. Interim action under the OU 3-13 ROD for the Tank Farm includes surface water runon diversion channels, grading, and surface sealing to divert 80% of the precipitation.

- *Leachate collection, monitoring, and treatment*—Leachate collection is used to minimize or eliminate the migration of leachate to groundwater

- *Groundwater pumping and treatment*—Groundwater is pumped to the surface for remediation and is returned to the aquifer. Interim action under the OU 3-13 ROD for the SRPA includes contingent active pump and treat remediation if the current groundwater concentrations will result in aquifer concentrations above MCLs after 2095, as predicted by the groundwater model. Furthermore, the area of the aquifer that is predicted to have concentrations above MCLs in 2095 must be able to sustain production above 0.5 gpm and be located outside the current INTEC security fence before remediation is required.

5.11 Identification of Potentially Applicable or Relevant and Appropriate Requirements

This section initially identifies ARARs for OU 3-14. The list represents a preliminary identification of ARARs based on site characteristics and knowledge of contaminants. Further identification and definition of ARARs will be conducted through a phased process as remedial action alternatives appropriate for the site are identified and will be presented in the OU 3-14 RI/FS, Proposed Plan, and ROD.

The CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (42 USC § 9601), requires the selection of remedial actions that satisfy two threshold criteria: overall protection of human health and the environment and compliance with ARARs. Remedies must address substantive standards, requirements, criteria, or limitations under any federal environmental law and any promulgated state environmental requirements, standards, criteria, or limitations that are more stringent than corresponding federal standards. In addition, the importance of nonpromulgated criteria or other advisory information to be considered is formally recognized in the NCP in the development of remediation goals or cleanup levels. This information is labeled to-be-considered (TBC) criteria.

The EPA has specified that potential ARARs identified for a site should be considered at several points in the remediation planning process (52 FR 32496). These points include the following:

- During scoping of the RI/FS, chemical- and location-specific ARARs may be identified on a preliminary basis.

- During the site characterization phase of the RI, when the baseline public health evaluation is conducted to assess risk at a given site, chemical-specific ARARs and TBC criteria are identified more comprehensively and are used to help identify preliminary remedial action objectives (RAOs).

- During the FS, location- and action-specific ARARs are identified for each alternative evaluated in the detailed analysis of alternatives. Changes in regulatory requirements can be assessed though the development of the ROD.

The ARAR identification process for the OU 3-14 comprehensive investigation consists of evaluating sites against the CERCLA *Compliance with Other Laws* manual (EPA 1988b) to identify preliminary chemical- and location-specific ARARs. Generally, action-specific ARARs are identified in the FS, as appropriate for the remedial alternatives under consideration. However, if an action-specific ARAR contains generic requirements that are deemed appropriate in most remedial scenarios likely to be employed at OU 3-14, it is identified below.

5.11.1 Preliminary ARARs Identification

Sections 5.11.1.1 through 5.11.2 discuss the preliminary list of ARARs that may apply to OU 3-14. Section 5.11.2 presents a preliminary list of TBC criteria that may apply to remedial actions under OU 3-14. Tables 5.1 and 5.2 present preliminary lists of potential ARARs and TBC guidance, respectively.

5.11.1.1 Action-Specific ARARs. Action-specific ARARs are technology- or activity-based requirements for actions taken at a site. Action-specific ARARs generally do not guide the development of remedial action alternatives, but they indicate how the selected remedy must be implemented. Action-specific ARARs will be refined following alternative development.

Principle action-specific ARARs relate to radioactive material and well construction requirement standards, the management of stormwater and fugitive dust emissions, and management and disposal of radioactive or hazardous waste or residuals. Dust suppression methods are used to control fugitive dust emissions.

5.11.1.2 Chemical-Specific ARARs. Chemical-specific ARARs are usually health- or risk-based values that establish the acceptable amounts or concentrations of a chemical that may be found in or discharged to the ambient environment.

Table 5-1. Preliminary list of ARARs for Tank Farm soil and groundwater.

Statute or Requirement	Citation	Type of Requirement	Comments
Idaho Fugitive Dust Emissions	IDAPA 16.01.01.650 et seq.	A	Applies to earthmoving and well drilling activities.
Rules for the Control of Air Pollution in Idaho (Air Toxics rules)	IDAPA 16.01.01.161, 16.01.01.585 and 16.01.01.586	A	Applies to earthmoving, well drilling activities, and on-Site treatment.
National Emission Standards for Hazardous Air Pollutants (NESHAPS) Radionuclides and other than radon-222 and radon-220 at DOE Facilities	40 CFR 61.92 40 CFR 61.93	A	Applies to earthmoving, well drilling activities, and on-Site treatment.
National Ambient Air Quality Standards for Specific Air Pollutants—Primary and Secondary PM-10 Standards	IDAPA 16.01.01.575 .577 40 CFR 50.6	A	Applies during on-Site treatment that has air emissions.
Site Security	IDAPA 16.01.05.008 (40 CFR 264.14)	A	Applies to institutional controls and on-Site treatment.
Disposal or decontamination of equipment, structures, and soil	IDAPA 16.01.05.008 40 CFR 264.114	A	Applies to drilling, sampling, or during remediation activities.
Remediation waste staging piles	IDAPA 16.01.05.008 (40 CFR 264.554)	A	Applies to drill cuttings that may be generated during monitoring well installation and any remediation involving excavation and on-Site storage.
Hazardous Waste Management Act	IDAPA 16.01.05.004 and .005 (40 CFR 260.10 and 261.2)	A	"Definition of Solid Waste"
	IDAPA 16.01.05.006 (40 CFR 262.11)	A	"Hazardous Waste Determination" Hazardous waste determination applies to all waste generated during remediation activities.
	IDAPA 16.01.05.008 (40 CFR 246)	A	"Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal facilities"
Closure and post-closure care	IDAPA 16.01.05.008 [40 CFR 264.310(b)(5)]	A	Closure requirements apply if there is any RCRA waste left on-Site.
Treatment Standards for Miscellaneous Units	IDAPA 16.01.05.008 (40 CFR 264.601)	A	Applies to on-Site treatment of RCRA waste.
Land Disposal Restrictions	IDAPA 16.01.05.011 40 CFR 268.40 40 CFR 268.45 40 CFR 268.48 40 CFR 268.4900	A	Soils determined to be RCRA hazardous Waste must meet land disposal restriction (LDRs) before disposal.
Storm water discharges during construction	40 CFR 122.26	A	Applies during all construction activities.
Idaho Rules for the Construction and use	IDAPA 37.03.09.025	A	Applies to SRPA monitoring.

Statute or Requirement	Citation	Type of Requirement	Comments
of Injection Wells			
Groundwater quality standards	IDAPA 16.01.11.200(a) (40 CFR 141)	C	Applies to groundwater remediation.
National Historic Preservation Act	16 USC 470 et seq.	L	Site is surveyed for cultural and archaeological resources.

A = Action; C= Chemical; L = Location

Table 5-2. Preliminary list of to-be-considered criteria for OU 3-14.

To-Be-Considered Criteria	Title
Contractor Requirements Document 420.1	Facility Safety
DOE Order 5480.23	Nuclear Safety Analysis Reports
DOE Order 5480.4	Environmental Protection, Safety, and Health Protection Standards
DOE Order 440.1	Worker Protection Management for DOE Federal and Contractor Employees
DOE Order 435.1	Radioactive Waste Management
DOE Order 231.1	Environment, Safety and Health Reporting
DOE Order 5400.5	Radiation Protection of the Public and Environment

Within the context of the effectiveness evaluation, chemical-specific ARARs assume significance, as each alternative is evaluated for its effectiveness in protecting human health and the environment.

The ability to protect human health and the environment is a threshold criterion that CERCLA remedial actions must meet (EPA 1998a) to be considered a preferred remedy. The EPA considers a remedy protective if it "adequately eliminates, reduces, or controls all current and potential risks posed through each [exposure] pathway [at] the site." In accomplishing protectiveness, a remediation alternative must meet or exceed ARARs or other risk-based levels established when ARARs do not exist or are waived.

In both the NCP and the CERCLA *Compliance With Other Laws Manual* (EPA 1988b), EPA specifies that when ARARs are not available for a given chemical or when such chemical-specific ARARs are not sufficient to be protective, risk-based levels should be identified or developed to ensure that a remedy is protective. Both carcinogenic and noncarcinogenic effects are considered in determining risk-based levels and evaluating protectiveness. For carcinogenic effects, the health advisory or risk-based levels are selected so that the total lifetime risk to the exposed population of all contaminants falls within the acceptable range of 10^{-4} to 10^{-6}. The 10^{-6} risk level is specified by EPA as a point of departure for levels of exposure, as determined by EPA reference doses, taking into account the effects of other contaminants at the site.

Therefore, chemical-specific ARARs serve three primary purposes:

- To identify requirements that must be met as a minimum by a selected remedial action alternative (unless a waiver is obtained)

- To provide a basis for establishing appropriate cleanup levels

- To identify chemical-specific ARARs for contaminants at OU 3-14. National emission Standards for Hazardous Air Pollutants (NESHAP) (40 CFR 61.92) established emission limits for radionuclides other than radon form DOE facilities. The standard limits an entire facility's emissions to ambient air to an amount that would not cause any member of the public to receive an effective dose equivalent of 10 millirem (mrem) per year. These requirements are considered potentially applicable to possible remedial actions that may be undertaken at OU 3-14.

The State of Idaho's rule governing new sources of toxic air pollutants, located in IDAPA 16.01.01585 and 16.01.01586, is a potential ARAR if a remedial option generates regulated toxic air pollutants. If toxic air pollutant emissions exceed relevant screening levels, appropriate air modeling would determine ambient air concentration. Reasonable available control technologies would be employed to control emissions if acceptable ambient air concentrations were exceeded. Should remedial action be necessary, air-screening analysis would determine the levels of emissions likely to be associated with the options being proposed. The INEEL is categorized as an attainment or unclassified area for ambient air quality (42 USC 7401 et seq.) and, therefore, is subject to IDAPA 16.01.01.575-77 and 40 CFR 50. In addition, the Safe Drinking Water Act applies to ensure protection of the groundwater beneath OU 3-14.

5.11.1.3 Location-Specific ARARs. This section identifies potential location-specific ARARs that may apply to remedial actions at OU 3-14. Location-specific ARARs are regulatory requirements or restrictions on activities in specific locations that a given remedial action must meet.

General location-specific regulatory requirements are identified and the applicability of these requirements to OU 3-14 is discussed below.

5.11.1.3.1 Identification of Location-Specific Regulatory Requirements—Federal and Idaho statutes and regulations were reviewed to identify location-specific regulatory requirements that may apply to potential remedial activities and new hazardous waste activities at OU 3-14. The requirements identified in this subsection are location-specific and restrict or prohibit certain activities at or near locations similar to OU 3-14. Specific characteristics of the OU 3-14 area, considered in this evaluation, are its proximity to a flood plan, the proximity of surface water (Big Lost River), its location in a seismic region, the presence of endangered species, the presence of archaeological and historical sites, and the presence of drinking water wells.

The following location-specific regulatory requirements potentially applicable to OU 3-14 remedial activities were reviewed:

- Prevention of Significant Deterioration of Air quality (IDAPA 16.01.01581)

- Flood plains [40 CFR 270 and 264; 40 CFR 6, appendix A (Executive Order 11988)]; Fish and Wildlife coordination Act [(16 U.S. Code (USC) et seq., 40 CFR 6.302, and Idaho Hazardous Waste Management Regulations, Title 1, Ch. 5, 01.5227,09)]

- Seismic Consideration (40 CFR 270 and 264; Idaho Hazardous Waste Management Regulations, Title 1, Ch. 5, 01.5227,09)
- Wetlands [10 CFR 1022, 40 CFR 230; 33 CFR Parts 320-330; and 40 CFR 6, Appendix A (Executive Order 11988)]
- Endangered Species Act (50 CFR Parts 17, 200, and 402; 33 CFR Parts 320-330)
- Archaeological Resources and Antiquities (Archaeological Resources Protection Act; 43 CFR 7, 36 CFR Parts 65 and 296; and 25 CFR 261)
- National Historic Places (National Historic Preservation Act, 16 USC 470; 36 CFR 800)
- Threatened Fish and Wildlife (50 CFR 227.4)
- Migratory Bird Conservation (16 USC 715)
- Protection of Bald and Golden Eagles Act (16 USC 1531).

5.11.1.3.2 Determination of Preliminary Location-Specific Regulatory Requirements for OU 3-14—A review of these location-specific regulatory requirements suggests that the National Historic places requirement may be a potential ARAR. The remaining requirements will be further evaluated in the RI/FS.

Currently, no sites within the area have been deemed by the Idaho State Historical Society as potentially eligible for the National Register of Historic Places. Potentially eligible sites must be protected under the National Historic Preservation Act. Any future activities that could potentially impact sites that may be identified in the future as being eligible for historic registration would be discussed with the Idaho State Historical Preservation Office.

5.11.1.3.3 Location-Specific Regulatory Requirements Not Applicable to OU 3-14—Currently, Site CPP-26, which is included in Site CPP-96, is located in the 100-year flood plain, (Berenbrock and Kjelstrom 1998). To more accurately depict the limits of the 100-year flood plain, DOE is performing additional flood plain analysis that may impact the flood plain boundary in the vicinity of these two sites. In addition, ongoing construction activities as part of the OU 3-13 Tank Farm interim action (see Section 1.5.4) may change the topography and modify the boundary of the 100-year flood plain. These activities and their impact on the two sites will be reevaluated during the OU 3-14 feasibility study.

Operable Unit OU 3-14 is not known to be located within a critical habitat of an endangered or threatened species, including bald or golden eagles, nor are such species known to frequent the area. However, bald eagles, golden eagles, and American peregrine falcons have been observed at the INEEL. In addition, eight species of concern to the Idaho Fish and Game and BLM have been observed at the INEEL. Potential impacts to endangered species may be further evaluated prior to remedial activities.

No fish or wildlife addressed by the Threatened Fish and Wildlife Act are found at OU 3-14, nor do the planned activities involve the modification of a stream because no streams are located on the OU 3-14 site, and surface runoff is controlled. Regulatory requirements associated with the protection of fish and wildlife will be further evaluated in the RI/FS.

Occasionally, migratory waterfowl are observed at WAG 3. However, the area contains no critical habitat, and potential remedial activities are not anticipated to have a potential for adverse impact to migratory waterfowl.

The seismic standards in RCRA and Idaho regulations apply to the counties specified in the regulations. Waste Area Group 3 is located in Butte county, which is not listed in Appendix VI to 40 CFR 264 or in the Idaho regulations, and is therefore presumed to be in compliance with the seismic standard.

5.11.2 To-Be-Considered Guidance

To-be-considered criteria are advisories, guidelines, or policies that do not meet the definition of ARARs. To-be-considered criteria may assist in determining protective criteria in the absence of specific ARARs. Preliminary TBC criteria for the OU 3-14 site include the following:

- DOE orders and manuals
- Executive orders
- Federal and state rules pertaining to relevant subjects that are not promulgated criteria, limits, or standards by definition of Section 121[d] of CERCLA (42 USC 9601)
- EPA guidance documents
- Remedial action decisions at similar Superfund sites.

Table 5-2 lists potential TBC criteria for OU 3-14.

5.12 Administrative Support

5.12.1 Administrative Record

An administrative record file will be maintained for the OU 3-14 RI/FS. In addition to other technical and legal documents and correspondence, the administrative record is a collection of project documents required by CERCLA. The official administrative record is located at the INEEL Technical Library in Idaho Falls, Idaho. Copies of documents in the administrative record file are also located in information repositories at the Albertson Library at Boise State University in Boise, Idaho and at the University of Idaho Library in Moscow, Idaho.

5.12.2 Community Relations Plan

Community relations activities for the OU 3-14 RI/FS will be guided by the INEEL Community Relations Plan (DOE-ID). This plan is a guide to public involvement and community relations in the Environmental Restoration Program at the INEEL. It was developed to involve the community in the environmental cleanup decision-making process. Copies of the Community Relations Plan may be reviewed at the information repositorieslisted above or by calling the INEEL toll-free number, 800-708-2680.

Community relations activities for OU 3-14 RI/FS, which coincide with important phases of the project, are designed to keep the public informed and involved. These activities are detailed below.

- A status description and a RI/FS overview were included in the *INEEL Reporter*, a bimonthly publication. Additional information may be included as the project progresses.

- A kick-off fact sheet was distributed. The fact sheet introduced background information about previous CERCLA investigations at WAG 3 and the current RI/FS.

- The proposed plan will be distributed to individuals on the INEEL mailing list before the start of the 30-day public comment period. A fact sheet describing RI/FS results will be distributed before the proposed plan is submitted.

- A public meeting will be held to present the proposed plan and the RI/FS results and to provide the public an opportunity for discussion and comment. Opportunities for briefings, site tours, conference calls, and group discussions will be available upon request. A site tour of the INEEL or INTEC, or a briefing may be requested at any time during the project.

- The RI/FS report, ROD, and other project documents will be available in the administrative record for public inspection as they are finalized and before finalization of the ROD. The ROD will include a responsiveness summary in which comments submitted by the public will be addressed. Those who submit comments will receive a copy of the final ROD.

6. SCHEDULE

A detailed schedule (chart size) showing the working schedule, major project deliverables and critical path activities for the OU 3-14 project is presented at the end of this section. Given the complexity of the project relative to sampling, analysis, and logistics and impacts from other programs such as RCRA and the HLW & FD EIS (DOE 1999), the scope and schedule for this project have been extended.

Before work commences on the major activities of the OU 3-14 RI/FS, a scoping discussion will be held between DOE-ID, EPA, and IDEQ. Depending on the complexity of the work scope, a scoping meeting may be held to obtain agreement as to direction and work scope. Following scoping, a memorandum delineating the scope of work will be submitted to all parties documenting the agreed-upon approach and activities.

6.1 OU 3-14 RI/FS Activities

Brief descriptions of the major OU 3-14 RI/FS activities are provided below.

- RI/FS Work Plan—This document delineates the history associated with the OU 3-14 site and presents a high-level path forward to site characterization, risk assessment, modeling, and potential remedial actions. Included within the OU 3-14 RI/FS Work Plan are the Tank Farm Soil and INTEC injection well field sampling plans and health and safety plans (HASPs), and the waste management plan to implement Phase I of the characterization activities.

- Phase I Data Collection—This activity will implement data gathering activities associated with the Tank Farm soil and the injection well. The data will be used to plan Phase II, collect sample material for the contaminant transport studies, plan the possible treatability studies, and develop the risk assessment and groundwater modeling strategies.

- Phase I Summary Report—A report compiling and evaluating the data collected during the Phase I Tank Farm soil investigation.

- Additional Soil Sites Summary Report—The sites CPP-61, CPP-81, and CPP-82 will be evaluated from past activities and process knowledge. The summary report will present a path forward concerning the data needs and data gaps.

- Remedial Alternatives Screening Report—This summary report will present the results of remedial technologies screening applicable to the OU 3-14 feasibility study. This report will address potential remedial alternatives for the Tank Farm soil and groundwater (i.e., injection well). Included in the Remedial Alternatives Screening Report is the identification of chemical and physical parameters and data gaps.

- Phase II Characterization Work Plan—The characterization work plan will cover all applicable aspects of field sampling, including methods, handling procedures, Quality Assurance/Quality Control, FSPs, HASPs, WMP, necessary to implement the Phase II characterization activities. The preparation of this work plan will be dependent upon the results from the Phase I investigation.

- Phase II Data Collection—This activity will implement the second phase of data collection for OU 3-14. Phase II will concentrate on those areas deemed to need a more exhaustive suite of analyses from Phase I Data Collection.

- Phase II Summary Report—A report compiling and evaluating the data collected in the Phase II. Contaminant Transport Study Work Plan—This work plan will document the approach to obtain K_d values and leachability of contaminants associated with the Tank Farm soil. Included in the Contaminant Transport Study Work Plan will be the characterization, waste management, and health and safety requirements and issues.

- Aquifer Summary Report—The Aquifer Summary Report will provide the information collected during the injection well and aquifer drilling activities described in the OU 3-14 RI/FS Work Plan.

- Contaminant Transport Study and Report—This encompasses two activities, one using cold Tank Farm soil to gather parameters such as acid demand and K_d values. The other activity will investigate leachability of contaminants from hot Tank Farm soil.

- Risk Assessment Strategy and Groundwater Report—This effort will identify the approach for the risk assessment and exposure modeling. The groundwater strategy will delineate the computer code and data input for the SPRA under INTEC. Finally, the conceptual site model will be determined that encompasses both a physical and contaminant release model for the SPRA and the Tank Farm soil.

- Remedial Investigation/Baseline Risk Assessment (RI/BRA) Report—This report will include the screening of all contaminants and calculations of exposures for the Tank Farm Soils and Injection Well contaminants. This report will also establish the contaminants of concern for the Tank Farm soil and the injection well that will be used in the Feasibility Study evaluations.

- Injection Well Treatability Study Work Plan—The work plan will delineate a detailed scope of work and technical approach for the injection well treatability study, including the necessary characterization, waste management, and health and safety requirements and issues.

- Injection Well Treatability Study and Report—The treatability study will address the efficacy of those remedial technologies agreed upon as having the highest probability of success.

- Tank Farm Treatability Study Work Plan—The work plan will delineate a detailed scope of work and technical approach for the Tank Farm soil treatability study, including the necessary characterization, waste management, and health and safety requirements and issues.

- Tank Farm Soil Treatability Study and Report—The treatability study will address the efficacy of those remedial technologies agreed upon as having the highest probability of success.

- RI/FS Report—This Report will complete screening, evaluate the remaining remedial technology alternatives using the information gathered during Phase I and II characterization and the various studies. The detailed evaluations will use seven of the nine CERCLA evaluation criteria.

- National Remedy Review Board— Due to the size, complexity, and cost (>$75 million) of the remedies selected for OU 3-14, it is expected that, the project will undergo an EPA National Remedy Review Board meeting.

- Proposed Plan—The Proposed Plan is a summary of the RI/BRA and RI/FS Report with a preferred remedy recommended for both the Tank Farm soil and the injection well issues.

- Public Comment Period—The public will be presented with the Proposed Plan, and a formal public comment period will be initiated along with public meetings on the Proposed Plan.

- Record of Decision—The Record of Decision (ROD), including the Responsiveness Summary, will be the document that describes the remedy selected for implementation during OU 3-14 RD/RA phases and the associated site risks.

Table 6-1 presents scheduled completion dates for these activities.

Table 6-1. Schedule for the major OU 3-14 RI/FS documents that will be submitted to the EPA and IDEQ for review and comment.

Document[a]	Document Type	Working Schedule	Enforceable Deadline
Draft RI/FS Work Plan submitted to EPA and IDEQ	Primary	June 27, 2000	June 30, 2000
Draft INTEC Aquifer Summary Report submitted to EPA and IDEQ	Secondary	March 26, 2003	NA
Draft Phase I Summary Report submitted to EPA and IDEQ	Secondary	December 8, 2003	NA
Draft Additional Soil Sites Summary Report submitted to EPA and IDEQ	Secondary	June 13, 2001	NA
Draft Remedial Alternatives Screening Report submitted to EPA and IDEQ	Secondary	March 1, 2004	NA
Draft Phase II Characterization Work Plan submitted to EPA and IDEQ	Primary	September 8, 2004	January 31, 2005
Draft Phase II Summary Report submitted to EPA and IDEQ	Secondary	December 14, 2006	NA
Draft Contaminant Transport Study Work Plan submitted to EPA and IDEQ	Secondary	May 4, 2004	NA
Draft Contaminant Transport Study Report submitted to EPA and IDEQ	Secondary	May 17, 2005	NA
Draft Risk Assessment and Groundwater Strategy Report submitted to EPA and IDEQ	Secondary	December 21, 2004	NA
Draft RI/BRA Report submitted to EPA and IDEQ	Secondary	October 25, 2007	NA
Draft Injection Well Treatability Study Work Plan submitted to EPA and IDEQ	Secondary	November 11, 2004	NA
Draft Injection Well Treatability Study Report submitted to EPA and IDEQ	Secondary	November 29, 2005	NA
Draft Tank Farm Soils Treatability Study WP submitted to EPA and IDEQ	Secondary	May 4, 2005	NA
Draft Tank Farm Soils Treatability Study Report submitted to EPA and IDEQ	Secondary	October 2, 2006	NA
Draft RI/FS Report submitted to EPA and IDEQ	Primary	April 10, 2008	October 31, 2008
EPA National Remedy Review Board Briefing Package and Presentation submitted to EPA	Other	August 29, 2008	NA
Draft Proposed Plan submitted to EPA and IDEQ	Secondary	January 13, 2009	NA
Draft OU 3-14 Record of Decision submitted to EPA and IDEQ	Primary	September 14, 2009	May 31, 2010

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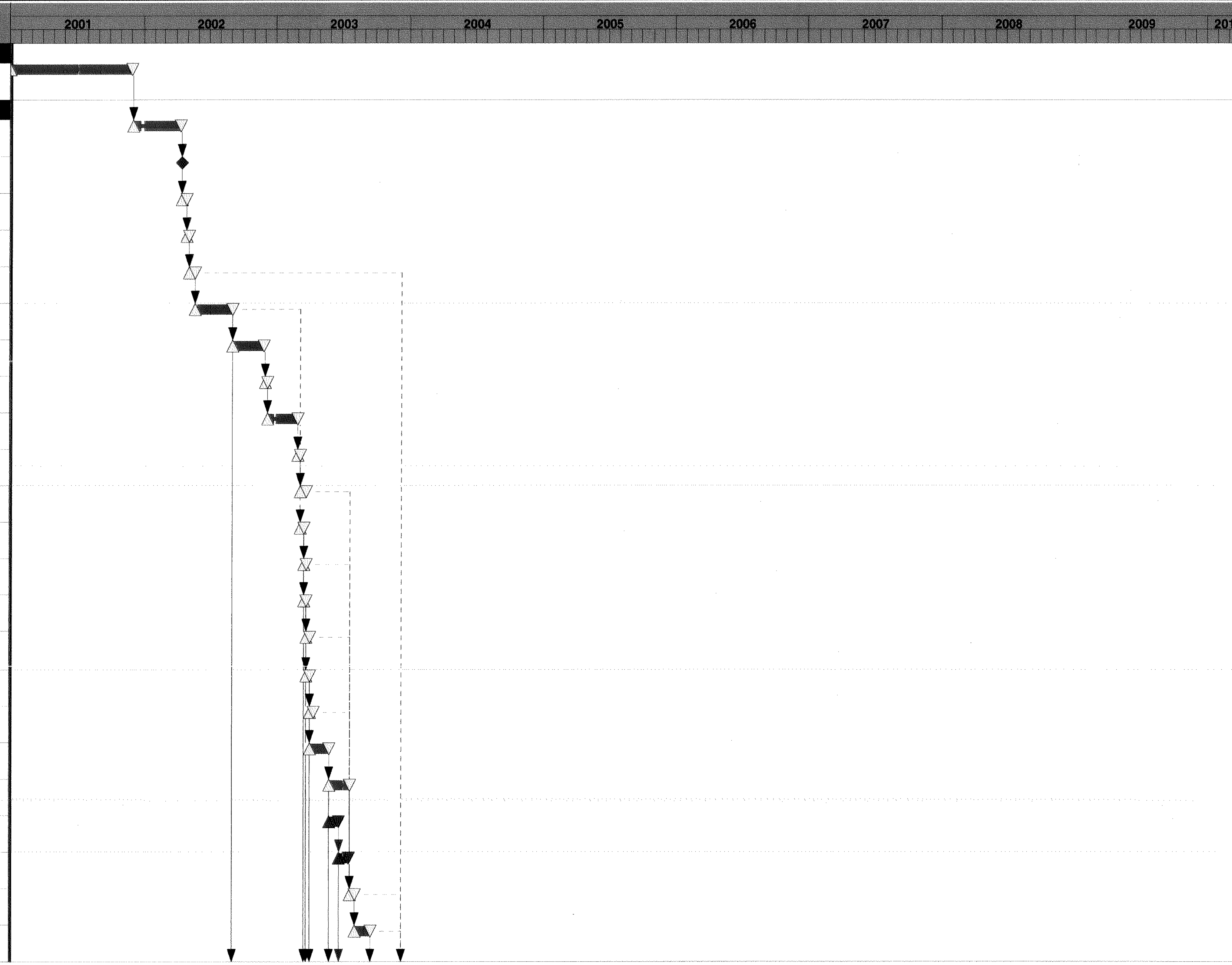
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Phase I Tank Farm Soils Data Collection					
4045	Tank Farm Soils Cold Test Demonstration	234	234	02JAN01*	30NOV01
OU 3-14 Group I Tank Farm Constrn Activities					
4050	Tank Farm Soils Startup	89	89	03DEC01	12APR02
4055	Beg Phase I Tank Farm Soils Data Collection Act	0	0	15APR02	
4060	14 day Notification to Agencies Concerning Sampl	11	11	15APR02	29APR02
4065	Mobilize to INTEC Tank Farm	5	5	30APR02	06MAY02
4070	Conduct Surface Gamma Survey	10	10	07MAY02	20MAY02
4075	Vacuum Excav the G-series Probeholes to 15 feet	73	73	21MAY02	03SEP02
4080	Begn Inst G-ser Probes to Top of Basalt (~45 ft)	61	61	04SEP02	27NOV02
4085	Demobilize from INTEC Tank Farm	5	5	02DEC02	06DEC02
4090	Winter Shutdown	54	54	09DEC02	28FEB03
4095	Mobilize to INTEC Tank Farm	5	5	03MAR03	07MAR03
4100	Fnsh Inst G-ser Probes to Top of Basalt (~45 ft)	12	12	10MAR03	25MAR03
4105	Vacuum Excav the D-series Probeholes to 15 feet	6	6	10MAR03*	17MAR03
4110	Instal D-series Probes to Top of Basalt (~45 ft)	6	6	18MAR03	25MAR03
4115	Vacuum Excav the E-series Probeholes to 15 feet	6	6	18MAR03*	25MAR03
4120	Instal E-series Probes to Top of Basalt (~45 ft)	6	6	26MAR03	02APR03
4125	Vacuum Excav the C-series Probeholes to 15 feet	7	7	26MAR03*	03APR03
4130	Instal C-series Probes to Top of Basalt (~45 ft)	7	7	04APR03	14APR03
4135	Vacuum Excav the A-series Probeholes to 15 feet	38	38	04APR03*	28MAY03
4140	Instal A-series Probes to Top of Basalt (~45 ft)	38	38	29MAY03	22JUL03
4145	Vacuum Excav the B-series Probeholes to 15 feet	18	18	29MAY03*	23JUN03
4150	Instal B-series Probes to Top of Basalt (~45 ft)	18	18	24JUN03	18JUL03
4155	Perf Downhole Gamma Logging of Exist Probeholes	10	10	23JUL03	05AUG03
4160	Pref Downhole Gamma Logging G-series Probeholes	30	30	06AUG03	17SEP03



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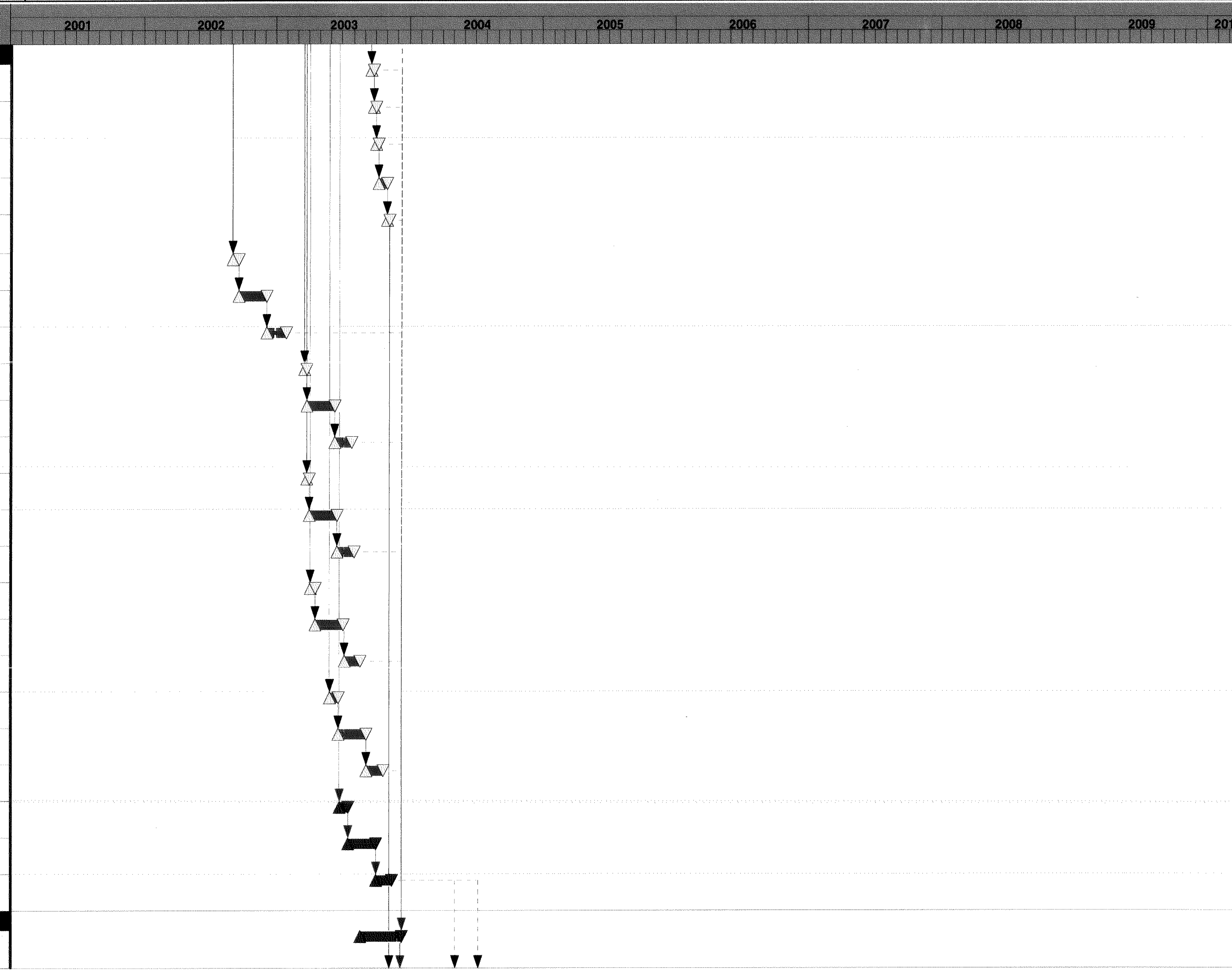
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
OU 3-14 Group I Tank Farm Constrn Activities					
4165	Pref Downhole Gamma Logging D-series Probeholes	5	5	18SEP03	24SEP03
4170	Pref Downhole Gamma Logging E-series Probeholes	5	5	25SEP03	01OCT03
4175	Pref Downhole Gamma Logging C-series Probeholes	5	5	02OCT03	08OCT03
4180	Pref Downhole Gamma Logging A-series Probeholes	15	15	09OCT03	29OCT03
4185	Perf Downhole Gamma Logging B-Series Probeholes	6	6	30OCT03	06NOV03
4190	Sample G-series Probehole Drums	10	10	04SEP02*	17SEP02
4195	Analyze G-series Probehole Samples	54	54	18SEP02	04DEC02
4200	Validate G-series Analytical Results	32	32	05DEC02	27JAN03
4205	Sample D-series Probehole Drums	5	5	18MAR03	24MAR03
4210	Analyze D-series Probehole Samples	54	54	25MAR03	09JUN03
4215	Validate D-series Analytical Results	32	32	10JUN03	24JUL03
4220	Sample E-series Probehole Drums	5	5	26MAR03	01APR03
4225	Analyze E-series Probehole Samples	54	54	02APR03	17JUN03
4230	Validate E-series Analytical Results	32	32	18JUN03	01AUG03
4235	Sample C-series Probehole Drums	10	10	04APR03	17APR03
4240	Analyze C-series Probehole Samples	54	54	18APR03	03JUL03
4245	Validate C-series Analytical Results	32	32	07JUL03	19AUG03
4250	Sample A-series Probehole Drums	15	15	29MAY03	18JUN03
4255	Analyze A-series Probehole Samples	54	54	19JUN03	04SEP03
4260	Validate A-series Analytical Results	32	32	05SEP03	20OCT03
4265	Sample B-series Probehole Drums	15	15	24JUN03	15JUL03
4270	Analyze B-series Probehole Samples	54	54	16JUL03	30SEP03
4275	Validate B-series Analytical Results	32	32	01OCT03	13NOV03
Phase I Tank Farm Soils Summary Report					
4280	Prepare Draft Phase I Tank Farm Soils Summ Reprt	76	76	20AUG03	08DEC03



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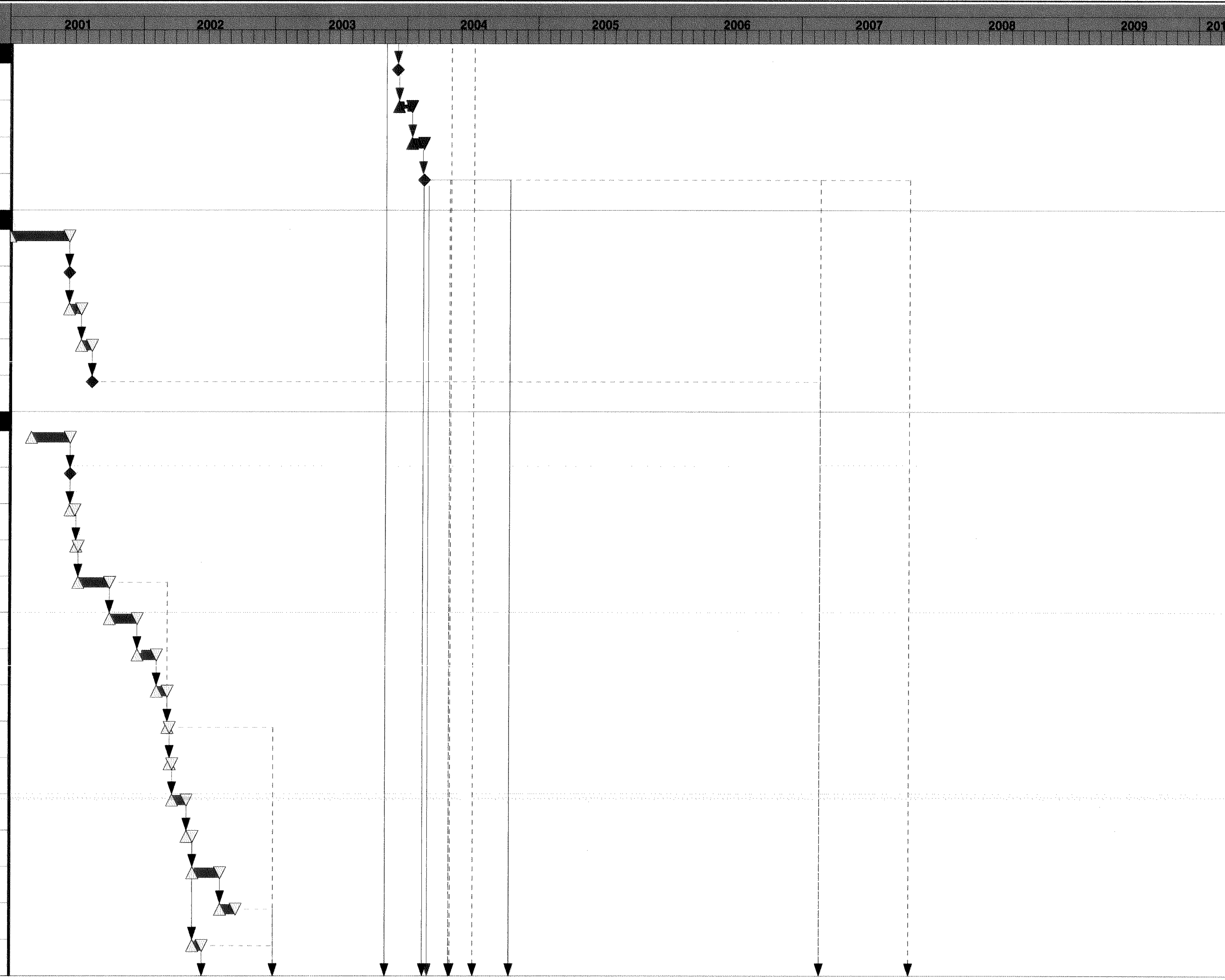
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Phase I Tank Farm Soils Summary Report					
4285	Drft Phas I Tnk Frm Soils Summ Rpt to EPA & IDEQ	0	0	08DEC03	
4290	EPA & IDEQ Review Drft Phase I Tnk Farm Summ Rpt	22	22	09DEC03	15JAN04
4295	Incorporate EPA and IDEQ Comments	22	22	16JAN04	16FEB04
4300	Sub Fnl Phs I Tnk Frm Soils Summ Rpt to EPA & ID	0	0		16FEB04
Additional Soil Sites Summary Report					
4305	Develop Additional Soil Sites Summary Report	116	116	02JAN01	13JUN01
4310	Drf Additional Soil Sites Summ Rpt to EPA & IDEQ	0	0	13JUN01	
4315	EPA & IDEQ Review Drft Add Soil Sites Summ Rpt	22	22	14JUN01	16JUL01
4320	Incorporate EPA and IDEQ Comments	22	22	17JUL01	15AUG01
4325	Sub Fnl Add Soil Sites Summ Rpt to EPA & IDEQ	0	0	15AUG01	
INTEC Aquifer Data Collection					
4330	INTEC Aquifer Startup	75	75	01MAR01*	14JUN01
4335	Begin Aquifer Data Collection Activities	0	0	15JUN01	
4340	14 day Notification to Agencies Concern Sampling	11	11	15JUN01	29JUN01*
4345	Mobilize to Injection Well Site	5	5	02JUL01*	09JUL01
4350	Drill and Sample Injection Well	60	60	10JUL01	02OCT01
4355	Analyze Injection Well Samples	54	54	03OCT01	19DEC01
4360	Validate Injection Well Data	32	32	20DEC01	11FEB02
4365	Agencies Review the Data	20	20	12FEB02	11MAR02
4370	Secure the Injection Well	5	5	12MAR02	18MAR02
4375	Mobilize to Aquifer Well 1 Site	5	5	19MAR02	25MAR02
4380	Drill and Sample Aquifer Well 1	30	30	26MAR02	06MAY02
4385	Packer Testing of Aquifer Well 1	10	10	07MAY02	20MAY02
4390	Analyze Aquifer Well 1 Samples	54	54	21MAY02	06AUG02
4395	Validate Aquifer Well 1 Data	32	32	07AUG02	20SEP02
4400	Complete Aquifer Well 1 Installation	20	20	21MAY02	18JUN02



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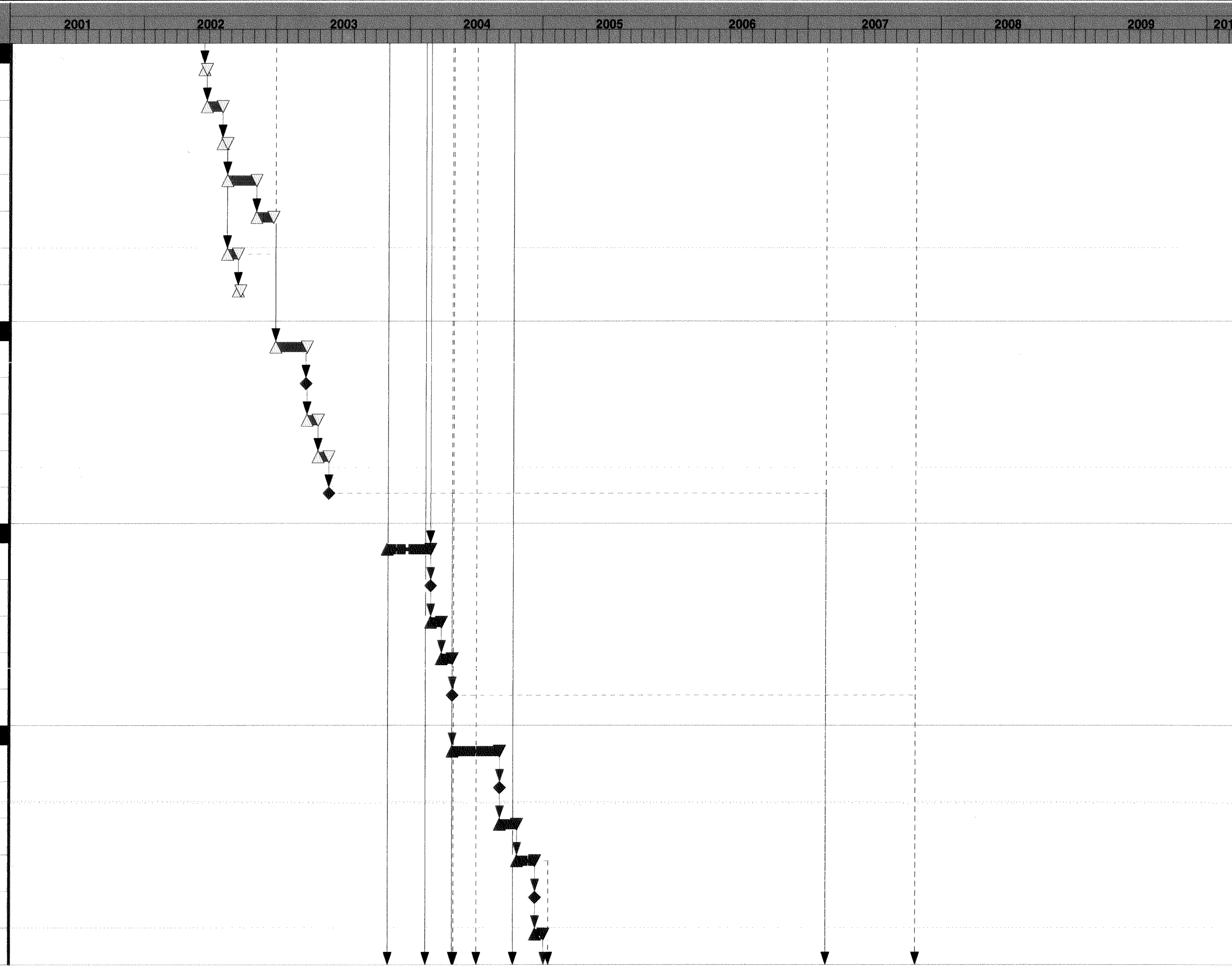
Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
INTEC Aquifer Data Collection					
4410	Mobilize to Aquifer Well 2 Site	5	5	19JUN02	25JUN02
4415	Drill and Sample Aquifer Well 2	30	30	26JUN02	07AUG02
4420	Packer Testing of Aquifer Well 2	10	10	08AUG02	21AUG02
4425	Analyze Aquifer Well 2 Samples	54	54	22AUG02	06NOV02
4430	Validate Aquifer Well 2 Data	32	32	07NOV02	24DEC02
4435	Complete Aquifer Well 2 Installation	20	20	22AUG02	19SEP02
4440	Decon & Demobilize from INTEC	5	5	20SEP02	26SEP02
INTEC Aquifer Data Summary Report					
4445	Prepare INTEC Aquifer Data Summary Report	60	60	02JAN03	26MAR03
4450	Subm Drft INTEC Aquifer Summ Rpt to EPA & IDEQ	0	0	26MAR03	
4455	EPA & IDEQ Rvw Drft INTEC Aquifer Data Summ Rprt	22	22	27MAR03	25APR03
4460	Incorporate EPA and IDEQ Comments	22	22	28APR03	28MAY03
4465	Submt INTEC Aquifer Data Summ Rprt to EPA & IDEQ	0	0		28MAY03
Remedial Alternatives Screening Report					
4470	Develop Remedial Alternatives Screening Report	76	76	05NOV03	01MAR04
4475	Subm Drft Remed Altern Screen Rpt to EPA & IDEQ	0	0	01MAR04	
4480	EPA & IDEQ Review Draft Remed Altern Screen Rpt	22	22	02MAR04	31MAR04
4485	Incorporate EPA and IDEQ Comments	22	22	01APR04	30APR04
4490	Sub Fnl Remed Altern Screen Rpt to EPA & IDEQ	0	0	30APR04	
Phase II Characterization Work Plan (CWP)					
4495	Develop Draft Phase II CWP	90	90	03MAY04	08SEP04
4500	Submit Draft Phase II CWP to EPA and IDEQ	0	0	08SEP04	
4505	EPA and IDEQ Review Draft Phase II CWP	33	33	09SEP04	25OCT04
4510	Incorporate EPA and IDEQ Comments	33	33	26OCT04	13DEC04
4515	Submit Draft Final Phase II CWP to EPA and IDEQ	0	0	13DEC04	
4520	EPA and IDEQ Review Draft Final Phase II CWP	11	11	14DEC04	05JAN05



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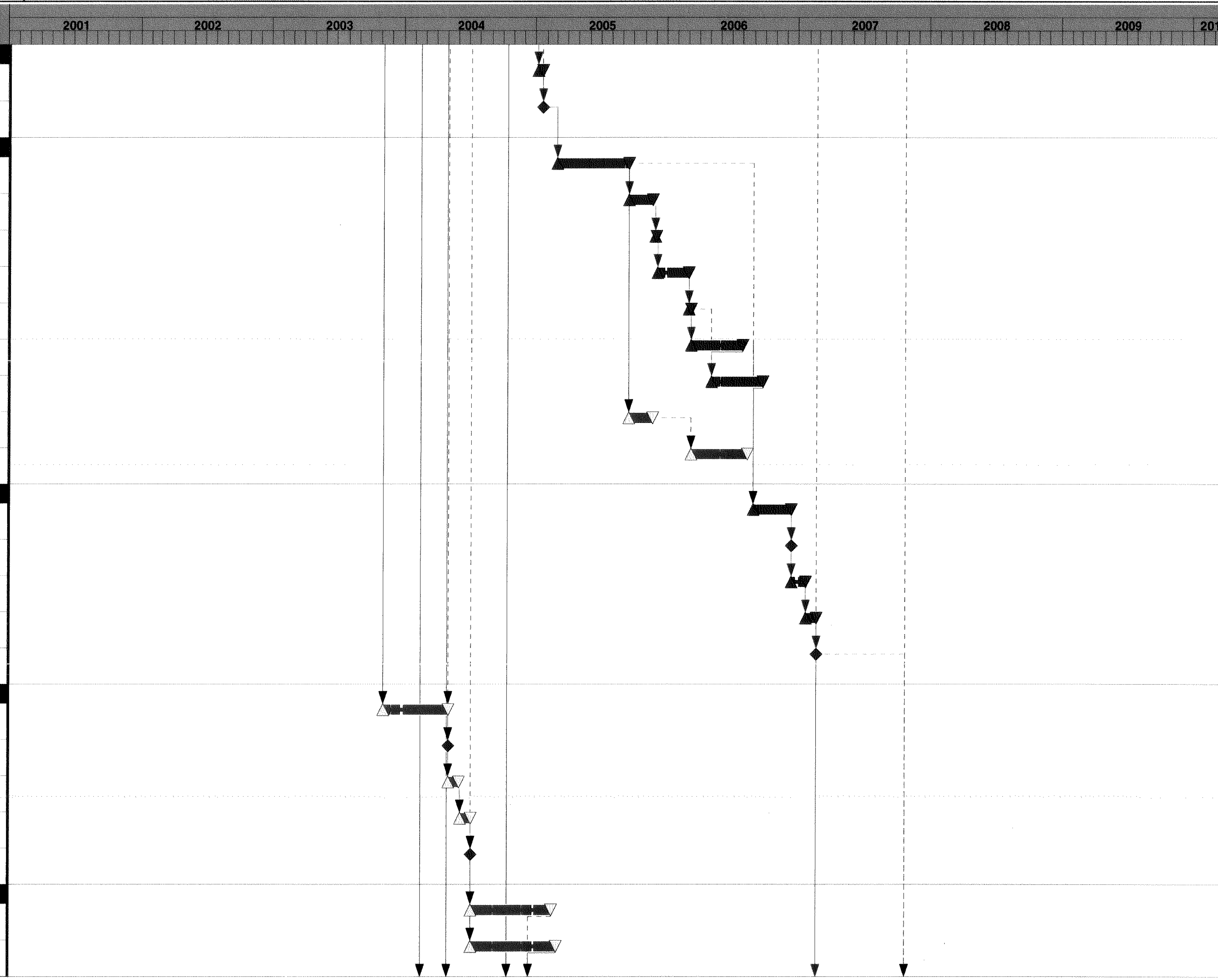
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Phase II Characterization Work Plan (CWP)					
4525	Incorporate EPA and IDEQ Comments	11	11	06JAN05	20JAN05
4530	Submit Final Phase II CWP to EPA and IDEQ	0	0	20JAN05	
Phase II Data Collection					
4535	Conduct Pothole Probing Activities	140	140	01MAR05	15SEP05
4540	Begin Probe Installation	49	49	16SEP05	23NOV05
4545	Demobilize from INTEC Tank Farm	5	5	28NOV05	02DEC05
4550	Winter Shutdown	56	56	05DEC05	28FEB06
4555	Mobilize to the Tank Farm	5	5	01MAR06	07MAR06
4560	Finish Probe Installation	101	101	08MAR06	28JUL06
4565	Conduct Radiation Surveys	100	100	04MAY06	25SEP06
4570	Begin Soil Samples Collection and Analyses	49	49	16SEP05	23NOV05
4575	Finish Soil Samples Collection and Analyses	111	111	08MAR06*	11AUG06
Phase II Summary Report					
4580	Prepare Draft Phase II Summary Report	76	76	28AUG06	14DEC06
4585	Subm Draft Phase II Summ Report to EPA and IDEQ	0	0	14DEC06	
4590	EPA and IDEQ Review Draft Summary Report	22	22	15DEC06	23JAN07
4595	Incorporate EPA and IDEQ Comments	22	22	24JAN07	22FEB07
4600	Subm Fnl Phase II Summary Report to EPA & IDEQ	0	0	22FEB07	
Contaminant Transport Study Work Plan (CTS WP)					
4605	Develop Draft CTS WP	120	120	07NOV03	04MAY04
4610	Submit Draft CTS WP to EPA and IDEQ	0	0	04MAY04	
4615	EPA and IDEQ Review Draft CTS WP	22	22	05MAY04	04JUN04
4620	Incorporate EPA and IDEQ Comments	22	22	07JUN04	07JUL04
4625	Submit Final CTS WP to EPA and IDEQ	0	0	07JUL04	
Contaminant Transport Studies					
4630	Conduct Cold Contaminant Transport Study	150	150	07JUL04	14FEB05
4635	Conduct Hot Contaminant Transport Study	160	160	07JUL04	28FEB05



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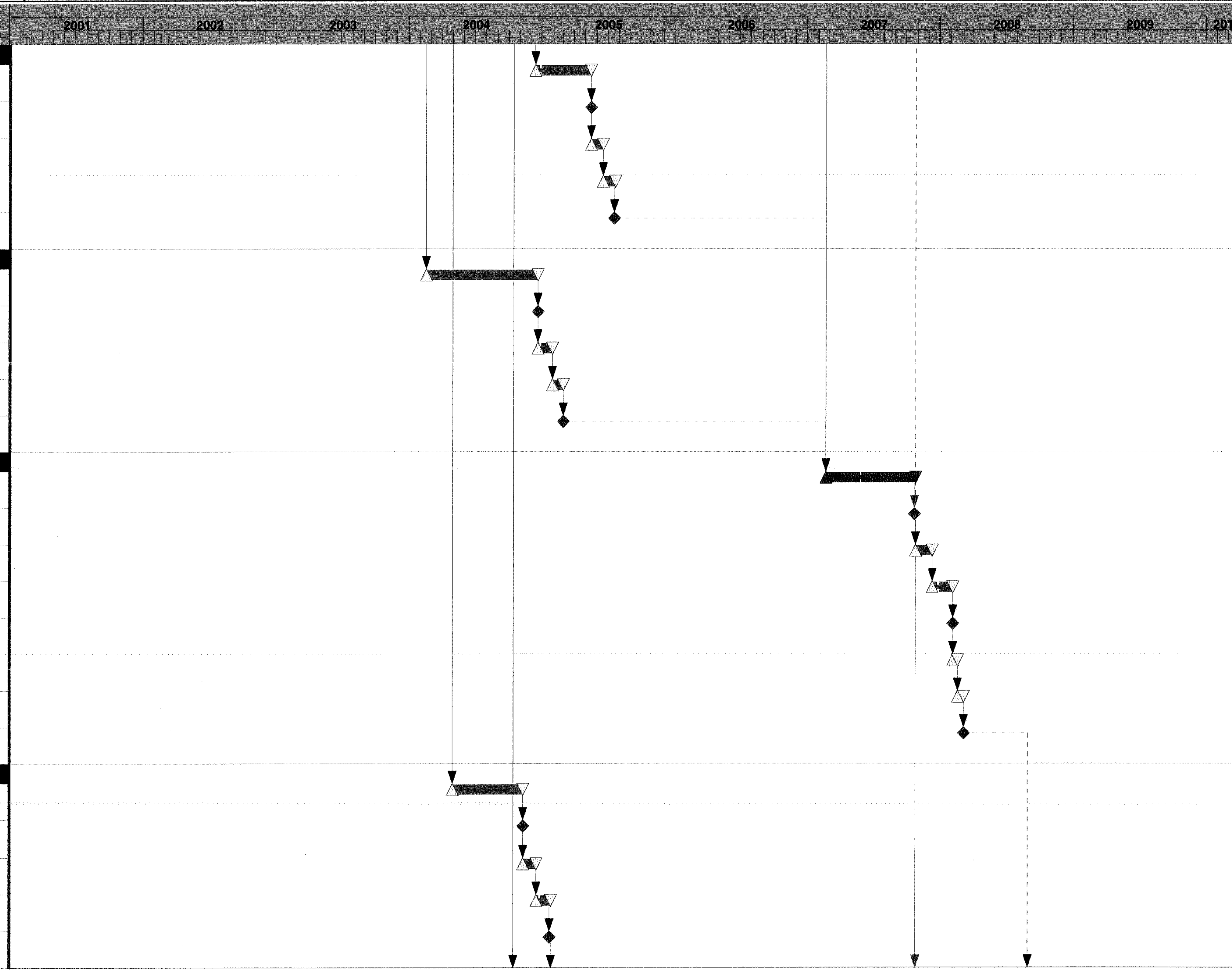
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Contaminant Transport Studies					
4640	Develop Draft Contaminant Transport Study Report	106	106	13DEC04	17MAY05
4645	Subm Drft Contam Transp Study Rpt to EPA & IDEQ	0	0	17MAY05	
4650	EPA & IDEQ Review Draft Contam Transp Study Rpt	22	22	18MAY05	17JUN05
4655	Incorporate EPA and IDEQ Comments	22	22	20JUN05	20JUL05
4660	Sub Fnl Contam Transp Study Report to EPA & IDEQ	0	0	20JUL05	
Risk Assessment & Groundwater Strategy Report					
4665	Dev Drft Risk Assess and Groundwater Strtgy Rpt	216	216	17FEB04	21DEC04
4670	Drft Risk Assess & GW Strategy Rpt to EPA & IDEQ	0	0	21DEC04	
4675	EPA & IDEQ Rvw Drft Risk Assess and GW Str Rpt	22	22	22DEC04	28JAN05
4680	Incorporate EPA and IDEQ Comments	22	22	31JAN05	01MAR05
4685	Sub Fnl Risk Assess & GW Strtg Rpt to EPA & IDEQ	0	0	01MAR05	
Remed Invest/Baseline Risk Assessm (RI/BRA) Rpt					
4690	Develop Draft RI/BRA Report	172	172	23FEB07	25OCT07
4695	Submit Draft RI/BRA Report to EPA and IDEQ	0	0	25OCT07	
4700	EPA and IDEQ Review Draft RI/BRA Report	33	33	26OCT07	13DEC07
4705	Incorporate EPA and IDEQ Comments	33	33	14DEC07	06FEB08
4715	Submit Draft Final RI/BRA Report to EPA and IDEQ	0	0	06FEB08	
4720	EPA and IDEQ Review Draft Final RI/BRA Report	11	11	07FEB08	21FEB08
4725	Incorporate EPA and IDEQ Comments	11	11	22FEB08	07MAR08
4730	Submit Final RI/BRA Report to EPA and IDEQ	0	0	07MAR08	
Inject Well Treatability Study Work Pln (ITS WP)					
4735	Develop Draft ITS WP	136	136	03MAY04	11NOV04
4740	Submit Draft ITS WP to EPA & IDEQ for Review	0	0	11NOV04	
4745	EPA and IDEQ Review Draft ITS WP	22	22	12NOV04	15DEC04
4750	Incorporate EPA and IDEQ Comments	22	22	16DEC04	24JAN05
4755	SubmIT Final ITS WP to EPA and IDEQ	0	0	24JAN05	



