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LETTER REPORT
FOR LEAD DELINEATION
IN THE AREA 1 PHASE II TRAP RANGE

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

NOVEMBER 1997

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

20710-RP-0002
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LIST OF ACRONYMS AND ABBREVIATIONS

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A1PII	Area 1 Phase II
ASL	Analytical Support Level
AWWT	Advanced Wastewater Treatment
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DO	Data Quality Objective
EM	Environmental Monitoring
FEMP	Fernald Environmental Management Project
FRL	final remediation level
GFAA	graphite furnace atomic absorption
GPS	Global Positioning System
kg	kilogram
mg	milligram
OSDF	On-Site Disposal Facility
OU5	Operable Unit 5
QA/QC	quality assurance/quality control
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCEP	Sitewide Characterization and Excavation Project
SCQ	Sitewide CERCLA Quality Assurance Project Plan
STP	Sewage Treatment Plant
TCLP	Toxic Characteristic Leaching Procedure
V/FCN	variance/field change notice
WDSS	Waste Disposition Support Services

EXECUTIVE SUMMARY

This document presents the results of sampling conducted to determine the extent of lead contamination in soils in and around the Fernald Environmental Management Project (FEMP) Trap Range (STP). These data were used to support the Area 1, Phase II (A1PII) Integrated Remedial Design Package (IRDP) to determine the quantity of soil to be excavated within the Trap Range. The sampling and analyses were conducted under Project Number 50.03.59.01, in accordance with the *Project-Specific Plan for Pre-Design Investigation for Lead Delineation in the Area 1, Phase 2 Trap Range* (DOE, August 1997).

As noted in the Remedial Investigation report for Operable Unit 5 (OU5), lead contamination in soil at the trap range in a pattern consistent with known recreational use of the area. Arsenic, a common contaminant in lead shot, was detected in a similar pattern. The Record of Decision (ROD) established Final Remediation Levels of 400 mg/kg and 12 mg/kg for lead and arsenic, respectively. The Feasibility Study for OU5 examined numerous remedial alternatives, concluding that excavation and removal of lead-contaminated soils is the preferred remedy.

The Remedial Investigation provided valuable data, but failed to fully define the areal and vertical extent of lead contamination at the trap range. The primary objective of this project was to collect additional samples to determine accurate estimates of the soil volume which needs to be excavated.

The Project Specific Plan for this investigation proposed sampling at 50 additional points to define the extent of contamination. Some points were sampled at two depths, 0-6 inches and 6-12 inches, to assess the vertical extent of contamination. Samples from points at which the RI revealed concentrations exceeding 400 mg/kg were submitted for Toxicity Characteristic Leaching Procedure (TCLP) analyses to determine if the materials exhibited the toxicity characteristics for lead.

At four different locations lead concentrations exceeded the 400 mg/kg FRL. The TCLP lead results from these samples also exceed the 5 mg/L, the level at which soil may be considered characteristically hazardous. One sample was below the 400 mg/kg FRL, but above the TCLP threshold. All these results lie in close proximity to Remedial Investigation samples with elevated lead concentrations.

Two locations contained arsenic concentrations that exceed the Final Remediation Level of 12 mg/kg from the 0 to 6 inch sampling interval. Concentrations in corresponding samples from a depth of 6 to 12 inches were below 12 mg/kg FRL.

The results of this investigation may be summarized as follows:

- Lead concentrations exceeding FRLs occurred most frequently in a relatively small area where the RI reported the highest concentrations. Very low concentrations at the periphery of the range help define the extent of contamination. The data are important in modeling the estimated limits of excavation.
- The analyses of samples collected from two depths indicate that concentrations are greatest in the uppermost six inches of soil. Figure 5-2 shows the anticipated limits of excavation.
- TCLP analyses show that a small soil volume may be characteristically hazardous. That volume appears to be confined to a small area, at shallow depths.

1.0 INTRODUCTION

This document presents the results of sampling conducted to determine the extent of lead and arsenic contamination in soils at the Fernald Environmental Management Project (FEMP) Trap Range. The sample analyses provided information required to determine the extent of contamination and the quantity of soil to be excavated during remedial activities at the Trap Range. The sampling and analyses were conducted under Project Number 50.03.59.01, in accordance with the *Project-Specific Plan for Pre-Design Investigation for Lead Delineation in the Area 1 Phase 2 Trap Range* (DOE, August 1997).