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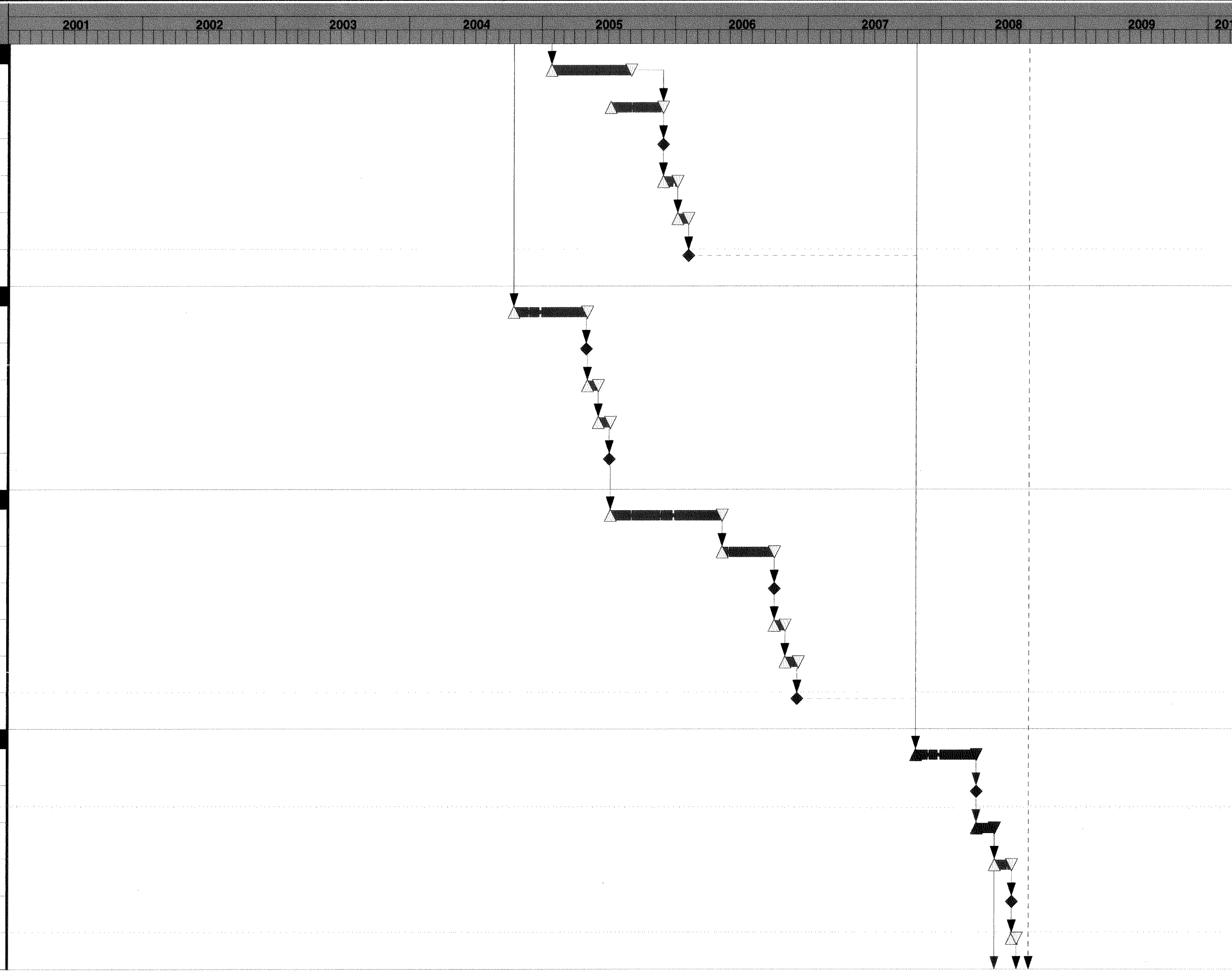
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Injection Well Treatability Study					
4760	Conduct Injection Well Treatability Study	156	156	25JAN05	01SEP05
4765	Dev Draft Injection Well Treatability Study Rpt	100	100	08JUL05	29NOV05
4770	Sub Drf Inject Well Treat Stdy Rpt to EPA & IDEQ	0	0	29NOV05	
4775	EPA & IDEQ Rvw Drft Inject Well Treat Study Rpt	22	22	30NOV05	06JAN06
4780	Incorporate EPA and IDEQ Comments	22	22	09JAN06	07FEB06
4785	Sub Fnl Inject Well Treat Stdy Rpt to EPA & IDEQ	0	0	07FEB06	
Tank Farm Soils Treat Study Work Plan (TTS WP)					
4790	Develop Draft TTS WP	136	136	15OCT04	04MAY05
4795	Subm Draft TTS WP to EPA and IDEQ for Review	0	0	04MAY05	
4800	EPA and IDEQ Review Draft TTS WP	22	22	05MAY05	06JUN05
4805	Incorporate EPA and IDEQ Comments	22	22	07JUN05	07JUL05
4810	Subm Final TTS WP to EPA and IDEQ	0	0	07JUL05	
Tank Farm Soils Treatbility Study					
4815	Conduct Tank Farm Soils Treatability Study	210	210	08JUL05	10MAY06
4820	Dev Drft Tank Farm Soils Treatability Study Rpt	100	100	11MAY06	02OCT06
4825	Drf Tnk Farm Soils Treat Study Rpt to EPA & IDEQ	0	0	02OCT06	
4830	EPA & IDEQ Rvw Drft Tnk Frm Soils Treat Stdy Rpt	22	22	03OCT06	01NOV06
4835	Incorporate EPA and IDEQ Comments	22	22	02NOV06	05DEC06
4840	Fnl Tank Farm Soils Treat Stdy Rpt to EPA & IDEQ	0	0	05DEC06	
Remedial Invest/Feasibility Study (RI/FS) Report					
4845	Develop Draft RI/FS Report	112	112	26OCT07	10APR08
4850	Submit Draft RI/FS Report to EPA and IDEQ	0	0	10APR08	
4855	EPA and IDEQ Review Draft RI/FS Report	33	33	11APR08	28MAY08
4860	Incorporate EPA and IDEQ Comments	33	33	29MAY08	15JUL08
4865	Submit Draft Final RI/FS Report to EPA and IDEQ	0	0	15JUL08	
4870	EPA and IDEQ Review Draft Final RI/FS Report	11	11	16JUL08	30JUL08



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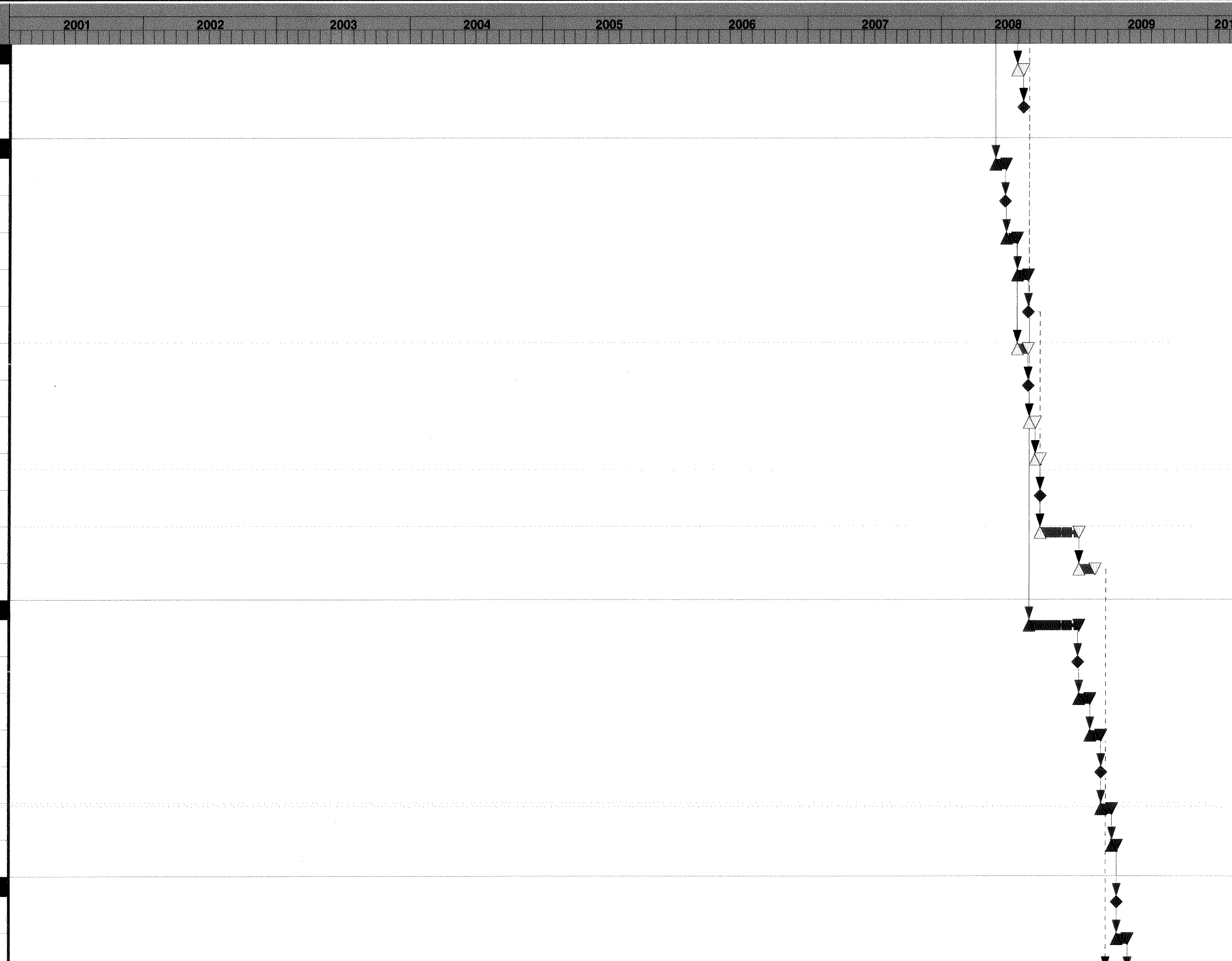
OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Remedial Invest/Feasibility Study (RI/FS) Report					
4875	Incorporate EPA and IDEQ Comments	11	11	31JUL08	14AUG08
4880	Submit Final RI/FS Report to EPA and IDEQ	0	0	14AUG08	
EPA National Remedy Review Board (NRRB)					
4885	Develop Draft NRRB Briefing Package	22	22	29MAY08	27JUN08
4890	Submit Draft NRRB Briefing Package to EPA	0	0	27JUN08	
4895	EPA Review Draft NRRB Briefing Package	22	22	30JUN08	30JUL08
4900	Incorporate EPA Comments	22	22	31JUL08	29AUG08
4905	Subm Final NRRB Briefing Package to EPA and IDEQ	0	0	29AUG08	
4910	Develop Draft NRRB Presentation	22	22	31JUL08	29AUG08
4915	Submit Draft NRRB Presentation to EPA	0	0	29AUG08	
4920	EPA Review Draft NRRB Presentation	11	11	02SEP08	16SEP08
4925	Incorporate EPA comments	11	11	17SEP08	01OCT08
4930	Submit Final NRRB Presentation to EPA and IDEQ	0	0	01OCT08	
4935	Conduct NRRB Meeting	66	66	02OCT08	13JAN09
4940	Receive NRRB Recommendation	33	33	14JAN09	27FEB09
Proposed Plan					
4945	Develop Draft Proposed Plan	88	88	02SEP08	13JAN09
4950	Submit Draft Proposed Plan to EPA and IDEQ	0	0	13JAN09	
4955	EPA and IDEQ Review Draft Proposed Plan	22	22	14JAN09	12FEB09
4960	Incorporate EPA and IDEQ Comments	22	22	13FEB09	16MAR09
4965	Submit Final Proposed Plan to EPA and IDEQ	0	0	16MAR09	
4970	Obtain DOE-ID, EPA, and IDEQ Management Approval	22	22	17MAR09	15APR09
4975	Issue Proposed Plan to Public	10	10	16APR09	29APR09
Public Comment Period					
4980	Start Public Comment Period	0	0	29APR09	
4985	30 day Comment Period	22	22	29APR09	28MAY09



Start Date	01JUN00
Finish Date	03MAR10
Data Date	01JAN01
Run Date	20DEC00 08:33

Early Bar
Progress Bar
Critical Activity

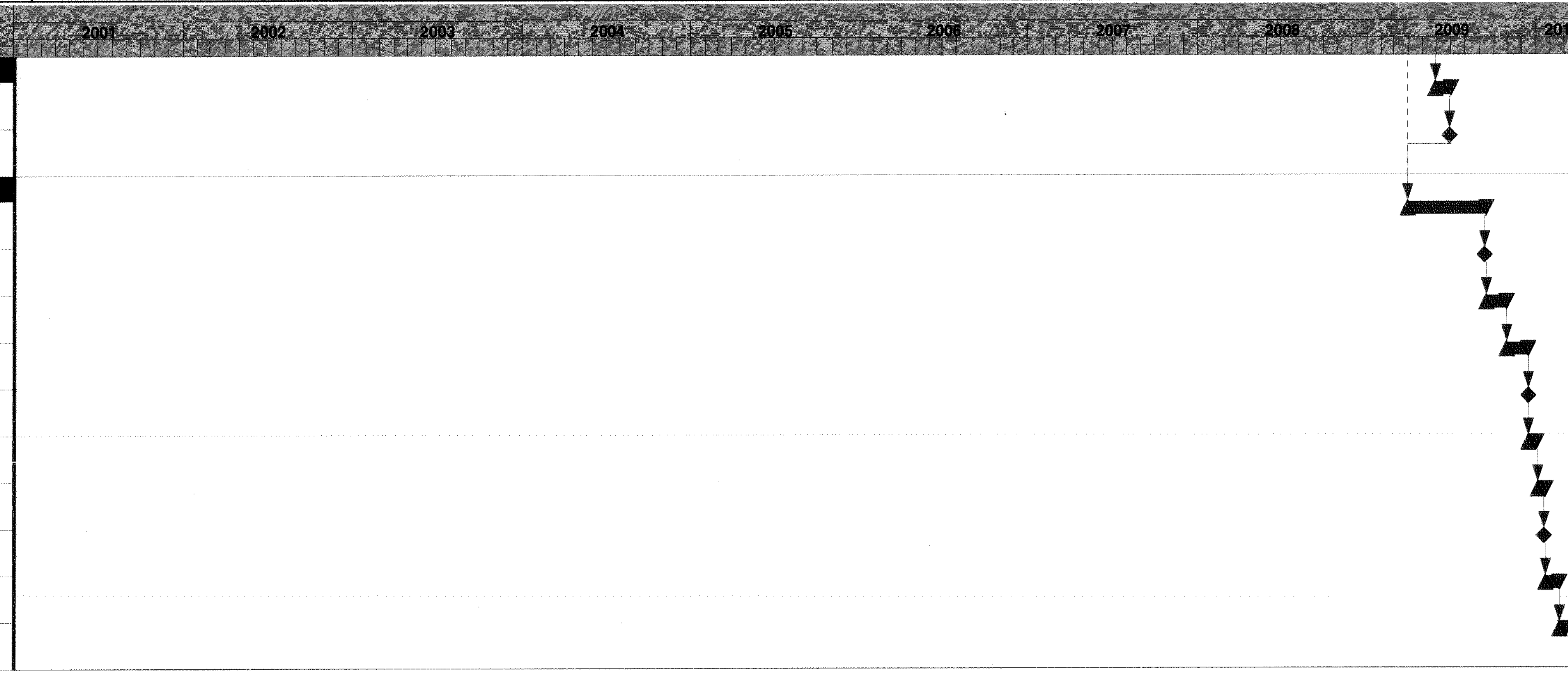
Sheet 8 of 9

Date	Revision	Checked	Approved

WAG 3

OU3-14 RI/FS Tank Farm Work Activities

Activity ID	Activity Description	Orig Dur	Rem Dur	Early Start	Early Finish
Public Comment Period					
4990	30 day Extension to Comment Period	22	22	29MAY09	29JUN09
4995	End Comment Period	0	0	29JUN09	
Record of Decision (ROD)					
5000	Develop Draft ROD	120	120	30MAR09	14SEP09
5005	Submit Draft ROD to EPA and IDEQ	0	0	14SEP09	
5010	EPA and IDEQ Review Draft ROD	33	33	15SEP09	29OCT09
5015	Incorporate EPA and IDEQ Comments	33	33	30OCT09	15DEC09
5020	Submit Draft Final ROD to EPA and IDEQ	0	0	15DEC09	
5025	EPA and IDEQ Review Draft Final ROD	11	11	16DEC09	31DEC09
5030	Incorporate EPA and IDEQ Comments	11	11	04JAN10	18JAN10
5035	Submit Final ROD to EPA and IDEQ	0	0	18JAN10	
5040	Obtain DOE-ID, EPA, and IDEQ Signature	22	22	19JAN10	17FEB10
5045	Publish OU 3-14 ROD	10	10	18FEB10	03MAR10



Start Date	01JUN00
Finish Date	03MAR10
Data Date	01JAN01
Run Date	20DEC00 08:33

Early Bar
Progress Bar
Critical Activity

Sheet 9 of 9

Date	Revision	Checked	Approved

7. PROJECT MANAGEMENT PLAN

This section describes the elements of project management for the OU 3-14 RI/FS as follows:

- Key positions and responsibilities
- Organization
- Change control
- Work performance
- Communications.

7.1 Key Positions and Responsibilities

7.1.1 Senior Project Manager

The senior project manager (DOE-ID contractor) is responsible for work planning, authorization, and performance; analysis; reporting; baseline change control; and day-to-day communication with DOE-ID. Responsibilities include:

- Preparing, issuing, reviewing, approving, and maintaining cost accounts that define work scope, scheduled milestones, and a budget that complies with the management control system
- Distributing funds to project managers and work performers for authorized work
- Preparing baseline documents and implementing the management control system, including preparation of a project work breakdown structure and development of control account authorization documents
- Evaluating project performance against the baseline control account plan, presenting variance analysis and corrective action plans, and preparing monthly reports for DOE-ID
- Implementing corrective actions through preparing and approving change documents as required
- Managing subcontracted work
- Guiding the project manager and contributing individuals.

7.1.2 Project Manager

The project manager is responsible to the senior project manager for the detailed planning and performance of work within the assigned work packages. The work package manager also is responsible for the technical quality of the work performed. The project manager is responsible for the following:

- Negotiating with the senior project manager about project scope, schedule, and budget

- Managing scope, schedule, and budget for work performed by organizations within BBWI
- Supporting the senior project manager in integrating schedules and resources in assigned control accounts
- Reporting project status weekly and monthly
- Maintaining proper change and revision control of assigned control account
- Implementing corrective actions, where required.

If a senior project manager has not been defined, the project manager assumes the duties of the senior project manager. When the project is too small to warrant a senior project manager, the project manager will assume those duties. When the project is too small to warrant a control account manager, the project manager will assume those duties.

7.1.3 Control Account Manager

The control account manager is responsible to the summary account manager for the detailed planning and performance of work within the assigned control accounts. The control account manager is also responsible for the technical quality of the work. The control account manager is responsible for the following:

- Negotiating with the summary account manager until both agree on scope, schedule, and budget
- Developing control account plans by defining work packages in accordance with scope, schedule, and budget provided on the cost account authorization
- Ensuring that control account plans are developed in compliance with the management control system
- Defining, planning, scheduling, and negotiating supporting work from performing organizations
- Supporting the summary account manager in integrating schedules and resources in assigned cost accounts with other cost account managers
- Providing progress status on the control account plan each month
- Ensuring performance of work planned on the control account plans
- Controlling changes to and revisions of assigned control accounts
- Implementing corrective actions, where required.

7.2 Organization

This section provides an overview of project planning, budgeting, and baselines.

7.2.1 Planning and Budgeting Overview

Planning and budgeting are the processes by which control accounts are developed, reviewed, approved, and authorized. The sum of the approved control account plans becomes the time-phased performance measurement baseline, which is the formal plan against which progress is evaluated. This section describes the parameters for project work, including the project master schedule and the work breakdown structure. From these documents the control account and its associated schedule, budget, and scope of work are defined.

The planning process requires that the full scope of work be planned and scheduled. Once this is done, resources are applied. Fully planned work and applied resources are then compared to the available budget. If the available budget is insufficient for the planned work, either the budget will be increased or the scope of work will be decreased.

A control account authorization is prepared using the project master schedule and the work breakdown structure as guidance. The control account authorization specifies the boundaries of each control account and is used by the senior project manager for planning the work package details. The control account plans and control account authorization are reviewed and approved by the DOE-ID counterpart, the senior project manager, and other appropriate management. Approval of the control account authorization and control account plan constitutes authority to perform work.

7.2.2 Project Baselines

The project baselines, used for evaluating project performance, are established in the project master schedule and work breakdown structure, and are further defined in the control account authorization and cost plan. The various baselines are defined as follows:

The budget baseline for the project is the sum of the approved budgets on the control account authorizations plus undistributed budgets, which are maintained through the change control system.

The schedule baseline consists of the key decision points and major milestones displayed on the project master schedule. Key decision points and major milestones are shown in the control accounts that directly support the milestones. Key milestones are defined by either DOE headquarters or DOE-ID, and major milestones are defined by BBWI.

The scope of baseline or technical baseline is defined in the work breakdown structure and detailed in the total control account authorizations. It is expanded further in design media, operating specifications, and process flow sheets.

The funds baseline is contained in the annual approved funding program plan. The budget authority is a ceiling for costs plus commitments, and the budget outlay is a ceiling for expenditure during each fiscal year.

7.3 Change Control

Operable Unit 3-14 uses the change control process to manage and control changes to the performance measurement baseline, schedule baseline, or scope of work. The change control process applies to all major projects and major system acquisitions and will be implemented in accordance with the latest revision of MCP-23, "Planning and Managing Projects with Grade I Cost and Schedule Controls," and MCP-3543, "Planning and Managing Projects with Grade II Cost and Schedule Controls."

7.4 Work Performance

The work performance measurement process consists of retrieving planning, performance, and cost data, then providing that data to various management levels for timely decision-making and corrective action. The data are used to calculate cost, schedule, and completion variances. Written variance analyses are required on an exception basis (i.e., when variances exceed predetermined thresholds) to identify causes of significant deviations from plans and to identify and implement appropriate corrective actions. The cost and schedule generated at the cost account level are summarized through both the work breakdown structure and the organization structure to provide information concerning each manager's area of responsibility. This information is analyzed by the appropriate manager and then summarized in written reports that document costs, schedule, and technical performance.

7.4.1 Work Performance Measurement

7.4.1.1 Senior Project Manager. The senior project manager is responsible for accomplishing work described in the control account plan.

7.4.1.2 Management Control System Elements. Five key data elements within the management control systems are used to calculate variances that give the senior project manager an indication of the progress toward the goals and objectives stated on the cost account plan. The various performance measurements are defined as follows:

- **Budget Cost for Work Scheduled**—The planned value for work in a control account plan that is scheduled in a given time period
- **Budgeted Cost for Work Performed**—The value of work actually completed during the measurement period. It is equal to the planned value for the work that was finished
- **Actual Cost of Work Scheduled**—The actual accrued costs incurred within a given time period, including labor and material, together with the associated indirect costs
- **Budget at Completion**—The total budget authorized for a control account
- **Estimate Cost at Completion**—An estimate that is the sum of the actual costs to date plus a forecast of the cost to complete the remainder of the work.

The status of the control account is determined monthly using the data elements discussed above.

7.5 Communications

Two types of reports will be prepared by the project manager for this project: routine and event reports.

7.5.1 Routine Reports

Weekly and monthly reports will be issued to the DOE-ID project manager. Reports will contain a summary of work in progress, planned work, problems encountered, results of any change control board or internal change board actions, work stoppages, anticipated schedule variances, work completed, key position changes, status of subcontracts, corrective action plans, audits performed, and earned value reports.

7.5.2 Event Reports

Unusual events may be within the scope of DOE Order 232.1. If such events occur, notifications will comply with this order. Unusual events outside the scope of 232.1 will be reported as follows:

- Minor problems will be reported to the site supervisor and, if necessary, the safety representative.
- Radiological health and safety problems that cannot be corrected onsite will be reported to the site supervisor or the health and safety officer.
- Problems that could stop work for a period of more than one shift, cause a schedule change greater than 2 days, or a budget change greater than $5,000 will be reported to the senior project manager. The senior project manager will report these problems to appropriate cost account, project, or program managers, including DOE-ID.

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Appendix A

Tank Farm Valve Box Valves, Piping, and Equipment

Appendix A

Tank Farm Valve Box Valves, Piping, and Equipment

The following valve box table was constructed to provide information on valves, piping, equipment and instrumentation contained within each valve box. For clarity, the table is divided into seven descriptive columns. A description of each individual column from left to right is provided in the table below. Corresponding information contained within the valve box table columns, lines up horizontally across the page.

Information was obtained from drawings and INTEC personnel familiar with the TFF operations.

Column Number	Column Identifier	Description
1.	Valve Box Name	A unique number given to represent each valve box within the identification table.
2.	Reference Drawings	Provides drawing number were valve box information was obtained.
3.	Valves	Provides valve names contained within the valve box.
4.	Process Piping	Provides piping names contained within the valve box.
5.	Equipment	Provides equipment names contained within the vale box (i.e. jet pumps).
6.	Instrumentation	Provides instrumentation names contained within the valve box.
7.	Comments	Discusses additional information and provides pipeline origin and destination points.

Table A-1. Valve box valves, piping, and equipment.

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
A 2	057501053	3" PUV-WM-16	3 PUA-201			3" PUV-WM-16 WL-101 (WL-500) TO WM-181 (REMOVED)
	881	3" PUV-WM-17	3 PUA-1013			3" PUV-WM-17 WL-101 (WL-505) TO WM-184, -186 (REMOVED)
		3" PUV-WM-18	3 PUA-203			3" PUV-WM-18 WL-101 (WL-505) TO WM-181 (REMOVED)
		3" PUV-WM-19	3 PUA-1014			WL-101 (WL-500) TO TANK FARM
		DCV-WM-1				DCV-WM-1 ABANDONED IN PLACE
		DCV-WM-2				DCV-WM-2 ABANDONED IN PLACE
			1-PU-A-205			DVB-WM-PW-A2 FLOOR DRAIN TO 3 PWM-48048C
						Nothing is connected except drain lines
A 5	057501	3" PUV-WM-10	3 PUA-601			WM-182 INLET
	054600	3" PUV-WM-11	3 PUA-602			WM-182 INLET
		3" PUV-WM-8	3 PUA-609			WM-183 INLET
		3" PUV-WM-9	3 PUA-610			WM-183 INLET
			1-PU-A-653			DVB-WM-PW-A5 TO CPP-783
			1-PU-A-654			DVB-WM-PW-A6 TO DVB-WM-PW-A5
A 6	053193			JET-WM-582-1A		JET FROM VES-WM-182 TO DIV BOX DVB-WM-PW-A6
	057501			JET-WM-582-1B		JET FROM VES-WM-181 TO DIV BOX DVB-WM-PW-A6
	137994	DCV-WM-14				DECON—ABANDONED IN PLACE
	137997	DCV-WM-15				DECON—ABANDONED IN PLACE
	057502	3" PUV-WM-12	3 PUA-602			WM-178 TO WM-185, -187, -188, -189, and -190
	154108	3" PUV-WM-13	3 PUA-1033			3 PUA-1033 MAIN TRANSFER BLOCK VALVE
	378053	3" PUV-WM-6	3 PUA-601			WM-178 TO WM-182 and -183
	378054	3" PUV-WM-7	3 PUA-602			WM-102 TO WM-182 and -183
			3-PU-A-1005			DVB-WM-PW-A6 TO 3" PUA-1030-B6 347SS SCH40 575' BD-17'9" FIRST 91' TITLEPIPE FIRST 225FT BECHTEL 1950 PRITCHARD
			1-PU-A-654			DVB-WM-PW-A6 TO DVB-WM-PW-A5
A 7	057502	DCV-WM-26				DECON ABANDONED IN PLACE
	095316	DCV-WM-27				DECON ABANDONED IN PLACE
	096156	3" PUV-WM-20	3 PUA-1013			WL-101 (WL-505) TO WM-186
	055539	3" PUV-WM-21	3 PUA-630			WL-101 (WL-505) TO WM-184
	054110	3" PUV-WM-22	3 PUA-631			WL-101 (WL-500) TO WM-184
	500498	3" PUV-WM-23	3 PUA-1014			WL-101 (WL-500) TO TANK FARM
	500505		3-PU-A-1087			DVB-WM-PW-A7 TO DVB-WM-PW-B1
			3-PU-A-1088			DVB-WM-PW-B1 TO DVB-WM-PW-A7
			3-PW-AR-151009			VES-WL-101 VIA JET-WL-500 and DVB-WL-PL-C37 TO 3-PUA-1014 TO DVB-WM-PW-A7
					LSH-WM-A7	RESERVED FOR C. MCDONALD 6-17-97 - LEVEL SWITCH IN VALVE BOX
A 8	057502	6" CSV-WM-72	6-CSN-663			6" BLOCK VALVE
		6" TWV-WM-32	6 TWN-602			6" BLOCK VALVE
		4" VGV-WM-25	4 VGN-602			4" BLOCK VALVE
		12" VGV-WM-26	12 VPN-602			12" BLOCK VALVE

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
B 1	057502	3" DCV-WM-72	3 PUA-1088			3 PUA-1013 DECON LINE
	057503	3" DCV-WM-73	3 PUA-1087			3 PUA-1014 DECON LINE
	055539	3" PUV-WM-70	3 PUA-1013			REMOVED—WL-101 (WL-505) TO WM-186
	096156	3" PUV-WM-71	3 PUA-1014			WL-101 (WL-500) TO WM-180, -182, -183, -185, -186, -187, -188, -190
	057501				LSH-WM-B1	RESERVED FOR C. MCDONALD 6-17-97 - LEVEL SWITCH IN VALVE
	137931					
	500505					
B 2	057502	3" PUV-WM-61	3" PUA-1030			WM-187, -188, -189, -190 INLET and OUTLET
	054109	3" PUV-WM-62	3" PUA-202			REMOVED—INTERM TO HIGH LEVEL CROSS TIE BLOCK VALVE
	057501	3" PUV-WM-63	3" PUA-1014			WM-181, -184 INLET and OUTLET BLOCK VALVE
	057502	3" PUV-WM-64	3" PUA-1036			3 PUA-1036 BLOCK VALVE
	096156	3" PUV-WM-65	3" PUA-202			INTERM TO HIGH LEVEL CROSS TIE BLOCK VALVE
		3" PUV-WM-66	3" PUA-1012			REMOVED—WM-186 INLET BLOCK VALVE
		3" PUV-WM-67	3" PUA-1040			WM-186 INLET BLOCK VALVE
		3" PUV-WM-68	3" PUA-1014			INTERM TO HIGH LEVEL CROSS TIE BLOCK VALVE
		3" PUV-WM-69	3" PUA-204			3 PUA-204 BLOCK VALVE
		1" DCV-WM-7	1 CA-1001			DECON LINE TO WM-186
			3-PU-A-1013			DVB-WM-PW-B1 TO 3-PUA-204 IN DVB-WM-PW-B2 TO VES-WM-18
B 3	057502	3" PUV-WM-55	3 PUA-1029			WM-178 TO WM-185
	054110	3" PUV-WM-56	3 PUA-208			WM-185 INLET BLOCK VALVE
	053193	3" PUV-WM-57	3 PUA-1030			3 PUA-1030 MAIN TRANSFER BLOCK VALVE
	057501	3" PUV-WM-58	3 PUA-1005			WM-178 TO WM-187, -188, -189, -190
	137994	3" PUV-WM-59	3 PUA-1014			WM-181 INLET and OUTLET BLOCK VALVE
	137997	3" PUV-WM-60	3 PUA-1014			WM-187, -188, -189, -190 INLET and OUTLET
		3" DCV-WM-8	3 PUA-1028			DECON LINE TO WM-185
				JET-WM-581-1A		JET FROM VES-WM-181 TO DIVERSION BOX DVB-WM-PW-B3 OR
				JET-WM-581-1B		RECYCLE
						JET FROM VES-WM-181 TO DIV BOX DVB-WM-PW-B3 OR RECYCLE
B 4	054108	3" DCV-WM-	3-PUA-1030			GROUT FILLING VALVE
	057502	420	OFF ENCASEMENT			GROUT FILLING VALVE
	106140	3" DCV-WM-	3 PUA-1030			REMOVED—TANK FARM TO CALCINER
	378053	421	3 PUA-1218			WM-187, -188, -189, -190, INLET and OUTLET VALVE
	378054	3" PUV-WM-74	3 PUA-1219			WM-179 TO WM-187, -188, -189 and -190
		3" PUV-WM-75	3 PUA-1005			WM-179 TO WCF
		3" PUV-WM-76	3-PU-A-204			3" PUA 1013 TO 3" PUA 1223 347SS SCH40 72' BD -14'2" CONCRETE
		3" PUV-WM-77				PIPEWAY #6
B 5	378053	DCV-WM-9				DECON LINE ABANDONED IN PLACE
	057503	DCV-WM-10				DECON LINE ABANDONED IN PLACE
	378054	DCV-WM-11				DECON LINE ABANDONED IN PLACE
	377823	DCV-WM-12				DECON LINE ABANDONED IN PLACE
	057502	3" PUV-WM-81				ABANDONED IN PLACE
	106226	3" PUV-WM-82	3" PUA-1232			WM-103, -104, -105, and -106 TO HIGH LEVEL TANK BLOCK VALVE FLUOR

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
	057503	3" PUV-WM-83				1961
	057850					ABANDONED IN PLACE
		3" PUV-WM-84	3" PUA-1233			
		3" PUV-WM-85	3" PUA-1222			WM-103, -104, -105, and -106 TO INTERM LEVEL TANK BLOCK VALV
		3" PUV-WM-86	3" PUA-1223			FLUOR 1961
				JET-WM-586-3A		3 PUA-1222 BLOCK VALVE
				JET-WM-586-3B		3 PUA-1223 BLOCK VALVE
				JET-WM-587-3A		JET FROM VES-WM-186 TO DIV BOX DVB-WM-PW-B5
				JET-WM-587-3B		JET FROM VES-WM-186 TO DIV BOX DVB-WM-PW-B5
						JET FROM VES-WM-187 TO DIV BOX DVB-WM-PW-B5
						JET FROM VES-WM-187 TO DIV BOX DVB-WM-PW-B5
B 6	055540	3" DCV-WM-79	3 PUA-1101			3 PUA-1219 DECON LINE
	137931	3" DCV-WM-80	3 PUA-1100			3 PUA-1218 DECON LINE
		3" PUV-WM-78	3 PUA-1005			WM-179 TO WCF
		3" PUV-WM-79	3 PUA-1101			DECON BLOCK VALVE TO 3 PUA-1005
		3" PUV-WM-80	3 PUA-1100			DECON BLOCK VALVE TO 3 PUA-1030
			3-PU-A-1215			GOES THROUGH DVB-WM-PW-B6 AND CAPPED ON EACH END
			3-PU-A-1216			GOES THROUGH DVB-WM-PW-B6 AND CAPPED ON EACH END
B 7	057503	1" DCV-WM-16				DECON VALVE TO PUV-WM-38
	055541	1" DCV-WM-17				DECON VALVE TO PUV-WM-36
	137951	3" PUV-WM-35	3 PUA-1233			WM-103 WM-104 TO INTER LEVEL TANKS
		3" PUV-WM-36	3 PUA-1233			DECON SOLUTION FOR 3 PUA-1233 BLOCK VALVE
		3" PUV-WM-37	3 PUA-1232			WM-103,-104,-105, and -106 TO HIGH LEVEL TANKS
		3" PUV-WM-38	3 PUA-1232			DECON SOLUTION FOR 3 PUA-1232 BLOCK VALVE
			1-PU-A-1234			DVB-WM-PW-B8 TO DVB-WM-PW-B7
B 8	053192			JET-WM-513		JET FROM VES-WM-103 TO DIVERSION BOX DVB-WM-PW-B8 (LO)
	057500			JET-WM-514		JET FROM VES-WM-104 TO DIVERSION BOX DVB-WM-PW-B8 (HI)
	137950			JET-WM-515		JET FROM VES-WM-105 TO DIVERSION BOX DVB-WM-PW-B8 (LO)
	057503			JET-WM-516		JET FROM VES-WM-105 TO DIVERSION BOX DVB-WM-PW-B8 (HI)
				JET-WM-517		JET FROM VES-WM-106 TO DIVERSION BOX DVB-WM-PW-B8 (LO)
				JET-WM-518		JET FROM VES-WM-106 TO DIVERSION BOX DVB-WM-PW-B8 (HI)
				JET-WM-519		JET FROM VES-WM-103 TO DIVERSION BOX DVB-WM-PW-B8 (HI)
				JET-WM-520		JET FROM VES-WM-104 TO DIVERSION BOX DVB-WM-PW-B8 (LO)
		1" DCV-WM-18				DECON VALVE TO WM-519
		1" DCV-WM-19				DECON VALVE TO WM-513
		1" DCV-WM-20				DECON VALVE TO WM-514
		1" DCV-WM-21				DECON VALVE TO WM-520
		1" DCV-WM-22				DECON VALVE TO WM-515
		1" DCV-WM-23				DECON VALVE TO WM-516
		1" DCV-WM-24				DECON VALVE TO WM-518
		1" DCV-WM-25				DECON VALVE TO WM-517
		3" PUV-WM-27	3 PUA-1233			WM-103 (WM-519) TO INTERMEDIATE LEVEL TANKS
		3" PUV-WM-28	3 PUA-1232			WM-103 (WM-513) TO HIGH LEVEL TANKS
		3" PUV-WM-29	3 PUA-1226			WM-104 (WM-514) TO HIGH LEVEL TANKS

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		3" PUV-WM-30	3 PUA-1227			WM-104 (WM-520) TO INTERM LEVEL TANKS
		3" PUV-WM-31	3 PUA-1228			WM-105 (WM-515) TO INTERM LEVEL TANKS
		3" PUV-WM-32	3 PUA-1229			WM-105 (WM-516) TO HIGH LEVEL TANKS
		3" PUV-WM-33	3 PUA-1231			WM-106 (WM-518) TO INTERM LEVEL TANKS
		3" PUV-WM-34	3 PUA-1230			WM-106 (WM-518) TO HIGH LEVEL TANKS
			1-PU-A-1234			DVB-WM-PW-B8 TO DVB-WM-PW-B7
B 9	057503	3" PUV-WM-87	3" PUA-1089			WM-187 INLET BLOCK VALVE
	378036	3" PUV-WM-88	3" PUA-1090			WM-187 INLET BLOCK VALVE
	378824	3" PUV-WM-89	3" PUA-1090			WM-187 and -188 INLET BLOCK VALVE
	377369	3" PUV-WM-90	3 PUA-1220			WM-189 and -190 INLET and OUTLET BLOCK VALVE
	054128	3" PUV-WM-91	3" PUA-1221			WM-189 and -190 INLET BLOCK VALVE
	378053	3" PUV-WM-92	3" PUA-1089			WM-187 and -188 INLET BLOCK VALVE
	378054	3" PUV-WM-93	3" PUA-1203			WM-188 INLET BLOCK VALVE
		3" PUV-WM-94	3" PUA-1204			WM-188 INLET BLOCK VALVE
B 10	057503	1" DCV-WM-	1-DC-AR-152567			DECON VALVE
	174021	387	1-DC-AR-152568			DECON VALVE
	137946	1" DCV-WM-	3 PUA-1304			WM-189 INLET BLOCK VALVE
	174020	388	3 PUA-1303			WM-189 INLET BLOCK VALVE
	174022	3" PUV-WM-	3-PUA-1220			WM-189 and WM-190 INLET BLOCK VALVE
	175127	301	3 PUA-1220			3 PUA-1220 BLOCK VALVE
	175128	3" PUV-WM-	3 PUA-1221			3 PUA-1221 BLOCK VALVE
		302	3-PUA-1221			WM-189 and WM-190 INLET BLOCK VALVE
		3" PUV-WM-	3 PUA-1315			WM-190 INLET BLOCK VALVE
		303	3 PUA-1316			WM-190 INLET BLOCK VALVE
		3" PUV-WM-	1-PU-A-1325			DVB-WM-PW-B10 TO SUMP DRAIN
		304			CE-WM-B10	CONDUCTIVITY ELEMENT IN DVB-WM-PW-B10
		3" PUV-WM-			CIA-WM-B10	CONDUCTIVITY INDICATING ALARM ABOVE DVB-WM-PW-B10
		305				
		3" PUV-WM-				
		306				
		3" PUV-WM-				
		307				
		3" PUV-WM-				
		308				
B 11	057503			JET-WM-511-4		JET FROM DVB-WM-PW-B11
	137947	¾" DCV-WM-	1-PLA-104764			DECON SUPPLY TO BOX-B11
	174020	255	3/4-DC			DECON VALVE--REMOVED
	174022	¾" DCV-WM-				3 PUA-1223 DECON LINE
	137948	258				3 PUA-1222 DECON LINE
	137949	¾" DCV-WM-				3 PUA-1220 DECON LINE
	175127	259	3 PUA-1220			NWCF TO TANK FARM BLOCK VALVE
	175128	¾" DCV-WM-	3 PUA-1222			NWCF TO TANK FARM BLOCK VALVE
		260	3-PU-A-1221			BLOCK VALVE
		¾" DCV-WM-	1 PLA-104764			BOX-B11 SUMP JET (WM-511-4) TO NWCF
		261	1-PLA-104738			BOX-B11 SUMP JET TO STORAGE TANKS

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		3" PUV-WM-320 3" PUV-WM-322 3" PUV-WM-338 1" PLV-WM-62 1" PLV-WM-64			CE-WM-B11 CIA-WM-B11	CONDUCTIVITY ELEMENT IN DVB-WM-PW-B11 CONDUCTIVITY INDICATING ALARM ABOVE DVB-WM-PW-B11
C 1	057501 137929	1 ½'HSV-WM-216 1 ½'HSV-WM-217 1 ½'HSV-WM-218 1 ½'HSV-WM-219 1 ½'HSV-WM-220	1 ½" HSA-104716 1 ½" HSA-604 1 ½" HSA-603 1 ½" HSA-602 1 ½" HSA-605 1 ½" HSA-104756			STEAM TO WM-182 and WM-183 SUMP JETS STEAM TO WM-183 SUMP JET (WM-533) TO WM-182 STEAM TO WM-182 SUMP JET (WM-530) TO WM-182 STEAM TO WM-182 SUMP JET (WM-531) TO WM-182 STEAM TO WM-183 SUMP JET (WM-534) TO WM-183
C 2	137927	PUV-WM-115 PUV-WM-116	2 PUA-1099 2 PUA-1033			WM-182 (WM-582-1B) OUTLET BLOCK VALVE WM-182 (WM-582-1A) OUTLET BLOCK VALVE
C 3	057501 137925	3" PUV-WM-117 3" PUV-WM-118 3" PUV-WM-119	3 PUA-1033 3 PUA-1034 3 PUA-1033 1-PL-A-104768			WM-180 WM-181 OUTLET BLOCK VALVE WM-180 INLET BLOCK VALVE WM-180 WM-182 OUTLET BLOCK VALVE and WM-180 INLET BLOCK DVB-WM-PW-C3 TO 1-PLA-104767
C 4	057501 137925	2" PUV-WM-113 2" PUV-WM-114	2 PUA-1097 2 PUA-1032 1-PL-A-104767 2-PU-A-1097			WM-180 (WM-580-1A) OUTLET BLOCK VALVE WM-180 (WM-580-1B) OUTLET BLOCK VALVE DVB-WM-PW-C4 TO DVB-WM-PW-C12 JET-WM-580-1A TO DVB-WM-PW-C4
C 5	057501 133406 137927	1" PLV-WM-31 1" PLV-WM-32 1" PLV-WM-33 2" PUV-WM-121 2" PUV-WM-122	1-PSAD-4425 1-PSAD-4426 1-PSAD-4426 2 PUA-1035 2 PUA-1098 1-PL-A-104771			ISOLATION VALVE ISOLATION VALVE ISOLATION VALVE WM-183 (WM-582-1B) OUTLET BLOCK VALVE WM-183 (WM-583-1A) OUTLET BLOCK VALVE DVB-WM-PW-C5 TO 1-PLA-104772
C 6	057501 137929	1" HSV-WM-221	1 HSA-104721 1 HSA-104722			STEAM TO WM-182 and WM-183 SUMP JETS - SOUTH SUMP STEAM TO WM-183 SUMP JET (WM-583-4) TO WL-102
C 6	053193 057501	1" HSV-WM-222	1 HSA-104723 1-1/4 PLA-104701			STEAM TO WM-182 SUMP JET (WM-582-4) TO WL-102 WM-182 SOUTH SUMP JET TO WL-102/133

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
	137994	1" HSV-WM-	1-1/4 PLA-104702			WM-183 SOUTH SUMP JET TO WL-102/133
	137997	223		JET-WM-583-1A		JET FROM VES-WM-183 SUMP TO DIV BOX DVB-WM-PW-C6
	137991	1 ¼" PLV-WM-1				
		1 ¼" PLV-WM-2		JET-WM-583-1B		JET FROM VES-WM-183 SUMP TO DIV BOX DVB-WM-PW-C6
				JET-WM-582-4		JET FROM VES-WM-182 SUMP TO DIVERSION BOX DVB-WM-PW-C6
				JET-WM-583-4		JET FROM VES-WM-583 SUMP TO DIV BOX DVB-WM-PW-C6
			1-PL-A-104770			DVB-WM-PW-C6 TO 1-PLA-104772
C 7	057501	3" PUV-WM-	3 PUA-1033			WM-180, 182, 183 OUTLET BLOCK VALVE and WM-180 INLET
	137928	120	3 PUA-1014			WM-181 INLET BLOCK VALVE
		3" PUV-WM-	3-PU-A-1036			3" PUA 1014 B2 TO 3" PUA 1022 B5 347SS SCH40 78' BD-6'11" CONCRETE and SS PIPE
		125	1-PL-A-104772			
						DVB-WM-PW-C7 TO 1-PLA-104767
C 8	057501	3" PUV-WM-	3 RWC			COOLING WATER TO WL-102 (VALVE BLINDED INTACT)
	137926	127	1-PL-A-104769			DVB-WM-PW-C8 TO 1-PLA-104767
C 9	137925	¾" DCV-WM-	3/4-DC-AR-151993			DC SOLUTION TO 2-PUA-1036 and 2-PUA-1096 1-DC-AR-151992 TO CAP BY
	377713	415	1-DC-AR-151992			DVB-WM-PW-C9
	377826	1" DCV-WM-	2" PUA-1096			DC SOLUTION TO 2-PUA-1036 and 2-PUA-1096
	377096	416	2" PUA-1036			WM-181 (WM-581-1A) OUTLET BLOCK VALVE
	057501	2" PUV-WM-				WM-181 (WM-581-1B) OUTLET BLOCK VALVE
		123				
		2" PUV-WM-	3" PUA-1036			
		124	1-PL-A-104775			
						DVB-WM-PW-C9 TO 1-PLA-104767
C 10	057501	3" PUV-WM-	3 PLA-104703			WASTE TANKS TO SAMPLE CABINET (DVB-WM-PW-C12) TO WL-10
	137937	126	1-PL-A-104774			DVB-WM-PW-C10 TO 1-PLA-104767
			1*1/2-PL-A-104701			1*1\4-PL-A-104701 TO DVB-WM-PW-C10
C 11	057501	1 ¼" PLV-WM-3	1-1/4 PLA-104704			WM-180 SUMP JET TP WL-102/133
	137930	1 ¼" PLV-WM-4	1-1/4 PLA-104705			WM-181 SUMP JET TO WL-102/133
	057501			JET-WM-580-4		JET FROM VES-WM-180 SUMP TO DIV BOX DVB-WM-PW-C11
	137991					
	137994			JET-WM-581-4		JET FROM VES-WM-181 SUMP TO DIVERSION BOX DVB-WM-PW-C11
	137997		1-PL-A-104777			DVB-WM-PW-C11 TO DVB-WM-PW-C12
	098372					
C 12	137937	¾" DCV-WM-	3/4-PL-AR-155002			DECON STATION FOR 1*1/2-PLA-104710
	057501	408	3/4 HAAM-110535			AIR TO SAMPLE JET
	098372	¾" HAV-WM-	1-HANN-110536			
	177592	66	1/4 HAAM			PI INLET FOR AIR TO C-12 SAMPLER
	098372	1" HAV-WM-67	1/2 DCAM-110529			SAMPLER DECON
	177608	¼" HAV-WM-	3 PLA-104710			WASTE TRANSFER BLOCK VALVE
	177609	68	3/4-PL-AR-155002			ISOLATION TO DECON STATION FOR 3-PLA-104710

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		½" DCV-WM-91	3/4-HS-AR-154995			TEMPORARY VALVE UNTIL COMPLETION OF DVB-WM-PW-C40-HEADER
		3" HY-WM-81	1-PL-AR-155001			BLOCK VALVE AT DVB-WM-
		¾" PLV-WM-				OUTLET FROM JET-WM-539
		232	1-HA-NN-110535			CONTROL VALVE FOR HV-WM-230
		PLV-WM-240	3/4-HS-AR-154995			WASTE TANKS TO SAMPLE CABINET (DVB-WM-PW-C12) TO WL-10
		1" HV-WM-230	3 PLA-104703			STEAM SUPPLY TO JET-WM-539
		HY-WM-230	1 PLAR-110527			SAMPLE BOX DRAIN TO C-12 SUMP
		1" PCV-WM-5	1/2 PLAM-110533			SAMPLE BOX DRAIN TO C-12 SUMP
		¾" HV-WM-608	1/2 PLAR-110532			SAMPLER BYPASS
		3" PUV-WM-	3/4 PLAR-110531			SAMPLER BOTTLE INLET
		126	1/2 PLAR-110532			SAMPLE JET RETURN
		1" PLV-WM-66	1 PLAR-110527			SAMPLER SUCTION
		½" PLV-WM-69	1/2 PLAM-110533			SAMPLER FLOWMETER OUTLET
		½" PLV-WM-70	1/2 LAAR-110534			AIRLIFT CONTROL VALVE TO C-12 SAMPLER
		¾" PLV-WM-71				CONTROL VALVE FOR HV-WM-81
		½" PLV-WM-72	1/2 LAAR-110534	JET-WM-539		
		1" PLV-WM-75		JET-WM-612		STEAM JET IN DVB-WM-PW-C12 SUMP
		½" PLV-WM-76			LSH-WM-C12	JET FOR WM-189 and WM-190 SAMPLER SYSTEM
		½" LAV-WM-10			ZS-WM-230-1	LEVEL MEASUREMENT FOR DVB-WM-PW-C12 SUMP
		HY-WM-81			FI-WM-612	CLOSED POSITION SWITCH FOR HV-WM-230
		3" HV-WM-81			ZI-WM-230	FLOW INDICATOR FOR WM-189 WM-190 SAMPLER JET SYSTEM
					CT-WM-C12	POSITION INDICATOR FOR HV-WM-230
					RE-WM-612	CONDUCTIVITY TRANSMITTER FOR DVB-WM-PW-C12 SUMP
					CE-WM-C12	RADIATION ELEMENT ON SAMPLE SUMP
					ZI-WM-81	CONDUCTIVITY ELEMENT FOR DVB-WM-PW-C12 SUMP
						POSITION INDICATOR FOR HV-WM-81
C 13	057502	¾" HSV-WM-	3/4 HSA			HOSE CONNECTION BLOCK VALVE
	137935	210	1 HSN-104730			STEAM TO WM-185 AND -186 SUMP JETS
	137981	1" HSV-WM-	1-1/2 HSA-1007			STEAM TO WM-185 NORTH SUMP JET (WM-585-2) TO WM-185
	137981	230	1-1/2 HSA-1006			STEAM TO WM-185 SOUTH SUMP JET (WM-585-1) TO WM-185
	057502	1 ½" HSV-WM-	1 HSA-104733			STEAM TO WM-185 SOUTH SUMP JET (WM-585-4) TO WL-102
	057503	231	1 HSA-104734			STEAM TO WM-186 SOUTH SUMP JET (WM-586-4) TO WL-102
	117940	1 ½" HSV-WM-	1-1/2 HSA-1004			STEAM TO WM-186 SOUTH SUMP JET (WM-586-1) TO WM-186
		232	1-1/2 HSA-1005			STEAM TO WM-186 NORTH SUMP JET (WM-586-2) TO WM-186
		1" HSV-WM-	1-HSN-104730			BLOWDOWN VALVE FOR STR-WM-614
		233				TEMPORARY ISOLATION VALVE
		1" HSV-WM-	1 HAA-104762			
		234				AIR TO BOX C-13 PURGER FOR WM-185 SUMP JETS
		1 ½" HSV-WM-		STR-WM-614		STRAINER ON LINE 1-HSN-104730
		235		STR-WM-615		TEMPORARY STRAINER
		1 ½" HSV-WM-	1-HS-A-104744			DVB-WM-PW-C13 TO JET-WM-587-4
		236	1-HS-A-104745			DVB-WM-PW-C13 TO JET-WM-525-4

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		1 ½” HSV-WM-668	1-HS-A-104747			DVB-WM-PW-C13 TO JET-WM-524-4
		HSV-WM-669				
		1” HAV-WM-62				
		1 ½” 1-1/2 HAS-1007				
C 14	057502	2” PUV-WM-130	2 PUA-1038			WM-185 (WM-585-3B) OUTLET BLOCK VALVE
	137932	2” PUV-WM-131	2 PUA-1094			WM-185 (WM-585-3A) OUTLET BLOCK VALVE
	106210			JET-WM-585-3A		JET FROM VES-WM-185 TO DIV BOX DVB-WM-PW-C14
				JET-WM-585-3B		JET FROM VES-WM-185 TO DIV BOX DVB-WM-PW-C14
			1-PL-A-104783			DVB-WM-PW-C14 TO 1-PLA-104773
C 15	057501 137926	3” PUV-WM-54	3 PUA-1030			3 PUA-1030 MAIN TRANSFER BLOCK VALVE
C 16	057502	2” PUV-WM-132	2 PUA-1037			VES-WM-184 (JET-WM-584-1A) OUTLET BLOCK VALVE
	137933	3” PUV-WM-133	3 PUA-1037			VES-WM-184 INLET BLOCK VALVE
	105528	2” PUV-WM-134	2 PUA-1093			VES-WM-184 (JET-WM-584-1B) OUTLET BLOCK VALVE
	106210	1 ¼” PLV-WM-5	1-1/4 PLA-104706			VES-WM-184 NORTH SUMP JET-WM-584-4 TO VES-WL-102 / 133 BLOCK VALVE
	106226	1 ¼” PLV-WM-6	1-1/4 PLA-104707			VES-WM-185 SOUTH SUMP JET-WM-584-4 TO VES-WL-102 / 133 BLOCK VALVE
	137992	1 ¼” PLV-WM-7	1-1/4 PLA-104708	JET-WM-584-1A		VES-WM-186 SOUTH SUMP JET-WM-586-4 TO VES-WL-102 / 133 BLOCK VALVE
				JET-WM-584-1B		JET FROM VES-WM-184 TO DIV BOX DVB-WM-PW-C16
				JET-WM-584-4		JET FROM VES-WM-184 TO DIV BOX DVB-WM-PW-C16
				JET-WM-585-4		JET FROM VES-WM-184 SUMP TO DIV BOX DVB-WM-PW-C16
			1-PL-A-104784	JET-WM-586-4		JET FROM VES-WM-185 SUMP TO DIV BOX DVB-WM-PW-C16
				JET-WM-518-4		JET FROM VES-WM-186 SUMP TO DIV BOX DVB-WM-PW-C16
						JET FROM DIVERSION BOX DVB-WM-PW-C18 TO DIVERSION BOX DVB-WM-PW-C16
						DVB-WM-PW-C16 TO 1-PLA-104773
C 17	057502	1” HSV-WM-226	1 HSA-104726			STEAM TO WM-184 SUMP JETS
	137935	1” HSV-WM-227	1 HSA-607			STEAM TO WM-184 SUMP JET (WM-537) TO WM-184
		1” HSV-WM-228	1 HSA-608			STEAM TO WM-184 NORTH SUMP JET (WM-536) TO WM-184
		1” HSV-WM-229	1 HSA-104729			STEAM TO WM-184 NORTH SUMP JET (WM-536) TO WM-184
C 18	057503	1 ½” PUV-WM-172	1-1/2 PUA-1211			WM-387 CONDENSATE TO WM-187
	137934	1 ½” PUV-WM-173	1-1/2 PUA-1205			WM-387 CONDENSATE TO WM-188
		1 ¼ PLV-WM-	1-1/4 PLA-104714			BOX C-18 SUMP JET WL-102/133
				JET-WM-518-4		JET FROM DIVERSION BOX DVB-WM-PW-C18 TO DIVERSION BOX DVB-WM-PW-C16

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		12				
C 19	057502	2" PUV-WM-	2 PUA-1095			WM-186 (WM-586-3A) OUTLET BLOCK VALVE
	137932	135	3 PUA-1039			WM-186 (WM-586-3B) OUTLET BLOCK VALVE
		3" PUV-WM-	1-PL-A-104782			DVB-WM-PW-C19 TO 1-PLA-104773
		136				
C 20	057503	CRV-WM-1	8 CRN-1261			COOLING WATER BYPASS TO WM-387
	137939	CRV-WM-2	8 CWN-1261			COOLING WATER RETURN FROM WM-387
		CRV-WM-3	8 CRN-1261			COOLING WATER TO HE-WM-387
		CRV-WM-5	6 CRN-1261			COOLING WATER RETURN FROM VES-WM-187 COILS
C 21	057503	PUV-WM-96	2 PUA-1202			WM-187 (WM-587-3B) OUTLET BLOCK VALVE
	137940	PUV-WM-95	2 PUA-1092			WM-187 WM-587-3A OUTLET BLOCK VALVE
		DCV-WM-382	3-PUA-1202			DECON VALVE IN DVB-WM-PW-C21
			1-PL-A-104779			DVB-WM-PW-C21 TO 1-PLA-104773
C 22	057503	PUV-WM-98	2 PUA-1091			WM-188 (WM-588-2A) OUTLET BLOCK VALVE
	137940	PUV-WM-97	2 PUA-1201			WM-188 (WM-588-2B) OUTLET BLOCK VALVE
	057851	DCV-WM-383	3-PUA-1201			DECON VALVE IN DVB-WM-PW-C22
				JET-WM-588-2A		JET FROM VES-WM-188 TO DIV BOX DVB-WM-PW-C22
				JET-WM-588-2B		JET FROM VES-WM-188 TO DIV BOX DVB-WM-PW-C22
			1-PL-A-104780			DVB-WM-PW-C22 TO 1-PLA-104773
C 23	377713	PLV-WM-79	1-1/4 PLA-104786			VES-WM-190 COLD SUMP JET-WM-590-4 TO VES-WL-102/133
	377098	PLV-WM-78	1 ½" PLA-104715			VES-WM-189 COLD SUMP JET-WM-589-4 TO VES-WL-102/133
	057503	PLV-WM-9	1 ½" PLA-104711			VES-WM-188 SOUTH SUMP JET-WM-588-4 TO VES-WL-102/133
	137943	PLV-WM-8	1 ½" PLA-104709			VES-WM-187 SOUTH SUMP JET-WM-587-4 TO VES-WL-102/133
	057850	DCV-WM-02	1 " PLA-104710			DECON BLOCK VALVE TO 1*1/2-PLA-104710
	137993	DCV-WM-01	1 ½" PLA-104786			DECON INLET FOR 1*1/2-PLA-104710
		DCV-WM-C23-				DVB-WM-PW-C23 ISOLATION VALVE
		02				DVB-WM-PW-C23 BLOCK VALVE
		DCV-WM-C23-	1 HSA-104755			STEAM TO WM-188 SUMP JET (WM-588-4) TO WL-102
		01	1 HSA-1202			STEAM TO WM-188 NORTH SUMP JET (WM-588-1A) TO WM-188
		HSV-WM-255	1 HSA-1201			STEAM TO WM-188 SOUTH SUMP JET (WM-588-1B) TO WM-188
		HSV-WM-254	1 HSA-1303			STEAM TO WM-190 HOT SUMP JET (WM-590-2) TO WM-190
		HSV-WM-253	1 HSA-1308			STEAM TO WM-190 COLD SUMP JET (WM-590-4) TO WL-102
		HSV-WM-252	1*1/4-PL-A-104079			JET-WM-587-4 TO DVB-WM-PW-C23
		HSV-WM-251		JET-WM-587-4		JET FROM VES-WM-187 SUMP TO DIV BOX DVB-WM-PW-C23
				JET-WM-524-4		JET FROM DIVERSION BOX DVB-WM-PW-C24 TO DIVERSION BOX DVB-
				JET-WM-525-4		WM-PW-C23
			1-PL-A-104713			JET FROM DIVERSION BOX DVB-WM-PW-C25 TO DIVERSION BOX DVB-
			1-PL-A-104773			WM-PW-C23
			1-HS-A-104755			JET-WM-524-4 TO DVB-WM-PW-C23
			1-HS-A-104756			DVB-WM-PW-C23 TO DVB-WM-PW-C12
						DVB-WM-PW-C23 TO JET-WM-588-4
						DVB-WM-PW-C23 TO HSV-WM-712

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
C 24	057503	PLV-WM-11	1-1/4 PLA-104713			BOX-C24 SUMP JET TO WL-102/133
	137941	PUV-WM-310	2 PUA-1301			WM-189 (WM-589-5) OUTLET BLOCK VALVE
	054137	PUV-WM-309	2 PUA-1313			WM-189 (WM-589-1) OUTLET BLOCK VALVE
	137996			AL-WM-589-5		AIRLIFT FROM VES-WM-189 TO DIV BOX DVB-WM-PW-C24
	137999			JET-WM-589-1		JET FROM VES-WM-189 TO DIV BOX DVB-WM-PW-C24
				JET-WM-524-4		JET FROM DIVERSION BOX DVB-WM-PW-C24 TO DIVERSION BOX DVB-WM-PW-C23
		1" DCV-WM-384	OFF 3-PUA-1301			DECON VALVE IN DVB-WM-PW-C24
C 25	057503	PLV-WM-74	1 PLAR-110541			WM-190 WEST SUMP JET TO WL-102
	137942	PLV-WM-73	1 PLA-100537			WM-187 SOUTH SUMP JET TO WL-102
	054137	PLV-WM-10	1-1/4 PLA-104710			BOX-C25 SUMP JET TO WL-102/133
	137996	PUV-WM-312	2 PUA-1302			WM-190 (WM-590-5) OUTLET BLOCK VALVE
	137999					
	057503	PUV-WM-311	2 PUA-1314			WM-190 (WM-590-1) OUTLET BLOCK VALVE
	057851	DCV-WM-385	3-PUA-1302			DECON VALVE IN DVB-WM-PW-C25
	098889	1" DCV-WM-384	3-PUA-1301			
	098890					
			2 PUA-1313	AL-WM-590-5		AIRLIFT FROM VES-WM-190 TO DIV BOX DVB-WM-PW-C25
				JET-WM-588-4		JET FROM VES-WM-188 SUMP TO DIV BOX DVB-WM-PW-C25
				UH-WM-204		UNIT HEATER IN DVB-WM-PW-C25
				JET-WM-525-4		JET FROM DIVERSION BOX DVB-WM-PW-C25 TO DIVERSION BOX DVB-WM-PW-C23
C 27	137952		1*1/2-PL-AR-110212			OUTSIDE CAP TO 2-PL-AV-8603 TO 2-PL-A-104803 IN DVB-SAA-PL-C27
	057499		1/2-LA-AR-110694			PV-SAA-1 TO DVB-SAA-PL-C27
	161467					
	053191					
	055320					
	138016					
C 28	137952	1" PLV-YDV-22				
	057499	2" PLV-YDW-125	2 PLA-104803			BYPASS FR-YDB-102
		2" PLV-YDB-121	2 PLA-104803			INLET ISOLATION FR-YDB-102
		2" PLV-YDB-124	1 PLA-104851			SUMP JET-YDB-502 DISCHARGE
		1" PLV-YDB-122	2 PLA-104803			OUTLET ISOLATION FR-YDB-102
		2" PLV-YDB-125	3/4 HSA-104805			STEAM TO SUMP JET-YDB-502
		2" HSV-YDB-				

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		123				
C 29	377714	2" PLV-YDA-23	2" PLA-110207			PROCESS CELLS TO WL-102/133
	057499	1" PLV-YDA-25	1 PLA-104858			JET-YDA-529-4 DISCHARGE BLOCK
	161467	2" PLV-YDA-22	2" PLA-110207			JET-WL-529-4 BLOCK TO WL SYSTEM
	053191	3" PLV-YDA-21	3" PLA-110206			CPP-601 BLOCK
			2" PWA-1560			DVB-C29 FROM 2"-PL-AR-104853 TO 3"-PL-AR-110206
			1 1/2" PWA-1560			
		PUV-YDA-326	1 1/2" PWA-1561			BLOCK TO TIE IN TO 2-PU-A-104853
			3" PLA-1102053"			
			PLA-110205			
			2" PUA-104854			
		PUV-YDA-325	2" PUA-104853			
C 30	057499	RCV-WM-196	1 VGAR-113542			SYPHON SYSTEM FILL POT DRAIN OR FILL
	053191	2" PUV-WM-	2 PUA-104853			PROCESS CELLS TO TANK FARM
	057499	336	2 PU-AR-113540			BLOCK TO VES-WM-196
	161467	2" PUV-WM-	2 PUA-104853			PROCESS CELLS TO TANK FARM
	057499	335	2 PUA-104854			BLOCK PROCESS CELLS TO TANK FARM
	161946	2" PUV-WM-	1 PUA-104855			SUMP JET-WM-530-4 DISCHARGE
	161949	328	3/4 HSA-104856			HIGH PRESSURE STEAM TO SUMP JET-WM-530-4
		2" PUV-WM-		JET-WM-530-4		SUMP JET
		327				
		2" PUV-WM-		VES-WM-196		6" DIA X 24" HIGH SURGE TANK IN VENT PIPING FOR LIQUID WASTE
		324				SYPHON TRANS
		¾" HSV-WM-				
		258				
C 31	057499	PUV-YDA-334	2-PUA-104854			
	141669	PUV-YDA-333	2-PUA-104853			
	161467	PUV-YDA-332				
		PUV-YDA-331				
		PUV-YDA-330				
		PUV-YDA-329				
C 32	094227	HY-WM-39				CONTROL VALVE FOR HV-WM-39
	177606	HY-WM-38				CONTROL VALVE FOR HV-WM-38
	177605	HY-WM-37				CONTROL VALVE FOR HV-WM-37
	094227	HY-WM-36				CONTROL VALVE FOR HV-WM-36
	177593	¾" HV-WM-	3/4-HS-AR-154997			STEAM SUPPLY TO JET-WM-540
	177594	609	1-PL-AR-155003			BLOCK VALVE FROM JET-WM-540 TO 3-PL-AR-113800
	177579	1" HV-WM-231	3-PLA-110206			
	057499	HV-WM-230	3-PL-AR-155563			ISOLATION VALVE
	094227	3" PLV-WM-247	3-PL-AR-155565			ISOLATION VALVE
	177593	3" PLV-WM-246	3/4-PL-AR-155004			ISOLATION VALVE TO DECON STATION TO HV-WM-36
		¾" PLV-WM-	3/4-PL-AR-155005			ISOLATION TO DECON STATION TO HV-WM-37
		234	3-PLA-110206			VES-WG-100 VES-WG-101 TO VES-WL-133

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		¾" PLV-WM-	3-PLA-110205			VES-WG-100 VES-WG-101 TO VES-WL-133 BLOCK VALVE
		233	3 PWL-3029C			3-PL-AR-113801 TO CAPPED IN DVB-WM-PW-C32 W/ DRAIN
		3" HV-WM-39	3 PWL-3028C			3-PL-AR-113800 TO CAPPED IN DVB-WM-PW-C32 W/DRAIN
		3" HV-WM-38	3/4-PL-AR-155004			BLOCK VALVE ON DECON STATION FOR HV-WM-36
		3" HV-WM-37	3/4-PL-AR-155005			BLOCK VALVE ON DECON STATION FOR HV-WM-37
		3" HV-WM-36		JET-WM-540		STEAM JET IN DVB-WM-PW-C32 SUMP
		¾" DCV-WM-				
		410	3-PL-AR-113800			3-PLA-110205 THRU DVB-WM-PW-C32 TO 6-PL-AR-113802
		¾" DCV-WM-	3-PL-AR-113801			3-PLA-110206 THRU DVB-WM-PW-C32 TO 6-PL-AR-113802
		409	1/2-HA-AR-154996			1-HA-NN-110536 ON E SIDE OF 604 TO DVB-WM-PW-C12, DVB-WM-PW-C32,
					LSH-WM-C32	and DVB-WL-PL-C37
					ZS-WM-231-1	DVB-WM-PW-C32 SUMP LEVEL MEASUREMENT
					ZS-WM-231-2	CLOSED POSITION SWITCH FOR HV-WM-231
					ZS-WM-231-2	OPEN POSITION SWITCH FOR HV-WM-231
					ZI-WM-231	OPEN POSITION SWITCH FOR HV-WM-231
					CT-WM-C32	POSITION INDICATOR FOR HV-WM-231
					ZS-WM-36-1	CONDUCTIVITY TRANSMITTER FROM DVB-WM-PW-C32 SUMP
					ZS-WM-36-2	CLOSED POSITION SWITCH FOR HV-WM-36
					ZS-WM-37-1	OPEN POSITION SWITCH FOR HV-WM-36
					ZS-WM-37-2	CLOSED POSITION SWITCH FOR HV-WM-37
					ZS-WM-38-1	OPEN POSITION SWITCH FOR HV-WM-37
					ZS-WM-38-2	CLOSED POSITION SWITCH FOR HV-WM-38
					ZS-WM-39-1	OPEN POSITION SWITCH FOR HV-WM-38
					ZS-WM-39-2	OPEN POSITION SWITCH FOR HV-WM-39
					LE-WM-C32	CLOSED POSITION SWITCH FOR HV-WM-39
					CE-WM-C32	LEVEL ELEMENT IN DVB-WM-PW-C32 SUMP
					LAH-WM-C32	CONDUCTIVITY ELEMENT IN DVB-WM-C32 SUMP
					LAH-WL-C37	SUMP LEVEL HIGH ALARM DVB-WM-PW-C32
					ZI-WM-36	
					ZI-WM-37	POSITION INDICATOR FOR HV-WM-36
					ZI-WM-38	POSITION INDICATOR FOR HV-WM-37
						POSITION INDICATOR FOR HV-WM-38
C 33	057499	1 ½" PLV-	1*1/2-PLA-776			CLOSED POSITION SWITCH FOR HV-WM-231
		YDA-33				
C 37	095316	HV-WL-607	3/4-HS-NN-154998			ISOLATION VALVE TO JET-WL-541
	096156	HV-WL-235	1-PL-AR-154999			JET-WL-541 OUTLET
	177590	HV-WL-187	3-PL-AR-113806			TANK FARM NWCF and WCF DIVERSION TO VES-WL-132
	177602	HY-WL-235				CONTROL VALVE FOR HV-WL-235
	177601	HY-WL-187				CONTROL VALVE FOR HV-WL-187
	378135	PLV-WL-243	1*1/2-PL-AR-3019			ISOLATION FROM 1*1/2-PWM-3019Y
	177579	PLV-WL-242	1*1/2-PL-AR-20028			ISOLATION FROM 1*1/2-PWM-20028Y
	378140	PLV-WL-237	2-PL-AR-113803			ISOLATION
		PLV-WL-216	1-1/2 PLAR-113804			VES-WL-133 JET DISCHARGE DIVERSION
		1 ½" PLV-WL-	1-1/2 PLAR-113808			DECON STATION ISOLATION VALVE
		186	1-HS-AR-154995			VES-WL-132 JET DISCHARGE DIVERSION

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
		1 ½" PLV-WL-	1-PW-AR-153535			
		185	1-PW-AR-153535			
		1" HSV-WL-631	1-PW-AR-153535			ISOLATION TO VES-WL-101
		1" HSV-WL-630	3-PW-AR-151009			ISOLATION TO VES-WL-101
		1" PUV-WM-	3-PU-AR-151822			ISOLATION FROM JET-WL-505 VES-WL-101
		143	3-PU-AR-151823			ISOLATION TO VES-WL-111—FUTURE
		1" PUV-WM-				ISOLATION TO VES-WL-111—FUTURE
		142				
		3" PUV-WM-	3/4-PL-AR-155000	JET-WL-541		STEAM JET IN DVB-WM-PL-C37 SUMP
		141				LINE DECON STATION SHUTOFF
		3" PUV-WM-	2-PL-AR-133808			RESERVED FOR M. CHRISTENSEN 3-22-95
		140				LINE DECON STATION SHUTOFF
		3" PUV-WM-	3-PL-A-104710			1*1/2-PL-A-104710 IN DVB-WM-PW-C12 TO 3-PL-A-101111 IN DVB-WL-PL-
		139	3-P-Y-2401Y			C37
		¾" DCV-WL-40	3-P-WM-48048C			1*1/2-PL-AR-113808 NEAR DVB-WL-PL-C37 TO VES-WL-101 VIA 3-P-Y-
						2403Y
		DCV-WL-40	3/4-DC-AR-113805			FROM TANK FARM TO DVB-WL-PL-C37, and CAPPED IN DVB-WL-PL-C37
		DCV-WM-414	3-PL-A-10111			TO VES-WL-102- ABANDONED
		DCV-WL-411	1-PL-A-104776			FROM CAPPED 1*1/2-PL-AR-113804 TO CAPPED END (ABANDONED)
			1*1/2-PL-AR-20028			WCF TO 3-PL-AR-113806 IN DVB-WL-PL-C37
					LSH-WL-C37	CAPPED IN DVB-WM-PW-C12 TO CAPPED IN DVB-WL-PL-C37
					ZI-WL-187	(ABANDONED)
					ZI-WL-235	1*1/2-P-WM-20028Y TO 3-PLA-104710
					ZS-WL-235-1	LEVEL MEASUREMENT FOR DVB-WL-PL-C37
					ZS-WL-235-2	POSITION INDICATOR FOR HV-WL-187
					CT-WL-C37	POSITION INDICATOR FOR HV-WL-235
					CE-WL-C37	CLOSED POSITION SWITCH FOR HV-WL-235
					ZS-WL-187-1	OPEN POSITION SWITCH FOR HV-WL-235
					ZS-WL-187-2	CONDUCTIVITY TRANSMITTER FROM DVB-WL-PL-C37
						CONDUCTIVITY ELEMENT IN DVB-WL-PL-C37
						CLOSED POSITION SWITCH FOR HV-WL-187
						OPEN POSITION SWITCH FOR HV-WL-187
C 38	377714	2" PLV-WL-197	2" PUA-1008			PUMP-WL-228 and WL-229 SUCTION SHUTOFF VES-WL-133
	096156	2" PLV-WL-191	2" PLA-113809			P-WL-228 and P-WL-229 SUCTION SHUTOFF VES-WL-133
	057498	2" PLV-WL-192	2" PLA-113811			PUMP-WL-228 and WL-229 DISCHARGE P-WL-228 and P-WL-229 DISCHARGE
		2" PLV-WL-190	2 PLAR-113810			SHUTOFF RECIRCULATION
		2" PLV-WL-189	2-PL-AR-113822			P-WL-228 and P-WL-229 RECIRCULATION SHUTOFF
		¾" DCV-WL-	2-PS-A-100587			ISOLATION VALVE
		419	3/4-DC-AR-151122			ISOLATION VALVE
		¾" DCV-WL-	3/4-DC-AR-151121			ON/OFF VALVE
		418	1-DC-AR-151120			FILL CAP TO 3/4-DC-AR-151122
		1" DCV-WL-417	3-PU-A-1008			FROM VES-WL-102 TO DVB-WL-PL-C38
		¾" DCV-WL-				
		411				
C 39			2"-PUAR-104854			From DVB-C-39 to DVB-WM-PW-C30

Valve Box	Reference Drawings	Valves	Process Piping	Equipment	Instrumentation	Comments
			2"-PUAR-104853			From DVB-C-39 to DVB-WM-PW-C30
			3" PLAR-110205			From DVB-C-39 to DVB-WM-PL-C32
			3" PLAR-110206			From DVB-C-39 to DVB-WM-PL-C32
						Pipe information was obtained through Electronic Document Control.

Appendix B

Valve Box Dimensional Information

Appendix B

Valve Box Dimensional Information

The following table contains valve box dimensional information. For clarity, the table is divided into several descriptive columns. A description of each individual column from left to right is provided in the table below.

Information was obtained from drawings and INTEC personnel familiar with the TFF operations.

Column Number	Column Identifier	Description
1.	Valve Box Name	A unique number given to represent each valve box within the identification table.
2.	Reference Drawings	Provides drawing number were valve box information was obtained.
3.	Length	Longest valve box side dimension.
4.	Width	Shortest valve box side dimension.
5.	Height	Valve box top to bottom outside height.
6.	Wall Thickness	Average valve box wall thickness.
7.	Top Thickness	Valve box Ceiling thickness.
8.	Access Opening Size	Valve box access opening size.
9.	Portion Above Grade	Portion of valve box that extends above grade
10.	Valve Box Location	Valve box location with respect to underground storage tanks.
11.	Comments	Discusses additional valve box dimensional information.

Table B-1. Valve box dimensional information.

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
A 2	053881 057501	9'- 7"	6'- 1"	See comments	8"	8"	30" dia.	3"	60 ft S.E of VES-WM-181	Valve box is "L" shaped with 6 sides 9'- 7" x 6'- 1" x 4'- 7" x 5'- 0 ½" x 1'- 6" x 4'- 6 ½" No piping is connected within the valve box except drain lines. Unable to determine exact height from drawings. Height is estimated to be 11 ft to 16 ft high.
A 5	377344 054600	5'- 5"	4'- 5"	9'- 10"	8"	12"	See comments	12"	45 ft SOUTH of VES-WM-183	No access opening, the entire valve box top is removable for access.
A 6	105595 377344 054108 057501	7'- 4"	6'- 0"	12'-0" approx.	8"	3"	2'- 6" x 2'- 10"	21 ½"	60 ft S.E of VES-WM-183	
A 7	057502 054110 500498	8'- 6	7'- 0"	7'- 0"	8"	6"	2'- 8 ½" x 2–3"		50 ft south of VES-WM-184	Valve box is "L" shaped with 6 sides 8'- 6" x 7'- 0" x 6'- 5" x 4'- 1" x 2'- 1" x 2'- 11"
A 8									70 ft N.E of VES-WM-183	Unable to acquire valve box information.
B 1	055539 137931	13'- 0"	7'- 0"	9'- 7"	6"	7"	2'- 6" x 2'- 6"	1'- 11"	80 ft WEST of CPP-659	
B 2	377361 054109 106128 057502 057501	16'- 3 ½"	7'- 6"	13'- 1"	8"	3"	2'- 6" x 2'- 10"	18"	55 ft SOUTH of VES-WM-186	
B 3	377361 054110	8'- 6"	5'-11"	10'- 9"	8"	3"	2'- 6" x 2'- 10"	18"	45 ft SOUTH of VES-WM-185	

Table B-1. (continued).

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
B 4	054108 377365 057502	7'- 1"	5'- 5"	16'-0" approx.	8"	3"	2'- 6" x 2'- 10"	18"	50 ft N.W. of VES-WM-188	
B 5	053881 057503 106251 377365 377823	9'- 3 9/16"	8'- 3 1/8"	18'- 0" approx.	8"	3"	2'- 6" x 2'- 10"	12"	60 ft N.W. of VES-WM-188	
B 6	055540 137931	11'- 4"	6'- 4"	15'- 8 " approx.	6"	8"	2'- 6" x 2'- 6"	20"	5 ft SOUTH of CPP-659	
B 7	055541 137951	11'- 4"	6'- 4'	13'- 10" approx.	6"	8."	2'- 6" x 2'- 6"		100 ft N.E. of VES-WM-186	
B 8	137950 057503	9'- 8"	7'- 3"	12'- 10" approx.	6"	6"	2'- 6" x 2'- 6"	12"		Identified on underground drawings as a man hole MAH
B 9	377369 054128	9'- 7 13/16"	6'- 4 9/16"	19'- 7 ½ approx.	8"	3"	Removable top plate	18"	40 ft N.W. of VES-WM-188	
B 10	055543 057503	9'- 3"	4'- 11"	19'- 0" approx.	6"	6"	2'- 6" x 2'- 6"	12"	40 ft N.W. of VES-WM-190	
B 11	137947 137948 137949	13'- 6"	12'- 3"	18'- 0" approx.	18"	12"		18"	45 ft N.E of VES-WM-190	
C 1	137929 057501	7'- 0"	6'- 0"	6'- 6"	6"	6"	2'- 6" x 2'- 6"	12"	35 ft EAST of VES-WM-182	
C 2	137927 057501 377095	6'- 11 ¼"	6'- 0 ½"	5'- 6"	6"	3"	2'- 6" x 2'- 10"	12"	15 ft S.W of VES-WM-182	

Table B-1. (continued).

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
C 3	137925 057501 138049 377095	7'- 0"	6'- 0"	6'- 6"	6"	3"	Removable top plate	12"	60 ft S.E of VES-WM-182	
C 4	137925 057501 138049 377095	7'- 0"	6'- 0"	5'- 9"	6"	3"	Removable top plate	12"	35 ft N.W. of VES-WM-180	
C 5	137927 377095	7'- 0"	6'- 0"	6'- 6"	6"	3"	2'- 6" x 2'- 10"	12"	15 ft S.E of VES-WM-183	
C 6	137929 057501	7'- 3"	5'- 0"	7'- 6"	6"	6"	2'- 6" x 2'- 6"	12"	45 ft S.W. of VES-WM-183	
C 7	137928 057501 377096	11'- 4"	6'- 4"	7'- 5"	8"	3"	2'- 6" x 2'- 10"		50 ft N.E. of VES-WM-181	
C 8	137926	6'- 9	4'- 9"	6'- 3" (5'- 3 ½")	6"	6"	2'- 6" x 2'- 6"	12"	50 ft N.E. of VES-WM-181	Valve box has a 1-foot sloping floor.
C 9	137925 057501 377826 377713 138049 377096	7'- 0"	6'- 0"	5'- 9"	6"	3"	2'- 6" x 2'- 10"	12"	30 ft N.W. of VES-WM-181	

Table B-1. (continued).

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
C 10	137937 057501	7'- 0"	6'- 0"	10'- 7"	6"	6"	2'- 6" x 2'- 6"	12"	45 ft N.W. of VES-WM-181	
C 11	1379930	7'- 0"	6'- 0"	10'- 7"	6"	6"	2'- 6" x 2'- 6"	12"	30 ft S.W. of VES-WM-181	
C 12	138049 137937	7'- 0"	6'- 0"	13'- 1"	6"	6"	2'- 6" x 2'- 6"	12"	35 ft S.E. of VES-WM-181	
C 13	137935	7'- 0"	6'- 0"	6'- 6"	6"	6"	2'- 6" x 2'- 6"	12"	40 ft N.W. of VES-WM-186	
C 14	377826 377096 137932	8'- 0"	6'- 0"	8'- 2"	6"	3"	2'- 6" x 2'- 10"		30 ft SOUTH of VES-WM-185	
C 15	377826 137926 377096	7'- 3 ½"	7'- 0"	11'- 9"	6"	3"	Removable top plate		55 ft S.W. of VES-WM-185	
C 16	377098 137933	9'- 6 ¾"	7'- 1 7/16"	7'- 6"	6"	3"	Removable top plate		30 ft NORTH of VES-WM-185	
C 17	137935	7'- 0"	6'- 0"	7'- 8"	6"	6"	2'- 6" x 2'- 6"	12"	40 ft N.W. of VES-WM-184	
C 18	137934	7'- 0"	6'- 0"	10'- 9 ¾"	6:	6"	2'- 6" x 2'- 6"	12"	55 ft N.E. of VES-WM-186	
C 19	137932 377098	7'- 10 9/16"	6'- 0 ¾"	8'- 2"	6"	3	Removable top plate	12"	30 ft SOUTH of VES-WM-186	
C 20	137939	8'- 0"	6'- 0"	9'- 6"	6"	6"	2'- 6" x 2'- 6	9"	60 ft N.E. of VES-WM-186	

Table B-1. (continued).

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
C 21	137940	7'- 6"	6'- 0"	5'- 3"	6"	6"	2'- 6" x 2'- 6	12"	20 ft S.W. of VES-WM-187	
C 22	137940	7'- 6"	6'- 0"	5'- 3"	6"	6"	2'- 6" x 2'- 6	12"	20 ft N.W. of VES-WM-188	
C 23	377713 137943 377098	8'- 0"	7'- 0"	6'- 6"	6"	3"	2'- 6" x 2'- 10"		20 ft N.E. of VES-WM-188	
C 24	137941	12'- 6"	6'- 0"	5'- 10"	6"	6"	2'- 6" x 2'- 6	12"	25 ft S.W. of VES-WM-189	
C 25	137942	12'- 6"	6'- 0"	5'- 10"	6"	6"	2'- 6" x 2'- 6	12"	20 ft N.W. of VES-WM-190	
C 27	137952	8'- 6"	6'- 6"	7'- 6"	6"	6"	2'- 6" x 2'- 10"	6"	West of fast	
C 28	137952 377098	7'- 0"	6'- 6"	10'- 2 ½"	6"	3"	2'- 6" x 2'- 10"	6"	East of 641	
C 29	377097 161014	9'- 4"	6'- 4"	18'- 10"	8"	3"	Removable top plate	6"	East of 604	
C 30	141674 377097	9'- 8"	6'- 8"	29'-0" approx.	10"	3"	2'- 6" x 2'- 10"	12"	85 ft S.E. of VES-WM-180	
C 31	141673 377097	9'- 4"	6'- 4"	16'-3"	10"	3"	2'- 6" x 2'- 10"	8"	East of 604	
C 32	161485 161484 161483	9' –6"	8' –3"	32' – 4"	10"	12"	2'- 6" x 2'- 6		100 ft SOUTH of VES-WM-	

Table B-1. (continued).

Valve Box Name	Reference Drawings	Length	Width	Height	Wall Thick	Top Thick	Access Opening Size	Portion Above Grade	Valve Box Location	Comments
	177579								181	
C 37	378140 177579 378042	10'-6"	8'-0"		12"	12"	2'-6" X 2'-6"		75 ft S.E of VES-WM-181	
C 38		10'- 3"	7'- 0"						135 ft S.E. of VES-WM-181	Information was obtained through Electronic Documentation Control.
C 39									115 ft S.W. of VES-WM-180	Unable to acquire valve box information.

Appendix C

Identification Table of Tank Farm Process Waste Pipelines

Appendix C

Identification Table of Tank Farm Process Waste Pipelines

Tank Farm process waste pipelines are identified in Table C-1. Cooling, instrumentation, ventilation, and decontamination pipelines were not included in the table. For clarity, the table is divided into several descriptive columns. A description of each individual column from left to right is as follows:

Column Number	Column Identifier	Description
1.	Item Number	A unique number given to represent each pipeline within the identification table.
2.	Identification Number	Provides the pipeline names as called out in drawings.
3.	Description	Provides descriptive pipeline use information.
4.	Origin and Termination	Describes the location where each pipe begins and where each line ends. Includes reference drawings.
5.	Reference Drawings	Provides reference drawing numbers followed by grid location.
6.	Secondary Containment	Estimated secondary containment type.
7.	Pipeline Material	Identifies material pipeline was made from.
8.	Comments	Discusses additional pipeline information.

Table C-1. Tank Farm process waste pipelines.

1	1 1/2" PWM-28113Y	Carries process waste from WM-181 Vault (CPP-781) sump to WM-180	VES-WM-181 vault (CPP-781) sump	057501-E4	VES-WM-180	057501-F7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
2	1 1/2" PWM-3017Y	Carries process waste from an above grade hose connection to WM-180	Above Grade Hose Connection	057501-F7	VES-WM-180	057501-F7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 057501 lists 1 1/2" PWM-3017Y and 1 1/2" PWM-20026Y together on the same line. The origin is unclear in drawing but seems to imply above grade piping.
3	1 1/2" PWM-20026Y	Carries process waste from above grade hose connection to WM-180	Above Grade Hose Connection	057501-F7	VES-WM-180	057501-F7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 057501 lists 1 1/2" PWM-3017Y and 1 1/2" PWM-20026Y together on the same line. The drawing does not clearly define the origin, but implies above grade piping.
4	1 1/2" PWM-3019Y	Carries process waste from above grade hose connection to WM-180	Above Grade Hose Connection	057501-F7	VES-WM-180	057501-F7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 057501 lists 1 1/2" PWM-3019Y together on the same line. The drawing does not clearly define the origin, but implies above grade piping.
5	1 1/2" PWM-20028Y	Carries process waste from above grade hose connection to WM-180	Above Grade Hose Connection	057501-F7	VES-WM-180	057501-F7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 057501 lists 1 1/2" PWM-3019Y together on the same line. The origin is unclear in drawing but seems to imply above grade piping.
6	2" PUA-1097	Carries process waste from WM-180 to Valve Box C4	Jet-WM-580-1A, inside VES-WM-180	057501-F7	DVB-WM-PW-C4, Valve PUV-WM-113	057501-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
7	3" PUA-1032	Carries process waste from Valve Box C4 to 3" PUA-1033 (item 70)	DVB-WM-PW-C4, Valve PUV-WM-113 and 114	057501-F7	3" PUA-1033	057501-E6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste from Valve Box C4 routes into Valve Box C3
8	3" PUA-1034	Carries waste from Valve Box C3 to reducer leading to 4" PWM-28004Y (item 9)	DVB-WM-PW-C3, Valve PUV WM-118	057501-E6	4" PWM-28004Y	057501-E7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
9	4" PWM-28004Y	Carries process waste from pipeline 3" PUA-1034 (item 8) to WM-180	3" PUA-1034 reducer	057501-E7	VES-WM-180	057501-E7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste travels through an inverted pipe reducer, enlarging before entering WM-180.
10	2" PUA-1032	Carries process waste from WM-180 to Valve Box C4	Jet-WM-580-1B, inside VES-WM-180	057501-F7	DVB-WM-PW-C4, Valve PUV-WM-114	057501-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	

Table C-1. (continued).

11	1 1/2" PLA-104704	Carries process waste from WM-180 vault sump to Valve Box C11	Jet 580-4 inside VES-WM-180 vault sump	057501-E7	DVB-WM-PW-C11, Valve PUV-WM-3	057501-G6	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
12	1 1/2" PLA-104705	Carries process waste from Valve Box C11 to Valve Box C12	DVB-WM-PW-C1, Valve PUV-WM-3 and 4	057501-G6	DVB-WM-PW-C12, In Line Sample Sump or pipe reducer	057501-E1	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
13	1 1/4" PLA-104705	Carries process waste from WM-181 sump to Valve Box C11	VES-WM-181 vault sump, Jet 581-4	057501-E4	DVB-WM-PW-C11, Valve PUV-WM-4	057501-E6	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
14	1 1/2 PWM-28001Y	Carries process waste from WM-180 sump to WM-181	VES-WM-180 vault sump, Jet 509	057501-E6	VES-WM-181	057501-E4	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
15	3" PUA-201	Abandoned Line, carried process waste from Junction Box-2A to WM-181. The original pipe origin point is unknown.	Junction Box-2A	057501-G6	VES-WM-181	057501-E3	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This was once a process waste transfer line. The original pipe origin point is unknown
16	3" PUA-203	Carries process waste or decontamination fluid from Junction Box-2B to WM-181	Junction Box-2B	057501-F4	VES-WM-181	057501-E3	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	It is unclear in dwg. 057501 if this is a decontamination line or a process waste line. This confusion is due to pipeline 1" DC-AR-157127 located just outside Junction Box-2B connecting to 3" PUA-203..
17	2" PUA-1096	Carries process waste from WM-181 to Valve Box C9	VES-WM-181 , Jet 581-1A	057501-E3	DVB-WM-PW-C9, Valve PUV-WM-123	057501-F3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
18	2" PUA-1036	Carries process waste from WM-181 to Valve Box C9	VES-WM-181 , Jet 581-1B	057501-E3	DVB-WM-PW-C9, Valve PUV-WM-124	057501-F3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
19	3" PUA-1036	Carries process waste from Valve Box C9 to Valve Box C7.	DVB-WM-C9, PUV-WM-123 and PUV-WM-124	057501-F3	DVB-WM-PW-C7, Valve PUV-WM-125	057501-E3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Two pipelines with the same name are given (items 19, 20). These pipelines are not connected and are called out on different drawings and different locations. Item 19: pipelines 3" PLA-104703 (item 97, leading to Valve Box C10) and 3" PLA-100163 (item 22, abandoned in place) are connected to 3" PUA-1036. Item 20: process waste from pipeline 3" PUA-1036 routs to Valve Box B11.

Table C-1. (continued).

20		Carries process waste from Valve Box B2 to Valve Box B5	DVB-WM-PW-B2, PUV-WM-64	057502-D2	DVB-WM-PW-B5, 3" PUA-1222 near Valve PUV-WM-84	057503-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
21	4" PWM-28104Y	Carries process waste from Valve Box C7 to WM-181	DVB-WM-C9, PUV-WM-125	057501-E3	VES-WM-181	057501-E3	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste travels through pipe reducer before entering WM-181.
22	3" PLA-100163	Abandoned Line, carried process waste from 3" PUA-1036 (item 19) to an unknown location. The original pipe termination point is unknown.	3" PUA-1036 (item 19)	057501-G3	Capped and abandoned, Location unknown.	057501-G3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1036 (item 19) and was abandoned in place. The original pipe termination point is unknown
23	3" PLA-104703	Carries process waste from 3" PUA-1036 to Valve Box C10	3" PUA-1036 (item 19)	057501-F3	DVB-WM-PW-C10, Valve PUV-WM-126	057501-D1	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
24	6" PLA-100164	Abandoned Line, carried process waste from an unknown origin to WM-181. The original pipe origin point is unknown.	Capped and abandoned	057501-E3	VES-WM-181	057501-E3	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to WM-181 and is capped and abandoned in place. The original pipe origin point is unknown.
25	1" PLA-104777	Valve Box C11 drain line, carries process waste to Valve Box C12	DVB-WM-C11, Drain	057501-G6	DVB-WM-PW-C12 sump	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
26	1" PLA-104775	Valve Box C9 drain line, carries process waste to Valve Box 1" PLA-104773 (item 94)	DVB-WM-C9, drain	057501-E3	1" PLA-104773 (item 94)	057501-D1	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drain waste travels to Valve Box C12 sump.
27	3" PUA-1013	Abandoned Line, Carried process waste from CPP-604 to Junction Box-2B. The original pipe termination point is unknown.	CPP 604	096156-B2	Junction Box-2B	057501-F4	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline begins at CPP-604. Drawings indicate that pipeline was capped at several locations including just outside junction box 2B. Exact capped locations are unknown at this time. The original pipe termination point is unknown.

Table C-1. (continued).

28	3" PUA-1014	Abandoned Line	CPP-604	096156-B1	Junction Box-2A	057501-G6	Concrete Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Items 28 through 31 with the same pipeline names are identified to distinguish between abandoned (item 28) and active (items 29 through 31) pipeline sections. Item 29 and 30 were given because this active pipeline is called out in Drawing. 057502 at two separate places (G7 and D7) and link up with item 31 (G4 through D3).
29		Carries process waste from Valve Box C7 to Valve Box B3	DVB-WM-PW-C7, Tie Point-153	057501-E3, 377825-G2	DVB-WM-PW-B2, PUV-WM-63	57502-D3	Concrete Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Item 28, 3" PUA-1014 pipeline is abandoned in place. From Drawing 096156-B2 it once attached to VES-WL-101 inside CPP-604. This abandoned pipeline is capped near junction box 2A (Drawing. 057501-G6). Item 29, 3" PUA-1014 connects at Valve Box C7 runs through Valve Box C15 (no valve connection), B3 (PUV-WM-59 and PUV-WM-60) and terminates at B2 (PUV-WM-63). There is a discrepancy in line connections inside Valve Box C7 between Drawing. 057501-E3, 137958-middle and 377825-G3. The first drawing shows 3" PUA-1014 terminating into 3" PUA-1036 (item 19). The later two drawings show 3" PUA-1014 running through the Valve Box C7 without pipe connections. Item 30, 3" PUA-1014 routed from Valve Box C37 to Valve Box A7 (PUV-WM-23) and terminated at Valve Box B1 (near Valve PUV-WM-228). From Drawing. 096156-E8 this pipeline began as 3" PL-AR-151009 (item 211) and change to 3" PUA-1014 at an unknown transition point. Item 31, 3" PUA-1014 connects item 30 with the item 29 at Valve PUV-WM-71 inside Valve Box B1 to PUV-WM-63 and inside Valve Box B2 (Drawing. 057502-G4 through D3).

Table C-1. (continued).

30		Carries process waste from Valve Box C37 to Valve Box B1	DVB-WM-PW-C37, PUV-WM-141 and PUV-WM-139	096156-D8	DVB-WM-PW-B1, near Valve PUV-WM-228	57502-G4	Concrete Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
31		Carries process waste from Valve Box B1 to Valve Box B2	DVB-WM-PW-B1, PUV-WM-71	057502-G4	DVB-WM-PW-B2, through PUV-WM-68 to 3" PUA-1014 near Valves PUV-WM-63 and PUV-WM-64	057502-D and E3	Concrete Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
32	1" PUA-205	Valve Box A2 drain line, carries drain waste from Valve Box A2 to 3" PLA-100163 (item 35)	DVB-WM-PW-A2, drain	057501-F6	3" PLA-100163 (item 35)	057501-A7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline T's in two places before reaching its termination point. First T begins line 1" PUA-209 (capped and abandoned, item 33); second T begins 1" PUA-218 (capped and abandoned, item 34). 1" PUA-205 changes to 3" PLA-100163 (item 35, this may be a drawing mistake) in Drawing. 057501 which then terminates to 3" PWM-48048C (item 212).
33	1" PUA-209	Abandoned Line, carried process waste from 1" PUA-105 (item 32) to an unknown location. The original pipe termination point is unknown.	1" PUA-205 (item 32)	057501-F7	Capped and Abandoned.	057501-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	First 1" PUA-205 (item 32) T connection. The original pipe termination point is unknown.
34	1" PUA-218	Abandoned Line, carried process waste from 1" PUA-205 (item 32) to an unknown location. The original pipe termination point is unknown.	1" PUA-205 (item 32)	057501-E7	Capped and Abandoned.	057501-E7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Second 1" PUA-205 (item 32) T connection. The original pipe termination point is unknown.

Table C-1. (continued).

35	3" PLA-100163	Valve Box A2 drain line, carries drain waste from Valve Box A2 to 3" PWM-48048C (item 212)	Unknown seems to be attached to 1" PUA-205 (item 32). May be a drawing mistake	057501-A7	3" PWM-48048C (item 212)	057501-A7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	1" PUA-205 (item 32) changes to 3" PLA-100163 (this may be a drawing mistake) in Drawing. 057501
36	4" PWM-3801C	Carries process waste from condenser tank HE-WM-300 to WM-180	CPP-737, condenser tank HE-WM-300	057501-E7	VES-WM-180	057501-E7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
37	3" PWM-2011Y	Abandoned Line, carried process waste from 1" DC-AR-151124 (estimated) to WM-180. The original pipe origin point is unknown.	1" DC-AR-151124 (estimated origin)	057501-F7	VES-WM-180	057501-E7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline may be attached to a capped decontamination line (1" DC-AR-151124) and pipe reducer (drawings are unclear). The original pipe origin point is unknown.
38	3" PWM-1024Y	Abandoned Line, carried process waste from 1" DC-AR-151123 (estimated) to WM-180. The original pipe origin point is unknown.	1" DC-AR-151123 (estimated origin)	057501-F7	VES-WM-180	057501-E7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline may be attached to a capped decontamination line (1" DC-AR-151124) and pipe reducer (drawings are unclear). The original pipe origin point is unknown.
39	3" PWM-10019Y	Abandoned Line, carried process waste from 1" DC-AR-151124 (estimated) to WM-180. The original pipe origin point is unknown.	1" DC-AR-151125 (estimated origin)	057501-F7	VES-WM-180	057501-E7	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline could be attached to a capped decontamination line (1" DC-AR-151125), drawing and are unclear. The original pipe origin point is unknown.
40	4" PWM-2803C	Carries process waste from condenser tank HE-WM-300 to 4" PWM-18032C (item 304)	CPP-737, condenser tank HE-WM-300	057501-E7	4" PWM-18032C (item 304)	057502-F8	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process Waste drains into VES-WM-100 inside CPP-604. 4" PWM-18032C (item 304) is renamed to 4"-VG-AR-18032 in Drawing. 377829.
41	2" PWM-28027C	CPP-737 drain line, carries drain waste from CPP-737 sumps to CPP-780 sump	CPP-737 Sump	057501-E7	CPP-780 Sump	057501-E6	Tile Encased/Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	

Table C-1. (continued).

42	1" PLA-104767	Valve Box C4 drain line, carries drain waste from Valve Box C4 to Valve Box C12 sump	DVB-WM-PW-C4, drain	057501-F6	DVB-WM-PW-C12, Sump	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This C4 Valve Box drain line (1" PLA-104767 (item 42)) attaches to six other Valve Box drain lines C2 (1" PLA 104766 (43)), C3 (1" PLA-104768 (item 44)), C5 (1" PLA-104771 (item 53)), C6 (1" PLA-104770 (item 74)), C7 (1" PLA-104772 (item 52)) and C8 (1" PLA-104769 (item 45)). This collection of drain line waste dumps into the Valve Box C12 sump.
43	1" PLA-104766	Valve Box C2 drain line, carries drain waste from Valve Box C2 to 1" PLA-104767 (item 42).	DVB-WM-PW-C2, drain	057501-D7	1" PLA-104767 (item 42)	057501-D7, 92092-D6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C2 will drain through 1" PLA-104766 to 1" PLA-104767 (item 42) which drains into Valve Box C12.
44	1" PLA-104768	Valve Box C3 drain line, carries drain waste from Valve Box C3 to 1" PLA-104767 (item 42).	DVB-WM-PW-C3, drain	057501-E6	1" PLA-104767 (item 42)	057501-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C3 will drain through 1" PLA-104766 (item 43) to 1" PLA-104767 (item 42) which will drain into Valve Box C12.
45	1" PLA-104769	Valve Box C8 drain line, carries drain waste from Valve Box C8 to 1" PLA-104767 (item 42)	DVB-WM-PW-C8, drain	057501-B7	1" PLA-104767 (item 42)	057501-A7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C8 will drain through 1" PLA-104766 (item 43) to 1" PLA-104767 (item 42) which will drain into Valve Box C12.

Table C-1. (continued).

46	3" PWM-10018C	Carries process waste from VES-WM-100 in 604 to Valve Box A6	VES-WM-100, Jet WM-500	057498-D4	DVB-WM-PW-A6, PUV-WM-18	057501-H8	Tile Encasement	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline changes to 3" PUA-1030 (item 47) before terminating in Valve Box A6. Drawing. 057501-D2. The last letter in pipeline identification also changes from Y in Drawing. 057498 to C in Drawing. 057501. This could be a drawing mistake.

Table C-1. (continued).

47	3" PUA-1030	Carries process waste from VES-WM-100 inside CPP-604 and routs through Valve Box A6, C15, B3, B2 and B4	CPP-604, inside VES-WM-100, Jet-WM-500	057498-D5	DVB-WM-PW-B4, pipeline splits, one pipe end is capped the other pipe end terminated at PUV-WM-75	057502-D2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Three items with the same pipeline names are given to distinguish between the active (item 47) and abandoned (Item 48, 49) pipeline sections. Item 47, 3" PUA-1030 is an active pipeline and carries process waste from VES-WM-100 inside CPP-604 through pipeline 3" PWM-10018C (item 46) to Valve Box A6 at Valve PUV-WM-13. Drawing. 057501 shows pipeline change from 3" PWM-10018C (item 46) to 3" PUA-1030 before it terminates into Valve Box A6. It is unknown where pipeline transition takes place. This could be a drawing mistake. The pipeline continues through Valve Box A6 to Valve Box C15 at Valve PUV-WM-54. The pipeline then routs to Valve Box B3 at Valve PUV-WM-57 then to Valve Box B2 at Valve PUV-WM-61 and finally to Valve Box B4 at Valve PUV-WM-75 (Drawing. 057502-D7-3). Item 48, PUA-1030 is inactive and abandoned in place. It runs from Valve Box B4 through Valve Box B6 and terminates just outside WCF (Waste Calcining Facility) at Valve PUV-WM-222. 3" PUA-1005 (item 90) attaches to 3" PUA-1030 inside Valve Box B6. Item 49, PUA-1030 is also inactive and abandoned in place. It runs from VES-WM-102 and terminates somewhere outside the waste tank vault as it routs toward the TFF storage tanks. It was determined from Drawing. 057498 and 057501 that the cut 3" PUA-1030 section leading to the storage tanks was attached to pipeline 3" PWM-10018Y (item 46) during an upgrade project. The location of abandoned pipe cap is unknown. The pipeline is RCRA controlled.

Table C-1. (continued).

48		Capped inside Valve Box B4 and runs through Valve Box B6 to WCF. This line is abandoned in place.	DVB-WM-PW-B4, Capped	057502-D2	PUV-WM-222	106326-C1	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
49		Capped outside Waste Tank Vault and abandoned in place	Waste Tank Vault, VES-WM-102, Jet-WM-502	057498-A7	Capped and abandoned outside Waste Tank Vault	057498-D5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
50	1" PLA-663	Carries process waste from CPP-721 sump to CPP-628, capped and abandoned	CPP-721, Jet-WM-532	057501-C7	CPP-628, Capped and abandoned	106181-G8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline changes from 1" PUA-663 in Drawing. 057501 to 1" PLA-665 in Drawing. 106181 and appears to be capped and abandoned in place.
51	2" PWM-28032C	CPP-738 drain line, carries process waste from CPP-738 sump to CPP-780 sump	CPP-738, sump drain	096157-B3	CPP-780 Sump	057501-E6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
52	1" PLA-104772	Valve Box C7 drain line, carries drain waste from Valve Box C7 to 1" PLA-104767 (item 42)	DVB-WM-PW-C7, drain	057501-E3	1" PLA-104767 (item 42)	057501-C3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C7 will drain through 1" PLA-104772 to 1" PLA-104767 (item 42) which will drain into Valve Box C12.

Table C-1. (continued).

53	1" PLA-104771	Valve Box C5 drain line, carries drain waste form Valve Box C5 to 1" PLA-104767 (item 42)	DVB-WM-PW-C5, drain	057501-D4	1" PLA-104767 (item 42)	057501-C3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C5 will drain through 1" PLA-104771 to 1" PLA-104767 (item 42) which will drains into Valve Box C12.
54	1 1/2" PLA-104701	Carries process waste from Valve Box C6 to Valve Box C10	DVB-WM-PW-C6, PUV-WM-1 and PUV-WM-2	057501-A5	DVB-WM-PW-C10, 3" x 1 1/2" Reducing Tee	137963-D3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects 1 1/4" PLA-104701 and 1 1/4" PLA-104702 (item 55) in Valve Box C6 then routs to Valve Box C10
55	1 1/4" PLA-104702	Carries process waste from JET-WM-583-4 to Valve Box C6	WM-182 south sump area, JET-WM-583-4	Drawing. 057501-C4 Drawing. 057894-C7	DVB-WM-PW-C6, PLV-WM-2	Drawing. 057501 - C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Line comes out of sump riser #21 (CPP-783) and is contained in a 3" encasement per dwg. 137961-K3.
56	1" PUA-644	Carries drain waste from west concrete enclosure North of CPP-782 (enclosure houses lines 10" VGA-603) to PUA-643 (item 60) which leads to the North sump inside CPP-782.	10" VGA-603 concrete enclosure drain (North end of CPP-782)	105458 Left Middle	1" PUA-643 (item 60) inside CPP-782	105458 Left Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	1" PUA-644 connects to 1" PUA-643 (item 60) which leads to CPP-782 North sump.
57	1" PUA-645	Carries drain waste from the West concrete enclosure North of CPP-782 (enclosure houses 2" PUA-652 (item 58)) to 1" PUA-644 (item 56), inside CPP-782.	2" PUA-652 (item 58) Concrete Encasement Drain (North end of CPP-782)	105458 Left Middle	1" PUA-644 (item 56) inside CPP-782	105458 Left Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	1" PUA-645 connects to 1" PUA-644 (item 56) which leads to CPP-782 North Sump through PUA-643 (item 60)

Table C-1. (continued).

58	2" PUA-652 [2" PWA-652]	Carries process waste from CPP-721 to VES-WM-182 in a concrete enclosure	CPP-721 PIT, From Tank WM-382 through a 4"x 2" eccentric reducer attached to HE-WM-382	105467 Bottom Right	VES-WM-182	105458 Right Middle Underground Utility Drawing C-3 grid D5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	2" PUA-652 comes from tank WM-382 and goes to a 4" x 2" eccentric reducer located inside CPP-721 then travels in a concrete encasement to CPP-782. After 2" PUA-652 penetrates CPP-782 it rises upward 1' and connects (horizontally) to 1/2" PUA-647 (after the 2" x 1/2") reducer which leads to VES-WM-182. This line is misrepresented in Drawing. 500177.
59	2" PUA-624	Carries liquid vault waste from north sump Jet WM-530 to VES-WM-182	CPP-782 North Sump, Jet WM-530	105458 Left Middle	VES-WM-182	105458 Left Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	2" PUA-624 rises vertically upward from Jet WM-530 turns horizontally (90 deg.) at (-) 19' 1" and turns down vertically (90 deg.) into VES-WM-182.
60	1" PUA-643	Carries drain waste from the East concrete enclosure North of CPP-782 (enclosure houses 10" VGA-604) to North sump, inside CPP-782.	10" VGA-604	105458 Left Middle	CPP-782 North Sump	105458 Left Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	The connection between 1" PUA-643 and 10" VGA 604 is unclear in Drawing. 105458. 1" PUA-644 (item 56) connects to 1" PUA-643 which leads to CPP-782 North sump.
61	1" PUA-646	Carries drain waste from the pipe enclosure located South East of CPP-782 to CPP-782 South sump (enclosure houses lines 3" PUA-601, 602, 604).	3" PUA-601 (item 64), 602 (item 63), 604 (item 65) Concrete Encasement Drain	105458 Top Left	CPP-782 South Sump	105458 Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Drain (origin) elevation for 1" PUA-646 can only be estimated from Drawing. 105458. Pipe runs from the concrete enclosure (housing 3" PUA-602 (item 63), 601 (item 64), 604 (item 65)) penetrates CPP-782 and runs along the inside wall to the South sump. Elevation of piping between CPP-782 penetration and sump cannot be determined from Drawing. 105458.
62	2" PUA-622	Carries vault waste from south sump Jet WM-531 to VES-WM-182	CPP-782 South Sump, Jet WM-531	105458 Bottom Middle	VES-WM-182	105458 Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	2" PUA-622 rises vertically upward from Jet WM-531 turns horizontally (90 deg.) at (-) 19' 1" and turns down vertically (90 deg.) into VES-WM-182.

Table C-1. (continued).

63	3" PUA-602 [PWA-602][i]	Carries Process waste from Valve Box A5, A6 and C15 in a concrete encasement to VES-WM-182	DVB-WM-PL-A6, capped and abandoned	092093-D7, 377819-G7 and 377837-G6	VES-WM-182	105458 Top Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline is encased. Pipe name in Drawing. 377819 (3" PWA 602) does not coincide with Drawing. 105458 (3" PUA-602) or Drawing. 092092 (3" PWA-602). Pipeline runs through Valve Box A6 (capped) and A5 (through valve PUV-WM-11) before terminating in WM-182.
64	3" PUA-601 [PWA-601]	Carries Process waste from Valve Box A5 in a concrete encasement to VES-WM-182 and is capped at Valve Box A6	DVB-WM-PL-A6, capped pipeline end. Begins again in DVB-WM-PL-A5, 3" PUV-WM-10	092093-D7, 377819-G7 and 057501-D3-7	VES-WM-182	105458 Top Middle and 057501-C7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line is capped inside Valve Box A6 (057501-D3). This line is incase in a concrete stainless steel encasement as it leaves Valve Box A5. Pipe name in Drawing. 377819 (3" PWA 601) does not coincide with Drawing. 105458 (3" PUA-601) or Drawing. 092092 (3" PWA-601).
65	3" PUA-604 [PWA-604]	Auxiliary capped line that runs from ground level enters concrete encasement holding process waste lines 3" PUA-602 (item 63) and 601 (item 64) (South East of VES-WM-182) and terminates into VES-WM-182	Grade level, possibly above ground, South East of concrete encasement and South of DVB-WM-PW-C6	092093-E4	VES-WM-182	105458 Top Middle	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipe name 3" PUA-604 in Drawing. 105458 corresponds to 3" PWA-602 (item 63) in Drawing. 092092. Lines (3" PWA-604, 3" PWA-602 (item 63), 3" PWA-601 (item 64) in the south east encasement are mislabeled in Drawing. 092092-E4, 3" PWA-604 should be the southern most line while 3" PWA-602 (item 63) should be the northern most line (Drawing. 092092-E4). 3" PUA-604 (item 65) is a spare line which has a decon stub installed above grade level (South East of VES-WM-182 and South of DVB-WM-PW-C6 to flush out pipe (Drawing. 105466 and 105460)
66	3" PUA-621	Carries process waste from Tank VES-WM-182 to VES-WM-183 in a concrete enclosure for overflow purposes	VES-WM-182	105458 TOP, 057501-C4-6, 057894-B7, 092092-G-F4	VES-WM-183	105460 Bottom Middle, 057894-B7, 057501-C46, 092092-G-F4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline encased in concrete as it leaves CPP-782. No valves, tees, etc. in this line. Line is encased in a concrete encasement (Drawing. 105460 Lower middle).

Table C-1. (continued).

67	3" PUA-620	Carries process waste from Tank VES-WM-182 to VES-WM-183 in a concrete enclosure for overflow purposes	VES-WM-182	105458 TOP, 057501-C4-6, 057894-B7, 092092-GF4	VES-WM-183	105460 Bottom Middle, Drawing. 057894-B7, 057501-C46, 092092-G-F4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline encased in concrete as it leaves CPP-782. No valves, tees, etc. in this line. Line is encased in a concrete encasement (Drawing. 105460 - Lower middle).
68	1-1/4" PLA-104701	Waste Removal Line from CPP-782 South Sump Jet WM-582-4 to Valve Box C6	CPP-782 (Sump Riser #19), Jet WM-582-4	92092-F5, 057893 Middle Left, 05750-C6	DVB-WM-PW-C6, PLV-WM-1	92092-E4 and 137961-H4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	1-1/4" PLA-104701 was installed after initial CPP-782 construction. 1-1/4" PLA-104701 is encased with a 3" pipe encasement.
69	2" PUA-1033	WM-182 Waste Removal Line from Jet WM-582-1A to Valve Box C2	Inside VES-WM-182 (Tank Riser #19) Jet WM-582-1A	92092-F6. 057893-B4 and 057501-C7	DVB-WM-PW-C2, PUV-WM-116	92092-F6 and 377824-G5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	2" PUA-1033 in Drawing. 057893 does not coincide with Drawing. 092092. It is assumed that P&ID drawings (Drawing. 057501) are more accurate and thus reflect the information stated. After Valve PUV-116 inside Valve Box C2, 2" PUA-1033 turns into 3" PUA-1033 (item 70).
70	3" PUA-1033 [3" PWA-1033]	Carries process Waste from Valve Box C2 to Valve Box C3, C7 and C15	DVB-WM-PW-C2, PUV-WM-115 and PUV-WM-116	92092-G6, 377824-G5 and 057501-D7	DVB-WM-PW-C15, Tie Point 165	92092-F6, 057501-D7 through C3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	3" PWA-1033 runs South from DVB-WM-PW-C2 and turns East between VES-WM-182 and VES-WM-180. The pipe continues east through DVB-WM-PW-C3 (Valves PUV-WM-117 and PUV-WM-119) and DVB-WM-PW-C7 (PUV-WM-120) and terminates at DVB-WM-PW-C15 (Tie Point 165). This pipe is encased as it leaves C2. The pipe also changes names from 3" PWA-1033 to 3" PLA-1033 as piping turns east (Drawing. 092092). The pipe name seems to change again to PUA-1033 as it enters Valve Box C15 (Drawing. 377826). Inside Valve Box C15 the pipe connects to 3" PUA-1030 at Tie Point 165. Estimated grade elevation is [(-) 0' 6"] (Drawing. 377826, 377819 and 137927)

Table C-1. (continued).

71	2" PUA-1099	VES-WM-182 Waste Removal Line from Jet WM-582-1B to Valve Box C2	Inside VES-WM-182 (Tank Riser #20) Jet WM-582-1B	92092-F5, 057893-B4 and 057501-C7	DVB-WM-PW-C2, PUV-WM-115	092092-F6, 377824-G5 and 057501-C7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Tank riser numbers in P and ID Drawing. 057893 does not coincide with Underground Utility Drawing. 092092. It is assumed that P and ID drawings are more accurate (057501) and thus reflect the information stated.
72	1" CTN-100647	Abandoned Line, Old Condensate Line, carried condensate from 10"VPN-602 to 1" CTA-104795.	10" VPN-602 South of CPP-628	137957-B4	1" CTA-104795 North East of WM-180	137956-L1	Unknown	Probably Carbon Steel (Mike Swenson)	This underground pipeline was abandoned in place during the C series Valve Box installation. Portions of this piping have been removed to make room for new construction. Since line has previously been abandoned (cut and capped) it is therefore considered isolated. Issues concerning this isolated pipeline should become a CERCLA matter. This line runs from the middle of the South side of CPP-628 at 12" VPN-602 to the east side of CPP-728 where it turns south towards the North East corner of CPP-781 where it terminates into 1-1/2" CTA-104795 . Pipe encasement is unknown at this time due to lack of information.
73	Existing Condensate	Carries condensate from an unknown place around the west side of Valve Box C1 and terminates to an unknown place (unable to determine from drawings)	Unable to determine from present drawings.	137954-M6	Unable to determine from present drawings	137954-M9	Unknown	Probably Carbon Steel (Mike Swenson)	A section of this line was cut and removed in order to make room for DVB-WM-C1 (Valve Box C1). Once Valve Box installation had taken place, the line was reconnected at both ends by routing a section of new line around to the West side of DVB-WM-C1 (Drawing. 137954). This line is referred to as {Existing Condensate} since no other information can be acquired from present drawings. Description, Pipe Diameter, Origin, Termination, Isolation point, Service, Material, and Pipe Elevation are unable to be determined from present drawings. This line is an older line independent of VES-WM-182 and CPP-782. (see DWG. 137954)

Table C-1. (continued).

74	1" PLA-104770	Valve Box C6 drain line, carries drain waste from Valve Box C6 to 1" PLA-104767 (item 42)	DVB-WM-PW-C6, drain	057501-A5	1" PLA-104767 (item 42)	057501-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST)	Leaking process waste inside Valve Box C6 will drain into 1" PLA-104770 to 1" PLA-104767 (item 42) which will drains into Valve Box C12.
75	1" PUA-648	Concrete encasement drain for encasement containing 10" VGA-602, carries drain waste to CPP-782 north sump	Concrete encasement containing 10" VGA-602	105460 - Upper left	CPP-782 north sump area, JET-WM-533	Drawing. 105460 – Section W	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	CPP-783 penetration - looks like line enters vault lower than 10" VGA-602 after the lines leave the same concrete encasement. The center line of the sleeve for 10" VGA-602 is at (-) 15' 0" - can't find the details on this section on Drawing. 105460 - Upper middle.
76	1" PUA-649	Drain for encasement containing 2" PUA-655 and connect to PUA-648, carries drain waste to CPP-783 vault sump..	2" PUA-655 (item 82) [2" PWA-655]	105460 - Section V	Tees into 1" PUA-648 (item 75) within CPP-783 vault outside of VES-WM-183.	Drawing. 105460 – Section V and Upper left	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Goes straight down from 2" PUA-655 (item 82) sleeve approximately 1 foot and turns 90 degrees into the side of the vault to tee into 1" PUA-648 (item 75). (Drawing. 105460 - Section V)
77	3" PUA-609 [3" PWA-609]	Carries process waste from DVB-WM-PW-A5 to VES-WM-183. Contained in concrete encasement.	DVB-WM-PW-A5, PUV-WM-8	057501-D5	VES-WM-183	Drawing. 057894-B3 and 057501-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	PUV-WM-8 is not remotely maintainable. Unable to determine valve (origin) elevation from Drawing. 377819. Pipeline is encased. Pipe name on Drawing. 377819 and 092093 is 3" PWA-609, and is 3" PWU-609 on Drawing. 105460.
78	3" PUA-610 [3" PWA-610]	Carries process waste from DVB-WM-PW-A5 to VES-WM-183. Contained in concrete encasement.	DVB-WM-PW-A5, PUV-WM-9	057501 - D5	VES-WM-183	Drawing. 057894-B3 and 057501-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipe name on Drawing. 377819 and 092093 is 3" PWA-610, and is 3" PWU-610 on Drawing. 105460.

Table C-1. (continued).

79	3" PUA-605	Hose connection - 1" CA-613 ties into the end of this line.	VES-WM-183	Drawing. 105460 - Upper Middle Drawing. 057894 - B3 Drawing. 105161	Line is cut 8" outside of vault wall and filled with 2 feet of concrete	Drawing. 057894 Drawing. 105460 – Upper Middle	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line is in a 6" diameter sleeve. Drawing. 105461 shows slopes to the tank.
80	2" PUA-616	Carries liquid from CPP-783 north sump to WM-183.	CPP-783, JET-WM-533	057501 - C4, 057894 - B4	VES-WM-183	Drawing. 057501 – C4 Drawing. 105460 – Middle Right	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Goes straight up from JET-WM-533 to an elevation of (-) 20'0" [(-) 0'6"] and then down into tank VES-WM-183 @ (-) 21'7" [(-) 0'6"]. There are no valves or tees, etc. in this line (Drawing. 105460).
81	2" PUA-614	Carries liquid waste from south sump to tank VES-WM-183.	CPP-783, JET-WM-534	057501-C4, 057894-A7	VES-WM-183	Drawing. 057894 – A7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Goes straight up from JET-WM-534 to an elevation of (-) 20'0" [(-) 0'6"] and then down into tank VES-WM-183 @ (-) 21'7" [(-) 0'6"]. There are no valves or tees, etc. in this line (Drawing. 105460)
82	2" PUA-655 [2" PWA-655]	Carries process waste from condenser tank (HE-WM-383) WM-183 in CPP-722 to tank VES-WM-183	CPP-722, PUV-WM-112	105466 - Section U and Plan, 057502-D8, 105460 - Section V	VES-WM-183	Drawing. 105460- Section V Underground Utility Drawing C-3 grid D3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Line runs from HE-WM-383 through 4" PUA-629, which is then reduced down to become 2" PUA-655 and continues on to VES-WM-183. Line is contained in a concrete encasement to the vault. The line is sleeved as it penetrates the vault (Drawing. 500176). However, Drawing. 500176 shows the line encased in a concrete encasement without a sleeve. Drawing. 105460, line is shown in a sleeve without a concrete encasement.
83	3" PUA-607	Overflow from VES-WM-183 to future storage tank - never used.	VES-WM-183	Drawing. 105460 Upper Middle Drawing. 057894 - B3 Drawing. 105161	Line is cut 8" outside of vault wall and filled with 2 feet of concrete	Drawing. 057894 Drawing. 105460 – Upper Middle	Pipe in Pipe Drawing. 105461	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 105461 shows pipeline slopes away from the tank.

Table C-1. (continued).

84	3" PUA-608	Overflow from VES-WM-183 to future storage tank - never used.	VES-WM-183	Drawing. 105460 - Upper Middle Drawing. 057894 - B3 Drawing. 105161	Line is cut 8" outside of vault wall and filled with 2 feet of concrete	057894 105460 – Upper Middle	Pipe in Pipe, Drawing. 105461	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 105461 shows pipeline slopes away from the tank.
85	1" PUA-651	3" PUA-620 (item 67), -621 (item 66) Encasement drain, carries drain waste to CPP-783 sump.	Concrete encasement holding 3" PUA-620 (item 67) and -621.(item 66)	Drawing. 105460 - Lower Middle	CPP-783 South sump area, JET-WM-534	105460 – Section X	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Encasement bottom elevation is 21' 4 3/4". (Drawing. 105590 - section L)
86	1" PUA-653	Valve Box A5 drain line, carries drain waste to CPP-783 south sump.	DVB-WM-PW-A5, drain	Drawing. 057501	CPP-783, south sump	105460 – Top middle and Section X, 057501-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 057894 shows the line terminating in the vault south end approximately 2/3 way up. Drawing 105460 shows the termination in 1" PUA-651 (item 85) @ an elevation of (-) 23' 9" [(-) 0' 6"]. Shows vault penetration at (-) 24' 4 3/4" and shows slope going down into vault. Drawing. 057501 shows origin in DVB-WM-PW-A5, but Drawing. 377819, the upgrade drawing for Valve Box A5, does not show this line. (may have been left out by mistake)
87	2" PUA-1035 [2" PLA-1035]	Carries process waste from WM-183 jet pump to Valve Box C5.	VES-WM-182, JET-WM-583-1B via tank riser #21	057501-C4, 057894-A-B7, 092093, 057501-C3	DVB-WM-PW-C5, Valve PUV-WM-121	057501 – C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Connects to 3" PUA-1035 inside Valve Box C5.
88	2" PUA-1098 [2" PLA-1098]	Carries process waste from WM-183 jet pump to Valve Box C5.	VES-WM-182, JET-WM-583-1A via tank riser #13	057501 - C4 057894 - AB7 092093	DVB-WM-PW-C5, PUV-WM-122	057501 – C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Connects to 3" PUA-1035 (item 87) inside Valve Box C5.

Table C-1. (continued).

89	1" PUA-654	Valve Box A6 drain line, drains to Valve Box A5	DVB-WM-PW-A6, drain	Drawing. 057501-D3	DVB-WM-PW-A5, sump	057501-D5	Pipe in Pipe/Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaks in Valve Box A6 drains into Valve Box A5 which drain into CPP-783 (Sump Riser #21) south sump.
90	3" PUA-1005	Carries process waste from Valve Box C30 (at 3" PU-AR-113540 (item 243)) to Valve Box A6	DVB-WM-PW-C30, (3" PU-AR-113540 (item 243)), PUV-WM-336 and RCV-WM-196	057499-A3	DVB-WM-PW-A6, PUV-WM-7	057501-D3	Pipe in Pipe/Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Items 90 through 93 are given to distinguish between the active (item 90) and abandoned (item 91, 92, 93) pipeline sections. Item 90, 3" PUA-1005 is an active pipeline and carries process waste from Valve Box C30 to Valve Box A6 beginning with pipeline 3" PU-AR-113540 (item 243), Drawing. 057499. The pipeline changes to 3" PUA-1005 in Drawing. 057501 before terminating into Valve Box A6. It is unknown where this pipeline transition takes place. This could be a drawing mistake.
91		Capped inside Valve Box A6, terminates inside Valve Box B4. This line in Abandoned in place.	DVB-WM-PW-A6, capped	057501-C3	DVB-WM-PW-B4, PUV-WM-76	057502-D2	Pipe in Pipe/Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Item 91, 3" PUA-1005 is capped inside Valve Box A6. The pipeline travels from A6 through Valve Box B3 (3" PUA-1029 (item 117) attaches to 3" PUA-1005 inside Valve Box B3) at Valve PUV-WM-58, through B2 (no valve or pipe intersection) and splits into two pipes inside B4. The first pipe is capped inside Valve Box B4 the second pipe terminates at Valve PUV-WM-76.
92		Capped inside Valve Box B4 and terminates inside Valve Box B6	DVB-WM-PW-B4, Capped	057502-D2	DVB-WM-PW-B6, pipeline splits, one end is capped the other end terminates at PUV-WM-78	057502-E2	Pipe in Pipe/Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Item 92, 3" PUA-1005 continues from the capped section inside Valve Box B4 to Valve Box B6 at Valve PUV-WM-78 where it finally terminates. Item 93, 3" PUA-1005 is capped at an unknown location inside the TFF and attaches to 2" PUA-1005 just outside CPP-604 Air Lift Pit. This pipeline is abandoned in place.

Table C-1. (continued).

93		Capped and connects to 2" PUA-1005 outside CPP-604 Air Lift Pit	Capped outside CPP-604 Air Lift Pit and abandoned in place	057498-A5	2" PUA-1005 outside CPP-604 Air Lift Pit	057498-A5	Pipe in Pipe/Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
94	1" PLA-104773	Valve Box C23 drain line, drains to Valve Box C12	DVB-WM-PW-C23, Drain/Sump	057503-F5	DVB-WM-PW-C12, Sump	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This C23 Valve Box drain line (1" PLA-104773) attaches to six other Valve Box drain lines C21 (1" PLA 104779 (item 178)), C19 (1" PLA-104782 (item 126)), C16 (1" PLA-104784 (item 109)), C14 (1" PLA-104783 (item 122)), C10 (1" PLA-104774 (item 95)) and C9 (1" PLA-104775 (item 26)). This collection of drain line waste will dump into the Valve Box C12 sump.
95	1" PLA104774	Valve Box C10 drain line, drains into 1" PLA-104773 (item 94)	DVB-WM-PW-C10, Drain/Sump	057501-D1	1" PLA-104773 (item 94)	057501-D2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C5 will drain through 1" PLA-104774 to 1" PLA-104773 (item 94) which will drain into Valve Box C12.
96	1 1/2" PLA-104710	Carries process waste from Valve Box C23 to Valve Box C12	DVB-WM-PW-C23, Tie Point 224	057503-F5, 377713-C5	DVB-WM-PW-C12, inline sample sump	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 1 1/4" PLA-104714 (item 179) from Valve Box C18, routs into Valve Box C16 attaching to three Valves (PUV-WM-7, 6, 5). The pipeline then exits Valve Box C16. Near Valve Box C10 the pipeline splits, one end terminates in Valve Box C10 were it is capped, the other end terminates inside Valve Box C12 at the inline sample sump. (Drawing. 057501)

Table C-1. (continued).

97	3" PLA-104703	Carries process waste from Valve Box C10 to Valve Box C12	DVB-WM-PW-C10, PUV-WM-126	057501-D1	DVB-WM-PW-C12, inline sample sump	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects with pipeline 1 1/2" PLA-104775 (item 26) Inside Valve Box C12 and rout to the inline sample sump.
98	1" PUA-657	Capped inside Valve Box A7, terminates at CPP-784 south sump.	DVB-WM-PW-A7, Capped	057502-F7	CPP-784, south sump	057502-E5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped inside Valve Box A7. Drain lines (pipe names not given in Drawing. 057502) from CPP-723 and concrete encasement holding 3" PUA-630 (item 100) and 3" PUA-631 (item 99) connect to this pipeline which dumps into CPP-784 south sump.
99	3" PUA-631	Carries process waste from Valve Box A7 to WM-184	DVB-WM-PW-A7, PUV-WM-22	057502-G7	VES-WM-184	057502-F6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is concrete encased as in leaves Valve Box A7 and terminates at CPP-784.
100	3" PUA-630	Capped inside Valve Box A7, terminates at WM-184.	DVB-WM-PW-A7, Capped	057502-F6	VES-WM-184	057502-F6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped inside Valve Box A7 and is concrete encased as it leaves Valve Box A7 and terminates at CPP-784.
101	2" PUA-638	Carries sump liquid from CPP-784 south sump to WM-184	CPP-784 south sump, Jet WM-537	057502-F5	VES-WM-184	057502-F6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-784.
102	1 1/4" PLA-104706	Carries sump liquid from CPP-784 north sump to Valve Box C16	CPP-784 north sump, Jet WM-584-4	057502-F5	DVB-WM-PW-C16, PLV-WM-5	057502-G6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 1 1/2" PLA-104710 (item 186) inside Valve Box C16.
103	2" PUA-639	Carries sump liquid from CPP-784 south sump to WM-184	CPP-784 north sump, Jet WM-536	057502-F5	VES-WM-184	057502-F6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-784.

Table C-1. (continued).

104	2" PUA-1093	Carries process waste from WM-184 to Valve Box C16	VES-WM-184, Jet-WM-584-1B	057502-E5	DVB-WM-PW-C16, PLV-WM-134	057502-G5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 3" PUA-1037 (item 105) inside Valve Box C16
105	2" PUA-1037	Carries process waste from WM-184 to Valve Box C16	VES-WM-184, Jet-WM-584-1A	057502-E5	DVB-WM-PW-C16, PLV-WM-132	057502-G5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 3" PUA-1037 inside Valve Box C16
106	3" PUA-1037	Process waste pipeline that runs from WM-184 to Valve Box B3	VES-WM-184	057502-E5	DVB-WM-PW-B3, near valves PLV-WM-59 and PLV-WM-60	057502-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipe line travels from tank WM-184 through Valve Box C16 and terminates inside Valve Box B3. 2" PUA-1093 (item 104) and 2" PUA-1037 (item 105) attaches to 3" PUA-1037 inside Valve Box C16. The flow direction from WM-184 to Valve Box C16 is unknown from Drawing. 057502.
107	1 1/4" PLA-104707	Carries process waste from CPP-785 south sump to Valve Box C16	CPP-784 south sump, 585-4	057502-C5	DVB-WM-PW-C16, PLV-WM-6	057502-G5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 1 1/2" PLA-104710 (item 186) inside Valve Box C16.
108	1 1/4" PLA-104708	Carries process waste from CPP-786 south sump to Valve Box C16	CPP-785 south sump, 586-4	057502-C4	DVB-WM-PW-C16, PLV-WM-7	057502-G5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 1 1/2" PLA-104710 (item 186) inside Valve Box C16.
109	1" PLA-104784	Valve Box C16 drain line, carries drain waste to 1" PLA-104773	DVB-WM-PW-C16, Drain	057502-G5	1" PLA-104773 (item 94)	057502-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste spills inside Valve Box C16 drains into pipeline 1" PLA-104773 (item 94) which then drains into Valve Box C12 sump.

Table C-1. (continued).

110	1 1/2" PUA-1022	Carries process waste from the condenser tank inside CPP-722 to WM-185	CPP-722, HE-WM-383 and Valve PUV-WM-111	057502-D7	VES-WM-185	057502-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Both WM-183 and WM-185 share condenser tank HE-WM-383 inside CPP-722.
111	1" PLA-676	Capped inside CPP-628, begins at CPP-722 sump	CPP-722, sump	057502-E7	CPP-628, Capped	106181-F3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline name changes from 1" PUA-676 (item 111) to 1" PUA 661 in Drawing. 106181. This may be a drawing mistake. The line is capped inside CPP-628.
112	2" PUA-1027	Carries CPP-785 north sump liquid to WM-185	CPP-785 north sump, Jet-WM 585-2	057502-C5	VES-WM-185	057502-C6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-785.
113	2" PUA-1024	Carries CPP-785 south sump liquid to WM-185	CPP-785 north sump, Jet-WM-585-1	057502-C5	VES-WM-185	057502-C6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-785.
114	2" PUA-1038	Carries process waste from WM-185 to Valve Box C14	VES-WM-185, 585-3B	057502-C5	DVB-WM-PW-C14, PUV-WM-130	057502-E5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 3" PUA-1038 inside Valve Box C14.
115	2" PUA-1094	Carries process waste from WM-185 to Valve Box C14	VES-WM-185, 585-3A	057502-C5	DVB-WM-PW-C14, PUV-WM-131	057502-E5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 3" PUA-1038 inside Valve Box C14.
116	3" PUA-1028	Travels from Valve Box B3 to WM-185	DVB-WM-PW-B3, DCV-WM-8	057502-D4	VES-WM-185	057502 C6	Concrete encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is incased in concrete along with pipelines 3" PUA-1029 (item 117) and 3" PUA-208 (item 118). It is directly attached to a decon Valve DCV-WM-8 inside Valve Box B3. Drawing. 057502 does not show any other attaching lines or Valves before terminating at WM-185. This may be a drawing mistake since decontamination fluid placed through the pipeline at the Valve will not decon any other line but itself (3" PUA-1028).

Table C-1. (continued).

117	3" PUA-1029	Carries process waste from Valve Box B3 to WM-185	DVB-WM-PW-B3, PUV-WM-55	057502-D4	VES-WM-185	057502-C6	Concrete encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is encased in concrete along with pipelines 3" PUA-1028 and 3" PUA-208 (item 118). This line is attached to pipeline 3" PUA-1005 (item 90) inside Valve Box B3
118	3" PUA-208	Carries process waste from Valve Box B3 to WM-185	DVB-WM-PW-B3, PUV-WM-56	057502-D4	VES-WM-185	057502-C6	Concrete encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is encased in concrete along with pipelines 3" PUA-1028 (item 116) and 3" PUA-1029 (item 117). This line is attached to pipeline 3" PUA-1030 (item 47) inside Valve Box B3
119	3" PUA-1023	Valve Box B4 drain line, carries drain waste to 1" PUA-1023	DVB-WM-PW-B4, drain	057502-D3	1" PUA-1023	057502-D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste spills inside Valve Box B4 drains into pipeline 1" PUA-1023 (item 120) which then drains into CPP-785 south sump.
120	1" PUA-1023	Valve Box B3 drain line, carries drain waste to CPP-785 south sump	DVB-WM-PW-B3, drain	057502-D4	CPP-785 south sump	057502-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	An unnamed drain line leading from a concrete encasement housing 3" PUA-1028 (item 116), 1029 (item 117), 208 (item 118) and 3" PUA-1023 (item 119, drain line from B4) attaches to 1" PUA-1023 before it empties into CPP-785 south sump.
121	3" PUA-1038	Carries process waste from Valve Box C14 to 3" PUA-1030	DVB-WM-PW-C14, near PUV-WM-130 and PUV-WM-131	057502-E5	3" PUA-1030	057502-D5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to both 2" PUA-1094 (item 115) and 2" PUA-1038 (item 121) inside Valve Box C14 and terminates at 3" PUA-1030 (item 47) before Valve Box B3.
122	1" PLA-104783	Valve Box C14 drain line, carries drain waste to 1" PLA-104773 (item 94)	DVB-WM-PW-C14, drain	057502-E5	1" PLA-104773 (item 94)	057502-E5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Valve Box C14 will drain through 1" PLA-104773 (item 94) which will drain into Valve Box C12.

Table C-1. (continued).

123	3" PUA-1013	Abandoned Line, Capped inside Valve Box A7 and B1. The original origin and termination points are unknown.	DVB-WM-PW-A7	057502-G6	DVB-WM-PW-B1	057502-G4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line is capped at either end in sided Valve Box A7 and B1 and is abandoned in place. The original origin and termination points are unknown.
124	2" PUA-1021	Carries sump liquid from CPP-786 north sump to WM-186	CPP-786, Jet-WM-586-2	057502-C4	VES-WM-186	057502-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-786.
125	2" PUA-1019	Carries sump liquid from CPP-786 south sump to WM-186	CPP-786, Jet-WM-586-1	057502-C4	VES-WM-186	057502-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be located exclusively inside CPP-786.
126	1" PLA-104782	Valve Box C19 drain line, carries drain waste to 1" PLA-104773.(item 94)	DVB-WM-PW-C19, drain	057502-C4	1" PLA-104773 (item 94)	057502-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste spills inside Valve Box C19 drains into pipeline 1" PUA-104782 and 104773 which then drains into Valve Box C12 sump.
127	2" PUA-1095	Carries process waste from WM-186 to Valve Box C19	VES-WM-186, Jet 586-3A	057502-C4 and 106226	DVB-WM-PW-C19, PUV-WM-135	057502-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1039 inside Valve Box C19
128	2" PUA-1039	Carries process waste from WM-186 to Valve Box C19	VES-WM-186, Jet 586-3A	057502-C4 and 106226	DVB-WM-PW-C19, PUV-WM-136	057502-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1039 inside Valve Box C19
129	3" PUA-1039	Carries process waste from Valve Box C19 to 3" PUA-1014 (item 28)	DVB-WM-PW-C19, near Valves PUV-WM-136 and PUV-WM-135	057502-C4	3" PUA-1014 (item 28)	057502-D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to both 2" PUA-1095 (item 127) and 2" PUA-1039 inside Valve Box C19 and terminates at 3" PUA-1039 between Valve Box B3 and B2.

Table C-1. (continued).

130	1" PUA-1017	Control Pit #1 drain line, carries drain waste to CPP-786 north sump.	Control Pit #1, drain	057502-B3	CPP-786 north sump	057502-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Leaking process waste inside Control Pit #1 will drain through 1" PLA-1017 to CPP-786 north sump.
131	1" PUA-1031	Capped inside Valve Box B1 and terminates at CPP-786 south sump	DVB-WM-PW-B1, Capped	057502-G4	CPP-786 south sump	057502-D4	Concrete Encased/ Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line is capped inside Valve Box B1 and routs to CPP-786 south sump. Drain line (unnamed) for concrete encasement housing 3" PUA-1016 (item 132), 1013 (item 133), and 1014 (item 28) also attaches to 1" PUA-1031 before terminating into south sump.
132	3" PUA-1016	Travels from Valve Box B2 to WM-186	DVB-WM-PW-B2, DCV-WM-7	057502-E3	VES-WM-186	057502-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is incased in concrete along with pipelines 3" PUA-1013 (item 133) and 3" PUA-1040 (item 135). It is directly attached to a decon Valve DCV-WM-7 inside Valve Box B2. Drawing. 057502 does not show any other attaching lines or valves before terminating at WM-186. This may be a drawing mistake since decontamination fluid placed through the pipeline at the valve will not decon any other line but itself (3" PUA-1016).
133	3" PUA-1013	Abandoned Line, Capped inside Valve Box B2 and terminates at CPP-786.	DVB-WM-PW-B2, Capped	057502-E3	VES-WM-186	057502-C4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	As the pipeline enters into Valve Box B2 from Valve Box B1 (capped at B1) it splits into two lines. One line connects to pipeline 3" PUA-204 (item 136) at valve PUV-WM-69. A portion of the second line was removed and capped at the remaining line ends. The second line continues from the end cap and terminates at WM-186. It is incased in concrete as it leaves Valve Box B2 to WM-186 along with pipelines 3" PUA-1016 and 3" PUA-1040. This line is abandoned in place. Original origin point is unknown (item 133, 134). Original termination point for item 134 is unknown.

Table C-1. (continued).

134		Abandoned Line, Capped inside Valve Box B1 and terminates inside B2.	DVB-WM-PW-B1, Capped	057502-G4	DVB-WM-PW-B2, splits in two to Valve PUV-WM-69, the other end is capped	057502-E3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
135	3" PUA-1040	Carries process waste from Valve Box B2 to WM-186	DVB-WM-PW-B2, PUV-WM-67	057502-E3	VES-WM-186	057502-C4	Concrete encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is incased in concrete along with pipelines 3" PUA-1016 (item 132) and 3" PUA-1014 (item 28) and attaches to 3" PUA-1040 inside Valve Box B2.
136	3" PUA-204	Abandoned Line, Capped from 3" PUA-1013. Travels from Valve Box B2 through Valve Box B4 to Valve Box B5 where it is capped. Original origin and termination points are unknown	DVB-WM-PW-B2, PUV-WM-69	057502-E3	DVB-WM-PW-B5, Capped	057503-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is a continuation of 3" PUA-1013 (item 133, 134) from Valve Box B1. This line is abandoned in place. Original origin and termination points are unknown.
137	3" PUA-1218	Carries process waste from Valve Box B4 to Valve Box B5	DVB-WM-PW-B4, PUV-WM-75	057502-D2	DVB-WM-PW-B5, 3" PUA-1232 (item 150) near Valve PUV-WM-82	057503-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste from this line will rout to Valve Box B11.
138	3" PUA-1219	Carries process waste from Valve Box B4 to Valve Box B5	DVB-WM-PW-B4, PUV-WM-76	057502-D2	DVB-WM-PW-B5, 3" PUA-1221 (item 174)	057503-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste from this line will rout to Valve Box B11.
139	1" PUA-1213	Valve Box B6 drain line, carries drain waste to Waste Calcining Facility	DVB-WM-PW-B6, Drain	057502-E2	Just out side WCF (Waste Calcine Facility)	106326-F1	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline changes from 1" PUA-1213 to 1" PUA-3005 (Drawing. 106326) just outside of WCF. The point of transition is unknown at this time.
140	3" PUA-1215	Abandoned Line, Process waste line with both ends capped just outside Valve Box B6	Capped just outside Valve Box B6 and abandoned in place	057502-E2	Capped just outside Valve Box B6 and abandoned in place	057502-E2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs through Valve Box B6. It is capped at either end outside the Valve Box and abandoned in place.

Table C-1. (continued).

141	3" PUA-1216	Abandoned Line, Process waste line with both ends capped just outside Valve Box B6	Capped just outside Valve Box B6 and abandoned in place	057502-E2	Capped just outside Valve Box B6 and abandoned in place	057502-E2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs through Valve Box B6. It is capped at either end outside the Valve Box and abandoned in place.
142	3" PUA-1100	Process waste pipeline that may carry decontamination solution from Valve Box B6 to 3" PUA-1030 (item 47)	Just outside Valve Box DVB-WM-PW-B6, DCV-WM-80	057502-E2	DVB-WM-PW-B6, PUV-WM-80	057502-E2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries decontamination fluid from an outside hookup into Valve Box B6 to 3" PUA-1030 (item 47).
143	3" PUA-1101	Process waste pipeline that may carry decontamination solution to 3" PUA-1005 (item 90)	Just outside Valve Box DVB-WM-PW-B6, DCV-WM-79	057502-E2	DVB-WM-PW-B6, PUV-WM-79	057502-E2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline seems to carry decontamination fluid from an outside hookup into Valve Box B6 to 3" PUA-1005 (item 90).
144	3" PUA-1226 [3" PWA-1226]	Carries process waste from WM-104 to Valve Box B8.	CPP-717B, VES-WM-104, JET-WM-514	057500-D3	DVB-WM-PW-B8, PUV-WM-29	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-104 to Valve Box B8 where the line terminates at 3" PUA-1232 (item 150).
145	3" PUA-1227	Carries process waste from WM-104 to Valve Box B8.	CPP-717B, VES-WM-104, JET-WM-520	057500-D3	DVB-WM-PW-B8, PUV-WM-30	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-104 to Valve Box B8 where the line terminates at 3" PUA-1233 (item 151)..
146	3" PUA-1228	Carries process waste from WM-105 to Valve Box B8.	CPP-717C, VES-WM-105, JET-WM-515	057500-D1	DVB-WM-PW-B8, PUV-WM-31	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-105 to Valve Box B8 where the line terminates at 3" PUA-1233 (item 151).
147	3" PUA-1229	Carries process waste from WM-105 to Valve Box B8.	CPP-717C, VES-WM-105, JET-WM-516	057500-D1	DVB-WM-PW-B8, PUV-WM-32	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-105 to Valve Box B8 where the line terminates at 3" PUA-1232 (item 150).
148	3" PUA-1230	Carries process waste from WM-106 to Valve Box B8	CPP-717D, VES-WM-106, JET-WM-517	057500-D7	DVB-WM-PW-B8, PUV-WM-34	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-106 to Valve Box B8 where the line terminates at 3" PUA-1232 (item 150).
149	3" PUA-1231	Carries process waste from WM-106 to Valve Box B8	CPP-717D, VES-WM-106, JET-WM-518	057500-D7	DVB-WM-PW-B8, PUV-WM-33	057503-G8	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-106 to Valve Box B8 where the line terminates at 3" PUA-1233 (item 151).

Table C-1. (continued).

150	3" PUA-1232 [3" PWA-1232]	Carries process waste from WM-103 to Valve Box B8, B7 and finally to B5	CPP-717A, VES-WM-106, JET-WM-519	057500-D5	DVB-WM-PW-B9, PUV-WM-82	057503-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from CPP-717A (VES-WM-103) to Valve Box B8 (Valve PUV-WM-30), B7 (PUV-WM-37) and B5 (PUV-WM-82). 3" PUA-1230 (item 148) and 1229 (item 147) attached to this line inside Valve Box B8.
151	3" PUA-1233 [3" PWA-1233]	Carries process waste from WM-103 to Valve Box B8, B7 and finally to B5.	CPP-717A, VES-WM-106, JET-WM-513	057500-D5	DVB-WM-PW-B5, PUV-WM-84 and 85	057503-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from VES-WM-103 to Valve Box B8 (Valve PUV-WM-27), B7 (PUV-WM-35), B5 (PUV-WM-84 and 85). 3" PUA-1227, 1228 (item 146) and 1231 (item 149) attached to this line inside Valve Box B8, 3" PUA-1036 (item 18) attaches to this line inside Valve Box B5.
152	1" PUA-1234 [1" PWA-1234]	Valve Box B8 drain line, carries drain waste to Valve Box B7 sump	DVB-WM-PW-B8, Drain	057503-G8	DVB-WM-PW-B7, Sump	057503-F8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Carries process waste from Valve Box B8 to Valve Box B7. Valve Box B8 waste will drain into CPP-713 (next to WM-187) north sump.
153	1" PUA-1235 [1" PWA-1235]	Valve Box B7 drain line, carries drain waste to Valve Box B5 sump	DVB-WM-PW-B7, Drain	057503-F8	DVB-WM-PW-B5, Sump	057503-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Carries process waste from Valve Box B7 (which may include waste from Valve Box B8) to Valve Box B5. Valve Box B7 waste will drain into CPP-713 (next to WM-187 north sump).
154	1" PUA-1210	Valve Box B5 drain line, carries drain waste to vault CPP-713 north sump	DVB-WM-PW-B5, Drain	057503-D7	CPP-713, VES-WM-187 North Sump	057503-B6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Carries process waste from Valve Box B5 (which may include waste from Valve Box B8 and B7) to CPP-713 (next to WM-187 north sump).
155	1 1/2" PUA-1205	Condenser tank HE-WM-387 Drain line, carries drain waste to WM-188.	CPP-743, HE-WM-387	057503-B5	CPP-713, VES-WM-188	057503-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This drain line carries waste from condenser tank HE-WM-387 through Valve Box C18 (PUV-WM-173) to WM-188. 1 1/2" PUA-1211 (item 180) connects to this pipeline in Valve Box C18.

Table C-1. (continued).

156	1" PLA-104780	Valve Box C22 drain line, carries drain waste to 1" PLA-104773.(item 94)	DVB-WM-PW-C22, Drain	057503-G7	1" PLA-104773 (item 94)	057503-G6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The waste from this drain line will drain into Valve Box C12 sump.
157	2" PUA-1091	Carries process waste from WM-188 to Valve Box C22	VES-WM-188, Jet-WM-588-2A	057503-F7	DVB-WM-PW-C22, PUV-WM-98	057503-G7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1201 (item 159) inside Valve Box C22.
158	2" PUA-1201	Carries process waste from WM-188 to Valve Box C22	VES-WM-188, Jet-WM-588-2B	057503-F7	DVB-WM-PW-C22, PUV-WM-97	057503-G7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line changes into 3" PUA-1201 (item 159) inside Valve Box C22
159	3" PUA-1201	Carries process waste from C22 to 3" PUA-1232 (item 150)	DVB-WM-PW-C22, PUV-WM-97 and 98	057503-G7	3" PUA-1232 (item 150)	057503-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1232 (item 150) between Valve Box B5 and B9.
160	3" PUA-1202	Carries process waste from C21 to 3" PUA-1232 (item 150)	DVB-WM-PW-C21, PUV-WM-95 and 96	057503-C7	3" PUA-1232 (item 150)	057503-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1232 (item 150) between Valve Box B5 and B9.
161	2" PUA-1202	Carries process waste from WM-187 to Valve Box C21	VES-WM-187, Jet-WM-587-3A	057503-B7	DVB-WM-PW-C21, PUV-WM-96	057503-C7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line changes into 3" PUA-1202 inside Valve Box C21
162	2" PUA-1092	Carries process waste from WM-187 to Valve Box C21	VES-WM-187, Jet-WM-587-3B	057503-B7	DVB-WM-PW-C21, PUV-WM-95	057503-C7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line attaches to 3" PUA-1202 (index 160) inside Valve Box C21.
163	2" PUA-1206	Carries sump liquid from CPP-713 south sump to WM-188	VES-WM-188, Jet-WM-588-1B, south sump	057503-F7	VES-WM-188	057503-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be enclosed in vault CPP-713 (WM-188)
164	2" PUA-1207	Carries sump liquid from CPP-713 north sump to WM-188	VES-WM-188, Jet-WM-588-1A, north sump	057503-F7	VES-WM-188	057503-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be enclosed in vault CPP-713 (WM-188)

Table C-1. (continued).

165	1 1/4" PLA-104711	Carries sump liquid from CPP-713 north sump (WM-188) to Valve Box C23	VES-WM-188, Jet-WM-588-4, north sump	057503-F6	DVB-WM-PW-C23, PLV-WM-9	057503-G6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Sump liquid will drain into Valve Box C12 sump
166	3" PUA-1204	Carries process waste from Valve Box B9 to WM-188	DVB-WM-PW-B9, PUV-WM-94	057503-E7	VES-WM-188	057503-F7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1089 (item 168) inside Valve Box B9 which runs to WM-187
167	3" PUA-1203	Carries process waste from Valve Box B9 to WM-188	DVB-WM-PW-B9, PUV-WM-93	057503-E7	VES-WM-188	057503-F7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1090 (item 169) inside Valve Box B9 which runs to WM-187
168	3" PUA-1089	Carries process waste from Valve Box B9 to WM-187	DVB-WM-PW-B9, PUV-WM-87	057503-D7	VES-WM-188	057503-F7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1204 (item 166) inside Valve Box B9 which runs to WM-188
169	3" PUA-1090	Carries process waste from Valve Box B9 to WM-187	DVB-WM-PW-B9, PUV-WM-88	057503-D7	VES-WM-188	057503-F7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1203 inside Valve Box B9 which runs to WM-188
170	2" PUA-1209	Carries sump liquid from CPP-713 north sump to WM-187	VES-WM-187, Jet-WM-587-2A, north sump	057503-B6	VES-WM-187	057503-B7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be enclosed in vault CPP-713 (WM-187)
171	2" PUA-1208	Carries sump liquid from CPP-713 south sump to WM-187	VES-WM-187, Jet-WM-587-2B, south sump	057503-B7	VES-WM-187	057503-B7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be enclosed in vault CPP-713 (WM-187)
172	1 1/4" PLA-104709	Carries sump liquid from CPP-713 south sump (WM-187) to Valve Box C23	VES-WM-187, Jet-WM-587-4, south sump	057503-B7	DVB-WM-PW-B9, PLV-WM-8	057503-F6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Sump liquid will drain to Valve Box C12 sump
173	1" PUA-1217	Junction Box 7, drain line	Junction Box-7, Drain	057503-D6	CPP-713 (WM-187) south sump	057503-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	No working valves (only abandoned valves) are located inside junction box 7.

Table C-1. (continued).

174	3" PWA-1221	Carries process waste from Valve Box B5 to B11	DVB-WM-PW-B5, 3" PUA-1219	057503-D7	DVB-WM-PW-B11, PUV-WM-338	057503-D3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs through Valve Box B9 (PUV-WM-91), JB-7 (no connecting valve), B10 (PUV-WM-303)
175	3" PWA-1223	Abandoned Line, Pipeline runs from B5 to B10 (through Valve Box B9 and junction box-7) and from B10 to B11	Abandoned pipeline has two origins (1) DVB-WM-PW-B5, Capped and (2) DVB-WM-PW-B10, Capped	057503-D7 and D4	Abandoned pipeline has two termination points, (1) DVB-WM-PW-B10, Capped and (2) DVB-WM-PW-B11, Capped (the termination points are respective to the origin points)	057503-D5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped inside Valve Box B5, B10 (2 places) and B11. 3" PWA-1223 begins at Valve Box B5 (capped) and runs through Valve Box B9 (no connecting valve) and JB-7 (no connecting valve) where it is capped at Valve Box B10. A portion of the line continues from the second cap inside Valve Box B10 and runs to Valve Box B10 where it is capped again.
176	3" PWA-1222	Carries process waste from Valve Box B5 to B11	DVB-WM-PW-B5, PUV-WM-85	057503-D6	DVB-WM-PW-B11, PUV-WM-322	057503-D3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs through Valve Box B9 (no connecting valve), Junction Box-7 (no connecting valve), Valve Box B10 (no connecting valve)
177	3" PWA-1220	Carries process waste from Valve Box B5 to B11	DVB-WM-PW-B5, PUV-WM-82	057503-D7	DVB-WM-PW-B11, PUV-WM-380	057503-D3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs through Valve Box B9 (PUV-WM-90), JB-7 (no connecting valve), B10 (no connecting valve)
178	1" PLA-104779	Valve Box C21, drain line, carries drain waste to 1" PLA-104773.(item 94)	DVB-WM-PW-C21, Drain	057503-C7	1" PLA-104773 (item 94)	057503-C8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drain liquid will drain to Valve Box C12 sump through 1" PIA-104773 (item 94).
179	1 1/4" PLA-104714	Carries process waste from Valve Box C18 to 1 1/2" PLA-104710 (item 186)	DVB-WM-PW-C18, PLV-WM-12	057503-B8	1" PLA-104710 (item 186)	057503-C8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste will drain to Valve Box C12 sump through 1" PLA-104710 (item 186).

Table C-1. (continued).

180	1 1/2" PUA-1211	Carries process waste from Valve Box C18 to WM-187	DVB-WM-PW-C18, PUV-WM-172	057503-B8	VES-WM-187	057503-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline is attached to condenser tank HE-WM-387 (CPP-743) drain line inside Valve Box C18.
181	1" PUA-1214	Control pit #2, drain line, carries drain waste to CPP-743, Sump	Control pit #2, Drain	057503-B6	CPP-743, Sump	057503-B5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
182	1" PLA-104713	Carries process waste from Valve Box C24 to Valve Box C23.	DVB-WM-PW-C24, PLV-WM-11	057503-D4	DVB-WM-PW-C23, Between valves PLV-WM-8 and 78	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste will drain to Valve Box C12 sump. 1" PLA-104710 (item 186) connect to this pipeline.
183	1 1/4" PLA-104715	Carries process waste from CPP-713 (WM-189) cold sump to Valve Box C23.	Pipe reducer outside CPP-713 (VES-WM-189), attaching to 2" PUA-1317 (item 184)	057503-C4	DVB-WM-PW-C23, PLV-WM-78	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipe reducer location (outside CPP-713 (WM-189)) is unknown at this time. Pipeline name changes from 2" PUA-1317 (item 184) to 1 1/4" PLA-104715 at this reducer.
184	2" PUA-1317	Carries process waste from CPP-713 (WM-189) cold sump to Valve Box C23.	CPP-713 (VES-WM-189), Cold Sump, Jet-WM-589-4	057503-B4	Pipe reducer outside CPP-713 (VES-WM-189) attaching to 1 1/4" PLA-104715 (item 183)	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipe reducer location (outside CPP-713) is unknown at this time. Pipeline name seems to change from 2" PUA-1317 to 1 1/4" PLA-104715 (item 183) at this reducer.
185	1" PUA-1325	Valve Box B10, drain line, carries drain waste to CPP-713 north sump.	DVB-WM-PW-B10, Drain	057503-D5	CPP-713 (VES-WM-189) North Sump	057503-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
186	1" PLA-104710	Carries process waste from Valve Box C25 to 1" PLA-104713 (item 186)	DVB-WM-PW-C25, PLV-WM-10	057503-F5	1" PLA-104713 (item 186)	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste will drain to Valve Box C12 sump

Table C-1. (continued).

187	1 1/4" PLA-104786	Carries process waste from CPP-713 (WM-190) cold sump to Valve Box C23.	Pipe reducer outside CPP-713 (VES-WM-190), attaching to 2" PUA-1318 (item 188)	057503-F5	DVB-WM-PW-C23, PLV-WM-79	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipe reducer location (outside CPP-713) is unknown at this time. Pipeline name seems to change from 2" PUA-1318 (item 188) to 1 1/4" PLA-104786 at this reducer.
188	2" PUA-1318	Carries process waste from CPP-713 cold sump to Valve Box C23.	CPP-713 (VES-WM-190), Cold Sump, Jet-WM-590-4	057503-F4	Pipe reducer outside CPP-713 (VES-WM-190) attaching to 1 1/4" PLA-104786 (item 187)	057503-F5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipe reducer location (outside CPP-713) is unknown at this time. Pipeline name seems to change from 2" PUA-1317 (item 184) to 1 1/4" PLA-104715 (item 183) at this reducer. 2" WRN-1337 connects to 2" PUA-1318 and is abandoned in place.
189	3" PUA-1302	Carries process waste from Valve Box C24 and C25 to 3" PUA-1301. (item 190)	DVB-WM-PW-C24, PUV-WM-310 and 309, DVB-WM-PW-C25, PUV-WM-312	057503-C4	3" PUA-1301 (item 190)	057503-G4 through D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline seems to connect in three places. (1) Valve Box C25 (PUV-WM-310 and 309), (2) Valve Box C24 (DVB-WM-312), (3) pipeline 3" PUA-1301 (item 190).
190	3" PUA-1301	Carries process waste from 3" PUA-1032 to Valve Box B10	3" PUA-1032 (item 189)	057503-D5	DVB-WM-PW-B10, 3" PWA-1220 (item 177)	057503-D5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PWA-1220 (item 177) inside Valve Box B10
191	1" PLA-110537	Carries process waste from CPP-713 (WM-189) south sump to Valve Box C25	CPP-713 (WM-189) South Sump, Jet-WM-589-2A	057503-B4	DVB-WM-PW-C25, 3" PLV-WM-73	057503-G4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline seems to change from 1" PLA-110537 to 1" PL-AR-110537 before terminating at Valve Box C25.
192	2" PUA-1307	Carries sump liquid from CPP-713 (WM-189) north sump to WM-189	CPP-713 (WM-189) North Sump, Jet-WM-589-3	057503-B4	VES-WM-189	057503-B3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be contained inside vault CPP-713 (WM-189)
193	2" PUA-1306	Carries sump liquid from CPP-713 (WM-189) south sump to WM-189	CPP-713 (WM-189) South Sump, Jet-WM-589-2	057503-B4	VES-WM-189	057503-B3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be contained inside vault CPP-713 (WM-189)

Table C-1. (continued).

194	3" PUA-1304	Carries process waste from Valve Box B10 to WM-189	DVB-WM-PW-B10, PUV-WM-301	057503-C5	VES-WM-189	057503-B3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connects to 3" PUA-1316 (item 196) inside Valve Box B10 which leads WM-190
195	3" PUA-1303	Carries process waste from Valve Box B10 to WM-189	DVB-WM-PW-B10, PUV-WM-302	057503-C5	VES-WM-189	057503-B3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connects to 3" PUA-1315 (item 197) inside Valve Box B10 which leads WM-190
196	3" PUA-1316	Carries process waste from Valve Box B10 to WM-190	DVB-WM-PW-B10, PUV-WM-308	057503-E5	VES-WM-190	057503-F3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connects to 3" PUA-1304 (item 194) inside Valve Box B10 which leads WM-189
197	3" PUA-1315	Carries process waste from Valve Box B10 to WM-190	DVB-WM-PW-B10, PUV-WM-307	057503-E5	VES-WM-190	057503-F3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connects to 3" PUA-1303 (item 195) inside Valve Box B10 which leads WM-189
198	1" PL-AR-10541	Carries sump liquid from CPP-713 (WM-190) north sump to Valve Box C25	CPP-713 (WM-190) North Sump, Jet-WM-590-3A	057503-F4	DVB-WM-PW-C25, PUV-WM-74	057503-G4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Sump liquid will drain to Valve Box C12 sump.
199	2" PUA-1309	Carries sump liquid from CPP-713 (WM-190) north sump to WM-190	CPP-713 (WM-190) North Sump, Jet-WM-590-3	057503-F4	VES-WM-190	057503-F4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be contained inside vault CPP-713 (WM-190)
200	2" PUA-1308	Carries sump liquid from CPP-713 (WM-190) south sump to WM-190	CPP-713 (WM-190) North Sump, Jet-WM-590-2	057503-F4	VES-WM-190	057503-F4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline may be contained inside vault CPP-713 (WM-190)

Table C-1. (continued).

201	2" PUA-1314	Carries process waste from WM-190 to Valve Box C25	VES-WM-190, Jet-WM-590	057503-F4	DVB-WM-PW-C25, PUV-WM-311	057503-G4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1302 (item 189) inside Valve Box C25
202	{3"}[li] 2" PUA-1302	Carries process waste from WM-190 to Valve Box C25	VES-WM-190, Jet-WM-590-5	057503-F4	DVB-WM-PW-C25, PUV-WM-312	057503-G4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing 057503 shows this as a 3" PUA-1302 (item 189), this may be a drawing mistake. Similar connections from tank to valve box with in the TFF have always been 2" lines. The 2" lines then connect to a 3" line inside the valve box and then rout to other TFF areas. Because of this I have changed the 3" PUA-1302 (as stated in Drawing. 057503-F4) to the correct designation of 2" PUA-1302 as line travels from tank to valve box.
203	1 1/2" PUA-1311	Carries process waste from control pit #3 to WM-190	Control Pit #3, PUV-WM-318	057503-D2	VES-WM-190	057503-F3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is connected to other pipelines that route to WM-189 (1 1/2 PUA-1305 (item 204)) and condenser tank HE-WM-387 (CPP-743) inside Control Pit #3.
204	1 1/2" PUA-1305	Carries process waste from 1 1/2" PUA-1205 (item 155) (HE-WM-387 (CPP-743) drain waste) through control pit #3 to WM-189	1 1/2" PUA-1205 (item 155)	057503-A6	VES-WM-189	057503-B3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste carried by this pipeline is from condenser tank HE-WM-387 (CPP-743). The pipeline travels through control pit #3 (PUV-WM-317) as it routs to WM-189.
205	1" PUA-1312	Control pit #3, drain line, carries drain waste to CPP-743 sump.	Control Pit #3, Drain	057503-D2	CPP-743, Sump	057503-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drain waste will dump into storage tanks WM-187 or WM-188.

Table C-1. (continued).

206	2" PUA-1313	Carries process waste from WM-189 to Valve Box C24	VES-WM-190, Jet-WM-589-1	057503-B3	DVB-WM-PW-C24, PUV-WM-309	057503-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 3" PUA-1302 (item 189) inside Valve Box C25
207	{3"} 2" PUA-1301	Carries process waste from WM-189 to Valve Box C24	VES-WM-190, Jet-WM-589-5	057503-B3	DVB-WM-PW-C24, PUV-WM-310	057503-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing 057503 shows this as a 3" PUA-1301, this may be a drawing mistake. Similar connections from tank to valve box with in the TFF have always been 2" lines. The 2" lines then connect to a 3" line inside the valve box and then rout to other TFF areas. Because of this I have changed the 3" PUA-1301 (as stated in Drawing. 057503-B3) to the correct designation of 2" PUA-1302 as line travels from tank to valve box.
208	3" PA-AB-1700	Carries process waste from Valve Box B11 to NWCF	DVB-WM-PW-B11, PUV-WM-338, 322, 64 and 380	057503-D3	NWCF (New Waste Calcining Facility)	133407-D6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
209	1" PLA-104776	Abandoned Line, Capped inside Valve Box C12 and C37. Original origin and termination points are unknown.	DVB-WM-PW-C37, Capped	096156-D8	Capped inside DVB-WM-PW-C12	057501-E2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is abandoned in placed and capped inside Valve Box C12 and C37. It is assumed that the pipe origin begins in C37 and terminates in C12. Original origin and termination points are unknown.
210	3" PLA-104710	Carries process waste from Valve Box C12 to C37	DVB-WM-PW-C12, HV-WM-81	057501-E2	DVB-WM-PW-C37, 3" PLA-10111	096156-D8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	It is assumed that the pipe origin begins in C12 and terminates is C37.

Table C-1. (continued).

211	3" PW-AR-151009	Carries process waste from VES-WL-101 through Valve Box C37 to pipeline 3" PUA-1014 (item 28).	VES-WL-101, Jet-WL-500	096156-A3	Unknown connection point location, 3" PUA-1014 (item 28)	057502-G8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline runs from VES-WL-101 through Valve Box C37 and seems to change into 3" PUA-1014 (item 28). The point of change is unknown.
212	3" PWM-48048C	Abandoned Line, Capped inside Valve Box C37 and terminates at VES-WL-102	DVB-WM-PW-C37, Capped	096156-D7	VES-WL-102	096156-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
213	3" PY-2401Y	Carries process waste from Valve Box C37 to VES-WL-101 (CPP-604)	DVB-WM-PW-C37, PLV-WL-185	096156-D7	VES-WL-101	096156-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline changes from 3" PY-2401Y to 3" PY-2403Y just before terminating into VES-WL-101. The point of change is unknown
214	1 1/2" PL-AR-113808	Carries process waste from VES-WL-132 (Sediment Tank Vault), Jet-WL-532, to Valve Box C37	Sediment Tank Vault, Jet-WL-532, VES-WL-132	096156-D6	DVB-WM-PW-C37, PLV-WL-185	096156-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
215	2" PL-AR-113803	Carries process waste from VES-WL-133 to Valve Box C37	VES-WL-133, Jet-WL-533-1	096156-A6	DVB-WM-PW-C37, PLV-WL-216	096156-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
216	3" Sump Drain	Capped inside Valve Box C37 sump and terminates at VES-WL-102 and 103 sump	DVB-WM-PW-C37, Sump Drain, Capped	096156-C7	VES-WL-102 and 103 sump	096156-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 096156 does not give an identification number for this pipeline.
217	1" Drain	Capped inside Valve Box C37 and terminates at VES-WL-102 and 103 sump	DVB-WM-PW-C37, Drain, Capped	096156-C7	VES-WL-102 and 103 sump	096156-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Drawing. 096156 does not give an identification number for this pipeline.

Table C-1. (continued).

218	3" PL-AR-113806	Carries process waste from Valve Box C37 to 6" PL-AR-113802 (item 305)	DVB-WM-PW-C37, HV-WL-235 and HV-WL-187	096156-C7	6" PL-AR-113802 (item 305)	096156-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	The pipeline connection to 6" PL-AR-113802 (item 305) occurs outside Valve Box C37, unknown location. This is a RCRA controlled pipeline.
219	3" PL-AR-113802	Carries process waste from 6" PL-AR-113802 (item 305) to VES-WL-132 (Sediment Tank Vault)	Outside Valve Box C37 (unknown), 3" PL-AR-113806 (item 218) Connection	096156-B7	DVB-WM-PW-C37	096156-D5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	3" PL-AR-113800 (item 220) and 113801 (item 221) connect to this pipeline before it routs into Valve Box C38. The pipeline finally terminates into VES-WL-132 (Sediment Tank Vault). This is a RCRA controlled pipeline. VES-WL-132 (Sediment Tank Vault), PLV-WLT-198
220	3" Pl-AR-113800	Carries process waste from Valve Box C32 to 6" PL-AR-113802	DVB-WM-PW-C32, HV-WM-38	057499-C3	6" PL-AR-113802	096156-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	RCRA controlled pipeline.
221	3" Pl-AR-113801	Carries process waste from Valve Box C32 to 6" PL-AR-113802 (item 305)	DVB-WM-PW-C32, HV-WM-38	057499-C3	6" PL-AR-113802 (item 305)	096156-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	RCRA controlled pipeline.
222	1 1/2" PWM-20028Y	Carries VES-WM-100 sump liquid to Valve Box C37	Waste Tank Vault, VES-WM-100 Sump	096156-B6	DVB-WM-PW-C37, PLV-WL-242	096156-C8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 1 1/2" PL-AR-20028 inside Valve Box C37
223	1 1/2" PWM-3019Y	Carries VES-WM-101 and 102 sump liquid to Valve Box C37	Waste Tank Vault, VES-WM-101 and 102 Sump	096156-A7	DVB-WM-PW-C37, PLV-WL-243	096156-C8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to 1 1/2" PL-AR-20028 (item 222) inside Valve Box C37
224	3" PU-AR-151822	Carries process waste from Valve Box C37 to P.E.W. Evaporator	DVB-WM-PW-C37, PUV-WM-140	096156-D8	P.E.W. Evaporator	094276-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Unable to find process waste lines in Drawing. 094276-D7. This may be a drawing mistake.

Table C-1. (continued).

225	3" PU-AR-151823	Carries process waste from Valve Box C37 to P.E.W. Evaporator	DVB-WM-PW-C37, PUV-WM-139	096156-D8	P.E.W. Evaporator	094276-D7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Unable to find process waste lines in Drawing. 094276-D7. This may be a drawing mistake.
226	3" PLA-10111	Carries process waste from CPP-633 through Valve Box D4 to C37	CPP-633, Manual Block Valve in Off-gas Blower Cell	106421-A5	DVB-WL-PL-C37, HV-WL-187	096156-D8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled from Valve Box D4 to C37
227	2" PL-AD-102750	Carries process waste from NWCF (New Waste Calcining Facility) to Valve Box D4	NWCF (New Waste Calcining Facility)	133407-C7	DVB-OGF-PL-D4, PLV-OGF-34	096156-B8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled
228	1" PLA-106923	Carries process waste from Waste Solvent Storage System to Valve Box D4	Waste Solvent Storage System, VES-NCE-184	058620-D7	DVB-OGF-PL-D4, PLV-OGF-45	096156-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
229	1" LI2-NN-110602	Carries process waste from main stack to Valve Box D4	CPP-692, LIV-OGF-003	444164-B2	DVB-OGF-PL-D4, 1/2" LA2N-106922	096156-B7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
230	1" PL-AR-113799	Carries process waste from VES-WL-133 through Valve Box C38 to CPP-604 Evaporation Cell, WL-161	Collection Tank Vault, Jet-WL-533-2, VES-WL-133	096156-B5	CPP-604, P.E.W. Evaporator, WL-161, PLV-WLE-183	096156-C3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the CPP-604 PEW Evaporator or if it remains inside buildings.
231	2" PL-AR-113807	Carries process waste from CPP-604 Evaporation Cell, WL-161 to Collection Tank Vault, VES-WL-133	CPP-604, Evaporation Cell, WL-161, 2" PWL-3068C	096156-C3	Collection Tank Vault, VES-WL-133	096156-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the collection tanks or if it remains inside buildings.

Table C-1. (continued).

232	3" PL-AR-113798	Carries process waste from CPP-604 Evaporation Cell, WL-161 to Collection Tank Vault, VES-WL-133	CPP-604, Evaporation Cell, WL-161, PLV-WLE-181	096156-C3	Collection Tank Vault, VES-WL-133	096156-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the collection tanks or if it remains inside buildings.
233	2" PL-AR-113809	Carries process waste from PEW Evaporator through Valve Box C38 to VES-WL-133	CPP-604, PEW Evaporators	094276-C4	Collection Tank Vault, VES-WL-133	096156-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the collection tanks or if it remains inside buildings.
234	3" PUA-3022C	Carries process waste from CPP-604 Drains to VES-WL-150	CPP-604 Drains	103589-D8	Collection Tank Vault, VES-WL-150	096156-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Unable to determine from drawings if this pipeline runs underground before terminating at the collection tanks or if it remains inside buildings.
235	2" PSA-100587	Carries process waste from Valve Box C38 to P.E.W. Evaporators	DVB-WL-PL-C38, 2" PL-AR-113811 and 113810	096156-D5	CPP-604, P.E.W. Evaporator	094276-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the CPP-604 PEW Evaporator or if it remains inside buildings.
236	2" PUA-1008	Capped inside Valve Box C38 and connects to pipeline 3" PUA-1008 (item 237), Abandoned in place	DVB-WL-PL-C38, Capped	096156-E4	3" PUA-1008 (item 237)	096156-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This capped pipeline connects to 3" PUA-1008 (item 237) which is also capped inside Waste Tank Vault (VES-WL-102). Unable to determine from drawings if this pipeline runs underground before terminating at Valve Box C38 or if it remains inside buildings.

Table C-1. (continued).

237	3" PUA-1008	Capped inside Waste Tank Vault (VES-WL-102) and connects to 2" PUA-1008 (item 236), Abandoned in place	Waste Tank Vault, VES-WL-102	096156-B4	2" PUA-1008 (item 236)	096156-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This capped pipeline connects to 2" PUA-1008 and is capped inside DVB-WL-PL-C38. Unable to determine from drawings if this pipeline runs underground before terminating at Waste Tank Vault or if it remains inside buildings.
238	2" PWL-AR-155149	Carries process waste to and from VES-WL-102 and CPP-604 P.E.W. Evaporator	P.E.W. Evaporators	094276-A4	Waste Tank Vault, VES-WL-102	096156-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is RCRA controlled. Unable to determine from drawings if this pipeline runs underground before terminating at the CPP-604 PEW Evaporator or if it remains inside buildings.
239	1 1/2" PL-AR-155553	Carries process waste from Sump SU-WL-153 to VES-WL-150	Sump, SU-WL-153	179008-C8	Waste Tank Vault, VES-WL-150	096156-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Unable to determine from drawings if this pipeline runs underground before terminating at the waste tank vault or if it remains inside buildings.
240	4" PWL-1134C	Carries process waste from PEW Evaporator to VES-WL-101 (Waste Tank Vault)	P.E.W. Evaporators	094276-A6	Waste Tank Vault, VES-WL-101	096156-A2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Unable to determine from drawings if this pipeline runs underground before terminating at the waste tank vault or if it remains inside buildings.
241	2" PLA-101105	Unable to determine origin of pipeline. Referenced drawing does not show pipeline.	Tank Farm Facility, Unknown	057501-F5	Collection Tank Vault, Sump (VES-WL-133)	096156-A6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	There is no pipeline connection as referred by 057501-F5. This may be a drawing mistake.
242	3" PWM-2016Y	Abandoned Line, Capped outside Waste Tank Vault. Original termination point is unknown	Waste Tank Vault, VES-WM-101, Jet-WM-501	057498-A6	Capped and abandoned outside Waste Tank Vault	057498-D5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped outside Waste Tank Vault and abandoned in place. Location of abandoned pipe cap is unknown. This pipeline is RCRA controlled. Original termination point is unknown

Table C-1. (continued).

243	3" PU-AR-113540	Carries process waste from Valve Box C30 to Waste Tank Vault (VES-WM-100)	DVB_WM-PW-C30, 1" VGAR-113542 and 2" PU-AR-113540 (item 243)	057499-A4	Waste Tank Vault, VES-WM-100	057498-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This is a RCRA controlled pipeline
244	3" PWM-1002Y	Carries process waste from CPP-604 Air Lift Pit to Waste Tank Vault (VES-WM-100)	CPP-604 Air Lift Pit, 1" PUA-1007 and 1" PUA-104840 (item 248)	057498-B4	Waste Tank Vault, VES-WM-100	057498-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This is a RCRA controlled pipeline. Unable to determine from drawings if this pipeline runs underground before terminating at the waste tank vault or if it remains inside buildings (CPP-604).
245	2" PUA-104853	Capped outside CPP-604 Air Lift Pit and abandoned in place	Capped and abandoned outside CPP-604 Air Lift Pit, unknown location	057498-A3	3" PUA-104853, Outside CPP-604 Air Lift Pit	057498-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Two items with the same pipeline are given to distinguish between the active (item 246) and abandoned (item 245) pipeline sections.
246		Carries process waste from CPP-601, U-Cell to 1 1/2" PWM-10013C (item 258)	CPP-601 U-Cell	091140-C1	1 1/2" PWM-10013C (item 258), Between Valve Box C30 and Waste Tank Vault. Process waste terminates inside Waste Tank Vault, VES-WM-100	057498-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Item 245, 2" PUA-104853 is an abandoned pipeline and capped outside CPP-604 Air Lift Pit. Location of cap within the TFF is unknown. This pipeline also connects to 3" PUA-104853 just outside CPP-604 air lift pit. Item 246, 2" PUA-104853 is an active pipeline and carries process waste from CPP-601, U-Cell through Valve Box C31 (PUV-YDA-329, 330), C29 (PUV-YDA-325) and C30 (PUV-WM-328, 336) and terminates at Waste Tank Vault, VES-WM-100. This is a RCRA controlled pipeline.

Table C-1. (continued).

247	2" PUA-1005	Capped outside CPP-604 Air Lift Pit and abandoned in place	CPP-604 Air Lift Pit, PUV-WM-212	057498-B3	Capped and abandoned outside CPP-604 Air Lift Pit	057498-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown.
248	1" PUA-104840	Abandoned Line, Capped outside CPP-604 Air Lift Pit Original Termination point is unknown.	CPP-604 Air Lift Pit, 1" PUA-1006 and 1" PUA-1007 inside CPP-604 air lift pit	057498-B3	Capped and abandoned outside CPP-604 Air Lift Pit	057498-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
249	4" PWM-20024Y	Abandoned Line, Capped outside CPP-739. Original Termination point is unknown.	CPP-739, VGV-WM-74	057498-D3	Capped and abandoned outside CPP-739	057498-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
250	1 1/2" PWL-10219C	Abandoned Line, Capped outside CPP-739. Original Termination point is unknown.	CPP-739, RCV-WM-35	057498-D3	Capped and abandoned outside CPP-739	057498-D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
251	1 1/2" PWL-3009C	Abandoned Line, Capped outside CPP-739. Original Termination point is unknown.	CPP-739, RCV-WM-34	057498-D3	Capped and abandoned outside CPP-739	057498-D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
252	2" PWM-20021C	Abandoned Line, CPP-739 drain line, capped outside CPP-739. Original Termination point is unknown.	CPP-739, Drain	057498-C4	Capped and abandoned outside CPP-739	057498-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
253	1" PUA-104840	Abandoned Line, Capped outside CPP-739. Original Termination point is unknown.	CPP-739, VES-WM-193	057498-D2	Capped and abandoned outside CPP-739	057498-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
254	1" PUA-104839	Abandoned Line, Capped outside CPP-739 Original Termination point is unknown.	CPP-739, VES-WM-193	057498-D3	Capped and abandoned outside CPP-739	057498-C4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.

Table C-1. (continued).

255	2" PUA-1003	Abandoned Line, Capped outside CPP-604 Air Lift Pit. Original Termination point is unknown.	CPP-604 Air Lift Pit, PUV-WM-213	057498-A4	Capped and abandoned outside CPP-604 Air Lift Pit	057498-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped and abandoned in place. Location of abandoned pipe cap is unknown. Original Termination point is unknown.
256	3" PU-2297Y	Connects to 3" PWM-1002Y (item 244) between Waste Tank Vault and CPP-604 Air Lift Pit	CPP-604 Air Lift Pit, 1" PUA-1008	057498-A4	Waste Tank Vault, 3" PWM-1002Y (item 244)	057498-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This is a RCRA controlled pipeline. Unable to determine from drawings if this pipeline runs underground before terminating at pipeline 3" PWM-1002Y (item 244) in the Waste Tank Vault or if it remains inside building (CPP-604 Air Lift Pit).
257	2" PWM-20025C	Capped outside CPP-604, Waste Tank Vault and abandoned in place	CPP-604, Waste Tank Vault	057498-B4	Capped and abandoned outside Waste Tank Vault	057498-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Capped outside Waste Tank Vault and abandoned in place. Location of abandoned pipe cap is unknown.
258	1 1/2" PUA-10013C	Carries process waste from 2" PUA-104853 (items 245, 246) to VES-WM-100	2" PUA-104853 (items 245, 246), connection located between Valve Box C30 and Waste Tan Vault	057499-A3 057498-D4	Waste Tank Vault, VES-WM-100	057498-A5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 2" PUA-104853 (items 245, 246) at an unknown location somewhere between Valve Box C30 and Waste Tank Vault.
259	2" PUA-104854	Carries process waste from CPP-601, Y-Cell to 2" PUA-104853 (items 245, 246)	CPP-601 Y-Cell	091181-C1	DVB-WM-PW-C30, 2" PUA-104853 (items 245, 246)	057499-A4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries process waste from CPP-601, Y-Cell through Valve Box C31 (PUV-YDA-332, 333), C29 and C30 (PUV-WM-327) where it terminates at 2" PUA-104853 (items 245, 246). This is a RCRA controlled pipeline.

Table C-1. (continued).

260	3" PLA-110205	Carries process waste from CPP-601 Deep Tanks to Valve Box C32	CPP-601 Deep Tanks	057005-D1	DVB-WM-PW-C32, HV-WM-38	057499-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from CPP-601, Deep Tanks through Valve Box C29 and terminates inside Valve Box C32. This is a RCRA controlled pipeline.
261	3" PLA-110206	Carries process waste from CPP-601, Deep Tanks to Valve Box C32	CPP-601 Deep Tanks	057005-D1	DVB-WM-PW-C32, HV-WM-39	057499-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from CPP-601, Deep Tanks through Valve Box C29 (PLV-YDA-21) and terminates inside Valve Box C32. Prior to termination 3" PLA-105559 (item 262) attaches to this pipeline outside Valve Box C32. This is a RCRA controlled pipeline.
262	3" PLA-105559	Carries process waste from Valve Box D2 to 3" PLA-110206 (item 261)	DVB-WM-SW-D2, RCV-WM-191	057499-C5	3" PLA-110206 (item 261)	057499-C5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	3" PLA-105559 attaches to 3" PLA-110206 (item 261) outside Valve Box C32.
263	1 1/2" PWA-1561	Carries process waste from CPP-641, VES-WL-105 Hot Tank to Valve Box C29	CPP-641, VES-WL-105 Hot Tank	111804-B3	DVB-YDA-PW-C29, PUV-YDA-326	057499-A6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from CPP-641, VES-WL-105 through Valve Box C28 and C33 to Valve Box C29.
264	2" PWA-1560	Carries process waste from Valve Box C28 to Valve Box C29	DVB-YDB-PW-C28, PLV-YDB-125	057499-B2	DVB-YDB-PW-C29, PUV-YDA-326	057499-B6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline carries process waste from Valve Box C28 through Valve Box C33 to Valve Box C29

Table C-1. (continued).

265	6" PLA-105556	Carries process waste from Valve Box D1 to CPP-763, VES-WM-191	DVB-WM-SW-D1, SWV-WM-12, 14	057499-D5	CPP-763, VES-WM-191	057499-C7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline T's outside Valve Box D1. The first T end (6" PLA-105556) continues to CPP-783, VES-WM-191. The second T end (3" PLA-105559 (item 262)) continues to Valve Box D2. 3" PLA-105557 (item 266) attaches to 6" PLA-105556 prior to entering CPP-763. Attachment location is unknown.
266	3" PLA-105557	Carries process waste from Valve Box D3 to 6" PLA-105556 (item 265)	DVB-WM-SW-D3, SWV-WM-16, 17	057499-C6	6" PLA-105556 (item 265)	057499-D6	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline attaches to 6" PLA-105556 (item 265) at an unknown location within the TFF between Valve Box D1, D3 and CPP-763.
267	1 1/2" PL-AR-155563	Carries process waste from CPP-604 Waste Treatment Building to Valve Box C32	CPP-604, Waste Treatment Building, West Tank Room	103589-E8	DVB-WM-PW-C32, PLV-WM-247	057499-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
268	1 1/2" PL-AR-155565	Carries process waste from CPP-604 Waste Tank Vault to Valve Box C32	CPP-604 Waste Tank Vault, Jet-WL-550	096156-A5	DVB-WM-PW-C32, PLV-WM-246	057499-B4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
269	1 1/2" PLA-776	Abandoned Line, Capped inside CPP-642 Pipeline leads to Valve Box C33. Original origin point is unknown.	CPP-642, Capped and Abandoned in place	093025-C7	DVB-YDA-PL-C33	057499-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped and abandoned in place. Unable to determine pipeline origin or termination. It is assumed that the pipeline came from CPP-642. Original origin point is unknown.
270	1 1/2" PLA-100397	Abandoned Line, Capped inside CPP-648. Pipeline connects to 1 1/2" PLA-776 (item 269) which leads to Valve Box C33. Original origin point is unknown.	CPP-C48, Capped and Abandoned in place	056612-A4	1 1/2" PLA-776 (item 269)	057499-A3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped and abandoned in place. It connects to 1 1/2" PLA-776 (item 269) outside Valve Box C33. Unable to determine location of connection. Original origin point is unknown.

Table C-1. (continued).

271	2" PLA-104803	Carries process waste from CPP-764 to Valve Box C28	CPP-764, PLV-SFE-128	093025-C2	DVB-YDB-PW-C28, PUV-YDB-124	057499-B1	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline begins at CPP-764 and travels through Valve Box C27 (PLV-FE-116) and terminates at Valve Box C28. This is a RCRA controlled pipeline.
272	2" PUV-YDB-217	Carries process waste from CPP-641, WL-104 to Valve Box C28	CPP-641, VES-WL-104 Hot Tank	111804-C1	DVB-YDB-PW-C28, 2" PWA-1560 (item 264)	057499-B2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
273	2" PL-AR-108760	Carries process waste from CPP-1619 to 2" PLA-104803 (item 271)	CPP-1619, PLV-SAB-3	057499-D1	2" PLA-104803 (item 271)	057499-C3	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste will drain into Valve Box C28.
274	2" PL-AV-8603	Carries process waste from VES-FT-134 to Valve Box C27	CPP-666, VES-FT-134	142709-G7	DVB-SAA-PL-C27, PLV-FE-117	057499-C2	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
275	6" PLA-100164	Carries process waste from CPP-750 to Valve Box D1	CPP-750, FE-YDA-750-1	092475-D3	DVB-WM-SW-D1, SWV-WM-14	057499-D5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Two items with the same pipeline are given to distinguish between the active (item 275) and abandoned (item 276) pipeline sections. Item 275, 6" PLA-100164 is an active pipeline and transfers process waste from CPP-750 to Valve Box D1 .
276		Abandoned Line, Capped outside Valve Box D1	DVB-WM-SW-D1, Blind Flange	057499-D5	Capped and abandoned in place outside DVB-WM-SW-D1	057499-D4	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	Item 276. 6" PLA-100164 is an abandoned pipeline. A blind flange is attached to this pipeline inside Valve Box D1. It is also capped outside Valve Box D1. The location of cap within the TFF is unknown.

Table C-1. (continued).

277	1" PUA-8	Abandoned Line, Carried process waste from 1" PWA-21 (item 34) to VES-WM-106	CPP-601, N-Cell, capped and abandoned	091498-D1	PUV-WM-100 adjacent to VES-WM-106	057500-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is abandoned in place however it looks as if it can connect to 1" PPA-19 (item 278) via an above grade temporary hose connection if needed.
278	1" PPA-19	Abandoned Line, Capped outside VES-WM-106 at grade level	Above grade cap before PUV-WM-110 adjacent to VES-WM-106	057500-D8	VES-WM-106	057500-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped and abandoned however it looks as if it can connect from 1" PUA-8 (item 277) to 1" PPA-19 via an above grade temporary hose connection.
279	1" PWA-19	Carries process waste from 1" PUA-8 (item 277) to VES-WM-106	1" PUA-8 (item 277)	091498-D1	VES-WM-106	057500-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
280	1" PWA-15	Carries process waste from 1" PUA-1 and 1" PUA-2 to VES-WM-103	1" PUA-1 1" PUA-2	091498-D1	VES-WM-103	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Pipeline 1" PUA-1 connects to 1" PWA-15 before it terminates at VES-WM-103.
281	1" PUA-6	Abandoned Line, Capped above grade next to VES-WM-103 and abandoned in place	1" PUA-5	057500-C6	Above grade cap after PUV-WM-102 adjacent to VES-WM-103	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped and abandoned however it looks as if it can connect to 1" PPA-15 (item 282) via an above grade temporary hose connection.

Table C-1. (continued).

282	1" PPA-15	Carries process waste from 1" PUA-1 to VES-WM-103. Connection located above grade.	Above grade adjacent to VES-WM-103, PUV-WM-101 and 103	057500-D6	VES-WM-103	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects to two valves above grade and outside VES-WM-103. The first valve (PUV-WM-101) connects to 1" PUV-1 the second valve (PUV-WM-103) connects to 1" PUA-2 (item 283) which is capped and abandoned.
283	1" PUA-2	Abandoned Line, Capped above grade adjacent to VES-WM-103	Above grade blind flange outside VES-WM-103 unknown location	057500-D6	PUV-WM-103, above grade	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This capped and abandoned pipeline looks as if it can connect PUV-WM-102 to PUV-WM-103 via a temporary hose connection.
284	1" PPA-16	Begins above grade at PUV-WM-104 and leads to VES-WM-103.	Blind flange next to PUV-WM-104 located above grade adjacent to VES-WM-103	057500-D6	VES-WM-103	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is capped and abandoned in place through pipeline 1" PUA-3 (item 285) which is capped and abandoned in place
285	1" PUA-3	Abandoned Line, Capped above grade adjacent to VES-WM-103 and carried waste to PUV-WM-104.	Above grade blind flange outside VES-WM-103 unknown location	057500-D6	PUV-WM-104, above grade	057500-D6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This above grade pipeline is abandoned in place through a blind flange which leads to 1" PPA-16 through valve PUV-WM-104.
286	(1" PWA-17) 1" PUA-5	Abandoned Line, Carried process waste from CPP-601, N-Cells to above grade blind flange. Original termination point is unknown.	CPP-601, N-Cell	091498-D1	Above grade blind flange adjacent to PUV-WM-109 and VES-WM-105	057500-D2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This abandoned pipeline connects to 1" PUA-6 (item 281) and 1" PUA-7 (item 287) and runs through valve PUV-WM-105 and 106 before terminating at above grade blind flange adjacent to VES-WM-105. Original termination point is unknown.
287	1" PUA-7	Abandoned Line, Carried process waste from 1" PUA-5 (item 286) to an above grade connection. Original termination point is unknown.	1" PUA-5 (item 286)	057500-C4	Capped and abandoned above grade next to VES-WM-104 by PUV-WM-106 at an unknown location	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This above grade pipeline is abandoned in place through a blind flange adjacent to PUV-WM-106. Original termination point is unknown.

Table C-1. (continued).

288	1" PPA-18	Abandoned Line, Carried process waste from an above grade connection to WM-104. Original origin point is unknown.	Blind flange next to PUV-WM-107 located above grade adjacent to VES-WM-104	057500-D4	CPP-717B, VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Although capped, this line appears as if it can connect 1" PUA-7 (item 287) via an above grade temporary hose connection. Original origin point is unknown.
289	1" PPA-17	Abandoned Line, carried process waste from an above grade connection adjacent to VES-WM-105. Original origin point is unknown.	Blind flange next to PUV-WM-109 located above grade adjacent to VES-WM-105	057500-D2	CPP-717C, VES-WM-105	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Although capped, this line appears as if it can connect 1" PUA-5 via an above grade temporary hose connection. Original origin point is unknown.
290	1" SWA-104825	Carries sump liquid waste from CPP-717A through D to 3" SWA-104825 (item 291)	CPP-717A, Jet WM-503-4 CPP-717B, Jet WM-504-4 CPP-717C, Jet WM-505-4 CPP-717D, Jet WM-506-4	057500-E8	3" SWA-104825 (item 291), four locations	092471-C1	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline connects all CPP-717A through D sumps to 3" SWA-104825 (item 291). It is interesting to note that 4 separate and distinct pipes leading from 4 different sumps to 3" SWA-104825 (item 291) and are called the same pipe name in Drawing 057500. These pipelines travel through PLV-WM-14, 16, 18 and 20 before terminating.
291	3" SWA-104825	Carries sump liquid from 1" SWA-104825 (item 290) to 4" SWA-104825 (item 292)	Near tank VES-WM-106	057500-E8	Near tank VES-WM-105, Pipe Reducer	057500-E2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	The reducer location that connects 3" SWA-104825 to 4" SWA-104825 (item 292) is unknown.
292	4" SWA-104825	Carries sump liquid from 3" SWA-104825 (item 291) to 6" SWN-100180 (item 303)	Near tank VES-WM-105, Pipe Reducer	057500-E2	6" SWN-100180 (item 303)	092471-C1	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	Process waste terminates at CPP-754
293	1" PLA-104810	Carries CPP-717D sump liquid to VES-WM-106	1" SWA-104825 (item 290)	057500-D8	VES-WM-106	057500-D7	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries sump liquid through valve PLV-WM-19 before it terminates into VES-WM-106

Table C-1. (continued).

294	1" PLA-104809	Carries CPP-717C sump liquid to VES-WM-106	1" SWA-104825 (item 290)	057500-E6	VES-WM-105	057500-D5	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries sump liquid through valve PLV-WM-17 before it terminates into VES-WM-106
295	1" PLA-104808	Carries CPP-717B sump liquid to VES-WM-106	1" SWA-104825 (item 290)	057500-E4	VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries sump liquid through Valve PLV-WM-15 before it terminates into VES-WM-106
296	1" PLA-104807	Carries CPP-717A sump liquid to VES-WM-106	1" SWA-104825 (item 290)	057500-E2	VES-WM-103	057500-D2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This line carries sump liquid through Valve PLV-WM-13 before it terminates into VES-WM-106
297	3" PPA-2	Carries process waste from VES-WM-103 to VES-WM-104	VES-WM-103, Jet WM-521	057500-D5	VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is one of two pipelines that transfers process waste from WM-103 to WM-104
298	3" PPA-1	Carries process waste from VES-WM-103 to VES-WM-104	VES-WM-103, Jet WM-511	057500-D5	VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is the second pipeline that transfers process waste from WM-103 to WM-104
299	3" PPA-13	Carries process waste from VES-WM-103 to VES-WM-104	VES-WM-103	057500-D5	VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is an overflow line from WM-103 to WM-104
300	3" PPA-3	Carries process waste from VES-WM-104 to VES-WM-105	VES-WM-104, Jet WM-522	057500-D3	VES-WM-105	057500-D2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is one of two pipelines that transfers process waste from WM-104 to WM-105
301	3" PPA-4	Carries process waste from VES-WM-104 to VES-WM-105	VES-WM-104, Jet WM-512	057500-D3	VES-WM-105	057500-D2	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is the second pipeline that transfers process waste from WM-103 to WM-104
302	3" PPA-14	Carries process waste from VES-WM-104 to VES-WM-105	VES-WM-103	057500-D5	VES-WM-104	057500-D4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is an overflow line from WM-104 to WM-105

Table C-1. (continued).

303	6" SWN-100180	Carries sump liquid from CPP-717 sumps and other liquid process waste to CPP-754	CPP-634, Floor Drain	056980-E6	CPP-754	092471-C1	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	This pipeline is located somewhere outside CPP-619.
304	4" PWM-18032C	Abandoned Line, carried process waste CPP-604 to an unknown termination point. Original pipe termination point is unknown	CPP-604	377829-C7	Capped and Abandoned	057502-F7	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
305	6" PL-AR-113802	Carries process waste from 3" PL-AR-113806 (item 218), 3" PL-AR-113800 (item 220) and 3" PL-AR-113801 (item 221)	3" PL-AR-113806 (item 218)	096156-B7	DVB-WL-PL-C38	096156-D5	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	3" PL-AR-113800 (item 220) and 3" PL-AR-113801 (item 221) connect to 6" PL-AR-113802 before it terminates inside Valve Box C38. This is a RCRA controlled pipeline
306	1" CT-AR-15427B	3" PUA-610 (item 78) and 3" PUA-609 (item 77) encasement drain line. Carries drain waste to CPP-783 south sump	3" PUA-610 (item 78) and 3" PUA-609 (item 77) encasement drain	057501-C4	CPP-783 south sump	057501-B4	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	
307	¾" PE-AR-151741	Carries process waste from CPP-708 to 3" PLA-10111 (item 226)	CPP-708	368931-D5	3" PLA-10111 (item 226)	096156-A8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	This is a RCRA controlled pipeline
308	½" LA2N-106922	Carries process waste from waste solvent storage system to 1" L12-NN-110602 (item 229)	Waste Solvent Storage System VES-NCE-184	058620-F8	1" L12-NN-110602 (item 229)	096156-B8	Pipe in Pipe	Schedule 40, seamless or welded, 347 SST or 304L SST	
309	½" PUA-642	Carries process waste from 10" VGA-605 to 3" PUA-630 (item 100).	10" VGA-605	057502-F6	3" PUA-630 (item 100).	057502-F6	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST	

Table C-1. (continued).

310	½" PUA-1015	Carries process waste from 10" VGA-1001 to WM-186.	10" VGA-1001	057502-C3	VES-WM-186	057502-C3	Concrete Encased	Schedule 40, seamless or welded, 347 SST or 304L SST

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[i] [ ] Indicate most recent pipeline names

[ii] { } Indicate pipeline diameter dimension taken from drawings but not used by the author.

Appendix D

Identification Table of Tank Farm Process Waste Pipelines Crossing the Tank Farm Perimeter

Appendix D

Identification Table of Tank Farm Process Waste Pipelines Crossing the Tank Farm Perimeter

The following table was constructed to help identify Tank Farm process waste pipelines that cross the Tank Farm perimeter. For clarity, the table is divided into several descriptive columns. A description of each individual column from left to right is as follows:

Column Number	Column Identifier	Description
1.	Item Number	A unique number given to represent each pipeline within the identification table.
2.	Identification Number	Provides the pipeline names as called out in drawings.
3.	Description	Provides descriptive pipeline use information.
4.	Origin and Termination	Describes the location where each pipe begins and where each line ends. Includes reference drawings.
5.	Reference Drawings	Provides reference drawing numbers followed by grid location.
6.	Secondary Containment	Estimated secondary containment type.
7.	Pipeline Material	Identifies material pipeline was made from.
8.	Pipe Elevation	Describes pipeline origin and termination elevation.
9.	Comments	Discusses additional pipeline information.

Table D-1. Tank Farm pipelines crossing the Tank Farm perimeter.

1	6" SWN 100180	Carries Service Waste from CPP-606 to CPP-634	CPP-606	055321 E5	CPP-634	500176 E4	Unknown	Carbon Steel	Unknown	4904.4	On drawing 500176 grid E4 the 6" line makes a 90 degree bend into a 4" line. The 4" line extends approximately 15' into building CPP-634. Crosses fence Grid E3 Drawing 55321
2	4" SWA 104825	Carries Service Waste from 12" SWN-100176 to CPP 619	Pipe 12" SWN-100176	055321 D4	CPP-619	500177 F7	Unknown	Schedule 40 Seamless or Welded 304L SST or 347 SST	4909.4	4909.4	Verified origin with TFF Engr. D. Machovec. Crosses fence Grid D3 Drawing 55321
3	2"PU-AR 104853	Carries Process Waste from CPP-601 to 3" PUA 104853 to VES-WM-178	CPP-601	057567 C6	VES-WM-178 from 3" PUA 104853 through DVB-WM-PW-C30	55328 E5	Pipe in Pipe	Schedule 40 Seamless or Welded 304L SST or 347 SST	4904.9	4898.4	Process waste line PU-AR 104853 passes through the C-30 Valve Box. From the valve box the process waste is transferred to tank VES-WM-100. Crosses fence Grid G3 Drawing 55327
4	2"PU-AR 104854	Carries Process Waste from CPP-601 to 2" PUA 104854 to DVB-WM-PW-C30	CPP-601	057567 D6	DVB-WM-PW-C30 into 2" PUA 104853	55328 E5	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	4904.9	4898.8	2" PU-AR also listed as 2" PUA-104854 Process waste lines PU-AR 104854 terminates in the C-30 Valve Box. Pipe PU-AR 104854 connects into PU-AR 104853 (item 3) in the valve box. Crosses fence Grid G3 Drawing 55327.
5	3" PL-AR 110205	Carries Process Waste from CPP-601 to DVB-WM-PL-C32	CPP-601	055327 G6	DVB-WM-PL-C32 into 3" PL-AR 113800	500181 D7	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	4910.1	4900.2	Line terminates in vault C-32 From there the waste exits in different pipes. Crosses fence Grid G3 Drawing 55327
6	3" PL-AR 110206	Carries Process Waste from CPP-601 to DVB-WM-PC-C32	CPP-601	055327 G6	DVB-WM-PL-C32 into 3" PL-AR 113801	500181 D7	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	4910.1	4900.2	Line terminates in vault C-32 From there the waste exits in different pipes. Crosses fence Grid G3 Drawing 55327
7	3"PY-2401Y	Abandoned Line, Carried Process Waste from CPP-601 to Dead End. Original termination point is unknown.	Cut and Capped Outside CPP-601	057567 D6	Cut & Capped Dead End	55328 E6	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	4902.8	Unknown	Also listed as 3"PWA-2401Y Pipe Cut & Capped Both Ends. Crosses fence Grid F3 Drawing 55327. Original termination point is unknown.
8	3" PU-2297	Abandoned Line, Carried Process Waste From CPP-601 to Dead End.	Cut and Capped Outside	055327 G6	Cut & Capped Dead End	55328 E6	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or	4903.8	Unknown	Also listed as 3" PWA-2297 Pipe Cut & Capped Both Ends. Crosses fence Grid F3 Drawing 55327. Original

Table D-1. (continued).

		Original termination point is unknown.	CPP-601					347 SST			termination point is unknown.
9	3" PLA-105559	Carries Process Waste from CPP-750 to PL-AR-110206 (item 6)	CPP-750	055327 E5	Pipe PL-AR 110206 (item 6)	55327 G3	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	4901.5	Connects to Pipe 3" PL-AR 110206 (item 6). Pipe crosses TFF fence at Grid F3 on drawing 55327
10	6" PLA-100164	Abandoned Line, Carried Process Waste from CPP-750 to Capped Dead End. Original termination point is unknown.	CPP-750	055327 E5	Cut & Capped Dead End	92094 C4	Unknown	Schedule 40 Seamless or Welded 304L or 347 SST	4906.6	4910.7	Crosses Fence at Grid F3 Drawing 55327. The 6" PLA-100164 still carries process waste from CPP-750 to value box DVB-WM-SW-D1. The waste is then diverted to the north in pipe 6" PLA-105556. The 6" PLA-100164 continues on to the east and northeast from the D1 Valve Box. It is abandoned in this section. The D1 vault is located on Drawing 055327-E3.. Original termination point is unknown.
11	3" PLA-1009C	Abandoned Line, Carried Process Waste from CPP-601 to VES-WL-101 & 102. Original termination point is unknown.	CPP-601	056227 G7	Cut and Capped Near TankVES-WL-101 & 102	500181 E7	Pipe in concrete encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4909.8	4897.0	Crosses Fence at Grid F3 Drawing 55327 Also listed as 3" WB-1009C (item 11). Original termination point is unknown.
12	3" PLA-1019 C	Abandoned Line, Carried Process Waste from CPP-601 to VES-WL-101 & 102. Original termination point is unknown.	CPP-601	056227 G7	Cut and Capped Near VES-WL-101 & 102	500181 E7	Pipe in concrete encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4900.6	4897.0	Crosses Fence at Grid F3 Drawing 55327 Also listed as 3" WB-1019C (item 11). Original termination point is unknown.
13	3" PLA-1004C	Abandoned Line, Carried Process Waste from CPP-601 to VES-WL-101 & 102. Original termination point is unknown.	CPP-601	056227 G7	Cut and Capped Near VES-WL-101 & 102	500181 E7	Pipe in concrete encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4900.6	4897.0	Crosses Fence at Grid F3 Drawing 55327 Also listed as 3" WB-1004C (item 13). Original termination point is unknown.

Table D-1. (continued).

14	10"SWA - 100167	Carries Service Waste from MAH-YDA-SW-143 to CPP-604	MAH-YDA-SW-143	055327 F3	CPP-604	55328 D4	Unknown	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	4905.8	Crosses Fence at Grid F3 Drawing 55327 10" SW-NH-108585 (item 15) Feeds this line See drawing 161474 & 161477
15	10" SW-NH-108585	Carries Service Waste from CPP-750 to MAH-YDA-SW-143	CPP-750	055327 E5	MAH-YDA-SW-143	55327 F3	Unknown	Polyethylene	Unknown	Unknown	NH is Polyethylene from Appendix M Coding Manual
16	1" PWA - 8	Carries Process Waste from CPP-601 to VES-WM-106	CPP-601	055327 E6	VES-WM-106	55322 E5	Pipe DB w/SST Liner	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	Unknown	Also labeled PUA-8 (Concrete Duct Bank noted on Drawing 55321) Pipe crosses TFF fence at Grid E3 Drawing 55327
17	1" PWA - 5	Carries Process Waste from CPP-601 to VES-WM-105	CPP-601	055327 E6	VES-WM-105	55322 E6	Pipe Duct Bank w/SST Liner	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	4898.8	Also labeled PUA-5 Pipe crosses TFF fence at Grid E3 on drawing 55327
18	1" PWA - 4	Carries Process Waste from CPP-601 to VES-WM-106	CPP-601	055327 E6	VES-WM-106	55322 E6	Pipe Duct Bank w/SST Liner	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	4898.8	Also labeled PUA-4 Pipe crosses TFF fence at Grid E3 on drawing 55327
19	1" PWA - 1	Carries Process Waste from CPP-601 to VES-WM-103	CPP-601	055327 E6	Other Pipe and VES-WM-103	55321 F3	Pipe Duct Bank w/SST Liner	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	Unknown	Also labeled PUA-1 Pipe crosses TFF fence at Grid E3 on drawing 55327
20	3" PLA-100611	Abandoned Line, Carried Process Waste from DVB-OGF-DG-D8 to PWA 100538 (item 21)	DVB-OGF-DG-D8	055333 F6	Frank Ward - TFF Engr said it Taps into 3" PWA 100538 (item 21)	500183 C5	Pipe in Pipe	Schedule Seamless or Welded 304L or 347 SST	Unknown	Unknown	Pipe labeled 1" PLA-100611 extends south from vault DVG-OGF-DG-D8 and goes to the north and east to DVB-OGF-DG-D5. Acts as a small drain from vault D5 to D8
21	3" PWA 100538	Carries Process Waste from CPP-649 to 3" PWA 100510	CPP-649	055333 G6	3" PWA 100510	500183 F5	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	4913.8	3"PWA 100510 terminates in Bldg. 604 - one ft. east of intersection
22	3" PLA 101198	Carries Process Waste from CPP-649 to CPP-604	CPP-649	055333 F6	CPP-604	500183 C5	Pipe in Pipe	Schedule 40 Seamless or Welded 304L or 347 SST	Unknown	Unknown	To floor drain in south off-gas cell in CPP-604

Table D-1. (continued).

23	3"PLA 100593	Carries Process Waste from CPP-604 to CPP-708	CPP-604	0500182 E7	CPP-708	500182 C5	3" Pipe in 5" Pipe Encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4907.0	4907.0	Crosses TFF Fence Grid D5 Drawing 500182
24	3"PLA-101111	Abandoned Line, Carried Process Waste from CPP-633 to DVB-WL-PL-C37. Original origin point is unknown.	Cut & Capped Outside of CPP-633	055335 E6	DVB-WL-PL-C37	500181 F6	3" Pipe in 5" and 6 " Pipe Encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4903.9	4889.2	Crosses TFF Fence Grid D7 Drawing 500180. Original origin point is unknown.
25	2" PL-AD 102750	Carries Process Waste from CPP-692 to CPP-659	CPP-692	0500180 E7	CPP-659	500179 E7	2" Pipe in 8" Pipe and Concrete Encasement	Schedule 40 Seamless or Welded 304L or 347 SST	4914.0	Unknown	Crosses TFF Fence Grid E6 Drawing 500180
26	1" PLA 106923	Carries Process Waste from DVB-OGF-PL-D4 to CPP--694	DVB-OGF-PL-D4	0500180 E7	CPP-694	56182 C5	Unknown	Schedule 40 Seamless or Welded 304L or 347 SST	4905.7	Unknown	Crosses TFF Fence Grid E6 Drawing 500180
27	1/2 " OW-AD 104404	Carries Organic Waste (solvent) from CPP-659 to CPP-694	CPP-659	055329 E7	CPP-694	56182 C4	Unknown	Schedule 40 Seamless or Welded 304L or 347 SST	4901.8	Unknown	Crosses TFF Fence Grid E5 Drawing 500180
28	3" PWA 1030	Abandoned Line & Grouted, Carried Process Waste from CPP-633 to DVG-WM-PW-B4. Original origin point is unknown.	Cut and Capped outside of CPP-633	055335 E5	DVB-WM-PW-B4	59837 E3	Pipe in Pile Supported Concrete Trench	Schedule 40 Seamless or Welded 304L or 347 SST	4899.3	Unknown	Pipe goes north from CPP 633 under building CPP 659 to vault B4. Abandoned in place & grouted. Original origin point is unknown.

THE CONTENTS OF THIS SECTION ARE
THE HIGHEST QUALITY AVAILABLE

INITIAL mmO DATE 4/17/02

Appendix E-1
Supervisor's Daily
Logbook

Supervisor's Daily Logbook

LOCKHEED MARTIN

Lockheed Martin Idaho Technologies Company

INTERDEPARTMENTAL COMMUNICATION

Date:	November 5, 1998	
To:	Ross E. Johnson	MS 3650
From:	Gail Hantman	MS 5105
Subject:	Location of Document	

I have located the document you requested; i.e,. entry in WCF Supervisor's Log Book for 08/25/77, Page 33. The document image is on a microfilm reel located in CPP-1605, Series 400, Reel 4. The original document was sent to the retention center at CFA - located in Box 36978, Space 132 D.

I have enclosed a copy of the page from the microfilm reel and copies of the pages/entries in the document control operations records indexes that identify the microfilm reel and the location of the storage box at the records retention center. A request for retrieval of the original document has been made. Judy Hamilton, of the retention center, informed me this morning that the box has been sent to the federal retention center in Washington. She has requested that it be shipped back to us which will take 8 – 10 days. You will contacted when we receive the box.

I hope this will help you with your research effort.

Enclosures

Gail Hantman

ID F-1324.1
(Rev. 09-80)

ORIGINAL COPY

DEPARTMENT OF ENERGY
IDAHO OPERATIONS OFFICE

Receipt No. 4947

RECORDS STORAGE RECEIPT

Page 1 of 1

Branch EXXON NUCLEAR IDAHO COMPANY   Section PRODUCTION SERVICES

Requested Disposition of Material (Check One)   ☒ Storage   ☐ Destruction

Contents and Dates (Include Necessary Identification for Future Reference)	Official Retention Period	Disposal Authority DOE Order 1324.2	To be Completed by Records Management Personnel: Retention Period Expires	Date of Destruction	Location: Box No.	Location: Space
List Boxes Numerically: 100 1. WCF Supervisors Log Books (5/13/77 to 6/8/79)	75 Years	C-25-6.c	12-31-2054		36978	132 D
2. WCF Supervisors Log Books (6/8/79 to 3/11/81 shutdown)			12-31-2056		36979	132 C
105 3. WCF & Tank Farm Operation Log Books (9/2/77 to 8/29/81)			"		36980	"
(Has Been Microfilmed)						
LIFETIME RECORD						

I certify that no classified matter is contained in this shipment   R. E. Sorenson R E Sorenson   Date 2/24/82
Section Supervisor

Complete in triplicate and send Original and first copy with Shipment to CFA-674-E

I certify that the above records were received by records management   H W Ng   Date 3-11-82

Upon completion, first copy will be returned to   M. L. Bernard M L Bernard   CPP-602 (603776)   Rm. 234
Name   Address   Location

(Replaces ID F-32 which may be used.)

PRODUCTION DEPARTMENT REEL ASSIGNMENTS

REEL NO. Storage receipt No. 4947	TITLE	DATE Processed	Received
400- 4 ~~4718~~	SUPERVISOR'S LOG BOOKS 5/13/77 -thru- 3/4/79		
400- 5 ~~4718~~ 4947	SUPERVISOR'S LOG BOOKS 3/5/79 -thru- 2/6/81		
400- 6	SUPERVISOR'S LOG BOOKS 1974 -thru- 1984		
400- 6A	WCF OPERATORS LOG 1976 -thru- 1985		
400- 7	WCF FRUN #9 Data Sheets 7/3/79 -thru- 3/20/81		
400- 8	WC-3 WCF FEED TANK & NOZZLE Data		
400- 9	WC-6 PRESSURE DATA 2/12/79 -thru- 3/20/81		
400- 10	WC-8 PURGE & Blast Air Data to Slide Valver		
	7/1/78 -thru- 3/20/81		
400- 11	WCF Daily Report Run H-9 6/1/79 -thru- 3/14/81		
400- 12	WCF RUN #9 DATA Sheets 10/28/80 -thru- 12/27/81		
400- 13	WCF RUN PLANS #3 to #9 8/14/68 -thru- 7/27/81		
400- 14	WCF Shutdown Readings 1/4/82 -thru- 3/11/84		
400- 15	WCF & NWCF 1990 -thru- 1991		

PRODUCTION DEPARTMENT REEL ASSIGNMENTS

SERIES 400

REEL NO.	TITLE	DATE Processed	Received
400-0001	Solid Storage WC-115-2, -3, -4	5/13/80	6/80
0002	Temp. of Solid Storage WC-136-, -2, -3, -4, -5, -6, -7	5/13/80	6/80
0003	Solids Storage III Temp. WC-140-1, -2, -3, -4	5/13/80	6/80
	-5, -6, -7 & Vault Temperatures		
0004	WCF Shift Supervisors Operating Logs 77 to 79	3/4/82	3/5/82
0005	WCF Shift Supervisors Operating Logs 79 to 81	3/3/82	3/5/82
0006	WCF Supervisors & Operation Logs 1974 to 1981	3/3/82	3/5/82
0006 Cont.	WCF Operation Logs 3/8/74 to 5/4/79	7/12/82	7/14/82
007	WCF RUN #9: WC-1 & WC-2	4/15/82	5/20/82
008	WCF RUN #9: WC-3, WC-4, WC-5	4/15/82	5/20/82
009	WCF RUN #9: WC-6, WC-7	4/15/82	5/20/82
010	WCF RUN #9: WC-8, WC-9	4/15/82	5/20/82
011	WCF RUN #9: Data Sheets and WC-9 cont.	4/15/82	5/20/82
012	WCF RUN #9 Data sheets 10/75 to 12/81	4/15/82	5/20/82
013	RUN PLANS #3 to #9 8/14/68 to 3/18/81	7/20/82	8/24/82
400-0001 add on	WC-115 Solid Storage 1982	1/28/83	2/2/83
002 add on	WC-136 Solid Storage 1982	1/28/83	2/2/83
03A add on	WC-140 Solid Storage 1982 (1/80-12/81Prev.)	1/28/83	2/2/83
014	WCF Data Sheets for 1982	1/28/83	2/2/83
400-0006-A	WCF Operator Log Books 1977 to 1982	2/2/83	2/11/83
014 add on	WCF RUN PLAN #H-9 Issued 12/5/80	3/17/83	3/21/83
002 add on	WCF-115-1 Temps. 1983 & WC-136 1983/84	7/25/84	8/23/84
003A add on	WC-140 Solids Storage 2/1/83 to 7/9/84	7/25/84	8/23/84
0014 add on	WCF Shutdown Data, WC-114, WC-119 1983/84	7/25/84	8/23/84
06A Add on	WCF OPERATORS LOG BOOKS	2/28/86	3/5/86

8-25-77 "D" 1600-2400

SHIFT (3) HELPERS:

CPP OPERATIONS			
HLA		MMM	
		RWM	[illegible]
FDS	[illegible]	FLM	
LWB		WAM	[illegible]
		ECN	
RCC		GFO	
LEC		GKO	
HDD	[illegible]	MJP	[illegible]
		KER	
SFF		JMS	JT
		RDT	
BH		LDW	
JLL		LOZ	
JKL	JKL		

1. Pumped WL-10 [illegible] steam on steam
2. Operated WL-14 locate leak in
   change. [illegible] tween CPP-655 & CPP-636.
3. Completed pressure steam line in (2)
4. Calciner is C. boiler house secure
5. 603 shipped (leaving). [illegible]

[illegible]

[illegible] to the calciner to
[illegible] area. - H.P. office & operating corridor.
[illegible] waste truck.

[illegible] @ CPP-604, 605,
[illegible]9, 619 & CPP-628.

[illegible] waiting for H.P. to
[illegible] H.P. ropes can be
the calciner. -

[illegible] properly all shift.

Appendix E-2
Occurence Report
UOR 86-0034 10/22/86

Occurrence Report

OUR 86-0034

10/22/86

Side 1 of Form

UI - 64573

9070889

ENVIRONMENTAL COMPLIANCE
Correspondence Control Form

Correspondence Description: Transfer of File All Units - Tank Farm Release Near Valve Box A-2 - CPP-79

Correspondence Source/Originator: Brenda Cole

Correspondence Date: June 11, 1991

☐ Incoming ☐ Significant Outgoing ☐ Other Outgoing (Check One)

If significant outgoing, fill out the reverse side before distribution or route.

EC Department Distribution & Route:	Route	Copy	Action	Specific Comment
Earle, O. K., *Mgr Env Restoration & Assessments*				
Franz, G. R., *Mgr Env Permitting & Regulations*				
Linhart, J. G., *Mgr Env Assessments & Administration*				
Stuart, L. R., *Mgr Environmental Assurance*				
Umek, A. M., *Department Manager*				
Pointer, T. F., *Special Assignment*				
Dee Williamson		X		Copy of EC Correspondence Control Form only

Other Distribution & Route:	Route	Copy	Action	Specific Comment
ER Section File		X		B. Holder please start new file CPP-79

	Copy	File Code	Specific Comment
Environmental Records Center (ERC)	X		CPP-79

Action:

Requires Action Item Tracking: ☐ Yes ☐ No
Requires Revision of Action Item: ☐ Yes ☐ No
Closes Out Action Item: ☐ Yes ☐ No

Description/Item Number (if applicable):

If new or revised action item, specify Due Date:

	Copy	Track Sys Type*	Specific Comment
Archibald, J. K., *Action Tracking Coordinator*			

* Identify tracking system type: ECM = Mgr EC only EPR = Env Perm/Reg only EIA = Env Impact Assessments only EAD = Env Administration only EA = Env Assurance only ERI = Env Rest/Int only DEPT = Department Wide

General Comments:

31

Brenda L Cole — June 11, 1991

Signature of Form Originator — Date

ENVIRONMENTAL COMPLIANCE
Correspondence Control Form

...s this correspondence/information close out an action Item: ☐ Yes ☐ No

(If so, in Action Section on front of form, check "yes" in appropriate box, check the Action Tracking Coordinator Copy box and note appropriate information in the "Description/Item Number" box as to which item the document closes out.)

Does this correspondence/information require verification: ☐ Yes ☐ No

If so, obtain verification from EC Quality Assurance (EC QA) and attach the Attachment 3 sheet.

Originator: ______________________ Date: ______________

Does this correspondence/information assign or create an Action item: ☐ Yes ☐ No

If "yes," Action Item Tracking must be initiated on the reverse side of this form.

Identify the signature level for this correspondence/information: ______________________

Approvals Obtained:

Name	Signature	Comment/Remarks

...gnature Authority Approval to release document:

______________________ ______________

Signature Date

Westinghouse Idaho Nuclear Company, Inc.

FORM WINCO-5690 (1-86)

UNUSUAL OCCURRENCE REPORT

1. Report Number: W I N — 8 6 - 0 0 3 4 — C P P
2. ☒ Initial Issue Date: October 22, 1986

   ☐ Interim Issue Date:

   ☐ Final Issue Date:

3. Department: Critique Report Reference No.:

   Production
4. Facility, System, or Equipment:

   NWCF, WCF, PEW Tank Farm
5. Date of Occurrence:

   July 7, 1986

6. Time of Occurrence:

   0230
7. Occurrence Subject:

   Inadvertent Transfer Resulting in Loss of Waste Solution
8. Apparent Cause Categories:

   ☒ Design ☐ Material ☒ Personnel ☐ Procedure ☐ System ☐ Equipment ☐ Process

   ☐ Other:

9. Description of Occurrence:

No analyzed but acidic <2 pH

On July 7, 1986 at 0230, "B" crew attempted to transfer WC-119 (WCF sump tank) to WL-102 (PEW feed tank). The transfer was started. The operator at CPP-604 (PEW) notified the operator at CPP-633 (WCF) that nothing showed up in WL-102. The transfer was stopped after approximately 1,000 gallons of waste solution were transferred. A rise in the WL-101/102 vault sump was then observed. The vault sump was jetted to WL-102 with a net increase in WL-102 of 900 gallons.

The shift supervisor suspected a problem with LR-WL-102 (level recorder). Maintenance personnel were requested to check the level instrumentation for WL-102. Nothing significant was found.

The shift supervisor assumed that the 900 gallons (+ or - 50 gallons) jetted from the WL-101/102 vault sump were in fact part of the missing 1,000 gallons just transferred. However, the WL-101/102 vault sump level was at 14% before the transfer and 15% after the transfer. Thus, approximately 200 to 250 gallons of the 900 gallons jetted from the sump to WL-102 can be attributed to the WC-119 to WL-102 transfer.

Believing all the transfer solution was accounted for, the shift supervisor requested that the transfer be completed. The transfer was started again at 0440. Again, the level in WL-102 did not rise, indicating that the transfer was not received in WL-102. The level in the WL-101/102 vault sump increased 14.5% or approximately 600 gallons; this led the shift supervisor to believe that the transfer was being routed via the WL-101/102 vault sump. During the second phase of the transfer, 1,550 gallons (+ or - 50 gallons) were transferred. The vault sump received 600 gallons (+ or - 50 gallons) which were transferred to WL-102.

(Continued on Page 5)

UNUSUAL OCCURRENCE REPORT

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

10. Operating Conditions at Time of Occurrence:

NWCF shut down for maintenance, PEW evaporator was in operation, and WCF-114 evaporator was in operation.

11. Immediate Evaluation:

Following the August 2 transfer, several theories existed concerning the location of the missing waste solution. One such theory was that the waste solution was in WL-132 (sludge removal tank for WL-133). The level instrumentation for WL-132 only measures the upper 10% of the vessel. This fact left uncertainty concerning the actual volume in the tank. Therefore, WL-132 was filled with water until the level recorder indicated a level. The next step was to recreate the transfer of July 7 using treated water in order to determine if the missing liquid leaked into WL-132. A test manifold was installed on the decon line to 3"PUA-10111 in valve box D-4. Treated water was connected to the test manifold and all valves on the transfer line were closed. The water was turned on; observers were placed at valve boxes D-4, C-8, C-12, and C-37. The level instrumentation for vessels WL-133, WL-132, WL-102 and the WL-101/102 vault sump were monitored for a level increase. No increase in WL-132 was observed; however, approximately 15 minutes after the

(Continued on Pages 5, 6 and 7)

12 Immediate Corrective Action Taken, and Results:

The transfers were terminated when it became apparent that the transfers were not being received in WL-102.

13. Further Evaluation Requirements:

- ☐ Further evaluation is required before continued operations are permitted. See Item 15 for evaluation assignments.
- ☒ Operations may continue but further evaluation is necessary. See Item 15 for evaluation assignments.
- ☐ Further evaluation is not required for the complete assignment of corrective actions.

UNUSUAL OCCURENCE REPORT

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

14. Final Evaluation and Lessons Learned:

☒ To be reported in the Final Report.

15. Permanent Corrective Action:

☒ Taken ☒ Recommended ☐ To be supplied ☐ Scheduled

☐ Above action subtitles listed with each corrective action item when more than one used.

Taken

(1) The operating procedures were changed to indicate that either PLV-WL-187 or PLV-WL-188 must remain open at all times.

Recommended

(2) Lock PLV-WL-188 in the open position.

Action: B. R. Dickey Due: November 7, 1986

(3) Investigate the feasibility of installing a valve on the drain line (1"PUA-205) from valve box A-2 and report the results to Facility Support.

Action: G. F. Offutt Due: December 1, 1986

(4) Investigate methods of sealing the encasements exiting valve box A-2 for 3"PUA-203 and 3"PUA-1013 and report the findings to Facility Support.

Action: G. F. Offutt Due: December 1, 1986

(Continued on Page 8)

UNUSUAL OCCURRENCE REPORT

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

16. Programmatic Impact:

☐ None ☐ As stated

17. Impact on Codes and Standards:

None

18. Similar Unusual Occurrence Report Numbers:

850006

19. Signatures:

Signature: J L Lee Originator Name & Title: J. L. Lee, Manager, Facility Support		Date: 10/20/86
Signature: J. C. Midgett / BAP Name & Title: J. C. Midgett, Assistant Plant Operations Manager		Date: 10/20/86
Signature: M J Green Name & Title: M. J. Green, Manager, Administrative Control		Date: 10/20/86
Signature: Gary F. Offutt Name & Title: G. F. Offutt, Manager, Systems Engineering		Date: 10-21-86
Signature: AJ Matule Name & Title: A. J. Matule, Manager, Environmental Engineering		Date: 10-21-86
Signature: BKD W C Moffitt Name & Title: W. C. Moffitt, Vice President and Manager, Production		Date: 10/22/86
Signature: Dut CJ Volpe Name & Title: C. J. Volpe, Vice President and Manager, N&IS		Date: 10/22/86

OTHER: Use a UOR Continuation Page for additional data and signatures (Form WINCO-5690A)

UNUSUAL OCCURRENCE REPORT
(Continuation Page)

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

9. Description of Occurrence: (Continued)

Approximately 820 gallons of the 2,650 gallons (+ or - 100 gallons) transferred can be accounted for in WL-102, leaving 1,830 gallons (+ or - 50 gallons) still missing. The appropriate data sheets and instrument strip charts for this transfer are included in Appendix-A.

Following the transfer on July 7, Waste Processing Facility Support began investigating the peculiar circumstances surrounding the transfer. In the Plan-of-the-Day (POD), a request was made to have the WL-101/102 vault sump empty before any transfers from the WCF or NWCF to WL-102. Also, the transfer route passes through valve boxes D-4, C-8, C-12, and C-37 (see Appendix-B). Therefore, a request was made that valve boxes C-37, C-12, C-8, and D-4 be observed for leaks during transfers. Several transfers were made in the days following July 7, all utilized the same transfer route and all were without incident.

Analyzed - Acidic Contac Howard Forsyth 6-3644

On August 2 at 1030, "A" crew attempted to transfer NCD-123 (NWCF decon area sump tank) to WL-102. The transfer was started and then stopped when no increase in WL-102 was observed. Approximately 1,289 gallons (+ or - 50 gallons) of waste solution were transferred before the transfer was terminated. The WL-101/102 vault sump increased 11% or approximately 100 gallons. This was jetted to WL-102. The shift supervisor requested that the transfer route valve arrangement be verified. Valve PLV-WL-188 was found to be partially open. The valve was opened completely and the transfer was restarted.

The records indicate that once PLV-WL-188 was fully open, waste solution must have drained from the transfer line into WL-102. As a result, 550 gallons (+ or - 50 gallons) of the 1289 gallons (+ or - 50 gallons) transferred during the first phase of the transfer can be accounted for in WL-102. During the second phase of the transfer, 1,620 gallons (+ or - 50 gallons) were transferred, and 1,676 gallons (+ or - 50 gallons) were received in WL-102. A total of 682 gallons (+ or - 50 gallons) are still missing as a result of this transfer. The appropriate data sheets and instrument strip charts for this transfer are included in Appendix-C.

The volume of waste solution missing, as a result of the two transfers, is 2,512 gallons (+ or - 100 gallons).

11. Immediate Evaluation: (Continued)

test started, an operator heard water running in valve box A-2. The water was shut off to the manifold at valve box D-4, and the water stopped running in valve box A-2 within minutes.

UNUSUAL OCCURRENCE REPORT
(Continuation Page)

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

An investigation of the current tank farm piping prints showed no connection between valve box A-2 and the transfer line from NWCF/WCF to WL-102. However, an investigation of the original 1954 construction prints for A-2 indicated that its drain line along with valve boxes A3A, A3B, and A3C were tied into the transfer line from CPP-738. This transfer line was originally installed to allow the water used for cooling WM-180 to be transferred to WL-102. When A-2 was installed, its drain line was tied into this existing transfer line to WL-102.

A test was run to verify that the drain line from A-2 is actually as shown on the construction prints and not as shown on the current tank farm prints. With PLV-WL-188 open, a garden hose was placed in valve box A-2. The level instrumentation indicated an increase in WL-102, which verified that valve box A-2 does drain to WL-102 through 3"PUA-10111.

If PLV-WL-188 is closed during a transfer, the transferred solution must back up into valve box A-2 through its drain line. Valve box A-2 has four clay tile encased transfer lines which could allow water to exit the valve box. Two line encasements would allow water to enter valve box A-7, one line encasement would allow water to enter WM-181 vault sump and another line encasement would allow water to enter the WL-101/102 vault. Because a significant volume of the water from the transfers on July 7 and August 2 did not show up in the WL-101/102 vault sump, a hypotheses was drawn that the missing water may have been in the WM-181 vault sump. The sump level instrumentation did not indicate a level but this particular sump level instrument had not indicated a level for several years. This left some uncertainty concerning the reliability of this instrument. Therefore, a few hundred gallons of water were placed in the sump. The vault sump was jetted to WM-180.

Approximately 300 gallons were transferred. This was the volume indicated on the vault sump level instrumentation prior to the transfer.

If the missing waste solution did not go to the WL-101/102 vault sump, and if the missing waste solution did not go to the WM-181 vault, then the final possibility for the missing waste solution that entered valve box A-2 is that it went to valve box A-7 which drains to the WM-184 vault. To test this theory, PLV-WL-188 was closed and a garden hose was placed in valve box A-2. Water was run for 30 minutes. When the water level in valve box A-2 stabilized, valve box A-7 was inspected for inleakage of water. No water was discovered.

In order to determine the exact exit route the water was taking out of valve box A-2, a visual inspection of the interior of the valve box was necessary. Therefore, water was once again placed into 3"PUA-10111 through the test manifold in valve box D-4. With all of the valves on

UNUSUAL OCCURRENCE REPORT
(Continuation Page)

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

the transfer line closed, a visual inspection was made of the interior of A-2 while water was entering the valve box through the drain line. The visual inspection indicated that the water was exiting the valve box through the encasement for 3"PUA-203 (to WM-181) and 3"PUA-1013 (to WL-101). The water ran for 90 minutes (600 gallons). No level increase was observed in the WL-101/102 vault sump or in the WM-181 vault sump.

The final test performed was an attempt to determine if solution would go to the WM-181 vault through the encasement for 3"PUA-203 (to WM-181). A garden hose was placed in the encasement for 3"PUA-203. The water was run for 30 minutes. No level increase was observed in the WM-181 sump. However, the WL-101/102 vault sump increased from 0 to 9% (50 gallons).

Further investigation of the 1951 construction prints revealed that 3"PUA-203 and 3"PUA-1013 both pass through a common junction box. This junction box allows the encasements for the two lines to make a 90 degree turn. In other words, both encasements drain from A-2 to this junction box. The prints also indicate that the transfer line to WM-181 is sloped to this junction box. The transfer line to WL-101 is sloped to the WL-101/102 vault. Therefore, all liquid in these two encasements should drain to the WL-101/102 vault. This explains why no solution entered the WM-181 vault.

In summary, conclusions drawn from the tests are listed below.

1. The drain line for valve box A-2 is tied directly into 3"PUA-10111 (NWCF/WCF to WL-102 transfer line).

2. Waste solution will back up into valve box A-2 through its drain line if PLV-WL-187 (to WL-132) and PLV-WL-188 (to WL-102) are closed during a transfer from the NWCF or WCF to WL-102.

3. The solution that enters valve box A-2 exits through two encasements to a common junction box that drains to the WL-101/102 vault.

4. The common junction box will hold approximately 10 gallons. All other solution should drain to WL-101/102.

5. The unaccounted for waste solution is not in WL-132/WL-133 (new sludge removal tank and feed tank for the PEW evaporators).

6. The unaccounted for solution is not in the WM-181 vault.

7. The unaccounted for solution is not in the WM-184 vault.

FORM WINCO-5690A (1-86)

UNUSUAL OCCURRENCE REPORT
(Continuation Page)

Report Number: W I N — 8 6 - 0 0 3 4 — C P P

8. An acceptable location for the missing liquid has not been identified.

9. 2512 gallons (+ or - 100 gallons) are missing from the two transfers and has most likely excaped to the soil through the broken clay tile encasement for 3"PUA-203 and 3"PUR-1013.

15. Permanent Corrective Action Recommended: (Continued)

(5) Remove 3"PUA-1013 from service by taking the following action.

a. Close, lock and tag valves HSV-WLO-25, PUV-WM-17 and PUV-WM-18.

Action: B. R. Dickey Due: December 1, 1986

b. Change the operating procedures to reflect that 3"PUA-1013 has been removed from service.

Action: M. J. Green Due: December 1, 1986

(6) Core drill and soil sample around 3"PUA-203 and 3"PUA-1013 to characterize the soil around potential pipe encasement leakage points.

Action: A. J. Matule Due: January 5, 1988

Attachment to UOR 860034
Appendix - A

JULY 7, 1986

Transfer from WC-119 to WL-102

SENDING VESSEL (WC-119)

Phase-1

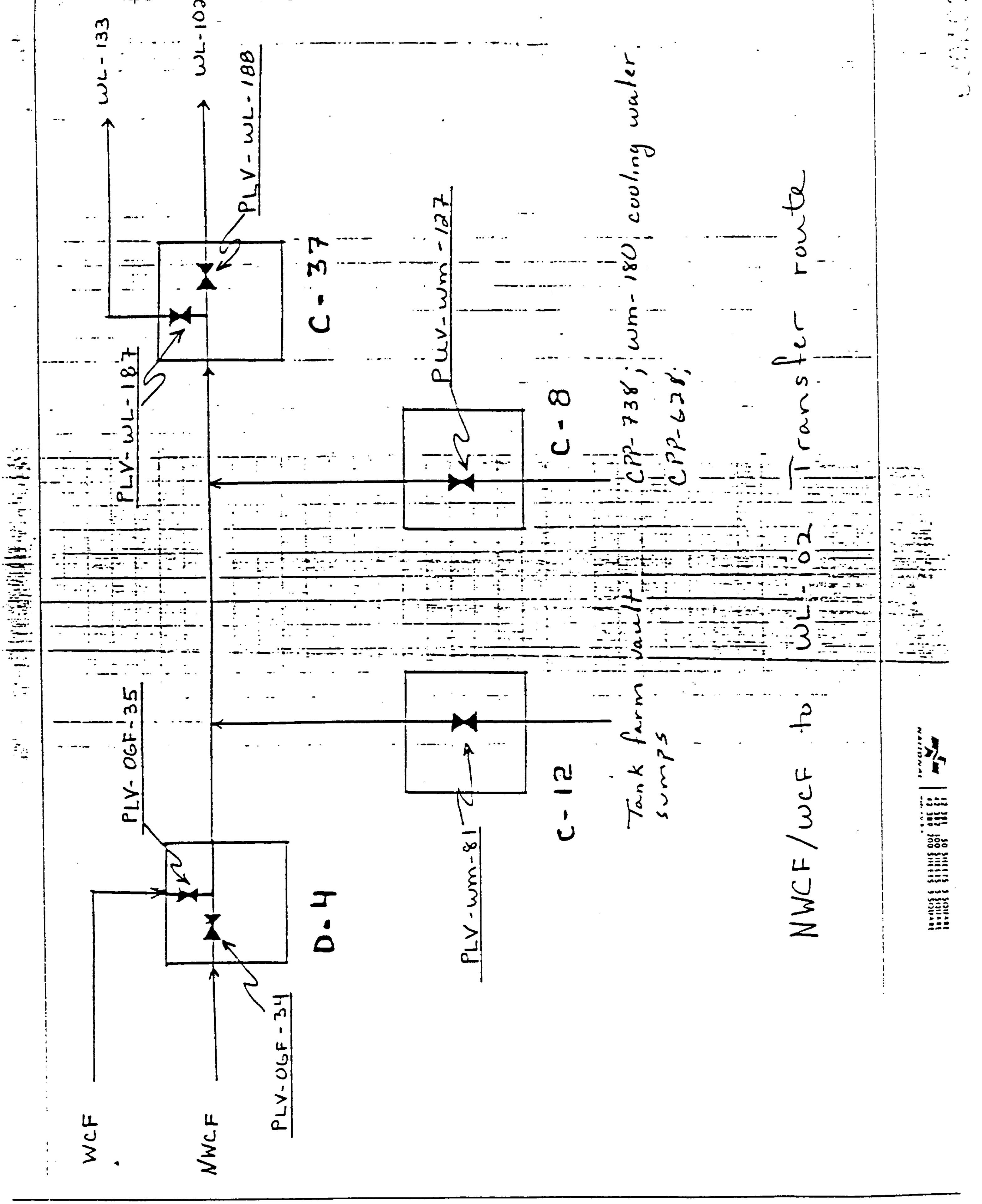
	Beginning	Ending	Volume
LR-WC-119	61%	46%	1000 gallons
LR-WL-102	40%	43%	650 **
LR-WL101/102	14%	15%	200
TOTAL RECEIVED			200

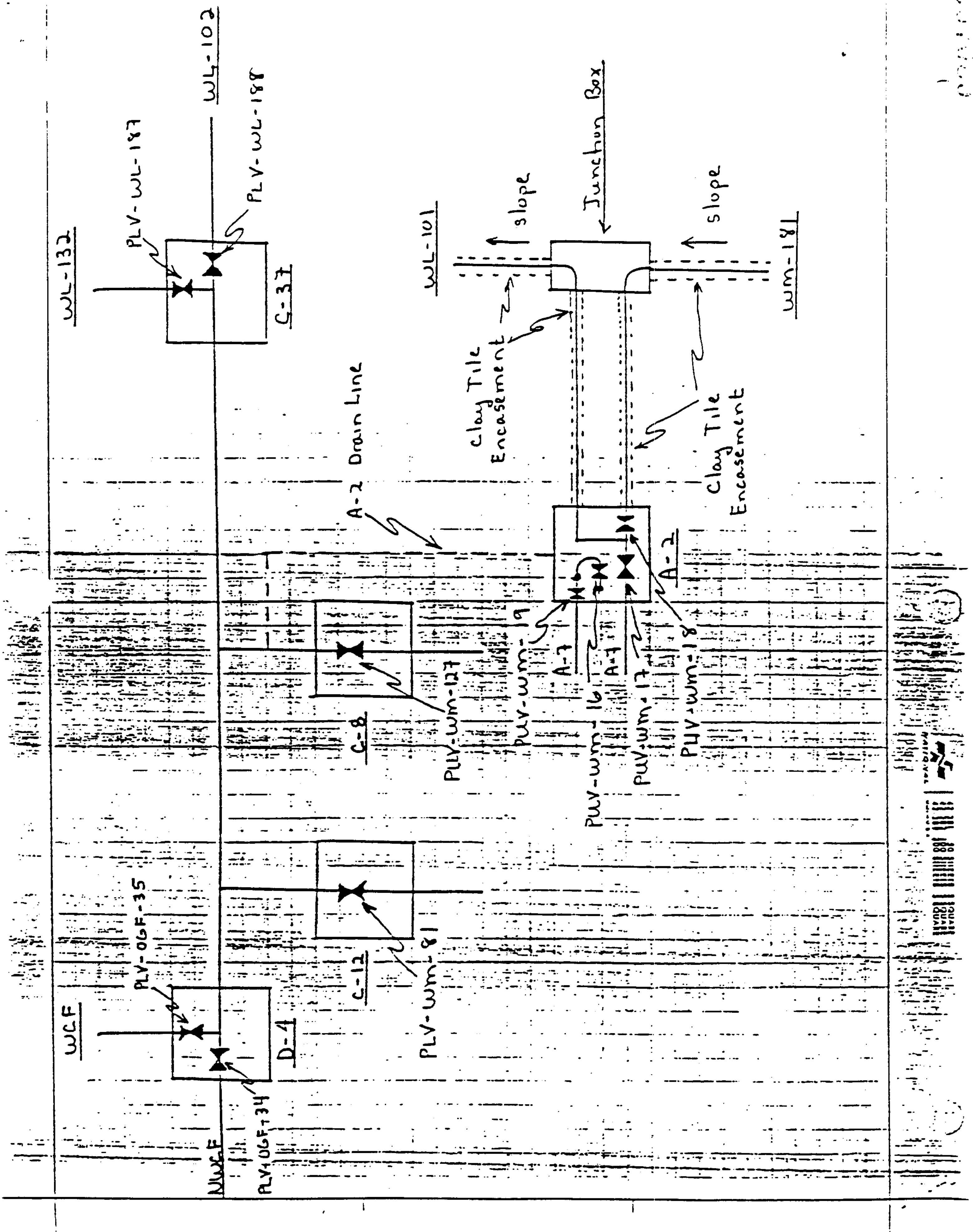
Phase-2

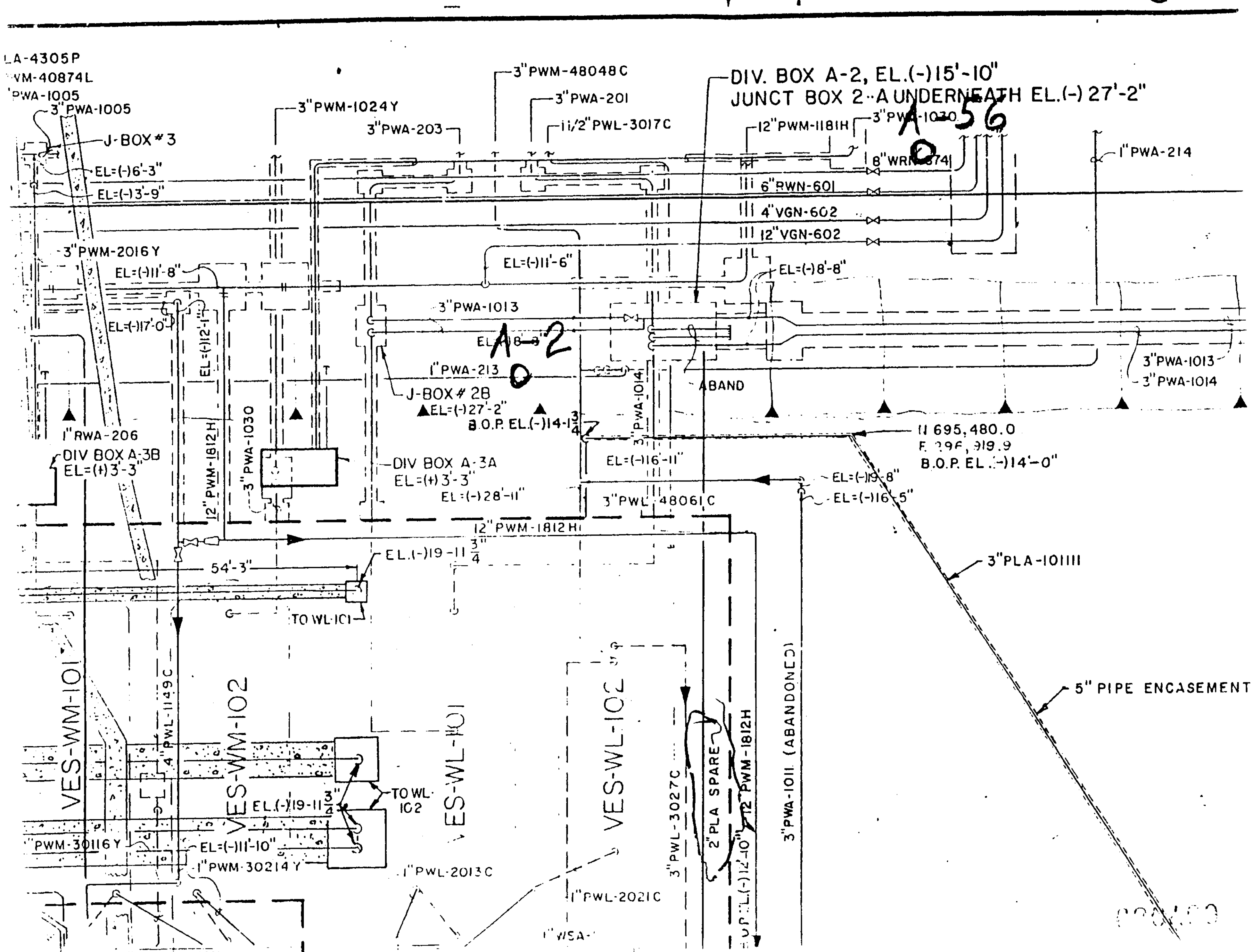
	Beginning	Ending	Volume
LR-WC-119	48%	24%	1550
LR-WL-102	43%	45.5%	600 **
LR-WL-101/102	2%	14.5%	600
TOTAL RECEIVED			600

TOTAL TRANSFERRED FROM WC-119	2650
TOTAL RECEIVED IN WL-102	800
TOTAL MISSING FROM TRANSFER	1850

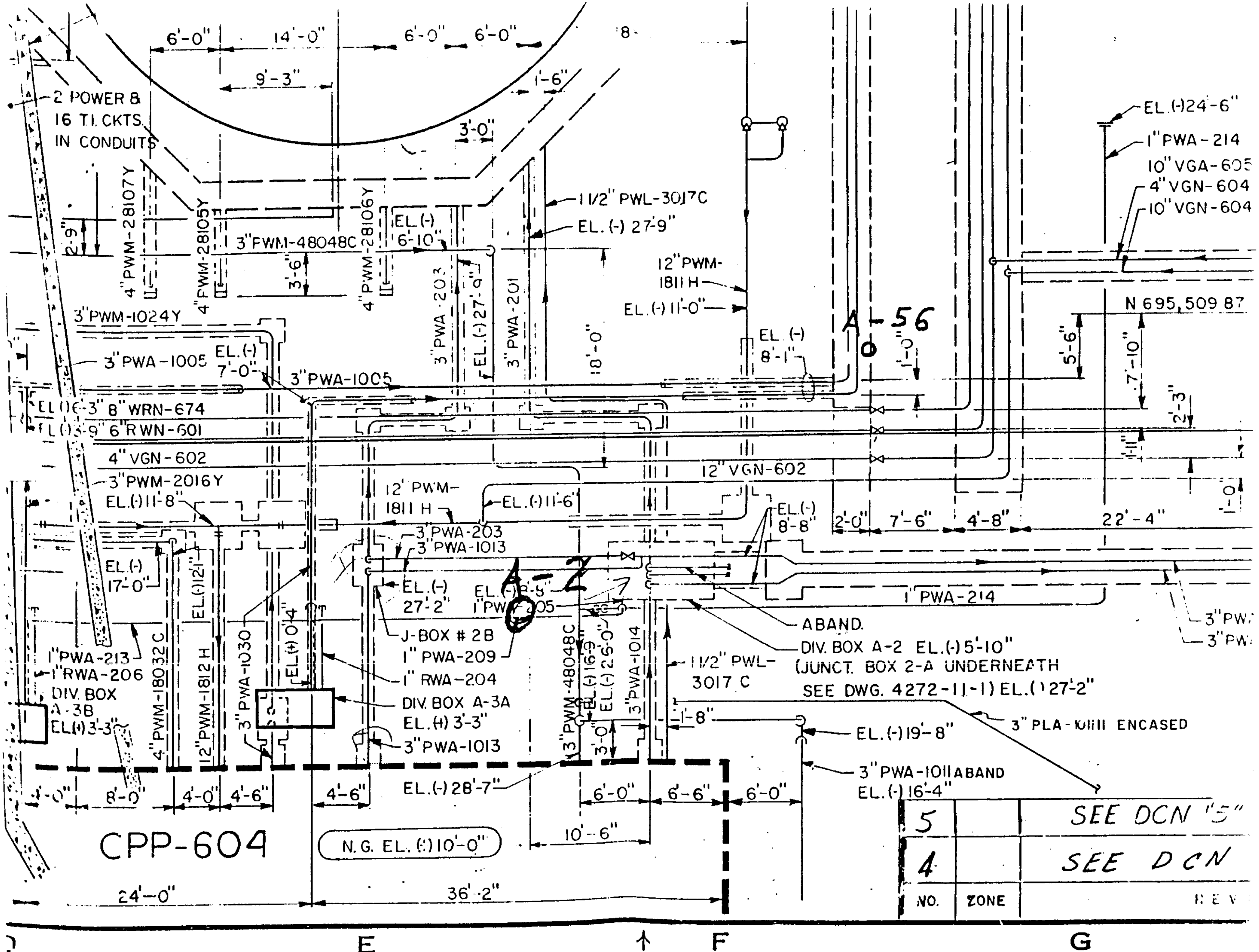
** The increase in WL-102 was a result of jetting the WL-101/102 vault sump.


NWCF/WCF to WL-102 Transfer route
WCF
NWCF
D-4
PLV-OGF-35
PLV-OGF-34
C-12
PLV-WM-81
Tank farm vault sumps
C-8
PLV-WM-127
CPP-738; WM-180 cooling water
CPP-638;
C-37
PLV-WL-187
PLV-WL-188
WL-133
WL-102


WL-102
PLV-WL-188
PLV-WL-187
WL-132
C-37
Junction Box
slope
slope
WL-101
WM-181
Clay Tile Encasement
Clay Tile Encasement
A-2 Drain Line
A-2
PLV-WM-127
C-8
PLV-WM-19
A-7
A-7
PLV-WM-16
PLV-WM-17
PLV-WM-18
C-12
PLV-WM-81
PLV-OGF-35
WCF
D-4
PLV-OGF-34
NWCF



LA-4305P
VM-40874L
PWA-1005
3"PWA-1005
J-BOX # 3
EL=(-)6'-3"
EL=(-)13'-9"
3"PWM-2016Y
EL=(-)11'-8"
EL=(-)17'-0"
EL=(-)12'-1"
1"RWA-206
DIV BOX A-3B
EL=(+)3'-3"
12"PWM-1812H
3"PWA-1030
3"PWM-1024Y
3"PWA-203
3"PWM-48048C
3"PWA-201
11/2"PWL-3017C
DIV. BOX A-2, EL.(-)15'-10"
JUNCT BOX 2-A UNDERNEATH EL.(-) 27'-2"
12"PWM-1181H
3"PWA-1030
A 56
O
8"WRN-874
6"RWN-601
4"VGN-602
12"VGN-602
1"PWA-214
EL=(-)11'-6"
EL=(-)8'-8"
3"PWA-1013
EL=(-)18-3"
A 2
O
1"PWA-213
J-BOX # 2B
EL=(-)27'-2"
B.O.P. EL.(-)14-1 3/4
3"PWA-1014
ABAND
3"PWA-1013
3"PWA-1014
N 695,480.0
E 296,919.9
B.O.P. EL.(-)14'-0"
DIV BOX A-3A
EL=(+)3'-3"
EL=(-)28'-11"
EL=(-)16'-11"
EL=(-)19'-8"
EL=(-)16'-5"
3"PWL-48061C
12"PWM-1812H
EL.(-)19-11 3/4"
54'-3"
TO WL-101
3"PLA-101111
5" PIPE ENCASEMENT
VES-WM-101
4"PWL-1149C
VES-WM-102
EL.(-)19-11 3/4"
TO WL-102
VES-WL-101
VES-WL-102
3"PWL-3027C
2"PLA SPARE
12"PWM-1812H
EL.(-)12'-10"
3"PWA-1011 (ABANDONED)
PWM-30116Y
EL=(-)11'-10"
1"PWM-30214Y
1"PWL-2013C
1"PWL-2021C
1"WSA-



6'-0"
14'-0"
6'-0"
6'-0"
9'-3"
1'-6"
3'-0"
2 POWER &
16 T.I. CKTS.
IN CONDUITS
EL.(-)24'-6"
1" PWA-214
10" VGA-605
4" VGN-604
10" VGN-604
2'-9"
4" PWM-28107Y
4" PWM-28105Y
3" PWM-48048C
3'-6"
4" PWM-28106Y
EL.(-) 6'-10"
1 1/2" PWL-3017C
EL. (-) 27'-9"
12" PWM-1811 H
EL.(-) 11'-0"
3" PWA-203
EL.(-)27'-9"
3" PWA-201
18'-0"
3" PWM-1024Y
3" PWA-1005
EL.(-) 7'-0"
3" PWA-1005
EL.(-) 8'-1"
A-56
1'-0"
5'-6"
7'-10"
N 695,509.87
2'-3"
EL.(-)6'-3" 8" WRN-674
EL.(-)3'-9" 6" RWN-601
4" VGN-602
12" VGN-602
3" PWM-2016Y
EL.(-)11'-8"
12" PWM-1811 H
EL.(-)11'-6"
EL.(-) 8'-8"
2'-0"
7'-6"
4'-8"
22'-4"
1'-0"
3" PWA-203
3" PWA-1013
EL.(-) 17'-0"
EL.(-)12'-1"
EL.(-) 27'-2"
A-2
1" PWA-1005
1" PWA-214
3" PWA
3" PWA
EL.(+) 0'-4"
J-BOX # 2B
1" PWA-209
1" RWA-204
ABAND.
DIV. BOX A-2 EL.(-)5'-10"
(JUNCT. BOX 2-A UNDERNEATH
SEE DWG. 4272-11-1) EL.(-)27'-2"
1" PWA-213
1" RWA-206
DIV. BOX A-3B EL.(+)3'-3"
4" PWM-18032C
12" PWM-1812 H
3" PWA-1030
DIV. BOX A-3A EL.(+) 3'-3"
3" PWA-1013
3" PWM-48048C
EL.(-)16'-9"
EL.(-)26'-0"
3" PWA-1014
1 1/2" PWL-3017 C
1'-8"
3'-0"
3" PLA-10111 ENCASED
EL.(-)19'-8"
3" PWA-1011 ABAND
EL.(-) 16'-4"
EL.(-) 28'-7"
4'-0"
8'-0"
4'-0"
4'-6"
4'-6"
6'-0"
6'-6"
6'-0"
10'-6"
CPP-604
N.G. EL. (-)10'-0"
24'-0"
36'-2"
5
SEE DCN "5"
4
SEE DCN
NO.
ZONE
REV
D
E
F
G

August 2, 1986

FINAL report for NCD-123

REPORT FOR	: GF JOHNSON		LOG NUMBER	:	080118
ADDRESS	: CPP-624		PHONE NUMBER	:	6-3007
DATE RECEIVED	: 08/01/86		DATE COMPLETED	:	08/03/86
TIME RECIEVED	: 22:54		TIME COMPLETED	:	04:34
GWA CHARGED	: 10250-244-100		REVIEWED BY	:	J.A. MURPHY
MSA MR/HR	: <1		SIGNATURE	:	

HAZARD INDEX: >1E4

ANALYSIS	METHOD	SAMPLE	ANALYST	RESULTS FOR 080118
SP-GR	77981	NCD-123	MGL	1.0098E+00+-5.54E-04 @ 25/4
ACID	67015	NCD-123	JSL	< 1.3920E-01 NACID
FLUORIDE	67093	NCD-123	JLK	< 2.6123E+01 UG/ML
CHLORIDE	67171	NCD-123	JLK	< 3.7298E+01 UG/ML
GROSS BETA	17970	NCD-123	JSL	9.6021E+03+-9.49E+02 B/MIN/ML
URANIUM	67920	NCD-123	LDG	8.4191E-05+-1.06E-05 G/L
UD-SLDS	7976	NCD-123	HCJ	195 UG/ML
SULFATE	7001	NCD-123	LMS	4.1903E+01 UG/ML

FINAL report for WC-119

Report for :	WCF	Log number :	092017
Address :	CPP-663	Phone number :	6-3697
Date received :	09/20/86	Date completed:	09/26/86
Time received :	14:21	Time completed:	19:26
GWA charged :	13820-450-100	Reviewed by :	R.L. DEMMER
MSA mR/hr :	2		

Signature: ______________________

HAZARD INDEX: >1E7

ANALYSIS	SAMPLE	METHOD	ANALYST	RESULTS for 092017
FLUORIDE	WC-119	67093	JSL	< 2.6123E+01 UG/ML
I-129	WC-119	3533	KPH	< 2.3961E+00 D/sec/ml
PH	WC-119	87017	JSL	5.7587E-01+-3.99E-02 PH
SP-GR	WC-119	77981	JSL	1.0097E+00+-1.55E-04 @ 25/4
TRITIUM	WC-119	3011	KPH	7.0453E+02+-2.26E+01 D/SEC/ML

July 7, 1986

FINAL report for WC-119

REPORT FOR :	WCF	LOG NUMBER :	092017
ADDRESS :	CPP-663	PHONE NUMBER :	6-3697
DATE RECEIVED :	09/20/86	DATE COMPLETED:	09/26/86
TIME RECIEVED :	14:21	TIME COMPLETED:	19:26
GWA CHARGED :	13820-450-100	REVIEWED BY :	R.L. DEMMER
MSA MR/HR :	2	SIGNATURE:	R L Demmer

HAZARD INDEX: >1E7

ALYSIS	METHOD	SAMPLE	ANALYST	RESULTS FOR 092017
	87017	WC-119	JSL	5.7587E-01+-3.99E-02 PH
ORIDE	67093	WC-119	JSL	< 2.6123E+01 UG/ML
-GR	77981	WC-119	JSL	1.0097E+00+-1.55E-04 @ 25/4
29	3533	WC-119	KPH	< 2.3961E+00 D/sec/ml
TIUM	3011	WC-119	KPH	7.0453E+02+-2.26E+01 D/SEC/ML

I 'ational Engineering Laboratory

AJM-48-87

From : A. J. Matule
Phone : 6-0115/CPP-630
Date : October 9, 1987
Subject: Corrective Action UOR 86-0034 #15(6)

To : L. C. Mitchell
Data Reliability

cc: J. L. Lyle, DOE-ID
W. C. Mallory
G. K. Oswald
T. F. Pointer
D. J. Poland
F. S. Ward

On September 28, 1987, DOE-ID (J. L. Lyle), Production, (G. K. Oswald) and N&IS (W. C. Mallory, A. J. Matule, and D. J. Poland) met to discuss the corrective action for UOR 86-0034 #15(6). It was concluded that the work required for the corrective action is the same as work required by the INEL Consent Order and Compliance Agreement (CO&CA) Action Plan for RCRA/CERCLA solid waste management units. We request that the corrective action for the UOR 86-0034 #15(6) be deleted since this work will be done in accordance with the CO&CA at a schedule to be determined by EPA.

If you have any questions, please call me.

AJMatule

A. J. Matule, Manager
R&ES Environmental Engineering

DJP/tlr

Westinghouse Idaho Nuclear Company, Inc.

Attachment to UOR 860034
Appendix - C

AUGUST 2, 1986

Transfer from NCD-123 to WL-102

SENDING VESSEL (NCD-123)

Phase-1

	Beginning	Ending	Volume
LR-NCD-123	73%	46%	1289 gallons
LR-WL-102	58%	56%	550 **
LR-WL101/102	0%	11%	100
TOTAL RECEIVED			550

Phase-2

	Beginning	Ending	Volume
LR-NCD-123	46%	17%	1620
LR-WL-102	56%	63%	1676 **
LR-WL-101/102	0%	0%	0
TOTAL RECEIVED			1676

TOTAL TRANSFERRED FROM NCD-123	2908
TOTAL RECEIVED IN WL-102	2226
TOTAL MISSING FROM TRANSFER	682

** The PEW evaporator was operating at the time of the transfer.

Table 1.1

Composition of ICPP High-Level Liquid Wastes

Ionic Component	Composition, Molarity		
	Aluminum Nitrate	Sodium Bearing	Fluorinel[a]
Zr	---	---	0.43
Al	1.5-1.9	0.4-0.8	0.18 - 0.34
F	---	0.003-0.04	3.0 - 3.3
Cd	---	---	0.13 - 0.14
B	0.02	0.008-0.05	0.22 - 0.24
Fe	0.006	0.01-0.02	0.001
Cr	---	---	0.002
H	0.8-1.2	0.4-1.8	1.8 - 1.9
NO_3	5.4-7.7	3.7-4.8	2.1 - 2.3
SO_4	---	0.04-0.07	0.08
Na	0.1	1.1-2.3	---
K	---	0.2	---
Ca	---	0.006-0.06	---
Mn	---	0.02	---
Cl	---	0.02-0.05	---
PO_4	---	0.005-0.03	---
Pb	---	0.003	---
Hg	0.001	---	---
Fission Products and Actinides	<0.1	<0.1	<0.1

[a] Projected, based on proposed flowsheet.

(Cont'd. from page 1)
exempted incinerated household and commercial wastes from RCRA's hazardous waste regulations, it requires that ash from such wastes be tested to determine treatment, according to Richard Dennison, an EDF scientist.

Robin Woods, an agency press spokesperson had a somewhat different interpretation of the codification rule than EDF did. Woods said current policy required commercial waste ash to be treated as hazardous if tests show that it is toxic. She said, however, that RCRA did not mandate testing.

Woods told BNA that some of the pressure to reconsider current policy came from state and municipal authorities who were confused by the present policy and wanted clarification. The U.S. Conference of Mayors confirmed Woods' assertion. David Gatton, director of policy for the conference told BNA Dec. 2 that commercial ash should be treated as a special waste and regulated somewhat more stringently than solid waste, but less stringently than hazardous waste.

Enforcement Actions

A Texas Indictment

A federal grand jury in Texas returned a six-count indictment charging three former federal prison employees with conspiracy, hazardous waste disposal without a permit, mail fraud, transporting hazardous waste without a manifest, hauling the waste to an unpermitted facility, and making a false claim. Each faces a maximum 27-year prison term and $500,000 if convicted (*U.S. v. Kruse*, DC WTexas, No. A-87-CR-115).

The three individuals were formerly employed by Unicor Inc., a government-owned prison factory managed by the Bureau of Prisons. The factory, located at the federal prison in Bastrop, Texas, makes U.S. Army helmets. The three indicted persons are Robert Kruse, Lee Bradley, and Carol Kay Kisamore.

The three allegedly arranged a $12,000 payment of government funds to Kruse through a fictitious company. Kruse then allegedly had 60 drums of hazardous solvents, used in making the helmets, dumped on his own property. The solvents included methyl ethyl ketone, methylene chloride, toluene, acetone, and 1,1,1,-trichloroethane. The prison's warden later fired the employees for their role in attempting to defraud the government.

The Bureau of Prisons paid the Texas Water Commission $300,000 to clean up the contaminated area.

The Forgotten Spill

Mobil Chemical Corp.'s Holyoke, Mass., plant had a chemical spill in March 1985 and notified state authorities in August 1986—523 days after the fact. For this act of forgetfulness, the state slapped the company with a $67,000 fine: $15,000 for failure to notify immediately and $100 for each day day that it failed to notify thereafter.

The state Department of Environmental Quality Engineering charged Mobil with violating the Massachusetts Oil and Hazardous Waste Prevention and Response Act.

The DEQ said Mobil dumped 11,000 pounds of ethyl benzene and styrene into a dirt-bottomed holding basin and left it there for more than three months. The company finally removed the material in late 1985.

In addition to the fine, a Nov. 25 agreement lodged in state court requires Mobil to hire an independent consultant to determine if further cleanup is necessary, Greg J. Wilson, an assistant state attorney general, told BNA.

A company spokesman told BNA Dec. 9 the spill occurred when polystyrene was accidentally dropped into the basin. He said the company did not report the accident because the material was in a semi-solid state that was unlikely to leach into the soil. The company decided to forego the expense of protracted litigation in favor of the consent judgment, the spokesman added.

Citizen Suits

Present Tense, Please

Can citizen suits under environmental laws stand up in court only when the alleged violation continues into the present?

That restriction—that the violation must be ongoing—applies at least to the Clean Water Act, according to a Dec. 1 U.S. Supreme Court decision, which reasoned that the language under the CWA citizen suit provision written in the present tense represents congressional intent and is, therefore, inapplicable to violations that are completed past actions. (*Gwaltney of Smithfield Ltd. v. Chesapeake Bay Foundation Inc.*, USSupCt, No. 86-473).

The citizen suit language in the water act requires citizens "to make a good faith allegation of continuous or intermittent violation," the Court said in its unanimous decision.

The Supreme Court decision overturned a federal appeals court ruling in the *Gwaltney* case, which held that placing limits on the timing of citizen suits would cancel a significant deterrent to violations.

The question now being asked by EPA's legal staff is how that decision affects citizen suit provisions under other environmental laws, particularly TSCA. A federal district court in Illinois quashed a TSCA citizen suit last July because the plaintiff was unable to show that the defendant's violation was ongoing.

TSCA's citizen suit language is similar to that of the CWA, according to Terrell Hunt, director of EPA's Office of Enforcement Policy, who told BNA that the agency is studying citizen suit language in environmental laws to determine the impact of the Supreme Court decision.

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NEW WASTE IDENTIFICATION FORM

CONTRACTOR/FACILITY: ICPP DATE: 10/22/89
CONTACT PERSON: Gerald Sehlke TELEPHONE: 6-3008
REVIEWER:

List all wastes associated with new units identified as a result of this survey that are not already on the COCA list or on the RCRA Part A Permit. Identify the type of waste/constituent/substance if known; the quantity by either weight or volume; and the disposal dates. In the comments section describe the reasons the waste was not disposed of prior to the survey.

WASTE DESCRIPTION	QUANTITY	DISPOSAL DATES	COMMENTS
High-level mixed waste (characteristic and possibly listed wastes) leak from tank farm valve box A-6 C-2	approx. 2500 gal (± 100 gal)	July 1986	Inadvertently left off COCA reprioritization.

AJM-58-89
11-16-89

SOIL SAMPLING TANK FARM AREA

UOR 86-0034
Date of Occurrence-July 7, 1986

Options for soil sampling in the Tank Farm west of valve box A-2.

1 No action, wait for the RCRA/CERCLA characterization.
Not acceptable because break in line needs to be determined as soon as possible. RCRA/CERCLA characterization could take 2-3 years.

2 Use a power auger to collect soil samples in the four junction areas of the line.
Not acceptable because some of the tank farm lines in the junction areas are 1-3 feet apart and the exact locations of the lines are not always known. A driller needs at least 6 feet between lines and the exact locations of the lines when using a power auger.

3 Use a hand auger to collect soil samples in the four junction areas of the line.
Not acceptable because of the gravel content in our soil. A hand auger only penetrates about 2-3 feet into CPP soils.

4 Use a hand shovel to excavate soil in the four junction areas of the line and then collect soil samples.

5 Use a hand shovel to excavate soil to a depth of approximately 8-10 feet (line would still have soil cover) in the four junction areas of the line and then with a hand auger collect soil samples.

SOIL SAMPLING TANK FARM AREA

Scope — Write Discussion before issuing

UOR 86-0034
Date of Occurrence-July 7, 1986

Options for soil sampling in the Tank Farm west of valve box A-2.

1 No action, wait for the RCRA/CERCLA characterization.
Not acceptable because break in line needs to be determined as soon as possible. RCRA/CERCLA characterization could take 2-3 years.

2 Use a power auger to collect soil samples in the four junction areas of the line.
Not acceptable because some of the tank farm lines in the junction areas are 1-3 feet apart and the exact locations of the lines are not always known. A driller needs at least 6 feet between lines and the exact locations of the lines when using a power auger.

3 Use a hand auger to collect soil samples in the four junction areas of the line.
Not acceptable because of the gravel content in our soil. A hand auger ~~will~~ only ~~to~~ penetrate about 2-3 feet into CPP soils.

4 Use a hand shovel to excavate soil in the four junction areas of the line and then collect soil samples.
Because of the depth of the lines (approximately 10 feet) this option would require shoring the excavation, and the exposure to workers would be high.

Weak help!!

or an opt excavat

5 Use a hand shovel to excavate soil to a depth of approximately 6-7 feet (line would still have soil cover) in the four junction areas of the line and then with a hand auger collect soil samples.
Soil cover would decrease exposure to workers and is the acceptable option.

Weak help, help!!

Requirements of 1.5:1 Slope

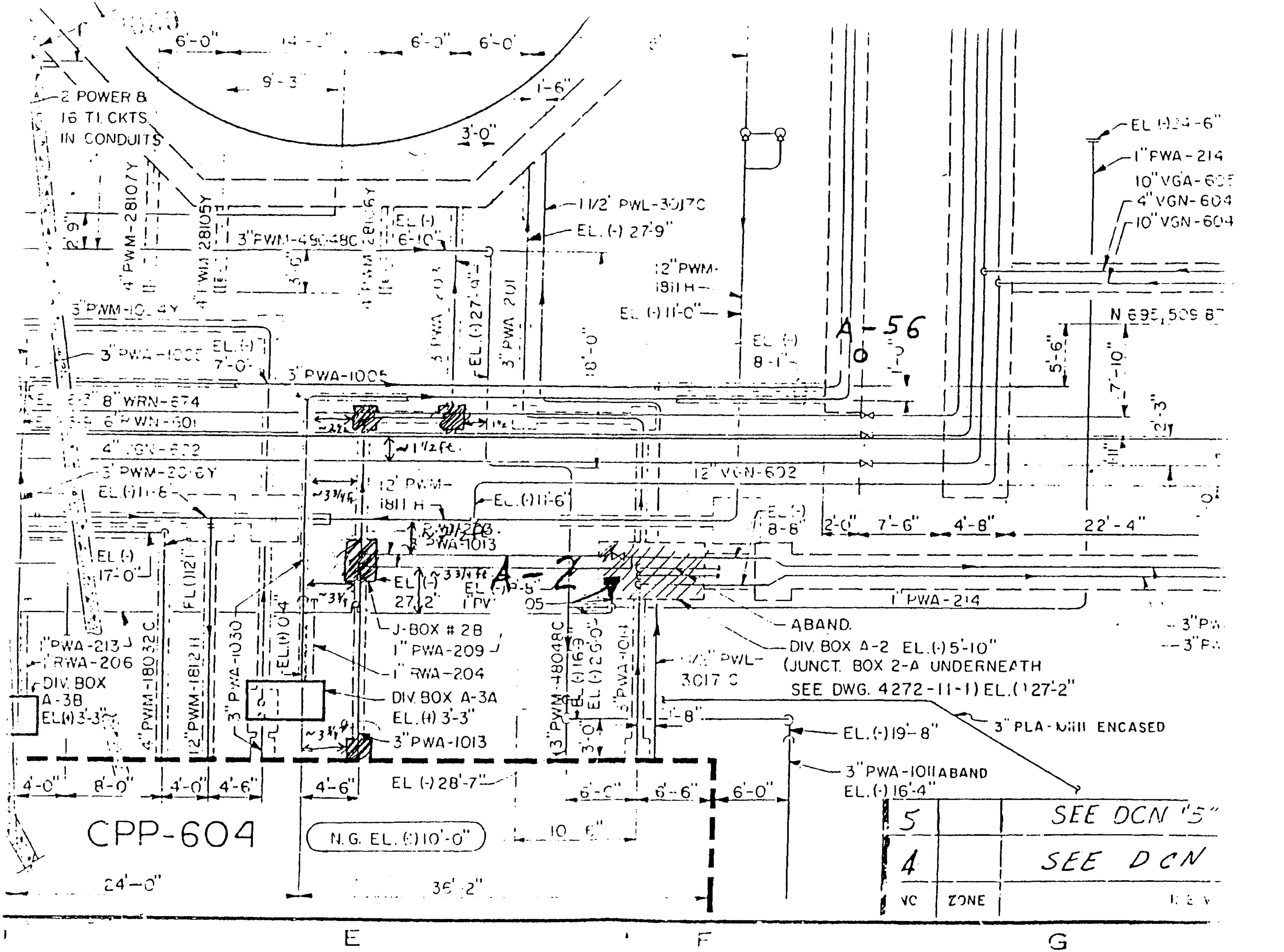
Excavated opening ~~approx~~ in excess of 18ft. wide.

replace lines

— Plan → Area to excavate

Radiation Worker - Training

Hand digging



2 POWER & 16 TEL CKTS IN CONDUITS
4" PWM-28107Y
4" PWM-28105Y
3" PWM-490480C
EL (-) 6'-10"
1 1/2" PWL-3017C
EL. (-) 27'-9"
12" PWM-1811H
EL (-) 11'-0"
EL (-) 8'-1"
A-56
EL (-) 24'-6"
1" PWA-214
10" VGA-605
4" VGN-604
10" VGN-604
N 695,509.87
3" PWM-1014Y
3" PWA-1005
EL (-) 7'-0"
8" WRN-674
6" RWN-601
4" VGN-602
3" PWM-2016Y
EL (-) 11'-6"
12" PWM-1811H
EL (-) 11'-6"
12" VGN-602
EL (-) 8'-8"
3" PWA-1013
EL (-) 17'-0"
EL (-) 27'-2"
A-2
J-BOX # 2B
1" PWA-209
1" RWA-204
1" PWA-213
1" RWA-206
DIV. BOX A-3B EL (+) 3'-3"
4" PWM-18032C
12" PWM-1812H
3" PWA-1030
DIV. BOX A-3A EL. (+) 3'-3"
3" PWA-1013
1" PWA-214
ABAND.
DIV. BOX A-2 EL. (-) 5'-10"
(JUNCT. BOX 2-A UNDERNEATH SEE DWG. 4272-11-1) EL. (-) 27'-2"
1 1/2" PWL-3017C
3" PWM-48048C
3" PWA-1014
3" PLA-M111 ENCASED
EL. (-) 19'-8"
3" PWA-1011 ABAND
EL. (-) 16'-4"
EL (-) 28'-7"
CPP-604
N.G. EL. (-) 10'-0"
24'-0"
36'-2"
10'-6"
5 SEE DCN "5"
4 SEE DCN
NO ZONE REV
E
F
G

STATEMENT OF WORK
TANK FARM (UOR-86-0034)

1.0 Purpose

his Statement of Work (SOW) identifies required subcontractor support at the Idaho Chemical Processing Plant (ICPP) in the preliminary investigation of the Tank Farm spill of July/August 1986 (UOR-86-0034). This SOW outlines the scope of activities to be performed by a subcontractor. Activity constraints in this SOW and the attached WINCO Hazardous and Radioactive Mixed Waste Sampling Subcontract Special Conditions are also included but may not be all inclusive.

2.0 BACKGROUND

The following summarizes the history of the Tank Farm spill of July/August 1986.

On July 7, 1986 while transfering solution from WC-119 (WCF sump tank) to WL-102 (PEW feed tank) 1850 gallons of liquid could not be accounted for. Approximately 2650 gallons were transferred from WC-119 while only 800 gallons were recieved in WL-102.

On August 2, 1986 while transferring solution from NCD-123 (NWCF decon area sump tank) to WL-102 682 gallons of liquid could not be accounted for. Approximately 2908 gallons were transferred from NCD-123 while only 2226 gallons were recieved in WL-102.

?532 gallons (+ or - 100 gallons) are missing from the two transfers nd has most likely been released to the soil through a broken tile encasement. This solution is radioactively contaminated, ~~and may~~ [illegible] [illegible] contain hazardous constituents.

Tests were conducted to determine the possible area of the release. Conclusions drawn from these tests are listed below. See figure 1. for the location of the lines, depth of the lines, area of the sampling site and the location of the junction box.

1. The solution entered valve box A-2 but did not get to WL-102.
2. The solution entered valve box A-2 and exited through two encasements to a common junction box that drains to the WL-101/102 vault.
3. The unaccounted for solution is not in the WM-181 vault.
4. The unaccounted for solution may have been released to the soil through a broken clay tile encasement for 3" PWA-203 and 3" PWA-1013.

Subcontractor support is required for sampling and analysis of the Tank Farm spill. The work will include: (1) preliminary investigation sampling and analysis of soil to determine the location of the break in the tile encasement; (2) remedial response investigation to determine the extent of remedial actions.

The preliminary investigation will include: collection of 25 soil samples and necessary sampling protocol, grid plan and sample location; handling, transportation and refrigeration of samples from collection point to laboratory per EPA requirements; laboratory analysis of 25 samples for pH, heavy metals (Ba, Cr, As, Ag, Pb, Hg, Se and Cd), nitrate, sulfate, fluoride and radionuclides; and reporting analysis results. All analysis will be in accordance with EPA approved methods. Services shall also include providing all necessary sampling equipment, decontamination equipment and chemicals, sample containers and preparation of containers to preserve samples. Services will also include the preparation of a formal final report.

A Health and Safety Plan tailored to the requirements of the Tank Farm spill sampling and remedial investigation will be prepared by the subcontrator before the start of work. This plan will follow the guidelines of the EPA Guidance on Remedial Investigations Under CERCLA, Chapter 5, Health and Safety Planning for Remedial Investigations and include the items addressed in the Safety Program Guidelines, Appendix A. The Health and Safety Plan will address hazards that the investigation activities may present to the investigation team and to the surrounding community. The plan should address all applicable regulatory requirements and detail personnel responsibilities, protective equipment, procedures and protocols, decontamination, training, and medical surveillance. The plan should identify problems or hazards that may be encountered and their solutions. Procedures for protecting third parties, such as visitors or the surrounding community, will also be provided.

subcontractor before the start of work. Services shall also include standard operating procedures for sampling activities that are not addressed in the Sampling Plan.

The subcontractor will provide a QA/QC Plan for soil sampling, handling, analysis and reporting activities including EPA chain-of-custody.

5.0 SPECIAL CONDITIONS AND CONSTRAINTS

Attachment I, WINCO hazardous and Radioactive Mixed Waste Sampling Subcontract Special Conditions, addresses special conditions that must be met to perform the work required by this SOW. The following additional special conditions or constraints are included:

The following are the radiation analysis results for a sample collected from the WC-119 transfer:

I-129	< 2.3961 E+00 D/sec/ml
Tritium	7.0453 E+02 +-2.26 E+01 D/sec/ml

The following are the radiation analysis results from the NCD-123 transfer:

Gross Beta	9.6021 E+03 +-9.49 E+02 B/min/ml
Uranium	8.4191 E-05 +-1.06 E-05 G/L

WINCO radiation worker training will be necessary for the soil sampling in the Tank Farm. WINCO will provide radiation Operational Health Physics (OHP) and Safety Engineering Support services.

In addition to the packaging requirements identified in the Soil Sampling Plan, 49 CFR packaging, marking, and labeling requirements for shipment of radioactive and hazardous materials shall be met. The subcontractor shall be responsible for shipping the samples if they have the personnel qualified to meet 49 CFR 173 training requirements for an originator of a radioactive materials shipment; otherwise, qualified WINCO Hazardous Materials Shippers and Radioactive Materials Shippers will be available through the Nuclear and Industrial Safety Department, Safety Support Subsection.

The use of a power auger to collect soil samples in the Tank Farm will not be acceptable because the Tank Farm subsurface lines are in some places 1-3 feet apart. Also, the exact locations of these lines is not always known. It will be necessary to use a hand auger or to excavate the soil by hand shoveling in order to collect soil samples.

The attached map shows four junction areas in the line where it is most likely that the spill has occurred. These junction areas will be sampled first. If it is determined that the leak has not occurred in one of those junction areas then additional sampling will be necessary.

SOIL SAMPLING TANK FARM AREA

UOR 86-0034
Date of Occurrence-July 7, 1986

Options for soil sampling in the Tank Farm west of valve box A-2.

1 No action, wait for the RCRA/CERCLA characterization.
Not acceptable because break in line needs to be determined as soon as possible. RCRA/CERCLA characterization could take 2-3 years.

2 Use a power auger to collect soil samples in the four junction areas of the line.
Not acceptable because some of the tank farm lines in the junction areas are 1-3 feet apart and the exact locations of the lines are not always known. A driller needs at least 6 feet between lines and the exact locations of the lines when using a power auger.

3 Use a hand auger to collect soil samples in the four junction areas of the line.
Not acceptable because of the gravel content in our soil. A hand auger will only to penetrate about 2-3 feet into CPP soils.

4 Use a hand shovel to excavate soil in the four junction areas of the line and then collect soil samples.
Because of the depth of the lines (approximately 10 feet) this option would require shoring the excavation and the exposure to workers would be high.

5 Use a hand shovel to excavate soil to a depth of approximately 6-7 feet (line would still have soil cover) in the four junction areas of the line and then with a hand auger collect soil samples.
Soil cover would decrease exposure to workers and is the acceptable option.

Appendix E-3
Occurence Report
7/27/98

Occurrence Report

7/27/98

OCCURRENCE REPORT

ICPP Waste Management Activities

(Name of Facility)

Nuclear Waste Operations/Disposal

(Facility Function)

Idaho National Engineering Lab. / Lockheed Idaho Technologies Company

---

(Name of Laboratory, Site or Organization)

Name: White, James M.
Title: Supervisor, Waste Processing Telephone No.: (208)526-3862

(Facility Manager/Designee)

Name: FINUP, TIMOTHY G
Title: PLANT SHIFT SUPERVISOR Telephone No.: (208)526-3100

(Originator/Transmitter)

Name: T. G. Finup Date: 02/16/1998

(Authorized Classifier (AC))

1. OCCURRENCE REPORT NUMBER: ID--LITC-WASTEMNGT-1997-0026
   Hazardous Liquid Leak From Heat Trace Conduit

2. REPORT TYPE AND DATE:

	Date	Time
[ ] Notification	12/02/1997	1116 MTZ
[ ] Initial Update	01/15/1998	1640 MTZ
[ ] Latest Update	02/16/1998	1436 MTZ
[X] Final	02/23/1998	1308 MTZ

3. OCCURRENCE CATEGORY:
   [ ] Emergency [ ] Unusual [X] Off-Normal [ ] Cancelled

4. NUMBER OF OCCURRENCES: 1 ORIG. OR:

---

5. DIVISION OR PROJECT: High Level Waste Operations

6. SECRETARIAL OFFICE: EM - Environmental Management

7. SYSTEM, BLDG., OR EQUIPMENT:
   Waste Processing/CPP-604/VES-WL-135

8. UCNI?: No

9. PLANT AREA: CPP-604/605

10. DATE AND TIME DISCOVERED:
    12/01/1997 1030 (MTZ)

11. DATE AND TIME CATEGORIZED:
    12/01/1997 1100 (MTZ)

12. DOE NOTIFICATION:

13. OTHER NOTIFICATIONS:
12/01/1997 1115 (MTZ) McNew, Jerry DOE-ID

14. SUBJECT OR TITLE OF OCCURRENCE:
Hazardous Liquid Leak From Heat Trace Conduit

---

15. NATURE OF OCCURRENCE:
02) Environmental
B. Hazardous Substances/Regulated Pollutants/Oil Releases
02) Environmental
E. Agreement/Compliance Activities

---

16. DESCRIPTION OF OCCURRENCE:
On 11/18/97 at 1630, droplets of liquid were observed to be falling onto the ground from insulation on the jet discharge line from vessel VES-WL-135. An investigation was immediately commenced to determine the origin of the liquid. On 12/01/97, after extensive troubleshooting, the leak was found to be coming from an incomplete butt weld in an adjacent electrical conduit which supplies the heat trace for the discharge line. The liquid is believed to come from condensed vapors originating from New Waste Calcining Facility (NWCF) process off-gas. Therefore, the liquid would carry the same listed waste codes as process waste from NWCF. The leak did not cause a release to the environment of a significant fraction of a Reportable Quantity (RQ), but does meet the criteria of an Off-Normal event due to environmental reporting requirements to off-site agencies.

The Idaho Chemical Processing Plant (ICPP) is a U.S. Department of Energy (DOE) nuclear material processing facility. The ICPP is located within the Idaho National Engineering and Environmental Laboratory (INEEL) boundaries. Lockheed Martin Idaho Technologies Company (LMITCO) is the facility contractor for the ICPP. The mission of the ICPP is to receive and store nuclear fuels and radioactive wastes and prepare them for disposition.

Buildings CPP-604 and CPP-605 form a physically continuous structure. These buildings are used to process intermediate-level liquid waste generated by various plant processes. These wastes are then concentrated in the Process Equipment Waste (PEW) evaporators and transferred to the high-level waste tank farm. Valve box D-5 contains Process Off-Gas lines from the NWCF and the Waste Calcining Facility, a vessel (VES-WL-135) to collect condensate from these lines, and valves that allow them to be isolated.

On the afternoon of 11/18/97, facility personnel discovered two small puddles of liquid, one on the gravel and one on concrete steps at the exit from building CPP-605. They also noted droplets of liquid falling at a very slow rate from the

16. DESCRIPTION OF OCCURRENCE: (continued)
insulation on the overhead jet discharge line from VES-WL-135, which is located in underground valve box D-5. A Radiation Control Technician surveyed the liquid and detected no radiation. An Industrial Hygienist also tested the liquid with litmus paper and determined that the pH was approximately zero, which made it RCRA hazardous, although there was no positive indication that the liquid originated from a process. The area was roped off and posted, the liquid and gravel was cleaned up and contained, and appropriate notifications were made to LMITCO management and DOE-ID. As the first step in troubleshooting the leak, a work order was processed to remove the insulation from the discharge pipe and inspect the piping for indications of leakage. In addition, measures were taken to reduce the rate of condensate buildup in VES-WL-135.

Following the initial inspection, which revealed no obvious source of leakage, a containment was installed around the suspect area. Over the next several days, facility personnel performed additional troubleshooting. At 1030 hours on 12/01/97, the source of the leak had not yet been positively identified, but facility engineering believed it likely that the leak originated from the electrical heat trace conduit which is tack welded to the discharge line. The engineers thought that NOx vapors could be drawn from the D-5 valve box into the conduit and then condense. In this case, the liquid would carry the same listed waste codes as the source of the NOx. This information, in turn, triggered a non-routine report to off-site environmental agencies and the Plant Shift Supervisor categorized the event as Off-Normal at 1100 on 12/01/97. At that time, the investigation for the source of the leak was still in progress. Later on 12/01/97, investigators determined that the leak had originated from an incomplete butt weld on the heat trace conduit where it was tack welded to the jet discharge piping.

The DOE-ID Facility Representative was informed of the problem when it was discovered, and was kept apprised until the event was categorized and formal notification took place.

---

17. OPERATING CONDITIONS OF FACILITY AT TIME OF OCCURRENCE:
The D-5 valve box and VES-WL-135 were in normal operation.

---

18. ACTIVITY CATEGORY:
Normal Operations

---

19. IMMEDIATE ACTIONS TAKEN AND RESULTS:

1. Placed containers below the leaks to catch the liquid.

2. Collected and contained the gravel and soil where the liquid fell.

19. IMMEDIATE ACTIONS TAKEN AND RESULTS: (continued)

3. Roped and posted the affected area.

4. Made notifications to LMITCO management, environmental personnel, and DOE-ID.

5. Reduced the flow rate of process off-gas from the NWCF to slow the liquid buildup rate in VES-WL-135.

6. Initiated a work order to remove insulation in order to inspect the pipe for the source of the leak. Inspection completed.

7. Installed containment around the area of the leak following the initial inspection.

8. Tagged the jet discharge line heat trace out of service following the initial troubleshooting.

20. DIRECT CAUSE:
1) EQUIPMENT/MATERIAL PROBLEM
C. Defective Weld, Braze, or Soldered Joint

21. CONTRIBUTING CAUSE(S):

22. ROOT CAUSE:
4) DESIGN PROBLEM
B. Inadequate or Defective Design

23. DESCRIPTION OF CAUSE:
Direct Cause: Equipment/Material Problem - Defective Weld, Braze, or Soldered Joint

The point of the leak occurred where two lengths of conduit were joined using an incomplete weld. If the conduit joints were adequately sealed any accumulated liquid would drain back to Valve Box D-5 which is secondary containment for vessel WL-135. (See Corrective Actions 1 and 2.)

Root Cause: Design Problem - Inadequate or Defective Design

The heat trace conduit was left open on both ends. One end was in valve box D-5 and the other end in the vessel off-gas blower cell (VOG). Valve box D-5 is at atmospheric pressure and the VOG cell is at 1/2 to 1 inch of water vacuum. This pressure differential allowed vapors from valve box D-5 to be drawn through the conduit and when conditions permitted, condensation could occur. (See Corrective Actions 3 and 4.)

Informal Root Cause Analysis was used to determine causes for this occurrence.

24. EVALUATION: (By Facility Manager/Designee)
This type of leak will occur only while the NWCF is in operation. This is the only time that conditions in valve box D-5 are such that moisture will condense when air is moving through the conduit. When the NWCF is not in operation the temperature in valve box D-5 is ambient, therefore the air is not cooled when passed through the conduit. When the NWCF is operating the temperature in valve box D-5 is elevated allowing the air to hold more moisture which will condense when cooled to ambient temperature while passing through the conduit. The implemented changes will eliminate the movement of air through the conduit, thus eliminating the possibility of liquid accumulation.

25. IS FURTHER EVALUATION REQUIRED?: Yes [ ] No [X]

26. CORRECTIVE ACTIONS:
(* = Date added/revised since final report was signed off)

01) See immediate actions taken.

TARGET COMPLETION DATE: 12/02/1997 COMPLETION DATE: 12/02/1997

02) Repair the incomplete butt weld in the conduit where the leak occurred.

TARGET COMPLETION DATE: 12/12/1997 COMPLETION DATE: 12/12/1997

03) Seal the open ends of the heat trace conduit in valve box D-5 to prevent flow of gases through the conduit.

TARGET COMPLETION DATE: 12/12/1997 COMPLETION DATE: 12/12/1997

04) Evaluate similar systems to determine if they may be at risk of a similar failure and recommend repairs as needed.

TARGET COMPLETION DATE: 03/30/1998 *COMPLETION DATE: 03/31/1998

27. IMPACT ON ENVIRONMENT, SAFETY AND HEALTH:
The potential hazards to human health and the environment from this leak are extremely low. All of the material involved in the leak was cleaned up, bagged, and placed in a temporary accumulation area pending final disposal. There was no release of a RQ of hazardous substance to the environment.

---

28. PROGRAMMATIC IMPACT:
None

---

29. IMPACT UPON CODES AND STANDARDS:
None

---

30. LESSONS LEARNED:
The discovery of this leak was made by the area operations personnel while walking through the area. This reinforces the importance of personnel walking down process areas in lieu of relying on automation.

---

31. SIMILAR OCCURRENCE REPORT NUMBERS:
1) ID--LITC-WASTEMNGT-1997-0023
2) ID--WINC-ICPP-1991-1054
3) ID--LITC-WASTEMNGT-1994-0003
4) HQ--SPR-SJ-1990-0004
5) ORO--MMES-K25GENLAN-1992-0067
6) ALO-LA-LANL-WASTEMNGT-1993-0002

---

32. USER FIELD #1:
5212

33. USER FIELD #2:

---

34. DOE FACILITY REPRESENTATIVE INPUT:

Entered by: Date:

---

35. DOE PROGRAM MANAGER INPUT:

Entered by: Date:

---

36. SIGNATURES: (FM's original signature on hardcopy)

Approved by: White, James M. Date: 02/16/1998
Facility Manager/Designee Telephone No.: (208)526-3862

Approved by: MCNEW, JERRY L Date: 02/23/1998
DOE Facility Representative/Designee Telephone No.: (208)526-5108

Approved by: Approval delegated to FR Date:
DOE Program Manager/Designee Telephone No.:

Appendix E-4
"Lord Report"

H.L. Lord Report

16.1

INEL

Idaho National Engineering Laboratory

HLL-02-92

From : H. L. Lord
Phone : 525-5467/MS-2304
Date : March 25, 1992
Subject: Description of Known Contamination in the ICPP High Level Waste Tank Farm

To : A. R. Eberle, Manager
HLWTFR Project Implementation

cc:
M. J. Beer, MS-2304
G. E. Bingham, MS-5306
M. R. Christensen, MS-2304
C. M. Cole, MS-2304
M. Cukurs, MS-5306
K. F. Hassing, MS-2304
H. C. Hund, MS-2304
H. A. Jaafar, MS-2304
R. D. Modrow, MS-5306
S. S. Mascareñas, MS-2304
F. R. Phelps, MS-2304
P. B. Summers, MS-2304
C. J. Urbanski, MS-2304
H. L. Lord - 2
Project File - HLWTFR

Attached for your information is a Description of Known Contamination in the ICPP High Level Waste Tank Farm.

If you have questions call me at 525-5467.

Harry L. Lord

H. L. Lord, Project Engineer
HLWTFR Project

HLL/

A Description of Known Contamination in the ICPP High Level Waste Tank Farm

Prepared by:
Harry L. Lord
WINCO Major Projects
March 27, 1992

I. Overview

The High Level Waste Tank Farm Replacement (HLWTFR) Project plans to build four 500,000 gallon waste tanks north of the existing Idaho Chemical Processing Plant (ICPP) Tank Farm. As part of this construction, the Project will tie into the existing High Level Liquid Waste (HLLW) piping. This tie-in will cause excavation in the Tank Farm area.

Past leaks and spills of radioactive liquids have occurred in the Tank Farm area. The Project requires knowledge of these leaks and spills to perform waste management and excavation planning. A review of known data and planned characterization activities was conducted and is presented here.

II. Background Knowledge

The WINCO Environmental Compliance (EC) Department has assigned areas and numbers to locations where leaks and spills are suspected to have occurred. These areas are designated as Environmentally Controlled Areas (ECAs) and access is controlled by EC. Each area will be discussed as to historical background, possible impact on the Project, and planned activities by EC or the HLWTFR Project. For specific locations see Attachment 1.

"No Action" determination paperwork for some of these sites was submitted to DOE, EPA, and IDHW in January 1992. Concurrence could be received any time but may be delayed until January 1993 when EC submits the annual report of ECA activities. Concurrence would mean that EC would have "No Action" for these sites.

The ECA disturbance notification process was initiated in May 1991. Completion of this process requires a determination of disturbance by EC and submission of a Letter of Intent (LOI) by the HLWTFR Project. The LOI requires data from the characterization being performed the summer of 1992 by EC.

ECA-16 In January 1976, HLLW solution was transferred from Tank WM-181 to the PEW evaporator. A leak in the transfer line resulted in the contamination of about 25 cubic feet of soil. The contaminated soil was left in place. The HLWTFR Project design has avoided this area. Since the documentation of this spill is lacking EC has submitted "No Action" paperwork to the EPA, DOE, and State of Idaho Project Managers.

ECA-20 Radioactive liquid waste was routinely unloaded from transport vehicles at the CPP-604 unloading area. The wastes were processed at the PEW evaporator. Occasional spills occurred during unloading, but were cleaned up. Since these spills were cleaned up EC has submitted "No Action" paperwork to the EPA, DOE, and State of Idaho Project Managers.

This area will be completely excavated by the HLWTFR Project. If the site is "closed" this will be no problem. If the site is not "closed," the Project will have to proceed with ECA disturbance notification to EC, IDHW, EPA, and DOE.

ECA-25 In August 1960, the area north of CPP-604 was found to be contaminated as a result of a ruptured transfer line. Approximately nine cubic yards of contaminated soil were removed and sent to the Radioactive Waste Management Complex (RWMC). Since this area was cleaned up EC has submitted "No Action" paperwork to the EPA, DOE, and State of Idaho Project Managers.

This area will be completely excavated by the HLWTFR Project. If the site is "closed" this will be no problem. If the site is not "closed" the Project will have to proceed with ECA disturbance notification to EC, Idaho, EPA, and DOE.

ECA-26 In May 1964, a hose coupling leak was detected during a steam flushing operation designed to remove radioactive contamination from existing pipelines. The contaminated fluid was dispersed over a 3-4 acre area inside the ICPP fence, but contamination above background was detected outside the fence (~10 acres) as well. The contaminated material was removed. Later a building (CPP-699) was erected over a portion of the contaminated area. The radioactive fluid was composed of Sr-90, Ru-106, Ce-144, and Cs-137. EC plans to install an "observation well" and a sampling well in this area during the summer of 1992.

The Project has obtained a determination that the construction of the security fence in this ECA does not constitute a disturbance. The construction of the transfer lines will most likely require an ECA disturbance notification. This decision was requested from EC in May 1991.

ECA-28 In October 1974, contaminated soil reading up to 40 R/hr was discovered adjacent to a HLLW transfer line, about 10 feet south of WM-181, near valve box A-6. Investigations showed that a small hole (0.15") had been accidentally drilled through the pipe during a modification in 1955. It is estimated that as much as 120 gallons of HLLW, containing about 6000 Ci of radioactivity, may have been released at a depth of seven feet below grade. Roughly 60 cubic yards of contaminated soil was sent to the RWMC, but a percentage of the contaminated soil was left in place (about 3000 Ci). Based on soil measurements, it is estimated that about 5 cubic yards of contaminated soil remain in this area. Eleven monitoring wells were installed and they showed that the contamination was between 6 and 10 feet below grade with the highest reading of 90 R/hr at 8 feet. These monitoring wells were sealed. EC plans to install an "observation well" in this area during the summer of 1992. Some design features have been relocated and the HLWTFR Project plans to use shoring, if necessary, to avoid this site.

ECA-30 In June 1975, contaminated soil was found near valve box B-9. Contaminated soil from a 20 square foot area was removed and sent to the RWMC. Since this area was cleaned up EC has submitted "No Action" paperwork to the EPA, DOE, and State of Idaho Project Managers.

If the site is not "closed" the Project will have to proceed with ECA disturbance notification to EC, Idaho, EPA, and DOE.

ECA-31 In September 1975, contaminated soil was found south of tank WM-183. The contaminated zone extended 150 feet by 20 feet along a pipe at a depth of 12-20 feet. The waste, estimated to be approximately 14,000 gallons, apparently leaked through an isolation valve from a High Level Liquid Waste (HLLW) transfer line to a cooling water drain line. The carbon steel cooling water drain line corroded and allowed the HLLW to leak into the soil. About 30,000 Ci of radioactivity, consisting of Cs-137, Sr-90, and Y-90 were estimated to have been released. Due to the quantity of contaminated soil (about 800 cubic yards) and depth of contamination, the soil was left in place. Several "monitoring wells" were installed to determine the extent of the contamination. These "monitoring wells" are pipes driven into the ground. Monitoring is done quarterly by lowering a radiation instrument down these pipes and recording the readings at 2 foot intervals. The data from these wells give good indication of the extent and levels of the contamination at this location (See the attached Radiation Isopleths for more information). EC is planning to install six more "monitoring wells" in this location during the summer of 1992.

A detailed discussion of this site follows. ECA disturbance notification must be completed.

ECA-32 In December 1976, contaminated soil reading 2 R/hr was detected southwest of valve box B-4. A leaking standpipe next to the valve box was assumed to be the source. However, similar contamination readings were found in soil located about 50 feet northwest of the same valve box. The contaminated soil was left in place. EC is planning to install a "monitoring well" and, if contamination levels permit, a sampling well at this location this summer.

The project will have to proceed with ECA disturbance notification for this area.

Other areas of suspected contamination not included in the ECAs exist in the Tank Farm area.

WL-132 & 133

The area north of CPP-604 was excavated in the early 1980s for the installation of a new Low Level Waste tank. Contaminated soil was discovered during this excavation. Soil with contact reading less than 5 mR/hr was used to backfill the excavation. As the excavation for the HLWTFR Project will encompass some of the same area, there is a reasonable expectation to encounter this soil. The HLWTFR Project plans to drill two boreholes in this area and sample the soil to determine contamination levels.

During the above construction, contamination was discovered near the bottom of valve box A-2. The HLWTFR Project plans to excavate in this area so contamination should be expected.

III. Monitoring Wells

The ICPP Tank Farm contains 37 "monitoring wells." The wells are basically pipes driven into the ground to various depths. Radiation profiles are obtained by lowering a detector down the wells and recording the readings at two foot intervals. Readings are taken quarterly so we have a reasonably good idea of the radiation levels where the monitoring wells are located. The location of the wells is given on the attached plot plan. (Attachment 2)

The attached annotated plot plan (Attachment 3) gives the readings from this monitoring. This data is from the 1990 and 1991 surveys and shows the maximum readings in the wells and the depth at which the highest reading was obtained.

IV. Conclusions

Radioactive contamination in the soil presents one of the challenging problems to be overcome when excavating in the tank farm area. The area between tanks 181, 183, 184, and 185 is highly contaminated. This is consistent with the historical data for ECA-31.

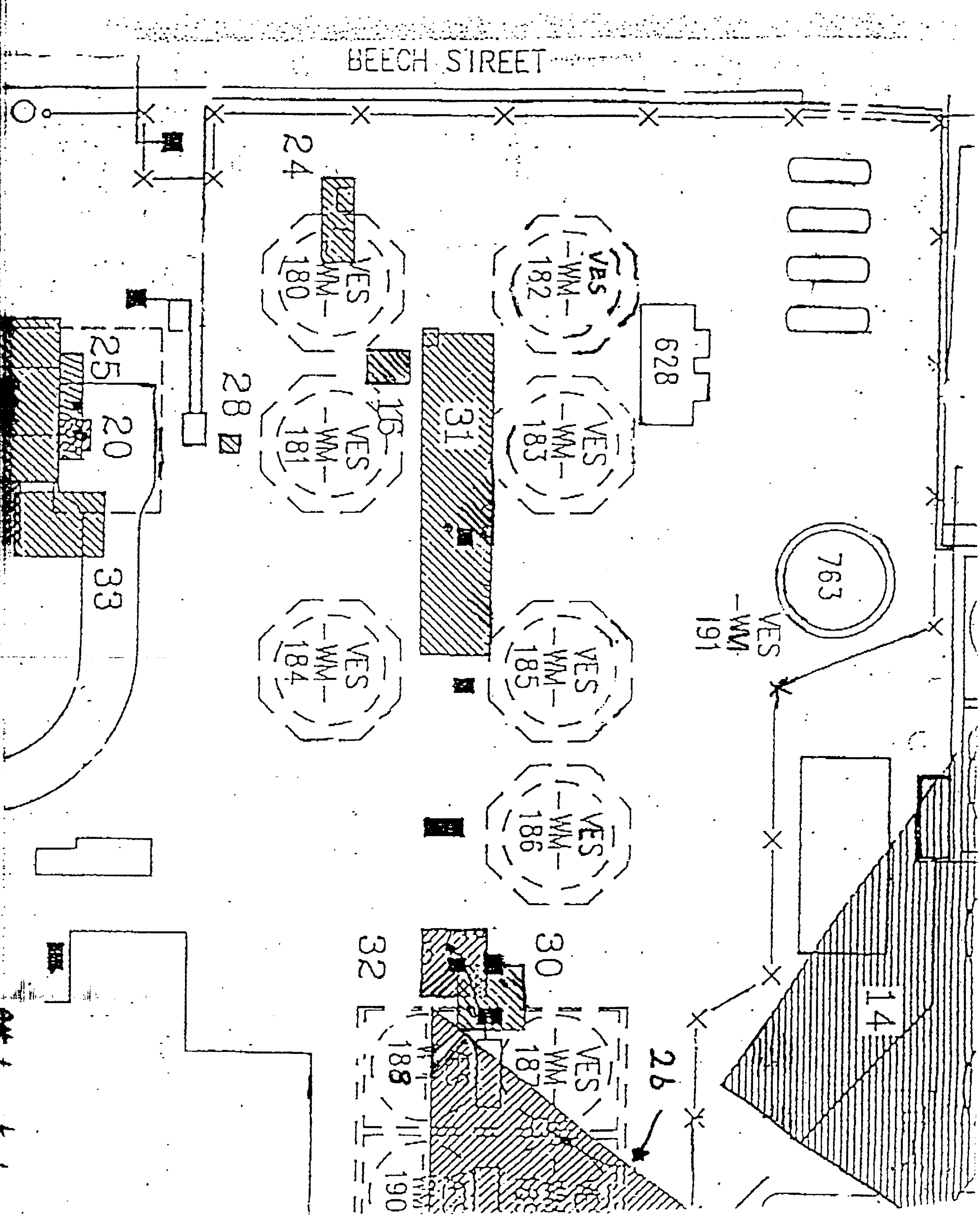
The monitoring well data also suggests there is some contamination in the south portion of the tank farm. The readings from wells A-52 and A-56 show contamination at 32 feet in the 200 mR/hr range. This is consistent with the contamination discovered during excavation in the early 1980s, but deeper. The HLWTFR Project does not plan to excavate to this depth in this area.

The HLWTFR Project plans to modify valve box A-6 in the area of ECA-31. This will involve digging to the top of the valve box, forming and placing concrete to bring the box walls above the surface. It also involves replacing valves in the boxes A-5 and A-6. The radiation fields in this area may be too high to allow this work to be accomplished without shielding. Data from surveys taken inside of the valve boxes after decontamination and from the new "monitoring wells" will be necessary before determining shielding requirements.

The HLWTFR Project plans to excavate the area north of CPP-604 to install the new valve box and make connections to the present system. Contaminated is expected in this area. We know contamination is present at the well locations (A-52 and A-56) and can infer that it exists throughout the area. The level of contamination is not high enough to halt construction but must be included in the excavation planning.

The other excavation areas for the HLWTFR Project can be reasonably assumed to be clean. The area north of the WM-103 to 106 tanks does not have a source and the monitoring well (A-48) located there has zero readings. The west side of the tank farm area also does not have a source and the wells (A-50 & 81-2) have zero readings. The area north of WM-186 does not have a source and wells (B-7, A-44, 81-17, & 81-24) have zero readings.

The two problem areas, as far as excavation, into contaminated soil is concerned for the HLWTFR Project are, 1) the ECA-31 area, and 2) the area north of CPP-604. The work in ECA-31 will have to be carefully planned to avoid radiation exposure to workers. Data from the EC characterization this summer and radiation surveys of the valve boxes will have to be evaluated to plan this activity. To complete the work required by the Project Design Criteria the area north of CPP-604 will have to be extensively excavated. The Project must plan for portions of this excavation to be in low level (<10 mR/hr) soil.


BEECH STREET
VES
WM
180
VES
WM
181
VES
WM
182
VES
WM
183
VES
WM
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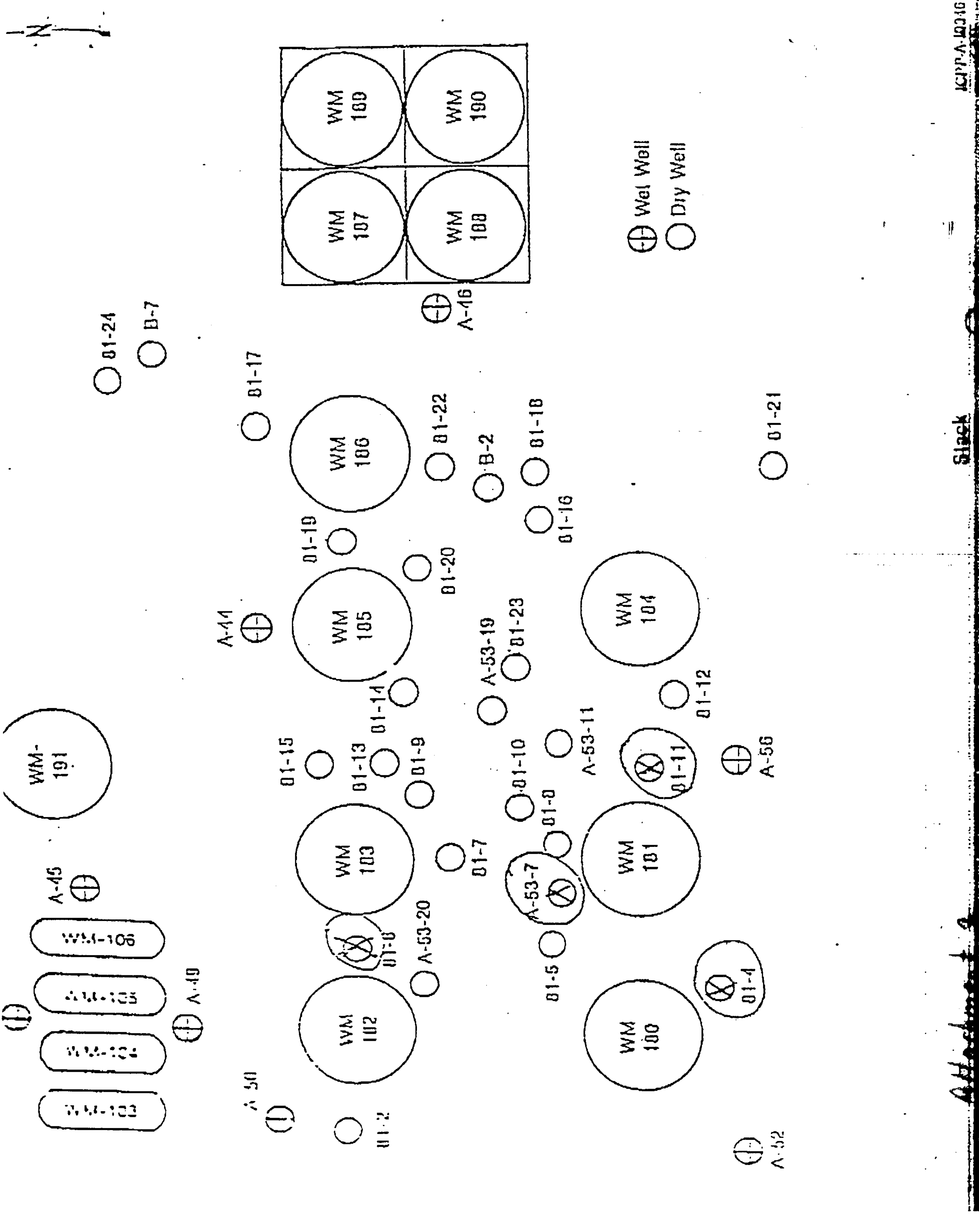
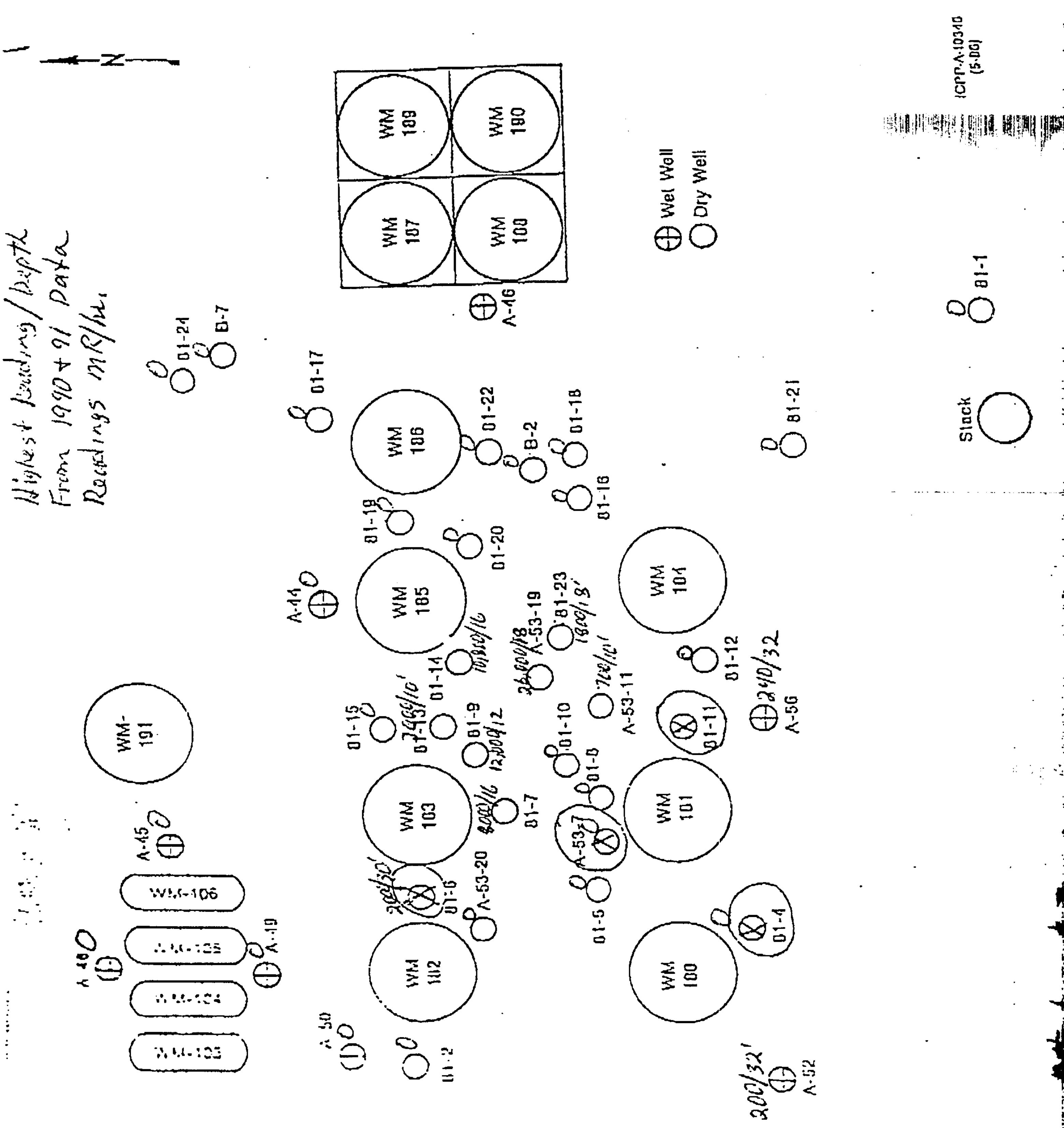
VES
WM
185
VES
WM
186
VES
WM
187
188
190
VES
WM
191
763
628
24
25
20
28
16
31
33
30
32
14
26


WM 189
WM 190
WM 187
WM 188
Wet Well
Dry Well
A-46
01-24
B-7
01-17
WM 186
01-22
B-2
01-18
01-21
01-16
01-19
01-20
A-44
WM 105
WM 104
A-53-19
01-23
01-14
01-12
WM-191
01-15
01-13
01-9
01-10
A-53-11
01-11
A-56
01-8
WM 103
01-7
WM 101
A-45
A-53-7
WM-106
01-6
A-53-20
01-5
01-4
A-49
WM 102
WM 100
A-50
01-2
A-52
Stack

6420 (8-86)

TANK FARM OBSERVATION WELLS LOCATION MAP



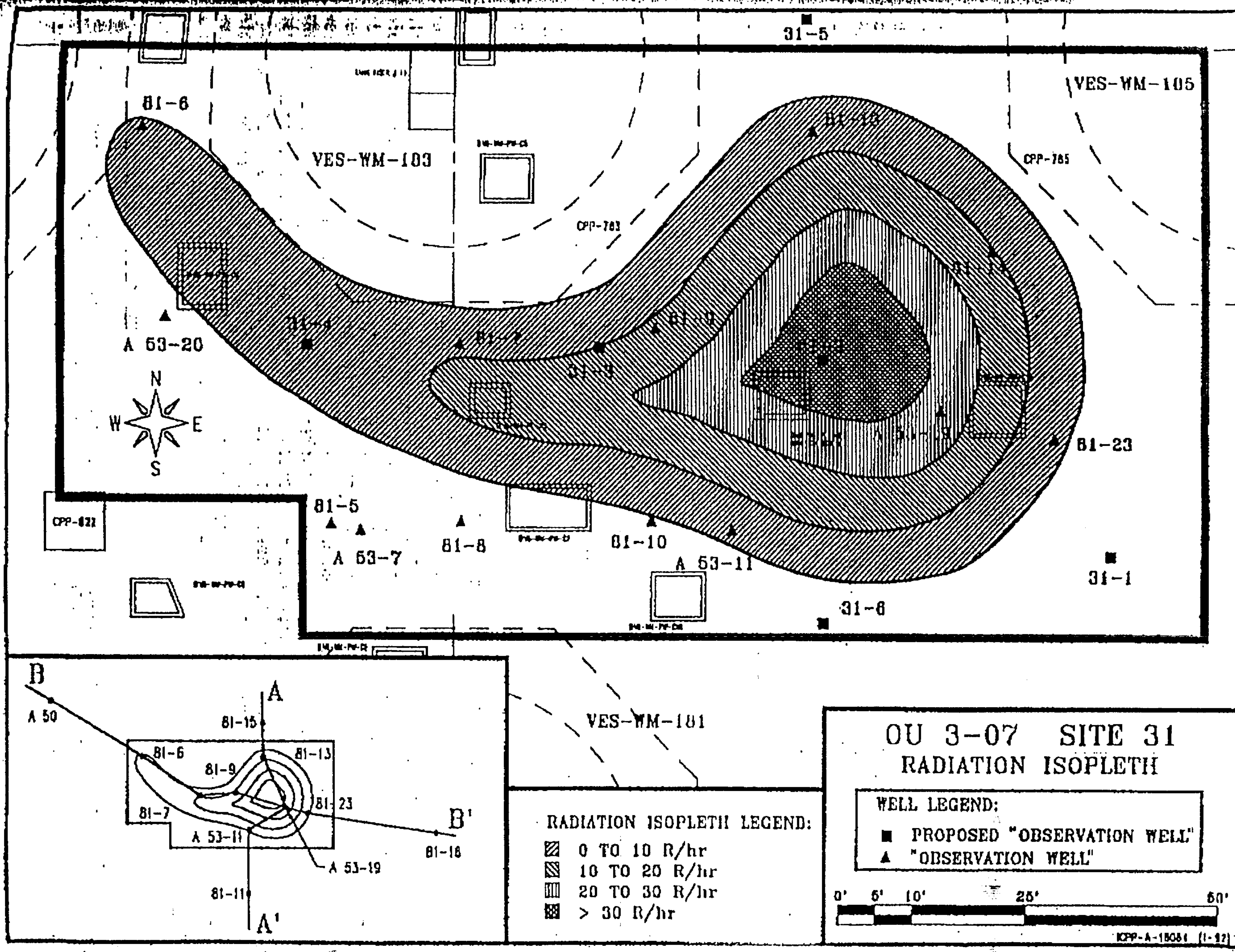

31-5
VES-WM-105
VES-WM-103
81-6
CPP-783
CPP-785
A 53-20
81-7
81-9
81-13
81-23
N
W
E
S
CPP-632
81-5
A 53-7
81-8
81-10
A 53-11
31-1
31-6
B
A
A 50
81-15
81-6
81-9
81-13
81-7
81-23
B'
A 53-11
81-16
A 53-19
81-11
A'
VES-WM-181
OU 3-07 SITE 31
RADIATION ISOPLETH
WELL LEGEND:
PROPOSED "OBSERVATION WELL"
"OBSERVATION WELL"
RADIATION ISOPLETH LEGEND:
0 TO 10 R/hr
10 TO 20 R/hr
20 TO 30 R/hr
> 30 R/hr
0'
5'
10'
25'
50'
ICPP-A-15051 (1-92)

Figure 4-3

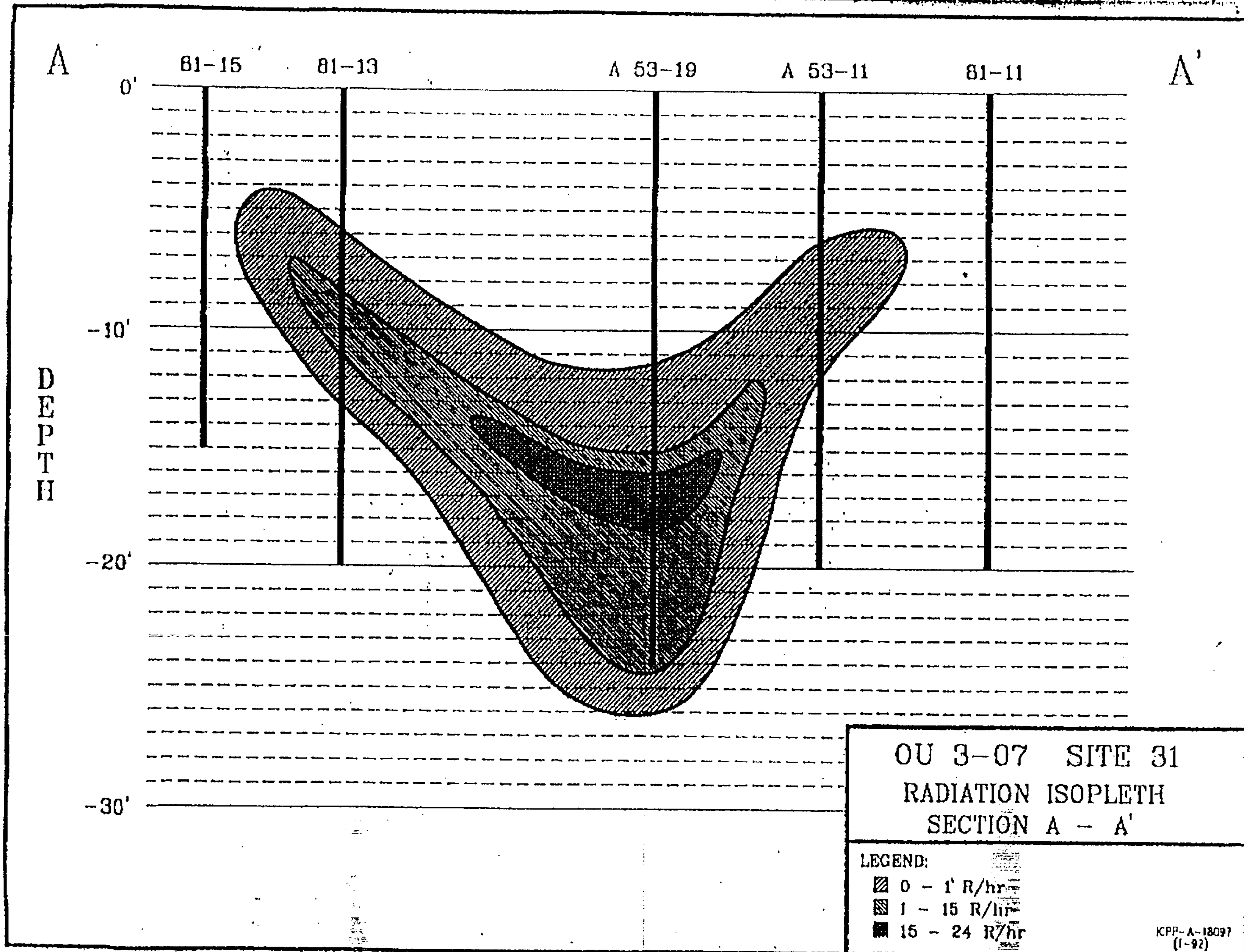

A
A'
81-15
81-13
A 53-19
A 53-11
81-11
0'
-10'
-20'
-30'
DEPTH
OU 3-07 SITE 31
RADIATION ISOPLETH
SECTION A - A'
LEGEND:
0 - 1 R/hr
1 - 15 R/hr
15 - 24 R/hr
ICPP-A-18097 (1-92)

Figure 4-1

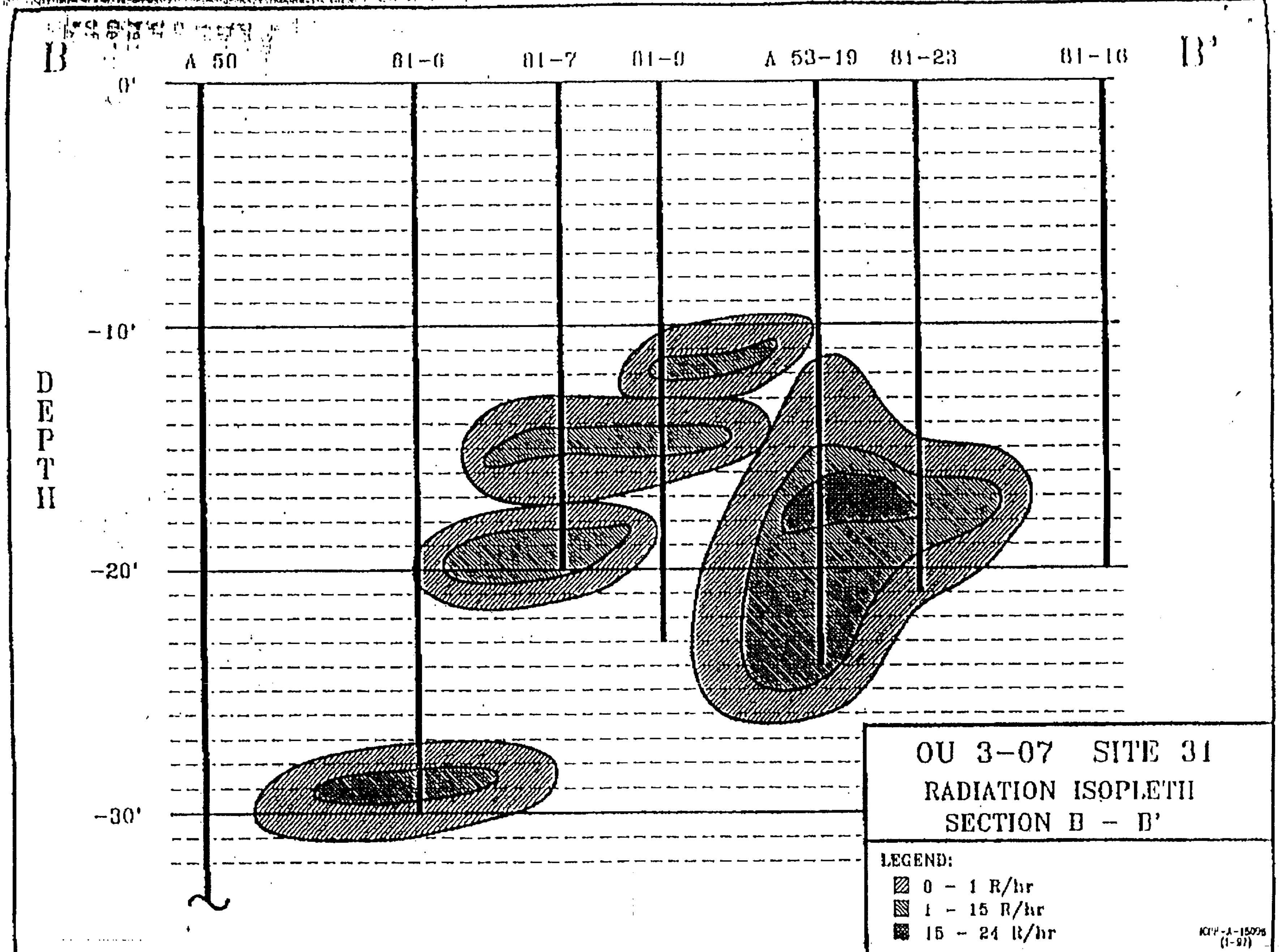

B
A 50
81-6
81-7
81-9
A 53-19
81-23
81-16
B'
0'
-10'
-20'
-30'
DEPTH
OU 3-07 SITE 31
RADIATION ISOPLETH
SECTION B - B'
LEGEND:
0 - 1 R/hr
1 - 15 R/hr
15 - 24 R/hr

Figure 4-5

Appendix E-5
Frank Ward Interviews

X-Lotus-FromDomain: INEL
From: "Frank S Ward" <FSW2@inel.gov>
To: hns@inel.gov (Ross Johnson)
Date: Thu, 27 Aug 1998 08:51:21 -0600
Subject: Re: Frank Ward Interview, 8/12/98
Mime-Version: 1.0

The Hydraulic fluid spill was less than 1 gallon, the hydraulic hose to an outrigger burst when the P&H crane was being started. The hydraulic system was not being used to move the outriggers at that time. The area is known and is covered with plastic and soil.

The sheet of lead has been reported and we have pictures of it.

The leaks from the unions associated with ECA #16 were reported by Dan Staiger. The above ground sump jet transfer system has not been used since I have been here, Sep 1977.

hns@inel.gov (Ross Johnson) on 08/14/98 02:30:04 PM

To: Tank Farm Release Sites Project <gel>
cc: FSW2 (bcc: Frank S Ward/FSW2/LMITCO/INEEL/US)
Subject: Frank Ward Interview, 8/12/98

Notes from interview on 8/12/98 with Frank Ward, ID=FSW2, regarding his recollection (and hearsay) of contamination releases since his employment, as follows:

Leaks and soil contamination incidents that were not reported because they did not involve radioactivity include a hydraulic fluid spill from the P&H crane blowout located between WM-187 and WM-189 (closer to WM-189). Hydraulic hose burst. Spill quantity (guessing 100gal.) or exact area unknown. Occurred some time in 1986-1988 era. Should have been reported in monthly report to DOE.

At the corner of Fir Street by B-1 Valve box, 1/4-in. lead sheet is buried below ground surface for shielding rad. contamination from soil below. The sheet is not reported or recorded anywhere.

When asked what reports other than the UOR's could have indicated soil contamination incidents or leakage, Frank thought that either monthly production/operational reports to DOE, operator's daily logs, or supervisor's daily logs could have reported leaks or soil contamination.

Soil contamination from minor (thought to be insignificant) spills and leakage were routinely stopped and repaired as they were discovered without being reported, excepted possibly being reported as entries in the operator's or supervisor's daily logs.

Dan Steiger, 6-3121, at WCB RM. 171, has compiled a complete sete of production/operational reports. Check with Dan for his recollection of other soil contamination incidents.

ECA #16 (CPP-16) records contamination resulted from leakage from a valve in a process line, but does not indicate leakage from pipe unions. All the unions in the line had to be tightened periodically because of leakage which resulted in contamination. These spills still remain at each union location.

Frank, please reply to this note if you have clarifications or recall additional information regarding our conversation or soil contamiantion incidents at INTEC Tank Farm.

+---+
Ross E. Johnson, A.I.A. Architect Id. #AR-1463
(208) 526-2431 org: 4130
E-mail address: hns@inel.gov
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Facility Engineering Unit FAX(208) 526-2681
Mechanical, Civil, & Industrial Engineering Department
Lockheed Martin Idaho Technologies Co. (LMITCO)
Idaho National Engineering & Environmental Laboratory (INEEL)
Idaho Falls, Idaho 83415-3650
+---+

hns@inel.gov (Ross Johnson) on 11/04/98 07:58:26 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Frank Ward Interview, 8/12/98

>Date: Fri, 14 Aug 1998 14:30:04 -0600
>To: TFF_OU-3-14_File
>From: Ross Johnson <hns@inel.gov>
>Subject: Frank Ward Interview, 8/12/98
>Cc: FSW2
>Bcc:
>X-Attachments:
>
>Notes from interview on 8/12/98 with Frank Ward, ID=FSW2, regarding his
>recollection (and hearsay) of contamination releases since his employment,
>as follows:
>
>------------------------
>
>Leaks and soil contamination incidents that were not reported because they
>did not involve radioactivity include a hydraulic fluid spill from the P&H
>crane blowout located between WM-187 and WM-189 (closer to WM-189).
>Hydraulic hose burst. Spill quantity (guessing 100gal.) or exact area
>unknown. Occurred some time in 1986-1988 era. Should have been reported
>in monthly report to DOE.
>
>At the corner of Fir Street by B-1 Valve box, 1/4-in. lead sheet is buried
>below ground surface for shielding rad. contamination from soil below.
>The sheet is not reported or recorded anywhere.
>
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>contamination incidents or leakage, Frank thought that either monthly
>production/operational reports to DOE, operator's daily logs, or
>supervisor's daily logs could have reported leaks or soil contamination.
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>leakage were routinely stopped and repaired as they were discovered
>without being reported, excepted possibly being reported as entries in the
>operator's or supervisor's daily logs.
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>in a process line, but does not indicate leakage from pipe unions. All
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>which resulted in contamination. These spills still remain at each union
>location.
>
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>
>Frank, please reply to this note if you have clarifications or recall
>additional information regarding our conversation or soil contamiantion
>incidents at INTEC Tank Farm.
>

+--+
Ross E. Johnson, A.I.A. Architect
E-mail address: hns@inel.gov
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hns@inel.gov (Ross Johnson) on 11/04/98 07:57:57 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: ECA-16 Pipe Union Leaks

Notes from phone interview with Frank Ward, ID=FSW2, on 10/27/98 regarding clarification of 8/12/98 interview comments on ECA-16 and other leakage from pipe unions during transfers of low-level contaminated service water from tank vaults to WL-102, as follows:

ECA-16 resulted from an occurrence reported in Occurrence Report #76-03.

Between about 196? to 1976-7, all the tank vaults sumps were evacuated periodically by steam-jetting the sumps with flex-hose evacuation lines to the PEW tank (WL-102) to remove low-level contaminated water buildup from the vaults. The level of activity in the contaminated water would vary depending which tank vault was being evacuated.

The flex-hoses used for these transfers were interconnected in 20-foot lengths to the total lengths necessary for each evacuation operation. The flex-hose lines, depending on which vault was being evacuated, would have been between 80-500 ft. long, and the exact line laydown location for each transfer would vary.

The occurrence reported in Occurrence Report #76-03 was a result of a failure in one of the flex-hose connections during a specific transfer. That occurrence causes 3000 gals. of service waste to spill on the ground. What was not reported was other minor leaks of this type during this and other service waste transfers from hose connections that would have to be periodically repaired and the leaks, if any, that would drip from hose sections as they were moved from location to location.

After approx. 1976-7, hard lines were installed for these transfers, and the flex-hoses were not used again. At various times since that installation the affected areas of the tankfarm has all been excavated and backfilled with a mix of low-level contaminated soil. According to Frank, it would be near impossible to find the results of these minor hose leaks, even if the exact location of each hose laydown could be determined.

+--+
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Idaho Falls, Idaho 83415-3650
+--+

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:59 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Re: Frank Ward Interview, 8/12/98

>X-Lotus-FromDomain: INEL
>From: "Frank S Ward" <FSW2@inel.gov>
>To: hns@inel.gov (Ross Johnson)
>Date: Thu, 27 Aug 1998 08:51:21 -0600
>Subject: Re: Frank Ward Interview, 8/12/98
>Mime-Version: 1.0
>
>The Hydraulic fluid spill was less than 1 gallon, the hydraulic hose to an
>outrigger burst when the P&H crane was being started. The hydraulic system
>was not being used to move the outriggers at that time. The area is known
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>Staiger. The above ground sump jet transfer system has not been used since
>I have been here, Sep 1977.
>
>
>
>
>
>hns@inel.gov (Ross Johnson) on 08/14/98 02:30:04 PM
>
>
>To: Tank Farm Release Sites Project <gel>
>cc: FSW2 (bcc: Frank S Ward/FSW2/LMITCO/INEEL/US)
>Subject: Frank Ward Interview, 8/12/98
>
>
>
>
>Notes from interview on 8/12/98 with Frank Ward, ID=FSW2, regarding his
>recollection (and hearsay) of contamination releases since his employment,
>as follows:
>
>------------------------
>
>Leaks and soil contamination incidents that were not reported because they
>did not involve radioactivity include a hydraulic fluid spill from the P&H
>crane blowout located between WM-187 and WM-189 (closer to WM-189).
>Hydraulic hose burst. Spill quantity (guessing 100gal.) or exact area

>unknown. Occurred some time in 1986-1988 era. Should have been reported
>in monthly report to DOE.
>
>At the corner of Fir Street by B-1 Valve box, 1/4-in. lead sheet is buried
>below ground surface for shielding rad. contamination from soil below. The
>sheet is not reported or recorded anywhere.
>
>When asked what reports other than the UOR's could have indicated soil
>contamination incidents or leakage, Frank thought that either monthly
>production/operational reports to DOE, operator's daily logs, or
>supervisor's daily logs could have reported leaks or soil contamination.
>
>Soil contamination from minor (thought to be insignificant) spills and
>leakage were routinely stopped and repaired as they were discovered without
>being reported, excepted possibly being reported as entries in the
>operator's or supervisor's daily logs.
>
>*Dan Steiger*, 6-3121, at WCB RM. 171, has compiled a complete sete of
>production/operational reports. Check with Dan for his recollection of
>other soil contamination incidents.
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>unions in the line had to be tightened periodically because of leakage
>which resulted in contamination. These spills still remain at each union
>location.
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>
>Frank, please reply to this note if you have clarifications or recall
>additional information regarding our conversation or soil contamiantion
>incidents at INTEC Tank Farm.
>
>
>
>+---+
>Ross E. Johnson, A.I.A. Architect Id. #AR-1463
>(208) 526-2431 org: 4130
>E-mail address: hns@inel.gov
>+---+
>Facility Engineering Unit FAX(208) 526-2681
>Mechanical, Civil, & Industrial Engineering Department
>Lockheed Martin Idaho Technologies Co. (LMITCO)
>Idaho National Engineering & Environmental Laboratory (INEEL)
>Idaho Falls, Idaho 83415-3650
>+---+
>

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Lockheed Martin Idaho Technologies Co. (LMITCO)

Idaho National Engineering & Environmental Laboratory (INEEL)
Idaho Falls, Idaho 83415-3650
+--+

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:26 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Frank Ward Interview, 8/12/98

Notes from interview on 8/12/98 with Frank Ward, ID=FSW2, regarding his recollection (and hearsay) of contamination releases since his employment, as follows:

Leaks and soil contamination incidents that were not reported because they did not involve radioactivity include a hydraulic fluid spill from the P&H crane blowout located between WM-187 and WM-189 (closer to WM-189). Hydraulic hose burst. Spill quantity (guessing 100gal.) or exact area unknown. Occurred some time in 1986-1988 era. Should have been reported in monthly report to DOE.

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When asked what reports other than the UOR's could have indicated soil contamination incidents or leakage, Frank thought that either monthly production/operational reports to DOE, operator's daily logs, or supervisor's daily logs could have reported leaks or soil contamination.

Soil contamination from minor (thought to be insignificant) spills and leakage were routinely stopped and repaired as they were discovered without being reported, excepted possibly being reported as entries in the operator's or supervisor's daily logs.

Dan Steiger, 6-3121, at WCB RM. 171, has compiled a complete sete of production/operational reports. Check with Dan for his recollection of other soil contamination incidents.

ECA #16 (CPP-16) records contamination resulted from leakage from a valve in a process line, but does not indicate leakage from pipe unions. All the unions in the line had to be tightened periodically because of leakage which resulted in contamination. These spills still remain at each union location.

Frank, please reply to this note if you have clarifications or recall additional information regarding our conversation or soil contamiantion incidents at INTEC Tank Farm.

Appendix E-6
Devon Meacham
Interview

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:23 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Devon Mecham Interview, 7/20/98

Notes from interview on 7/20/98 with Devon Mecham, ID=DMECHAM, regarding his recollection (and hearsay) of contamination releases since his employment from 3/23/59, as follows:

Dave Makivek has three documented releases at tank farm. Talk to him for documentation and details. One of these incidents according to D. Mecham's recall is as follows:

<<Water Relief Valve WRV-147 >>: Happened in the 1960's or 1970's. An incident regarding Water Relief Valve WRV-147, located southeast of VES-183 in relief pipe line to 3"WRN-1037 which intersects with process pipe line 3"PVA-1014. 3"WRN-1037 is a carbon steel relief line used to inject steam into 3"PVA-1014 stainless steel encased process line between process transfers. The 3"WRN-1037 valve was left open and process solutions backflowed into 3"WRN-1037 carbon steel line. The relief line corroded and caused a release into the soil. The lines are located approx. 7-8 ft. below surface.

Another discovery of soil contamination that may have been caused by the WRV-147 incident: In 1978 during excavation for new process piping construction (pipes HSA-104733, PLA-104708, PLA-104710 & PLA-104733), soil contamination was discovered in an area where the pipe routing was planned. That area was, according to D. Mecham's recall, somewhere between DVB-WM-PW-B3 and DVB-WM-PW-C15 or somewhere nearly south of there. (It is D. Mecham's guess that the contamination could be caused by migration of leakage for the WRV-147 valve indicent.) Pipes HSA-104733, PLA-104708, PLA-104710 & PLA-104733 were rerouted south at DVB-WM-PW-B3 to avoid the contaminated area.

Another incident according to D. Mecham's recall was located near the SW corner of CPP-635: The incident caused surface contamination resulting from some failure in a procedure to decontaminate a process line by injecting steam into the line. There was a failure at the point of injection, and contaminated steam from the process line was ejected into the air, causing surface contamination in the surrounding area. To D. Mecham's recall, the area was decontaminated and contaminated soil hauled off.

To D. Mecham's recall, in the earlier days of CPP minor leaks which may have contaminated the soil, if noticed, were repaired without much, if any, documentation or incident reporting. Some of the oldtimers who would have been directly involved in these repairs or incidents and who may remember some of them. Some of these people and their capacity are:

Reece Kern (retired, possibly in Idaho Falls).
Jerry Cole (retired in Idaho Falls) -- Plant Eng/ mgr. Hired D. Mecham. Worked for Reece Kern. 523-3691 home phone.
George K. Cedarburg (retired in Firth) -- Safety Analysis.
George Lohse (retired in Idaho Falls) -- CPP troubleshooter (tech. planner/supervisor/ mgr.? involved in planning/directing the fixes). 522-6479 home phone.
Phil Richert (retired in Idaho Falls) -- Plant Engineer, knows G. Lohse. 522-2374 home phone.
Don Reed (retired, possibly in Idaho Falls) -- Plant Mgr.
Pete Meckelsen (retired in Idaho Falls) -- Plant supervisor/ mgr. 529-5808 home phone.

According to D. Mecham, another area that has since been D&D'd (in 1960's or 1970's) concerns a building project and process piping called <<RALA>> may or may not have contamination. RALA was, according to D. Mecham, formerly secret in the early days to conceal imaging offgas from operations from spy satellites. Its function was to condense evaporative offgas from CPP-631 and reroute the condensate back the CPP-604 for processing. RALA was located east of CPP-659 near the fourth bin set (CPP-761). Evap. piping was routed from CPP-631 under Olive Ave. to RALA. Condensate piping was routed from RALA back to CPP-604. The piping may either have been capped/abandoned or removed. Mecham did not know of specific incidents or contamination regarding RALA but thought there could have been.

<<<<<To D. Mecham>>>>>: Please reply to this note with corrections, if your recall of events are not as noted herein, or if you can recall additional information regarding contamination incidents at CPP Fank Farm.

+---+
Ross E. Johnson, A.I.A. Architect
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Idaho Falls, Idaho 83415-3650
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Appendix E-7
Dan Staiger Interview

hns@inel.gov (Ross Johnson) on 11/04/98 07:58:19 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Dan Staiger Interview, 8/12/98

>Date: Fri, 14 Aug 1998 14:29:59 -0600
>To: TFF_OU-3-14_File
>From: Ross Johnson <hns@inel.gov>
>Subject: Dan Staiger Interview, 8/12/98
>Cc: staigmd
>Bcc:
>X-Attachments:
>
>Notes from interview on 8/12/98 with Frank Ward, ID=STAIGMD, regarding his
>recollection (and hearsay) of contamination releases since his employment,
>as follows:
>
>-------------------------
>
>Chromated water leakage continues to occur throughout the tank farm at
>joints and unions in steam piping, but are not reported at soil
>contamination incidents.
>
>In early 70's, chromate leak adjacent to condenser pit -387 from buried
>valves.
>
>Also in early 70's, chromate leaks from buried valves north of CPP-635.
>
>Transfer line from WM-181 to WL-102 set in inverted U-shaped culvert w/
>sand bottom leaked. Valve w/ teflon gasket failed through gasket.
>Gasket replaced. Unions in pipe joints leaked and were periodically
>tightened to stop leaks. Leaks contaminated soil. Leaking valve in
>manhole near WM-181 was replaced. Contaminated soil remained and not
>reported, except maybe in daily logs.
>
>Exterior area NE of CPP-628 between -191 and -106 was used as area to
>decon contaminated backhoes, and trucks, & heavy equipment. Equipment was
>decon'd. by steam cleaning to remove contamination. Soil would have
>contamination from radionuclides and petroleum products. No reports
>recorded for soil contamiantion resulting from decon operations.
>
>12- or 14-in. dia. service waste line on NW corner of CPP-604 was removed
>and replaced. Soil could have been contaminated from chromated waste and
>other chemical leakage as result of D&D.
>
>Past employees (retired) who may have recollection of undocumented
>leakages, spells, and nonrad. contamination incidents, that would have

>been cleaned up/repaired as normal work operations:
>
> Pete Mickelsen
> Moyland Young
> G.E. Lohse
>
>Septic Tank/Cesspool draining from CPP-604 possibly contaminated with
>mercury or petroleum oil from instruments. Mercury used to calibrate
>monometer instruments was occasionally spilled on floor. Spills were
>mopped, contaminating mop water. Mop water poured down floor drains/sinks
>which drain to cesspool. Effluent from septic tank/cesspool drained to
>drain field. Septic tank/cesspool was replaced by CPP Waste Treatment
>Plant. Unknowned if septic tank/cesspool and drainage field was decon'd.
>and removed.
>
>Other possible records that may have records of leaks,spills, and
>contamination, and that may still exist:
>
> Tank Farm Daily Data Sheets
> Supervisor's Daily Logs
> Personal Daily Logs
> Monthly Reports to DOE
>
>Monthly Reports summarized monthly activity at Tank Farm. If occurrence
>was reported reported in monthly report, it would have been previously
>entered in supervisor's and/or operator's daily log. But entries in daily
>logs may not have been reported in monthly reports.
>
>12/2/74 -- Staiger Personal Log entry: Loss of Chromated cooling water
>upstream of WRV-1.
>
>
>------------------------
>
>Dan, please reply to this note if you have clarifications or recall
>additional information regarding our conversation or soil contamiantion
>incidents at INTEC Tank Farm.
>

+--+
Ross E. Johnson, A.I.A. Architect
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Lockheed Martin Idaho Technologies Co. (LMITCO)
Idaho National Engineering & Environmental Laboratory (INEEL)
Idaho Falls, Idaho 83415-3650
+--+

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:32 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Dan Staiger Interview, 8/12/98

Notes from interview on 8/12/98 with Frank Ward, ID=STAIGMD, regarding his recollection (and hearsay) of contamination releases since his employment, as follows:

Chromated water leakage continues to occur throughout the tank farm at joints and unions in steam piping, but are not reported at soil contamination incidents.

In early 70's, chromate leak adjacent to condenser pit -387 from buried valves.

Also in early 70's, chromate leaks from buried valves north of CPP-635.

Transfer line from WM-181 to WL-102 set in inverted U-shaped culvert w/ sand bottom leaked. Valve w/ teflon gasket failed through gasket. Gasket replaced. Unions in pipe joints leaked and were periodically tightened to stop leaks. Leaks contaminated soil. Leaking valve in manhole near WM-181 was replaced. Contaminated soil remained and not reported, except maybe in daily logs.

Exterior area NE of CPP-628 between -191 and -106 was used as area to decon contaminated backhoes, and trucks, & heavy equipment. Equipment was decon'd. by steam cleaning to remove contamination. Soil would have contamination from radionuclides and petroleum products. No reports recorded for soil contamiantion resulting from decon operations.

12- or 14-in. dia. service waste line on NW corner of CPP-604 was removed and replaced. Soil could have been contaminated from chromated waste and other chemical leakage as result of D&D.

Past employees (retired) who may have recollection of undocumented leakages, spells, and nonrad. contamination incidents, that would have been cleaned up/repaired as normal work operations:

Pete Mickelsen
Moyland Young
G.E. Lohse

Septic Tank/Cesspool draining from CPP-604 possibly contaminated with mercury or petroleum oil from instruments. Mercury used to calibrate monometer instruments was occasionally spilled on floor. Spills were mopped, contaminating mop water. Mop water poured down floor drains/sinks which drain to cesspool. Effluent from septic tank/cesspool drained to drain field. Septic tank/cesspool was replaced by CPP Waste Treatment Plant. Unknowned if septic tank/cesspool and drainage field was decon'd. and removed.

Other possible records that may have records of leaks,spills, and contamination, and that may still exist:

Tank Farm Daily Data Sheets
Supervisor's Daily Logs
Personal Daily Logs
Monthly Reports to DOE

Monthly Reports summarized monthly activity at Tank Farm. If occurrence was reported reported in monthly report, it would have been previously entered in supervisor's and/or operator's daily log. But entries in daily logs may not have been reported in monthly reports.

12/2/74 -- Staiger Personal Log entry: Loss of Chromated cooling water upstream of WRV-1.

Dan, please reply to this note if you have clarifications or recall additional information regarding our conversation or soil contamiantion incidents at INTEC Tank Farm.

To: TFF_OU-3-14_File
From: Ross Johnson <hns@inel.gov>
Subject: Dan Staiger Interview, 8/12/98
Cc: staigmd
Bcc:
X-Attachments:

Notes from interview on 8/12/98 with Frank Ward, ID=STAIGMD, regarding his recollection (and hearsay) of contamination releases since his employment, as follows:

Chromated water leakage continues to occur throughout the tank farm at joints and unions in steam piping, but are not reported at soil contamination incidents.

In early 70's, chromate leak adjacent to condenser pit -387 from buried valves.

Also in early 70's, chromate leaks from buried valves north of CPP-635.

Transfer line from WM-181 to WL-102 set in inverted U-shaped culvert w/ sand bottom leaked. Valve w/ teflon gasket failed through gasket. Gasket replaced. Unions in pipe joints leaked and were periodically tightened to stop leaks. Leaks contaminated soil. Leaking valve in manhole near WM-181 was replaced. Contaminated soil remained and not reported, except maybe in daily logs.

Exterior area NE of CPP-628 between -191 and -106 was used as area to decon contaminated backhoes, and trucks, & heavy equipment. Equipment was decon'd. by steam cleaning to remove contamination. Soil would have contamination from radionuclides and petroleum products. No reports recorded for soil contamiantion resulting from decon operations.

12- or 14-in. dia. service waste line on NW corner of CPP-604 was removed and replaced. Soil could have been contaminated from chromated waste and other chemical leakage as result of D&D.

Past employees (retired) who may have recollection of undocumented leakages, spells, and nonrad. contamination incidents, that would have been cleaned up/repaired as normal work operations:

Pete Mickelsen
Moyland Young
G.E. Lohse

Septic Tank/Cesspool draining from CPP-604 possibly contaminated with mercury or petroleum oil from instruments. Mercury used to calibrate monometer instruments was occasionally spilled on floor. Spills were mopped, contaminating mop water. Mop water poured down floor drains/sinks which drain to cesspool. Effluent from septic tank/cesspool drained to drain field. Septic tank/cesspool was replaced by CPP Waste Treatment Plant. Unknowned if septic tank/cesspool and drainage field was decon'd. and removed.

Other possible records that may have records of leaks,spills, and contamination, and that may still exist:

Tank Farm Daily Data Sheets
Supervisor's Daily Logs
Personal Daily Logs
Monthly Reports to DOE

Monthly Reports summarized monthly activity at Tank Farm. If occurrence was reported reported in monthly report, it would have been previously entered in supervisor's and/or operator's daily log. But entries in daily logs may not have been reported in monthly reports.

12/2/74 -- Staiger Personal Log entry: Loss of Chromated cooling water upstream of WRV-1.

Dan, please reply to this note if you have clarifications or recall additional information regarding our conversation or soil contamiantion incidents at INTEC Tank Farm.

Appendix E-8
Les Mitchell Interview

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:40 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Les Mitchell Interview, 8/17/98

Notes from interview on 8/17/98 with Les Mitchell, ID=LCM, from INTEC Quality Assurance regarding rocords and hearsay of contamination releases since his employment in the early 1970's, as follows:

I indicated that I was looking for soil contamination incidents in the Tank Farm that were not already well known or recorded as Enviromental Control Area release sites. My task was part of a work package agreement in support of the scope of work for OU3-14 Tank Farm Remedial Investigation/Feasibility Study for Rene Rodriguiz.

Les indicated that a congressional subcommittee commissioned a couple of private firms, Radiological Assessment Corp. (from Idaho Falls) and S C & A, to do a similar search of records for hazardous releases at INTEC. Included in their search were searches for soil contamination sites.

S C & A did a release documents search which resulted in a database on CD-ROM. Eddy Chew from DOE-ID was the contact involved in that study and may have a copy of the CD-ROM.

Radiological Assessment Corp. (RAC) started their search approx. 2 yrs. ago and have another 2 yrs. to go. Marilyn Case (RAC) in Idaho Falls is looking into radiological release records. Pat McGavert (RAC) was looking into nonrad. release records; he is located in Boise. These people may have already found records that indicate releases.

Max Hales (proceeds Lohse) kept records of releases as one of his ongoing assignments at ICPP. Record Mgt. (and the records) went from Max Hales to:

Lohse, then to
Lynn Bernard (retired about 10 yrs. ago).

These files prior to 1972 were kept in their personal files. They may be microfilmed-- ask Frank Ward, he will know. Frank inherited Lohse's files.

Other who may know of contamination records are:

Dan Steiger
Pete Michelsen
Walt Michelsen

Also check with Health Physics. They retain permanent records of the the Health Physics Logs. The logs would indicate contamination releases.

<<<<<To Les Mitchell>>>>>: Please reply to this note with corrections, if your recall of our conversation is not as noted herein, or if you can recall additional information regarding contamination incidents and records at CPP Fank Farm.

+--+
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Idaho Falls, Idaho 83415-3650
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Appendix E-9
Lohse File Disposition

Lohse File Disposition

hns@inel.gov (Ross Johnson) on 11/04/98 07:55:50 AM

To: MCALKD
cc: (bcc: K D Mcallister/MCALKD/LMITCO/INEEL/US)
Subject: Lohse File Disposition

I checked with Frank Ward on 8/19/98 on the disposition of Lohse personal files as result of Les Mitchell interview who indicated that F. Ward would have those files.

Frank said when Lohse retired, his files wereplaced in boxes and the boxes place outside his office for anyone to rummage for useful info. Frank retrieved info that was pertinent to his work--specifically, construction dwgs., drawing changes, and tank farm transfer flow records. Other records, such as letter files, memos, work orders, etc., that may have indicated minor leaks or soil contamination incidents were not kept.

I reviewed some of Frank's files for the type of files retained from Lohse's files. It appears that only constructrion dwg. prints, design changes, and flow records were retained.

+--+
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Idaho Falls, Idaho 83415-3650
+--+

Appendix F

Construction History of the Tank Farm

Appendix F

Construction History of the Tank Farm

The following information about the Tank Farm construction history was developed as part of an investigation conducted by Facility Engineering from July through November 1998 to provide information about Tank Farm known and previously undocumented potential release sites. The historical construction information was obtained for areas both inside and crossing the Tank Farm boundaries as defined in the OU 3-14 Scope of Work (DOE-ID 1999a) and as shown in Figure F-1. The information focuses on the following Tank Farm topics:

- Chronology of storage tank construction
- Soil excavation required for construction
- Construction details of the 300,000-gal tanks (WM-180 through WM-190 and the 30,000-gal tanks (WM-103 through WM-106)
- Construction details of the tank vaults (CPP-780 through -786 and CPP-713)
- Construction details of valve boxes (see also Appendices A and B)
- Descriptions of the main process waste transfer pipelines both operational and abandoned within the Tank Farm and crossing the Tank Farm perimeter (see also Appendices C and D).

F-1. CHRONOLOGY

The construction of the Tank Farm began in 1951 with the installation of two 318,000-gal underground storage tanks, WM-180 and WM-181. Nine additional 300,000-gal tanks (WM-182 through WM-190) plus four 30,000-gal tanks (WM-103 through WM-106) were installed between 1954 and 1964. Tanks WM-182 through -184 were constructed concurrently with WM-103 through WM-106, followed by WM-185 and WM-186. Tanks WM-187 and -188 were installed next with construction ending with WM-189 and WM-190. Additional construction phases modified the Tank Farm by adding waste removal lines and valve boxes and by upgrading valves and existing valve boxes. Three-dimensional views of the Tank Farm looking northwest, south, and east are provided in Figures F-2, F-3, and F-4. Each construction phase of the Tank Farm is discussed in the following subsections.

F-1.1 Construction Phase 1, WM-180 and WM-181

The Tank Farm began with the construction of Tanks WM-180 and -181 and Vaults CPP-780 and -781, referred to as the "542" project. (The number designation refers to the number of the drawing used to perform the construction project.) Vault CPP-780 houses Tank WM-180, and Vault CPP-781 houses Tank WM-181. Construction began in 1951 with the excavation of the southwest corner of the Tank Farm. Both octagonal concrete vault floors were poured on bedrock. Both floors were constructed flat with sump areas cast within the vault floor for liquid drainage. Vault CPP-780 was installed with two sump areas, 2 × 2 × 4 ft deep in the southeast corner and 2.5 × 2.5 × 2 ft deep in the northeast corner. Vault CPP-781 was installed with one sump area 2 × 2 × 4 ft deep in the southwest corner.

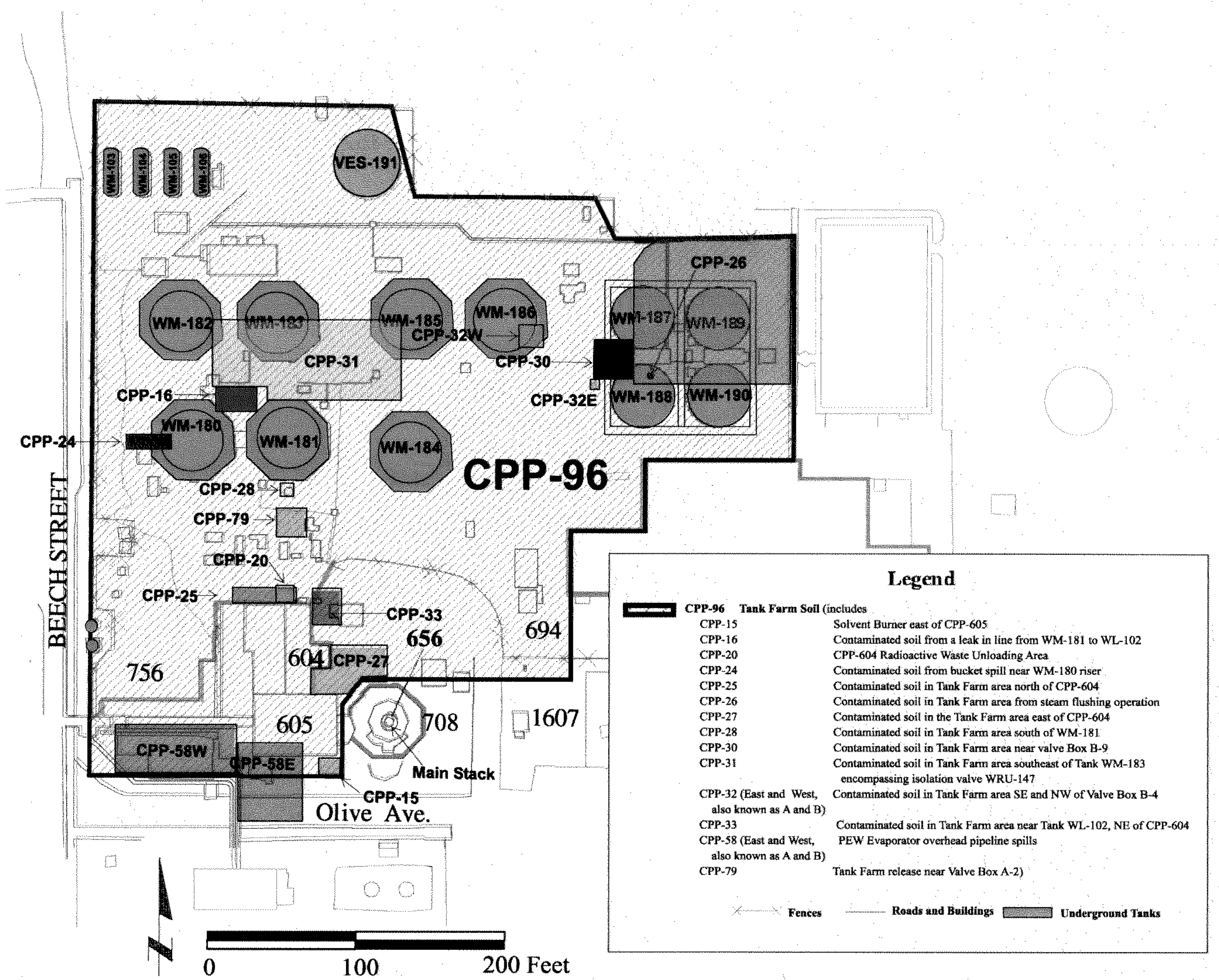


Figure F-1. Known OU 3-14 Tank Farm contaminant release sites.

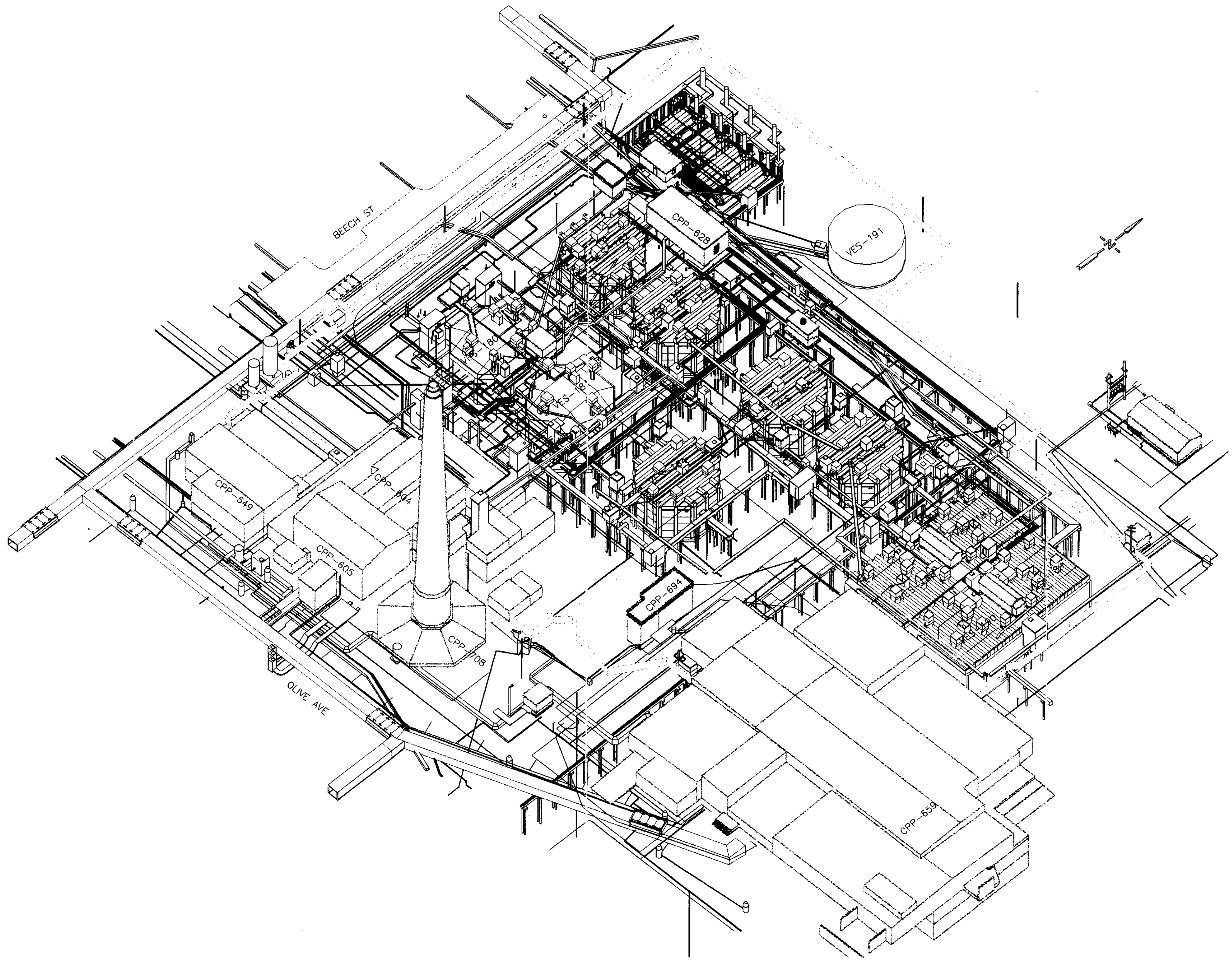


Figure F-2. Tank Farm three-dimensional view, looking northwest.

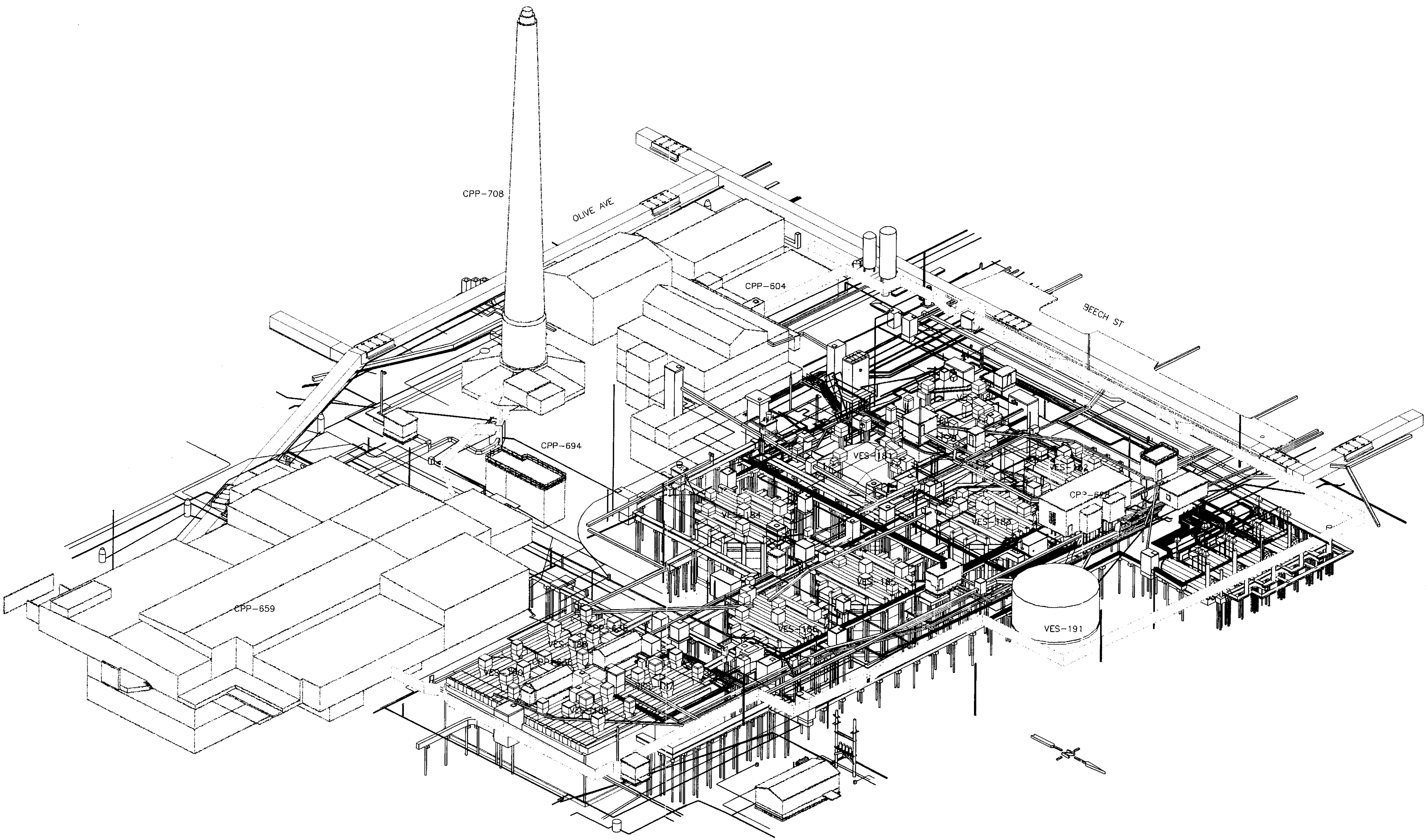


Figure F-3. Tank Farm three-dimensional view, looking southwest.

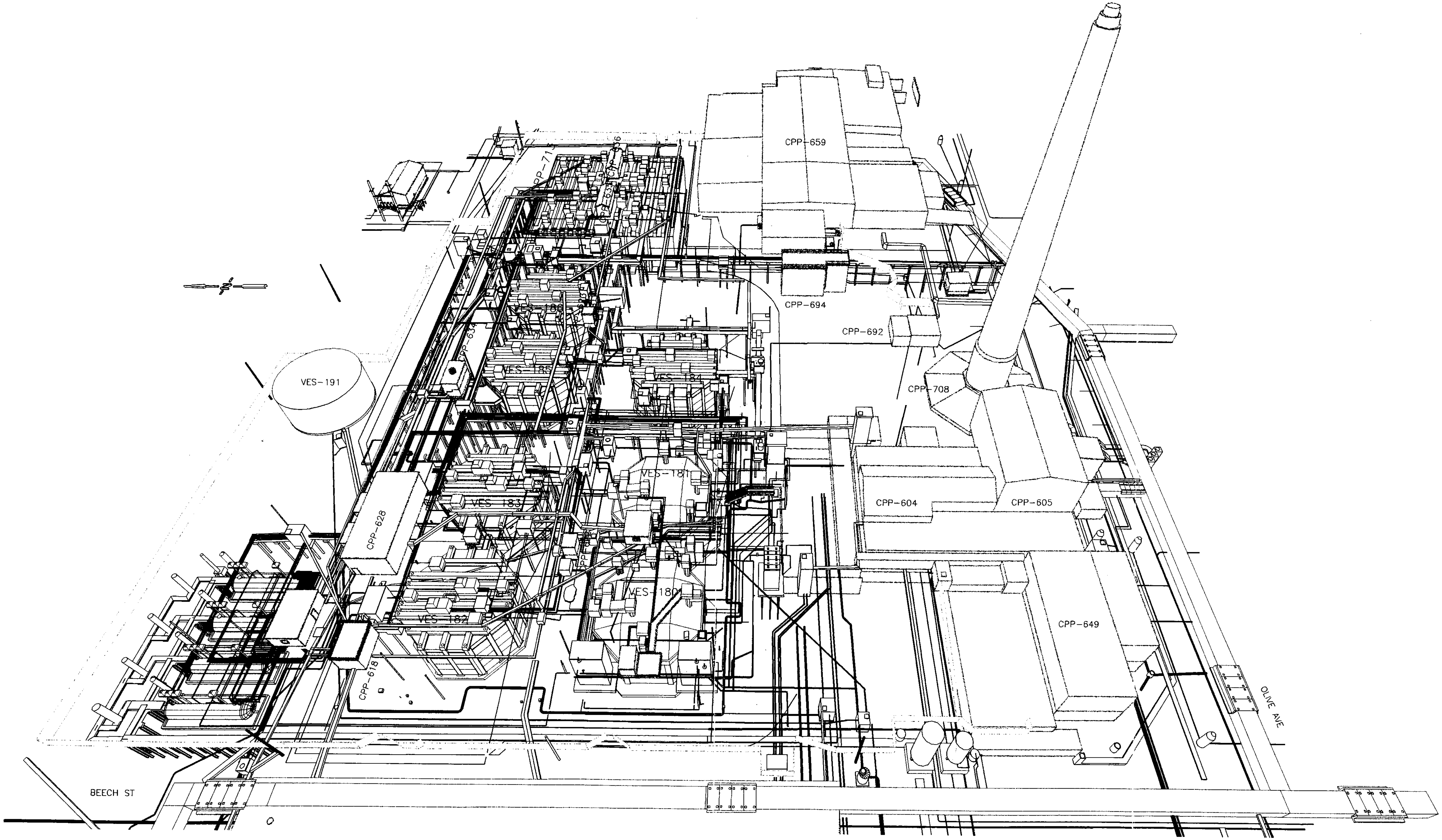


Figure F-4. Tank Farm three-dimensional view, looking east.

The concrete vault walls were cast once the vault floors were poured. Each of the two 318,000-gal liquid storage capacity tanks was then assembled and bolted to its respective vault floor. The diameter of the tanks is 15.2-m (50-ft).

Waste transfer, cooling (WM-180 only), decontamination, instrumentation, and vessel off-gas pipelines were then plumbed to the individual tanks and vaults. Split tile piping (ceramic pipe sealed together with cement mortar) was used as secondary containment for waste transfer piping running to the tanks. The secondary encasement was intended to prevent leaking radioactive waste from contaminating the surrounding soils. The continuous extension of the secondary encasement allowed leaking liquid waste to drain back into CPP-604.

Sump jet pumps were installed to remove liquid from the respective vaults. Attaching a portable, high-pressure steam source to an abovegrade hose connection activated the jet pump. As steam moved through the sump jet, vacuum was created, transferring sump liquid into the respective storage tank.

Once the tanks, vaults, and plumbing were in place, the concrete vault roof was cast in place. This enclosed each tank inside the respective vault. The vault roof was constructed to rise at an angle from the vault walls and flatten toward the middle (INTEC Drawing 103362). A Monoseal silicon sealant was placed on the vault roof as a moisture barrier. Once installation was complete, the excavation pit was then backfilled to grade level, burying the tank, vault, piping, and pipe encasements.

Additional tanks were constructed before WM-180 and -181 were filled to capacity because liquid removing devices, such as steam jets, were not installed in the storage tanks during original tank construction. These devices were not installed because an effective method of treating and storing radioactive liquid waste such as calcining was not yet available.

F-1.2 Construction Phase 2, WM-182 Through–184

Construction of Tanks WM-182 through WM-184 and Vaults CPP-782 through CPP-784 (i.e., the "4272" project) began in 1954 with the excavation of the area north and east of Tanks WM-180 and WM-181. More than likely as a cost-savings measure, the type of vault used to encase the 300,000-gal tanks changed from all poured-in-place concrete vaults for Phase 1 to pillar-and-panel vaults built in forms and then placed underground for Phases 2 and 4 (Machovec 1999). The octagonal concrete vault floor for the pillar and panel vaults was poured on bedrock first. The floor was constructed with a 4-in. slope, beginning at the floor center and tapering to the slab edge. This slope created a conical-shaped floor. Sump areas, 12 in. deep and 12 in. square, located on the north and south side of the vault were cast within the vault floor. A 6 × 6-in. curb was installed 6 ft in from the edge of the concrete base slab. The curb creates an octagonal area 51 ft wide encircling a sand pad. The sand pad was designed to cushion the tank bottom.Using concrete pillars and panels, the vault walls were erected once the vault floor was poured. The four 300,000-gal storage tanks were then assembled on the sand pad within the vault (see Figure F-5).

Waste transfer, cooling, decontamination, instrumentation, and vessel off-gas pipelines were then plumbed to the individual tanks and vaults. The waste transfer pipe running from the valve boxes to just outside the vault walls was encased in concrete enclosures with stainless steel liners to prevent radioactive waste from contaminating the surrounding soils. The concrete enclosures did not penetrate the vault, however. Pipes penetrated the vaults via a sleeve, or pipe-in-pipe encasement. Drains were installed within each concrete encasement to direct liquid from a leaking pipe or water infiltration into the nearest tank vault.

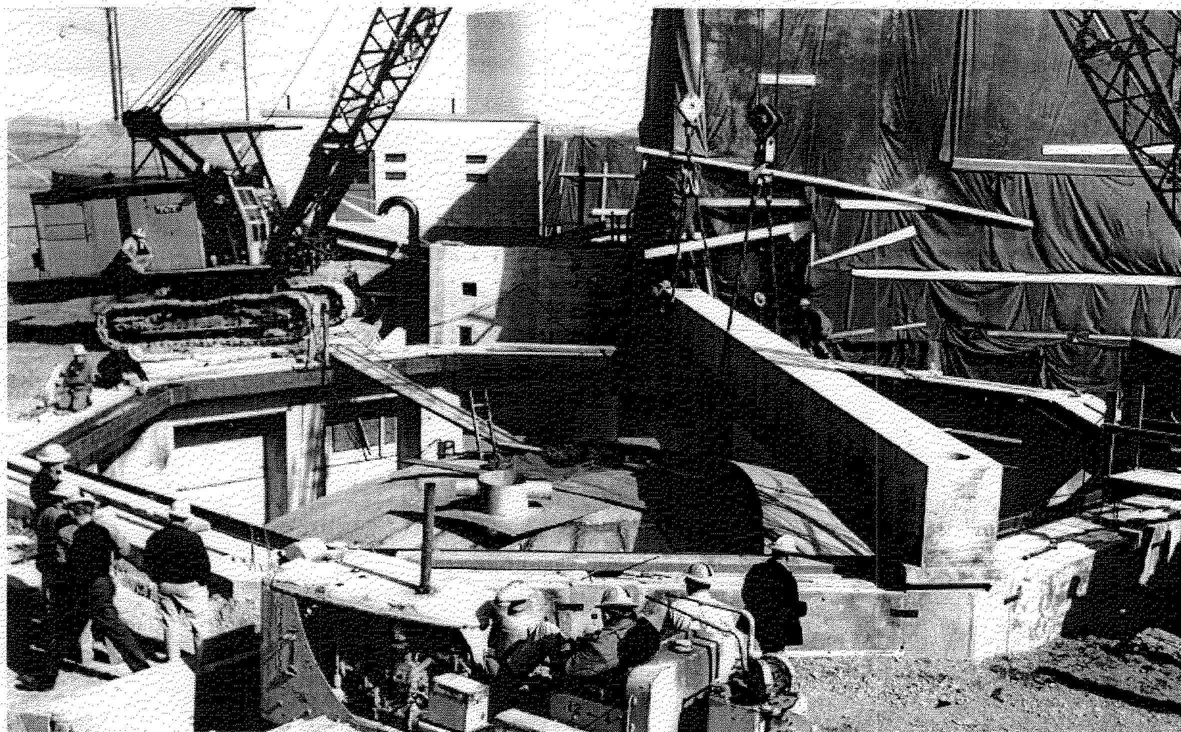


Figure F-5. Typical 300,000-gal underground pillar and panel storage tank.

Sump jets were installed into the vault sumps located on the north and south side of each tank vault bottom to provide liquid removal capabilities. As with WM-180 and WM-181, a portable, high-pressure steam source was attached to an abovegrade hose connection leading to each vault sump jet to transfer sump liquid into the respective storage tanks.

Once the tanks, vaults, and plumbing were in place, the vault roof was installed, enclosing the tank inside the vault. No moisture barrier was applied to the vault roof. Concrete platforms, supported by vertical concrete pillars, were constructed between the tank vaults (CPP-782 and CPP-783) and the Piping Control House (CPP-628) to support the cooling coils, instrumentation pipelines, process waste pipelines, and their respective encasements. The excavation pit was then backfilled to grade level, burying the tank, vault, and pipe encasements.

Additional tanks were constructed before WM-182 through -184 were filled to capacity because liquid removing jets were not yet installed inside the storage tanks. These jets were not installed because an effective method of treating and storing radioactive liquid waste, such as calcining, was not yet available.

Initially, the piping within the Tank Farm consisted of minimal pipe junctions and interfaces (i.e., valve connections). The valve connections that were made were installed inside the A series valve boxes. These valve boxes allowed easy access to valves for maintenance and provided containment for possible leaks. Drains leading to the nearest tank or vault sump were installed in each valve box.

F-1.3 Construction Phase 3, 30,000-gal Tanks

During Phase 2 construction (i.e., the 4272 project), the excavated area was expanded north of WM-182 to accommodate another fuel processing system using four 30,000-gal horizontal cylinder tanks (see Figure F-6). Construction of Phase 3 (i.e., the "4193" project) began in 1954 and ended in 1955.

Unlike the larger 300,000-gal tanks, the 30,000-gal storage tanks were not encased by concrete vaults, but were buried directly in the ground on concrete slabs. The slabs (CPP-717-A through –D), $47.5 \times 17 \times 1.25$ ft thick were constructed with a 0.75×1-ft-high curb to contain leaking waste and were covered with a gravel pad. The curb and gravel construction was designed to provide base slab drainage to the sump.

Once the tanks were placed on the gravel pads, waste transfer, cooling, decontamination, instrumentation, and vessel off-gas pipelines were then plumbed to the individual tanks and vaults. The waste transfer piping running from CPP-619 and CPP-601 was encased in concrete enclosures with stainless steel liners to prevent radioactive waste from contaminating the surrounding soils. Drains were installed within each concrete encasement to direct leaking pipe liquid into the nearest tank base slab sump.

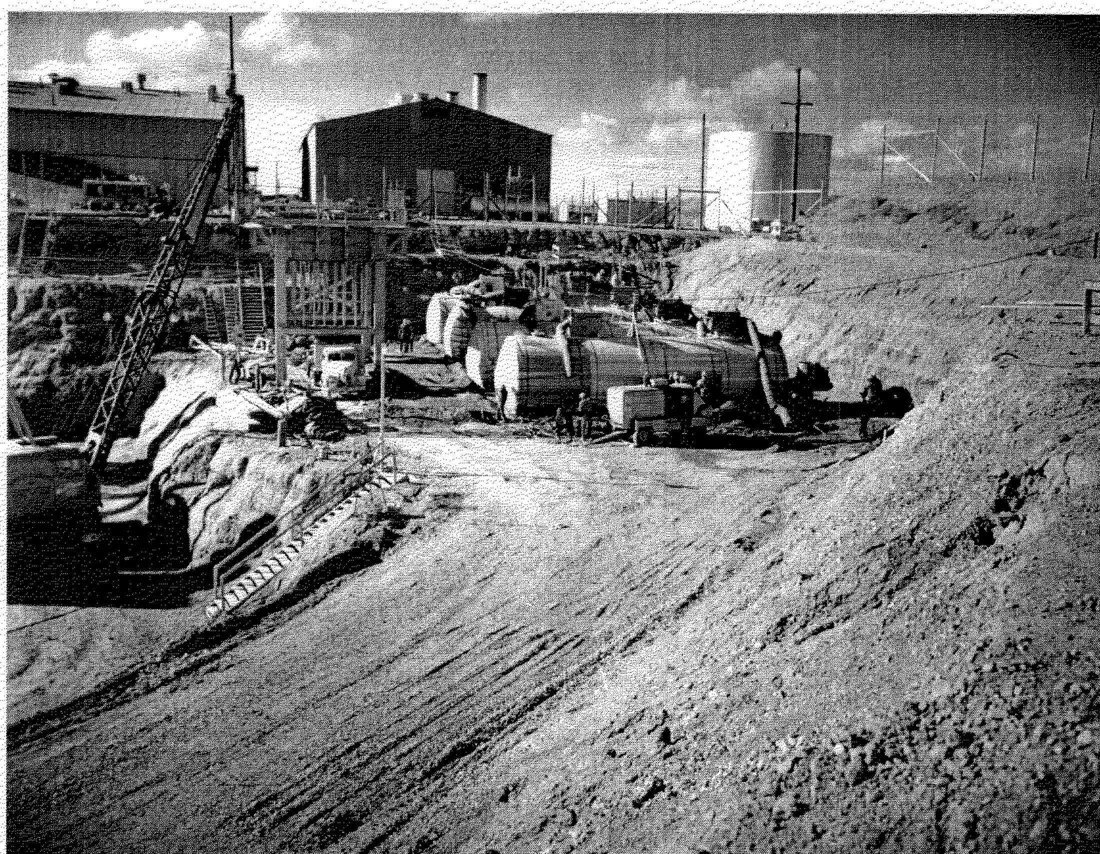


Figure F-6. 30,000-gal storage tanks.

During tank construction, no permanent method was installed to empty liquid from the 2 × 2 × 2-ft-deep sumps cast into the northeast corner of each concrete tank base slab. Instead, a portable steam jet pump was lowered through the sump riser into the sump for liquid removal. Once sump liquid was emptied, the portable jet pump was removed and the sump riser sealed. The liquid removed was routed through an abovegrade hose connection leading to Building CPP-619. Eventually permanent sump jet pumps were installed during the "1578" project.

Liquid removing jet pumps were permanently installed into each tank with lines penetrating through the tank personnel access, extending underground to strategic Tank Farm locations. The lines were not connected to existing Tank Farm waste processes or equipment during the initial construction but were temporarily capped for possible future uses.

The 30,000-gal tank system was originally designed to process special waste types (i.e., submarine reactor waste). The main Tank Farm was designed to process aluminum-clad waste. To prevent mixing special fuel waste with the standard aluminum-clad waste, the 30,000-gal tank system was built as a stand-alone system, segregated from the main Tank Farm. Once methods to combine different waste types were available in 1961, the original temporary line caps were removed during construction project "4016" and the 30,000-gal tank system was connected to the main Tank Farm.

In 1974 and 1975, high-level liquid waste contained within the 30,000-gal tanks was removed and the tanks were flushed with water. The tank system was not used again until 1982–83 when an emergency condensate collection point for the PEW Evaporator was needed. The tanks were then emptied to their heels, and the contents were transferred to Tank WL-102. In 1990, water was added to the tanks to allow RCRA sampling, and the remaining residue was deemed nonhazardous (WINCO 1994). The tanks again were emptied to their heels, and the contents were transferred to Tank WL-133. Tanks WM-103 through -106 and the associated piping are no longer used and isolated.

F-1.4 Construction Phase 4, WM-185 and WM-186 and Jet Pump Installation

Following the 4272 tank construction phase, the Waste Calcining Facility (WCF) was built as a pilot plant for a new "calcining" technology. The calcination process minimized waste volume by a factor of up to 10 to 1 by transforming radioactive liquid waste into a dry solid. Facilitators at INTEC accepted the calcining method, and the WCF began calcining operations following the 4272 project.

As a result of the calcining process, a permanent waste transfer system was required to move liquid waste from the 300,000-gal storage tanks to the WCF. However, only abovegrade transfer hoses, manual hookups, and temporary steam sources were available. Thus new jet pumps designed to provide a permanent means for transferring waste to the calcining facility were installed as part of the "5773" project in 1957. The main focus of this project, however, was to build two additional waste storage tanks (WM-185 and WM-186 and associated vaults CPP-785 and CPP-786) inside the Tank Farm.

Construction of Tanks WM-185 and WM-186 began with the excavation of the area north of WM-184 and east of WM-183 to bedrock. The construction of these two tank and vault systems paralleled the previous 4272 tank construction (WM-182 through WM-184) project. The construction included a 300,000-gal tank system enclosed in a pillar and panel vault system with north and south sump jets.

This construction phase permanently installed liquid removing steam jets (also called jet pumps) into Tanks WM-185, WM-186, and previously constructed Tanks WM-180 through WM-184. These jet pumps were located 3 to 9.5 in. (INTEC Drawings 106205 and 106207) above the tank floor. Permanent pumps were located 3 to 9.5 in. (INTEC Drawings 106205 and 106207) above the tank floor. Permanent steam lines were connected to each jet pump and routed through underground piping to steam sources within the Piping Control House (CPP-628). Double-contained process waste lines were routed underground from the jet pumps to the main transfer/filling system. The B series valve boxes were installed to consolidate some of the process waste line valves, primarily those associated with the tank-filling process waste lines. These valve boxes were installed to provide a means to transfer process waste between belowgrade storage tanks and the WCF. They were built as the tanks were constructed as the main transfer junction boxes on the Tank Farm transfer routes.

Not all process waste line valves were placed into the B series valve boxes. Each process waste pipeline associated with the storage tank was connected to separate flow control valves. The turning shaft and handle extend above grade level for manual manipulation. A protective sleeve surrounding the turning post was extended to grade surface. These valves were located inside the double-contained portion of the process piping. A double-contained pipe consists of two concentric pipes.

F-1.5 Construction Phase 5, WM-187 and WM-188

After the construction of the seven octagonal-vault-encased storage tanks, two more tanks were constructed, WM-187 and WM-188. Because of problems with leakage through the walls of the pillar-and-panel vaults, the type of vaults used to encase the remaining four 300,000-gal tanks was changed to a modified poured-in-place vault construction for Phases 5 and 6. With the exception of the vault roofs, the vaults in Phases 5 and 6 were entirely poured in place, similar to Tanks WM-180 and WM-181. The tanks in Phase 5 and 6 were placed adjacent to each other in square vaults (Vault CPP-713). The construction of these square vault-encased tanks began in 1958 with the excavation of the area east of Tank WM-186. The construction phase of Tanks WM-187 and WM-188 is referred to as the "5774" project.

The square concrete vault floors for both tanks were poured side by side on bedrock. Both floors were constructed with a 4-in. slope, beginning at the floor center and rising to the slab edge. The slope created a conical-shaped floor similar to the floor in the pillar and panel vaults. Two sump areas, 12 in. deep and 12 in. square, were cast within each vault floor for liquid drainage. These sumps were located at the northwest and southeast side for the WM-187 vault and northeast and southwest for the WM-188 vault. A 6 × 6-in. octagonal curb was installed inside the square vault. The curb creates an octagonal area 51 ft wide encircling a sand pad. The sand pad was designed to cushion the tank bottom.

The concrete vault walls were erected in three concrete pours (INTEC Drawing 106319). Each of the two 300,000-gal storage tanks was then assembled on the sand pad within the vault.

Waste transfer, cooling, decontamination, instrumentation, and vessel off-gas pipelines were then plumbed to the individual tanks and vaults. The waste transfer pipes running from the valve boxes to just outside the vault walls were encased in stainless steel pipe enclosures to prevent radioactive waste from contaminating the surrounding soils. Process waste line leaks were directed by the pipe encasements into the nearest valve box sump. Sump jets with permanently attached steam sources and transfer lines were installed into each vault sump to allow liquid removal.

Once the tanks, vaults, and plumbing were in place, the vault roof was installed, permanently enclosing the tank inside the vault. The moisture barrier was applied to the vault roof. The excavation pit was then backfilled to grade level, burying tanks, vaults, and process piping.

Liquid transfer jets were permanently installed inside the storage tanks through the tank risers to allow waste removal.

F-1.6 Construction Phase 6, WM-189 and WM-190

After the side-by-side installation of WM-187 and -188, the last two 300,000-gal tanks, WM-189 and WM-190, were installed. These tanks were placed in a square vault identical to the preceding vault and tank construction. These vaults were located east of, and adjacent to WM-187 and -188. This created a side-by-side four-tank configuration. Vault CPP-713 separates and encases tanks WM-187, WM-188, WM-189 and WM-190 in a "four-pack" configuration. The construction of these two square vault-encased tanks was completed in 1964. This construction phase is referred to as the "4112" project.

The WM-189 and -190 vault floors were installed on bedrock and attached adjacent to the existing WM-187 and -188 vault floors. The floors were constructed with a 4-in. sloping conical shape identical to that described in Phase 5. Two 36-in.-deep sumps and a 9-ft-deep drain trench were cast within the vault floors for liquid drainage. The sumps were located at the northwest and southeast side for WM-189 vault and northeast and southwest for WM-190 vault. The drain trench was located at the southwest and northwest vault corners for WM-189 and -190 respectively. A 6 × 6-in. octagonal curb was installed inside the square vault. The curb creates an octagonal area 51 ft wide encircling a sand pad. A sand pad was designed to cushion the tank bottom.

Waste transfer, cooling, decontamination, instrumentation, and vessel off-gas pipelines were then plumbed to the individual tanks and vaults. The waste transfer piping running from the valve boxes to just outside the vault walls was encased in stainless steel pipe enclosures to prevent radioactive waste from contaminating the surrounding soils. Process waste line leaks were directed via the pipe encasements into the nearest valve box sump.

After completion of the 5773 construction project, individual buried process waste valves began to fail (i.e., leaking, sticking open or closed). While the specific dates of valve failure are not known, several valves were repaired during the early 1970s (Machovec 1999). Repairing each valve required radiation shielding and excavation in soils that had been previously contaminated by spills (WINCO 1992). Liquid also began to accumulate inside the tank vaults. This accumulation of slightly contaminated vault liquids resulted from surface-water seepage (rainfall and snowmelt), vault condensation, and valve leakage. Premature reduction in waste storage capacity resulted because vault jet pumps could move liquid only from each vault to its respective storage tank. These issues were addressed during the C series valve box installation phase.

F-1.7 Construction Phase 7, C Series Valve Box Installation

Excavation to replace failing process valves continued as the Tank Farm continued operation. In 1975, the "1578" project was implemented to improve the waste transfer valve system. The project consisted of installing C series valve boxes, refurbishing older valves, rerouting pipes to valve boxes, and consolidating valves within the new valve boxes. This improved valve access, increased protection to workers from contaminated soils, and reduced repair costs by minimizing excavation. These valve boxes were built with drain lines that were designed to drain leaking liquids to a central location for transferred directly to the PEW Evaporator.

Before the C series valve box installation phase, vault sump liquid could be jetted only from the vault sump to the respective belowgrade storage tanks. As this jetting process continued, storage tank volume reserved for concentrated process waste began to decrease as more and more slightly contaminated vault liquid filled the tanks. A method employed to slow the increase in tank volume was to insert a temporary jet pump into the vault sump. The vault liquid was transferred to the PEW

Evaporator via an abovegrade flex hose. The slightly contaminated liquid was then concentrated through evaporation and placed into the 300,000-gal storage tanks.

Permanently installing an extra jet pump into the vault sump and routing underground liquid transfer lines to the PEW Evaporator solved storage tank capacity reduction issues. This project also permanently installed jet pumps into CPP-717-A through –D sumps. The liquid removed from the base slab sumps was transferred to the PEW Evaporator.

Radiation monitors were installed throughout the Tank Farm during the 1578 project. These monitors were installed to detect leaks within valve boxes or other enclosed areas. These monitors were connected to surface accessible junction boxes and inaccessible conduit duct banks, which routed to the Computer Interface Building (CPP-618).

To improve detection of possible system leaks and tank level accuracy, an enhanced liquid level monitoring system was installed in each tank during this phase. Before the improvement, the quantity of liquid waste transferred to a storage tank was difficult to determine because of the low accuracy of tank liquid level monitoring systems. Because the amount of waste sent to the storage tank could not be verified accurately, leaks within the Tank Farm would go unnoticed. The new liquid level detection system could detect a +/- 200-gal level change. The system enabled operators to verify the quantity of waste jetted out of or into a tank.

After the valve box and leak detection system were installed and buried, a watertight, 0.02-in.-thick, Dupont Polyolefin 3110 membrane was placed over the Tank Farm graded surface to prevent water ingress from the surface. The membrane was sandwiched between two 3-in. sand layers. The sand-Polyolefin-sand layers were then covered with 3 in. of gravel.

Around 1989, the radiation monitors installed during this C series valve box installation project were replaced with improved radiation monitors. This replacement provided for more accurate process waste leak detection in enclosed Tank Farm areas. The replacement was done as a stand-alone project before the Tank Farm upgrade, which is discussed below.

F-1.8 Construction Phase 8, Tank Farm Upgrade

Continued use and aging caused valves to fail. Valve failure allowed radioactive process waste to leak into associated valve boxes. Before Phase 8, the Tank Farm upgrade project, failed valves were manually replaced or repaired.

The Tank Farm upgrade project began in 1992 and was designed to reduce personnel radiation exposures. A different type of valve that could be remotely repaired was used. Workers could replace the valve cartridge from above using extension tools without entering the valve box.

The carbon-steel pressure relief discharge header connecting each Tank Farm tank to the exhaust stack had to be replaced because corrosion holes were found in the header. The header was disconnected from each tank condenser pit, capped, and abandoned in place. A new stainless steel relief discharge line was connected from each Tank Farm condenser pit to a newly installed header pipe leading to the atmospheric protection system (APS) "vent tunnel" ventilation system.

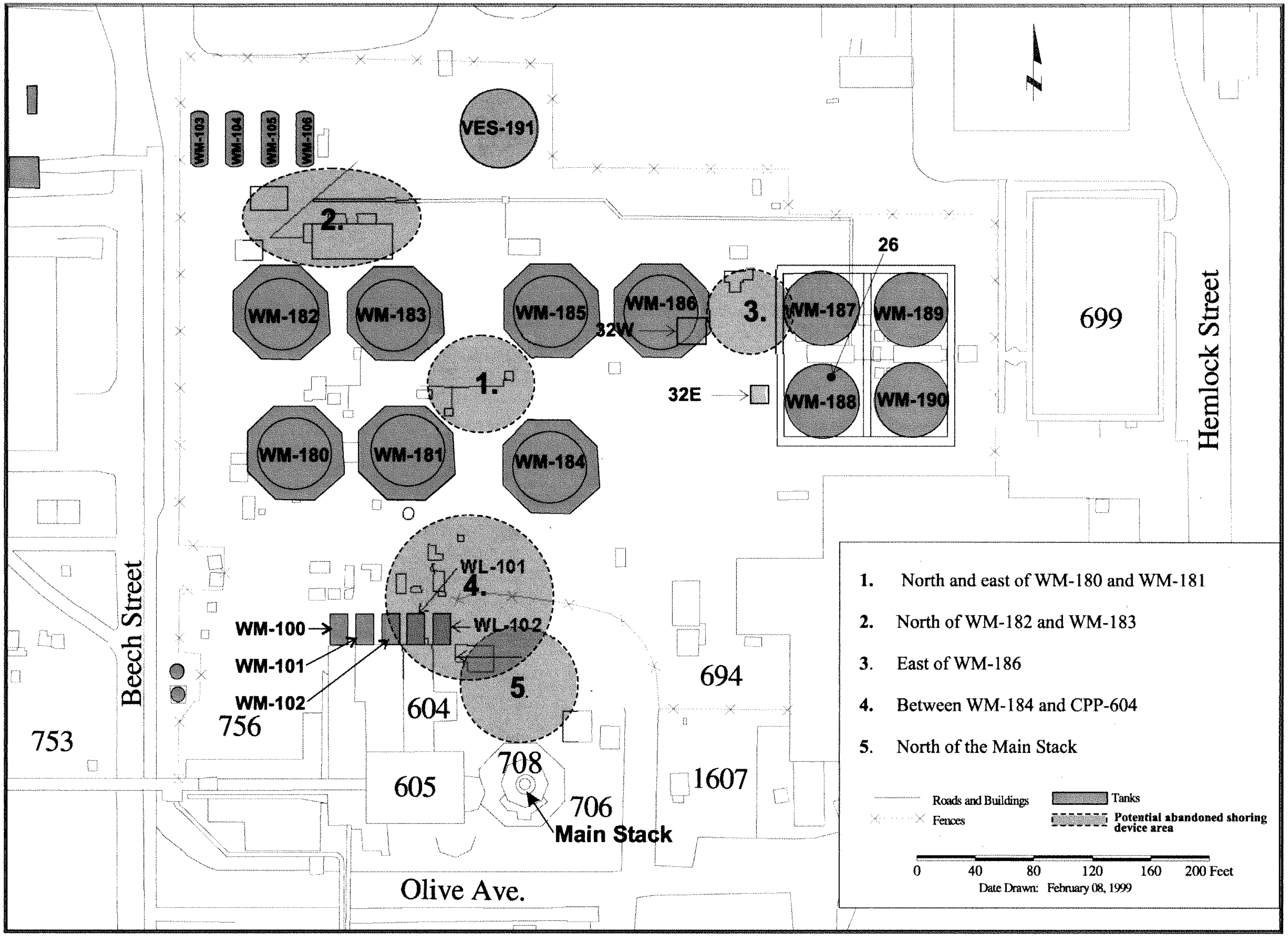
As part of this project and previous unstated minor upgrade projects, pipelines with inadequate secondary containment were replaced (i.e., capped and abandoned in place) and other pipelines were eliminated as needed (e.g., the 3-in. PUA-601 pipeline). Abandoned structures and debris were removed from north of CPP-604.

F-2. SOIL EXCAVATION AND SHORING

The installation of the Tank Farm tanks and subsequent construction phases required numerous ground excavation campaigns within the Tank Farm for vault, piping, and valve box installation. During excavation, various types of shoring devices such as wooden planking held in place with steel beams or a conjoining concrete spray maintained the initial grade of adjacent surfaces and prevented wall failure. Once work was completed, most shoring devices were abandoned and buried in place as the excavated areas were backfilled to grade level. The use of this technique was discontinued during the 1992 upgrade project (see Section F-1.8).

During remediation efforts, bore drilling into Tank Farm soils may be required for contaminant testing. As illustrated in Figure F-7, abandoned shoring devices could be encountered within the following Tank Farm areas:

- North and east of WM-180 and WM-181 because of WM-182, WM-183, and WM-184 tank construction
- North of WM-182 and WM-183 because of WM-103 through WM-106 tank construction
- East of WM-186 because of WM-187 and WM-188 tank construction
- Between WM-184 and CPP-604 because of WL-132 and WL-133 tank construction (located inside CPP-604)
- North of the CPP-708 stack because of stack reconstruction and enlargement.



(/projects cpp/tank_farm_maps: wells_81_cpp_a_series- al_v1)

Figure F-7. Potential locations of abandoned shoring devices.

F-3. CONSTRUCTION DETAILS OF THE 300,000 AND 30,000-GAL TANKS

Details are provided in the following subsections of the construction of the eleven 300,000-gal (WM-180 through WM-190) and the four 30,000-gal (WM-103 through WM-106) tanks buried underground within the Tank Farm. Construction details such as tank and vault dimensions, capacity, construction materials, and other similar information are provided in the following subsections. Information about valve boxes and process waste pipelines is provided in this section and in Appendices A through D.

F-3.1 300,000-gal Tanks

The 300,000-gal storage tanks WM-180 through -190 are contained in belowgrade, unlined, octagonal (WM-180 through WM-186) or square (WM-187 through WM-190) concrete vaults. The tanks are stand-alone, stainless steel, cylindrically shaped vessels. Each tank is administratively limited to storing 285,000 gal of liquid waste. The inside tank diameter and wall height are 50 ft and 21 ft, with the exception of 23 ft for WM-180 and WM-181. The higher wall of those two tanks provides a storage capacity of 318,000 gal for each of the two tanks. Tanks WM-182 through -190 are constructed with an 11-in.-wide horizontal plate that connects the tank wall top to the dome. This horizontal plate provides a flat surface for process and instrumentation pipelines to penetrate the tank. Equally spaced gussets support the plate from underneath. Tanks WM-180 and WM-181 have no horizontal plate because the dome edge connects directly to the tank wall top. Tank domes are spherical in shape and rise above the tank wall from 8.5 to 8.7 ft.

Eight of the eleven 300,000-gal tanks contain stainless steel cooling coils (WM-180 through WM-185 and WM-187 through WM-190) to maintain the liquid waste temperature below 35°C for fluoride-containing waste and below 55°C for nonfluoride-containing waste. The liquid waste is maintained below these temperatures to minimize tank corrosion. The lower tank temperature also reduces the liquid surface evaporation rate, which in turn reduces condensation in the buried condenser off-gas lines. Demineralized water in the cooling coils along with chromate additives circulates through a closed system and is cooled by secondary cooling water.

Access to the 300,000-gal tanks is provided through risers. Each tank has four to five 12 in.-diameter risers. Tanks WM-184 through WM-190 also have one of two 18-in. risers. Most risers have equipment installed in them such as radio frequency probes for level measurement, corrosion coupons, or waste transfer equipment (steam jets and air lifts). Two steam jets are located inside each tank with the exception of WM-189 and WM-190, each of which has one steam jet and one air lift pump. A single steam jet can transfer waste out of a tank at approximately 50 gpm, and an air lift can transfer waste out of a tank at approximately 35 gpm. Table F-1 provides general information on the 300,000-gal tanks. Table F-2 provides general information on the 30,000-gal tanks.

F-3.2 30,000-gal Tanks

The 30,000-gal storage tanks (WM-103 through WM-106) were built between the summers of 1954 and 1955. Each tank has a total volume of 30,750 gal and are horizontal cylinders with American Society of Mechanical Engineers (ASME) dished heads attached on both ends. General information and tank dimensions are found in Table 2-6 of Section 2 of the Work Plan.

All four tanks contain stainless steel closed loop recalculating cooling coils to maintain the liquid waste temperature, the evaporation rate, and condensation accumulation. Base slab sump access is

Table F-1. Design information summary for 300,000 tanks.[a]

	WM-180	WM-181	WM-182	WM-183	WM-184	WM-185	WM-186	WM-187	WM-188	WM-189	WM-190
Design organization	Foster-Wheeler	Foster-Wheeler	Blaw-Knox	Blaw-Knox	Blaw-Knox	Fluor Corp.	Fluor Corp.	Fluor Corp.	Fluor Corp.	Fluor Corp.	Fluor Corp.
Tank subcontractor	Chicago Bridge & Iron (CBI)	CBI	CBI	CBI	CBI	CBI	CBI	Hammond Iron	Hammond Iron	Industrial Contractors	Industrial Contractors
Years constructed	1951–52	1951–52	1954–55	1954–55	1954–55	1957	1955–57	1958–59	1958–59	1964	1964
Initial service date	1954	1953	1955	1958	1958	1959	1962	1959	1963	1966	Spare
Design codes	Unknown	Unknown	API-12C	API-12C	API-12C	API-12C	API-12C	API-12C	API-12C	API-650	API-650
Cooling coils	Yes	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes
Tank diameter (feet)	50	50	50	50	50	50	50	50	50	50	50
Tank height to springline (feet)	23	23	21	21	21	21	21	21	21	21	21
Tank capacity (gallons)	318,000	318,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000	300,000
Lower tank thickness (inches)	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125	0.3125
Upper tank thickness (inches)	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Corrosion allowance (mils)	Unknown	Unknown	125	125	125	125	125	125	125	125	125
Type of stainless steel	347	347	304 L	304 L	304 L	304 L	304 L	304 L	304 L	304 L	304 L
Design specific gravity	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.4

Physical Characteristics	**Dimensions**	
Dome height	8.5 ft (WM-182 through WM-190) – 8.7 ft (WM-180 and –WM181)[a]	
Approximate total tank volume	2,000 yd^3 [a,b,c]	1,825 yd^3 [a,b,d]
Approximate dome volume	330 yd^3 [a,c,c]	300 yd^3 [a,c,d]

a. Values shown in table are approximations to aid in cost estimation and provide a general tank description.

b. Estimated volume is based on the tank dimensions not the tank capacity.

c. Calculated volume for Tanks WM-180 and -181.

d. Calculated volume for Tanks WM-182 through 190.

e. Volume calculated using standard spherical cap equation, a diameter of 50 ft, and appropriate dome height.

Table F-2. Design information summary for 30,000-gal tanks.

Tank Identification Number	WM-103	WM-104	WM-105	WM-106
Design organization	Blaw – Knox Company	Blaw – Knox Company	Blaw – Knox Company	Blaw – Knox Company
Vendor	Alloy Fabricators	Alloy Fabricators	Alloy Fabricators	Alloy Fabricators
Years constructed	1954–1955	1954–1955	1954–1955	1954–1955
Total tank volume	30,750 gal[a]	30,750 gal[a]	30,750 gal[a]	30,750 gal[b]
Tank cylindrical length	38 ft[a]	38 ft[a]	38 ft[a]	38 ft[b]
Cylindrical heads (two per tank)	ASME Standard Flanged and Dished Heads (~2 ft deep)[a]	ASME Standard Flanged and Dished Heads (~2 ft deep)[a]	ASME Standard Flanged and Dished Heads (~2 ft deep)[a]	ASME Standard Flanged and Dished Heads (~2 ft deep)[b]
Total tank length (feet)	42	42	42	42
Tank inner diameter (feet)	11.5[a]	11.5[a]	11.5[a]	11.5[b]
Tank wall thickness (inches)	11/16[a]	11/16[a]	11/16[a]	11/16[b]
Tank supporting base slab size	47.5 × 17 × 1.25 ft thick[c]	47.5 × 17 × 1.25 ft thick[c]	47.5 × 17 × 1.25 ft thick[c]	47.5 × 17 × 1.25 ft thick[c]
Liquid containment perimeter curb size	12 in. high × 9 in. wide[c]	12 in. high × 9 in. wide[c]	12 in. high × 9 in. wide[c]	12 in. high × 9 in. wide[c]
Tank access risers	Three 6-in. diameter One 3-in. diameter[c]	Three 6-in. diameter One 3-in. diameter[c]	Three 6-in. diameter One 3-in. diameter[c]	Three 6-in. diameter One 3-in. diameter[c]
Sump riser (concrete pipe)	24-in. diameter Pipe wall is 3 in. thick[c]	24-in. diameter Pipe wall is 3 in. thick[c]	24-in. diameter Pipe wall is 3 in. thick[c]	24-in. diameter Pipe wall is 3 in. thick[c]
Sump dimensions	2 × 2 × 2 ft[c]	2 × 2 × 2 ft[c]	2 × 2 × 2 ft[c]	2 × 2 × 2 ft[c]
Buried tank depths (dimensions to tank bottom)	28.5 ft[c]	29 ft[c]	29.5 ft[c]	29.5ft[c]

a. Drawing 104807.
b. Drawing 104809.
c. Drawing 105027.

F-4. TANK VAULT DETAILS

F-4.1 Vaults CPP-780 through CPP–786 and CPP-713

Each 300,000-gal storage tank is enclosed in a concrete vault. The vaults vary in design from square to octagonal shapes, but all are constructed of reinforced concrete (see Table F-3 for general physical information about the tank vaults). The enclosing vaults and respective underground storage tanks include the following:[a]

- Monolithic octagonal vaults (i.e., CPP-780 and –781) enclose Tanks WM-180 and WM–181, respectively
- Pillar and panel octagonal vaults (i.e., CPP-782 through –786) enclose Tanks WM-182 through WM–186, respectively
- Monolithic square vaults (i.e., CPP-713) enclose Tanks WM-187 through WM–190.

Each vault floor is cast with liquid draining sumps varying in size and capacity. The number of sumps per vault and the respective capacities include the following:

- Vaults for WM-180 and -181 each contain one leak detection sump (120 gal)
- Vaults for WM-182 through -188 each have two hot sumps (7.5 gal each)
- Vaults for WM-189 and -190 each have two hot sumps (22.5 gal) and one larger cold sump (1,011 gal).

Cold sumps collect rainwater, snowmelt, or surface water infiltration (Tanks WM-189 and WM-190). Hot sumps collect leaking tank waste. Each sump is equipped with a liquid-level sensor that detects leakage into a vault. Each vault sump has transfer jets that empty the sump contents at 20 gpm to the PEW Evaporator feed collection tanks in CPP-604 (WL-102, and WL-133) or back into the tank enclosed by the vault. Vault sumps for Tanks WM-180 and WM-181 can be emptied to the alternate tank but not back to the tank enclosed by the vault. The 6-in.-thick concrete vault roofs are covered with approximately 10 ft of soil for radiation protection of personnel.

a. Tanks WM-103 through WM-106 were not placed inside a vault but buried directly in the ground.

Table F-3. Design information summary for Vaults CPP-780 through CPP-786 and CPP-713.

	CPP-780	CPP-781	CPP-782	CPP-783	CPP-784	CPP-785	CPP-786	CPP-713			
	WM-180	WM-181	WM-182	WM-183	WM-184	WM-185	WM-186	WM-187	WM-188	WM-189	WM-190
Design organization	Foster-Wheeler	Foster-Wheeler	Blaw-Knox	Blaw-Knox	Blaw-Knox	Flour Corp.	Flour Corp.	Flour Corp.	Flour Corp.	Flour Corp.	Flour Corp.
Years constructed	1951–52	1951–52	1954–55	1954–55	1954–55	1957	1955–57	1958–59	1958–59	1964	1964
Vault type	Cast-in-place monolithic octagonal	Cast-in-place monolithic octagonal	Pillar and panel octagonal	Pillar and panel octagonal	Pillar and panel octagonal	Pillar and panel octagonal	Pillar and panel octagonal	Cast-in-place monolithic square	Cast-in-place monolithic square	Cast-in-place monolithic square	Cast-in-place monolithic square
Vault roof shape	Pyramidal[1]	Pyramidal[1]	Flat[2]	Flat[2]	Flat[2]	Flat[3]	Flat[3]	Flat[4]	Flat[4]	Flat[5]	Flat[5]
Inside width	56 ft[1]	56 ft[1]	58.9 ft[6]	58.9 ft[6]	58.9 ft[6]	58.8 ft[7]	58.8 ft[7]	56 ft[18]	56 ft[8]	56 ft[8]	56 ft[8]
Wall thickness	2.33 or 1.75 ft[1]	2.33 or 1.75 ft[1]	0.5 ft[9]	0.5 ft[9]	0.5 ft[9]	0.542 ft[10]	0.542 ft[10]	N[1] = 3.5 ft S = 3.5 ft W = 1.5 ft E = 3.5 ft[11]	N[1] = 3.5 ft S = 3.5 ft W = 1.5 ft E = 3.5 ft[11]	N[1] = 3.5 ft S = 3.5 ft W = 3.5 ft E = 1.5 ft[11]	N[1] = 3.5 ft S = 3.5 ft W = 3.5 ft E = 1.5 ft[11]
Inside vault wall height	27.33 ft[12]	27.33 ft[12]	32 ft[6,9]	32 ft[6,9]	32 ft[6,9]	29.5 ft[13]	29.5 ft[13]	32.6 ft[14]	32.6 ft[14]	32.6 ft	32.6 ft
No. of Vault risers and sumps	1[15]	1[15]	2[16]	2[17]	2[18]	2[19]	2[20]	2[21]	2[22]	3[23]	3[24]
Maximum roof thickness	5.75 ft[1]	5.75 ft[1]	3.66 ft[25]	3.66 ft[25]	3.66 ft[25]	3.5 ft[26]	3.5 ft[26]	4.5 ft[27]	4.5 ft[27]	4 ft[28]	4 ft[28]
Minimum roof thickness	1.25 ft[4]	1.25 ft[4]	0.5 ft[29]	0.5 ft[29]	0.5 ft[29]	0.5 ft[26]	0.5 ft[26]	0.5 ft[30]	0.5 ft[30]	0.5 ft[28]	0.5 ft[28]
Vault top to grade	6.75 ft[31]	6.75 ft[31]	8.5 to 9 ft[32,33]	9 to 9.5 ft[32,33]	9 ft[32]	9 ft[34]	9 ft[34]	9 ft[27]	9 ft[27]	9 ft[28]	9 ft[28]
Total vault volume[7]	3,386 yd^3	3,386 yd^3	3,229 yd^3	3,229 yd^3	3,229 yd^3	3,229 yd^3	3,229 yd^3	3,737 yd^3	3,737 yd^3	3,737 yd^3	3,737 yd^3
Vault volume with tank in vault[7]	1,384 yd^3	1,384 yd^3	1,404 yd^3	1,404 yd^3	1,404 yd^3	1,404 yd^3	1,404 yd^3	1,911 yd^3	1,911 yd^3	1,911 yd^3	1,911 yd^3

N = North; S = South; W = West; E = East.

1. INTEC Drawing 1033628.
2. INTEC Drawing 105588.
3. INTEC Drawing 106218.
4. INTEC Drawing 106238.
5. INTEC Drawing 117967
6. INTEC Drawing105587
7. INTEC Drawing106216
8. INTEC Drawing106311
9. INTEC Drawing105590
10. INTEC Drawing 106221
11. INTEC Drawing 106308 and 106311
12. INTEC Drawing103362
13. INTEC Drawing 106220 and 106217
14. INTEC Drawing106310
15. INTEC Drawing 103557
16. INTEC Drawing 105458
17. INTEC Drawing 105460
18. INTEC Drawing 105528
19. INTEC Drawing 106210
20. INTEC Drawing 106226
21. INTEC Drawing 106237
22. INTEC Drawing 106249
23. INTEC Drawing 117958
24. INTEC Drawing 117960
25. INTEC Drawing 105593
26. INTEC Drawing 106219
27. INTEC Drawing 106309
28. INTEC Drawing 119769
29. INTEC Drawing 105588
30. INTEC Drawing 106314
31. INTEC Drawing 103557
32. INTEC Drawing 105582
33. INTEC Drawing 105057
34. INTEC Drawing 106223

The various tank and vault designs have different abilities to withstand a seismic event. Studies (AEC 1991a; EQE 1988; AEC 1991b, 1993b; EQE 1994; Malik and Bolourchi 1993) were performed to determine whether the vaults and tanks would meet seismic criteria set forth by DOE Standard DOE-STD-1020 and DOE-ID architectural and engineering standards (DOE-ID 1999b). The cast-in-place monolithic octagonal vaults (WM-180 and WM-181) have been qualified through analytical modeling to meet the seismic criteria (AEC 1991b). The cast-in-place monolithic square vaults (WM-187 through WM-190) are believed to meet seismic criteria but were not tested (Swenson 1999). The pillar-and-panel octagonal vaults (WM-182 through -186) may not qualify.[b]

An engineering study (Blume & Associates 1990) was performed to evaluate the effects of various loads on the Tank Farm vaults. The study was initiated because of a specific concern that large cranes, multiple trucks, personnel, or other equipment placed within the Tank Farm could damage or collapse the Tank Farm vaults. Vault damage would most likely cause damage to the tank contained inside. Based on this study, load limits were established for vehicular loads within the Tank Farm to ensure the vaults were not overstressed. Before entry into the Tank Farm, load configurations that could exceed limits specified by established load studies must be evaluated to ensure vault damage does not occur. None of the tank vaults meets current Uniform Building Code static loading criteria (AEC 1993a).

F-4.2 Valve Box Construction

Valve boxes, located were pipe runs change directions, were constructed to provide protection for pipe joints, improve valve access, increase protection to workers from contaminated soils and reduce valve repair costs by minimizing ground excavation. Valve boxes were installed with sumps and attaching drain lines to transfer liquid waste to vault sumps or the PEW Evaporator (CPP-604 via DVB-WM-C12) in the event pipe encasement draining or process valve leaking occurs.

Each concrete valve box is reinforced and lined with stainless steel. The interior surfaces of C series valve boxes were painted. Americoat 33, an enamel based paint, was used to paint C series valve boxes. Bitumastic #50, a material similar to tar thatch, was used as filler around pipe sleeves or on carbon steel piping. The approximate valve box dimensions are 6 ft long, 6 ft wide, and 6.5 ft high with a wall thickness of 0.5 ft. Typically, valve boxes extend approximately 1 ft abovegrade (INTEC Drawings 377819, 137961, and 137929).

Valve boxes were constructed within the Tank Farm area in groups or series. Series A and B valve boxes were installed in the 1950s and 1960s during the initial 300,000-gal liquid storage tank construction. Series C and D valve boxes were installed in 1975 to provide easier access to process waste valves.

More detailed information concerning individual valve boxes associated with the Tank Farm can be found in Appendices A and B.

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b. Initially none of the tank vaults passed a seismic analysis. Later, a more refined analysis was performed to show that two of the 11 vaults met the current requirements. Such a refined analysis was planned for the remaining nine vaults, but was canceled because of a lack of funding. It was thought that they also could pass; however, an analysis was not performed. In addition, today's seismic requirements would be less stringent then those against which the original analysis was performed. The original analysis was performed to an equivalent safety hazards analysis performance category (PC) of PC-4. Today, such analyses would require use of PC-3 criteria.

F-5. PROCESS WASTE PIPELINES

A general overview of process waste pipe systems associated with the Tank Farm is presented in this section. Each pipeline within the Tank Farm has been given a unique identifier, or name (e.g., 1-1/2" WRA-601 or 3" PUA-604). (More detailed information about individual process waste pipelines associated with the Tank Farm can be found in Appendices C and D.) Recent efforts to conform to updated pipe identification codes transformed original pipeline identification names in two ways:

- Different letters were used to represent the same original pipe system (e.g., 1-1/2" WRA-601 was changed to 1-1/2" CRA-601)
- The original three-digit PIN[c] was changed to a six-digit PIN.

The first three digits of the six-digit PIN were assigned by INTEC configuration administrators, and the last three digits consisted of the original three-digit PIN (e.g., the 3" WRN-661 was changed to the 3" PLN-152661). These and other pipeline identification changes[d] have caused confusion and difficulty in comparing individual pipelines to original and more recent pipe drawings. All lines that transport waste within the Tank Farm are buried and enclosed in pipe encasements for secondary containment. The four main types of Tank Farm secondary containment include the following:

- Split tile (ceramic cast pipe)
- Concrete troughs lined with stainless steel
- Direct buried pipes in concrete
- Double-walled stainless steel pipe.

During recent Tank Farm upgrades, most pipe sections encased in split tile were either replaced or abandoned in place (Swenson 1990).[e] Process waste lines and respective secondary containment are generally covered with 10 to 15 ft of soil.

Initially, pipelines transferred high-level liquid waste directly to one of the 300,000-gal storage tanks or to tanks WM-100 through WM-102 (inside CPP-604). As discussed in Sections 2.1 and 2.2.1, the high-level waste generating processes have ceased, and the lines from these processes to the tanks have been capped. Concentrated PEW Evaporator bottoms are directed to Tank WL-101 (inside CPP-604) for temporary storage and then transferred to one of the 300,000-gal storage tanks.

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c. Pipeline identification number (PIN) is given to piping to distinguish it from other piping of the same classification (e.g., PUA and LAA) and diameter.

d. Original Tank Farm pipelines were given three different pipeline identifier names as they entered a building. The first name represented the pipeline exterior to the building, the second pipe name represented the pipeline inside the building wall, and the third pipe name represented the pipe interior to the building. This naming practice was eventually discontinued. Pipeline identifier names are now continuous even though building walls are penetrated.

e. With this type of secondary containment, leaking acidic waste could eat through the mortar used to attach and seal sections of the split tile piping, compromising the secondary containment. Most of the tile encased pipes were replaced or abandoned. However, short sections of pipe encased in tile still remain on active fill lines for WM-180 and WM-181 but cannot be used unless authorized by upper management.

Any fluid leaking from a process line drains into an encasement and then into a valve box or vault sump. Leaking liquid is detected by radiation and tank level detection instrumentation. A leaking line is immediately taken out of service and is not reused until it has been repaired. Waste collected in a valve box or vault sump is jetted to Tank WL-133 (located in building CPP-604) or drained to Valve Box C12. Waste collected in Valve Box C12 also is jetted to Tank WL-133. Waste from WL-133 is sent to the PEW Evaporator for processing.

F-5.1 Process Waste Pipeline Investigation

As part of the development of the OU 3-14 RI/FS Work Plan, all known pipelines within the Tank Farm and crossing the Tank Farm perimeter were evaluated. During the pipeline investigative process, all known individual underground Tank Farm process waste pipelines were located and identified to provide information about pipelines that could be environmental release sources.

No previously undocumented potential release sites associated with process waste pipelines were identified based on the investigation of process waste pipelines within and crossing the Tank Farm perimeter.

The pipeline investigation was conducted in two phases. The first phase investigated process waste pipelines contained within the Tank Farm perimeter. The first phase used piping and instrument drawings (P&IDs) to identify pipe origins and terminations for all underground process waste pipelines not contained within structures (i.e., tank vaults and valve boxes). Official underground utility drawings (UUDs) were not used in this phase because drawing credibility became questionable relative to drawing inconsistencies found between corresponding adjacent drawings, inaccurate as-built representation, and pipeline placement and location (Mace 1998).

The second phase investigated process waste pipelines crossing the Tank Farm perimeter. The second phase included pipelines coming from buildings, valve boxes, manholes, or other pipelines located outside the Tank Farm that transfer process and service waste back and forth across the Tank Farm perimeter.

Plan-view UUDs were required to determine Tank Farm perimeter pipeline crossing locations and respective pipe identification, notwithstanding the drawing credibility issues. When the underground drawings were not explicit about origin, termination, or location, additional information was obtained by interviewing the Tank Farm systems engineers, reviewing valve box details, and reviewing improved UUDs produced by the Facility Drafting Department. While improved UUDs are not officially released, they were helpful to verify and supplement the current official UUDs.

The depth of the underground pipelines at the Tank Farm ranges from 4 to 43 ft. Electrical, steam, and air lines are buried down to a depth of 8 ft, and process pipelines are buried to a depth of 15 ft, with the exceptions of the berm area north of CPP-604, under which the depth of the process lines is 43 ft, and in the vicinity of Tanks WM-180 and WM-181, where the process lines are buried at a depth of about 20 ft.

Information obtained in the investigation is summarized in Appendices C and D. The information includes pipe identification numbers, descriptions, origin and termination locations with drawing references, estimated pipeline secondary containment types, pipeline material and additional information, and comments specific to a pipeline.

Though an attempt was made to identify all process waste piping contained within and crossing the Tank Farm perimeter, information from these investigations was only as accurate as the currently available drawings. Because current available pipe drawings are imperfect,[f] unknown abandoned lines may still exist within the Tank Farm. Future studies may include comparing the most recent P&IDs with later revisions to determine which pipelines were added or removed since the Tank Farm inception.

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f. Pipeline drawing accuracy will be improved once official underground utility drawings (UUDs) are upgraded in accordance with the improved UUDs of the Facility Drafting Department

F-6. REFERENCES

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Appendix G

Investigation of Potential Environmental Release Sites

Appendix G

Investigation of Potential Environmental Release Sites

To provide information about known and previously undocumented Tank Farm potential release sites, documented and anecdotal information about release sites was gathered and reviewed for the Work Plan as part of an investigation conducted by Facility Engineering from July to November 1998. The documented information comprised supervisors' daily logs, occurrence reports, and other published reports. The anecdotal information was generated from interviews that were conducted with current and former INEEL employees knowledgeable about the Tank Farm. The discovery of nine previously undocumented potential releases within the Tank Farm boundaries, as defined by the draft OU 3-14 Scope of Work (DOE-ID 1999), resulted from the investigation of documented and anecdotal information. The nine potential release sites are described in the subsections below and summarized in Table G-1.

The documented and anecdotal information was compared with previously documented environmentally controlled areas (ECAs). An ECA is a CERCLA-controlled area in which an environmental release occurred or could have occurred. Environmental release sites not corresponding with documented ECAs were identified as potential environmental release sites.

G-1. INVESTIGATION OF DOCUMENTED INFORMATION

Documented information such as supervisors' daily logs, occurrence reports, and published reports, such as the H.L. Lord report (see Appendix E), were generated from the inception of Tank Farm operations to the present day. This information recorded environmental releases throughout the Tank Farm history. Each documented environmental release site was examined and compared with known ECAs. The investigation resulted in the discovery of four previously undocumented release sites. The results are discussed in the following subsections.

The supervisor's daily logs, occurrence reports, and published reports were used to aid in documenting the historical information compiled in Section 3 of the work plan. This information was derived from the Track 1 and the Track 2 studies. The information fed the RI/BRA, 3-13 RI/FS and the 3-13 ROD. In turn, that information was used not only to guide the Phase I sampling and logging effort, but also aided in the determination that further characterization was needed due to the lack of specific information about each site.

G-1.1 Supervisors' Daily Logs

From the inception of operation of the Tank Farm, supervisors have kept a daily record of facility operations and maintenance in logbooks. The information recorded in the logbooks allows supervisors to track Tank Farm activities, plan work activities, and verify task completion. The historical information contained within the logbooks can provide information in determining environmental release sites within the Tank Farm not previously documented as ECAs.

Original logbook entries are located in the INTEC Nuclear Operations Records Library. An estimated 12,000 hand-written pages have been recorded on microfiche for lifetime retention and review. Examination difficulties because of illegible hand-written entries, blurred microfiche, and time limitations confined this investigation to approximately 300 microfiche pages. Further logbook investigation could potentially uncover additional environmental releases not previously identified as ECAs or determined by this investigation.

Table G-1. Previously undocumented potential environmental releases at the Tank Farm.

Tank Farm Potential Environmental Release Location	Occurrence Description	Occurrence Date	Environmental Release Substance	Remedial Actions	Reference	Comments
Between CPP-635 and CPP-636	Severed steam line	August 25, 1977	Steam (possible unknown contaminants such as chromates). Unknown volume or quantity.	Unknown	WCF Supervisor's Logbook, August 25, 1977, p. 33	See Appendix E for original logbook pages.
CPP-605 building entrance	Jet discharge line for WL-135 inside NWCF leaking condensate (NO_x) because of incomplete butt weld.	December 1, 1997	NO_x condensate solution. Two small puddles formed on the ground with less than a significant fraction of reportable quantity.	Removed contaminated gravel and soil.	Occurrence Report #IDLITC-WASTEMGNT-1997-0026	See Appendix E for original logbook pages.
Within the excavated area north of CPP-604.	During excavation for low level waste tanks WL-132 and WL-133, soil contamination was discovered north of CPP-604.	1980s	Radionuclides. Unknown volume or quantity.	Unknown remediation actions. Excavated areas were back filled using soils with contact readings less than 5mR/hour. Contaminated soils may have been removed during the High Level Waste Tank Farm Replacement Project.	H.L. Lord Report, 3-25-92, HLL-02-92, "Description of Known Contamination in the ICPP High Level Waste Tank Farm"	A copy of the H. L. Lord report is located in Appendix E.
Bottom of Valve Box A2	During excavation for low level waste Tanks WL-132 and WL-133, soil contamination was discovered near the bottom of Valve Box A2 (on the south side).	1980s	Radionuclides. Unknown volume or quantity.	Unknown remediation actions. Contaminated soils may have been removed during the High Level Waste Tank Farm Replacement Project.	H.L. Lord Report, 3-25-92, HLL-02-92, "Description of Known Contamination in the ICPP High Level Waste Tank Farm"	A copy of the H. L. Lord report is located in Appendix E.

Table G-1. (continued).

Tank Farm Potential Environmental Release Location	Occurrence Description	Occurrence Date	Environmental Release Substance	Remedial Actions	Reference	Comments
Area between WM-191 and WM-106	Area was used to decontaminate construction equipment before WM-191 was constructed.	Before 1970	Steam condensate, decontamination solution, petroleum products, and radioactive contaminates. Unknown volume or quantity.	Excavated area for WM-191 construction but no contamination was found.	F.S. Ward Interview	Though this area may have been used to decontaminate construction equipment, no contamination was found during WM-191 construction. See Appendix E for original interview notes.
Ground surface north of WM-187 and WM-189	Hydraulic oil spill from a P & H construction crane.	Between 1986 and 1988	1 to 10 gal of hydraulic oil.	Hydraulic oil was left on the ground covered with a plastic sheet and gravel.	F.S. Ward Interview	See Appendix E for original interview notes.
Tank Farm surface area.	Abovegrade hose connection leaks while transferring vault liquid to PEW Evaporator.	Before 1975	Water with slight radioactive contamination. Unknown volume or quantity.	No remediation actions	F.S. Ward Interview	See Appendix E for original interview notes.
Adjacent to condenser pit CPP-387 and northwest of CPP-635	Chromate solution leak from two failed buried valves WRV-1 and WRV-2 (valve names may have changed to WRV-WM-1 and 2).	Before 1977	Chromate solution. Unknown volume or quantity	Unknown remediation actions, area was excavated for Valve Box C20.	F.S. Ward Interview	See Appendix E for original interview notes. Valves are now located inside Valve Box C20
North of CPP-635 in a dirt bottom valve box (valve box has no name)	Chromate solution leak from a failed valve WSV-6 located inside a dirt bottom valve box.	Before 1977	Chromate solution. Unknown volume or quantity	Unknown past remediation actions, area is tested periodically no contamination found	F.S. Ward Interview	See Appendix E for original interview notes.

One log entry was found during the examination of the 300 microfiche pages that may indicate a potential environmental release site not previous recorded. The log entry describes a severed steam line located between CPP-635 and CPP-636. The exact steam line location and amount of escaping steam was not recorded in the log entry. A copy of the original log entry is provided in Appendix E.

G-1.2 Occurrence Reports Investigation

Occurrence reporting informs DOE and LMITCO management, on a timely basis, of events that could adversely affect national security; the safeguards and security interests of DOE; the health and safety of the public and workers or the environment; the intended purpose of DOE facilities; or the credibility of the DOE and LMITCO (Management Control Procedure [MCP] -190). An occurrence is an event or a condition that adversely affects, or may adversely affect, DOE or contractor personnel, the public, property, the environment, or the DOE mission as defined by the criteria threshold identified in DOE M 232.1-1A. Examples of documented occurrence reports include the following:

- Personnel exposure
- Soil contamination
- Fire alarms
- Power outages
- Procedure violations.

An occurrence report is initiated when a significant event, as defined in DOE M 232.1-1A, occurs. The responsible manager reports this event to the plant shift manager. The plant shift manager interviews the personnel involved and determines whether the event meets occurrence reporting criteria as defined by DOE Order O 232.1A. If an occurrence report is required, the plant shift manager files a "Notification of Occurrence" to DOE-ID within a timely manner. The responsible manager is given 45 days to document the occurrence and provide methods for preventing recurrence. Once the report is complete and accepted by the plant shift manager, it is given to DOE-ID for evaluation and approval. After the report has been approved, it is given to DOE-Headquarters for a second evaluation and approval. Once the report is accepted, the occurrence report is then filed with the Office of the Deputy Assistant Secretary for Safety, Health, and Quality Assurance and placed within the INTEC Information Center located in CPP-665. If the occurrence report is rejected, the responsible manager is given 21 days to modify the report in accordance with suggested resolutions and resubmit for approval.

Because occurrence reports are filed with the Office of the Deputy Assistant Secretary, all recent occurrence reports are given a permanent lifetime retention or an 80-year retention status. Permanent lifetime retention status is provided for occurrence reports of widespread public and congressional interest. An 80-year retention status is provided for any other occurrence report filed with the Office of the Deputy Assistant Secretary (DOE M 232.1-1A).

The INTEC Information Center occurrence reports were examined and compared with existing ECAs to determine whether any undocumented environmental release sites were present within the Tank Farm boundary. The comparison revealed that a 1997 occurrence report, ID-LITC-WASTEMGNT-1997-0026, provided in Appendix E, was not previously identified as an ECA. This occurrence was a NO_x fluid leak dripping on the ground next to the CPP-605 building entrance. The leak was caused by an incomplete weld on an NWCF tank discharge pipeline.

G-1.3 H. L. Lord Report

In 1992, INEEL Facility Engineer H. L. Lord generated a letter report titled "Description of Known Contamination in the ICPP High Level Waste Tank Farm" (see Appendix E). The report contains a comprehensive review of all known ECAs and suspected environmental release sites within the Tank Farm. The information provided within this report was compared with currently known Tank Farm ECA information. The report identified two potential environmental release sites not previously identified as Tank Farm ECAs.

Both potential release sites were discovered north of CPP-604 during a 1982 excavation for low-level waste storage Tanks WL-132 and -133. The first potential release site is located within the excavation area near Building CPP-604 (the exact location is unknown). Soil with contact reading less than 5 mR/hour was used to backfill the excavation. The second potential release site is located near the bottom of Valve Box A2.

The report indicated that excavation within these areas was planned under the High Level Waste Tank Farm Replacement Project. The project, commenced in 1992 and completed in 1995, consisted of upgrading existing valve boxes with new remotely reparable valves and bringing the valve box roof to the surface, replacing pressure relief piping that had failed, and bringing into compliance pipelines that were not RCRA compliant (Machovec 1999a). Detailed project records may provide further information on encountered soil contamination.

G-2. INTERVIEWS WITH TANK FARM PERSONNEL

To investigate Tank Farm occurrences before 1972 and obtain information on undocumented environmental release sites, interviews were conducted over the phone or corresponding e-mail with experienced Tank Farm personnel. Each interviewee has at least 20 years of INTEC experience and provided eyewitness accounts of past Tank Farm activities. The following subsections provide information obtained from the interviews with Tank Farm personnel.

G-2.1 F.S. Ward Interview

F. S. Ward is a facility engineer with 21 years of Tank Farm experience. Because of his expertise and eyewitness observations of Tank Farm activities, he was able to identify five undocumented potential environmental release sites within the Tank Farm. This information was compared with known ECAs. Information that did not correspond with known ECAs was signified as potential undocumented environmental release sites and is discussed below (see Appendix E).

The first undocumented potential release site identified by Ward encompasses the area between storage Tanks WM-191 and WM-106.[a] During underground storage tank construction, construction equipment such as trucks, cranes, and backhoes was taken to the area and rinsed with water, steam, and decontamination fluid. No liquid collection device was used, allowing contamination to accumulate. A portion of the area was checked by an unknown method for contamination before WM-191 construction, but no contamination was found (see Appendix E).

The second undocumented potential release site originated from a hydraulic oil spill between 1986 and 1988 from a P&H construction crane. An estimated 1 to 10 gal spilled on the gravel surface north of WM-187 and WM-189. Because the spill was considered minimal, the oil was never removed from the ground surface. However, the oil left a noticeable 5-ft-diameter dark stain on the ground. To cover the surface discoloration, a plastic sheet was placed over the area and covered with 6 in. of gravel (see Appendix E).

The third undocumented potential release site identified by Ward pertains to abovegrade hose connection leaks. Several 20-ft hose lengths, connected end to end, were used to transfer vault liquid aboveground to the PEW Evaporator before the C-series valve box installation. Reliable records of the locations of the hose lengths are not available. As the abovegrade hoses transferred vault liquid, minor hose connection leaks occurred. Vault liquid would trickle from these connections onto the ground until the leaking connection was found and repaired. Leak locations could not be determined because of random hose placement by personnel and soil dispersion from C series valve box installation excavations (see Appendix E).

The fourth and fifth undocumented potential release sites were caused by chromate solution leaks (sodium chromate and potassium chromate, 200 to 300 ppm, and pH between 7 and 8). One was from two failed buried valves located adjacent to condenser Pit CPP-387 and northwest of Building CPP-635. Both valves were eventually repaired and placed inside Valve Box C20. The other was from a failed valve located inside a direct-bottom valve box north of CPP-635. It is unknown whether the contaminated soil was removed from these locations or left in place (see Appendix E).

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a. This area is located north of Tanks WM-182, WM-183, and WM-185.

G-2.2 Interviews with Other INEEL Personnel

In addition to the F. S. Ward interview, other interviews were conducted with INEEL employees possessing knowledge about the Tank Farm. It was determined that the information obtained was already previously documented as ECAs. The following is a list of the other interviewed INEEL employees (see Appendix E):

- D. W. Mecham, Waste Configuration Management Engineer, 40 years of experience
- D. M. Staiger, High Level Waste Program Advisory Engineer, 25 years of experience
- L. C. Mitchell, Consulting Technical Specialist, Quality Engineer, Site-wide INEEL Nonconformance Report (NCR) Coordinator, INTEC NCR Coordinator, INTEC Occurrence Report Coordinator, 24 years of INEEL experience
- D. C. Machovec, High Level Waste Program Advisory Engineer, 21 years experience (no transcripts were generated because of the simplicity and brevity of the interview).

G-2.3 Interviews with Former INEEL Personnel

During the interview process, a list of retired INEEL employees was compiled for further investigation of possible undocumented environmental release sites within the Tank Farm. Most of the retired employees could not be contacted because either their whereabouts were unknown or they had deceased. Those contacted were unable to recall any environmental releases sites not previously documented as ECAs. The following is a list of retired individuals who were contacted:

- R. Kern
- J. Cole
- G. K. Cederberg
- G. E. Lohse
- P. Richert
- D. Reed
- P. Mickelsen
- M. Young.

G-3. REFERENCES

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