1.1 PURPOSE

The Trap Range lies in the Southeast quadrant of the Fernald Environmental Management Project (FEMP), southeast of the Sewage Treatment Plant (STP) Access Road. FEMP employees used the range for recreational purposes from the mid-1950s until 1988, resulting in surface deposition of the lead shot and shot fragments. The Operable Unit 5 (OU5) Remedial Investigation/Feasibility Study (RI/FS) included an evaluation of soil contamination in this area (WBS No. 50.03.14). Soil sample analytical results indicated six locations with lead concentrations above the Final Remediation Level (FRL) of 400 mg/kg established in the Operable Unit 5 (OU5) Record of Decision (ROD) (DOE 1996). The results also identified several locations at which arsenic concentrations exceeded the FRL of 12 mg/kg. Arsenic is a common impurity in lead shot, and the elevated arsenic concentrations coincided with the elevated lead concentrations. The RI/FS data are not sufficient for remedial design purposes because the sampling failed to adequately define the areal extent of contamination. Moreover, sample collection during the RI/FS characterization was restricted to surface soil sampling due to the assumption that lead is relatively immobile in soil.

The RI/FS Work Plan Addendum discussed the potential for contamination from the clay targets or clay pigeons used at the range (DOE 1993). The Material Safety Data Sheet for the targets indicate that their composition is approximately 67% dolomitic limestone, 32% petroleum pitch, and 0.1 % latex paint. None of the constituents are considered hazardous. Targets used during earlier years of operation may have contained lead-based paint. If so, the analyses discussed below will include lead concentrations from paint. Subsequent remedial actions will remove lead deposited by shot and lead-based paint.

Remedial actions in OU5 must meet FRLs and two additional criteria:

- Waste Acceptance Criteria (WAC) are concentrations that must not be exceeded by materials placed in the On-Site Disposal Facility (OSDF). No criteria for lead or arsenic were set forth in the ROD. No significant lead leaching will occur in a properly-constructed landfill, and investigations have shown no evidence that arsenic presents a hazard.

- The maximum allowable lead concentration in TCLP leachate is 5 mg/kg. The "twenty times" rule suggests that soil concentrations must exceed 100 mg/kg for the leachate concentration to exceed 5 mg/kg. Therefore, this project focused on locations in which soil concentrations exceeded 100 mg/k. The maximum arsenic concentration (25.3 mg/kg) reported in earlier investigations indicated that TCLP analyses for arsenic were unnecessary.

The three goals of this project were:

- To delineate the areal extent of soil containing lead concentrations exceeding FRLs

- To perform subsurface soil analyses to confirm the RI assumption that subsurface lead contamination is unlikely because lead is relatively immobile in the environment

- To determine by TCLP analyses for lead if soils in any part of the Trap Range exhibits the toxicity characteristic for lead and arsenic.

1.2 SCOPE

The Project Specific Plan (PSP) proposed soil sampling at the 50 locations shown in Figure 1-2. The samples were analyzed for total lead by Graphite Furnace Atomic Absorption (GFAA) method and arsenic by Inductively Coupled Plasma (ICP) Spectroscopy. The results of these analyses were used to delineate the vertical and horizontal extent of soil contaminated above the FRLs of lead and arsenic (400 mg/kg and 12 mg/kg, respectively). In addition, the six sample locations where concentrations of lead exceeding FRLs were detected during the RI/FS were analyzed for lead by TCLP analysis. All sampling and analysis activities were consistent with the PSP, the Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), and Data Quality Objective (DQO) Number SL-036, Rev. 2 (Appendix A).

The bases for PSP strategy included the Sitewide Environmental Database (SED), OU5 Task Closure Reports, and interviews with former members of the FEMP Trap Shooting Club. A previous soil study of the Trap Range completed in 1993 included analysis of 18 soil samples and a metal detector survey to characterize the general distribution of the lead shot. The spatial distribution of lead shot in the former

Trap Range was estimated by evaluating the lead-shot distribution in a similar facility where the shot is readily visible.

Prior to sampling for this program, the approximate spatial distribution of the lead shot at the FEMP Trap Range was then examined by using a scoop and a sieve. Beginning in areas of high lead shot concentration, soil scoops were collected to several inches below the surface, and sieved for lead shot. After moving approximately 30 to 50 feet toward the periphery, this process was repeated. When a scoop revealed little or no lead shot and a second nearby scoop verified this finding, the location was marked with a flag. The flag locations were surveyed when the approximate periphery of the shot distribution was flagged.

2.0 SAMPLING PROGRAM

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The sample locations for this investigation were at selected nodes of a 50-foot by 50-foot sampling grid placed over the FEMP Trap Range area. Figure 1-2 shows the locations and Appendix A presents the sampling locations (NAD83 State Planar Coordinates), sample depths, and sample identification numbers. The selected locations were based on the existing RI/FS data and the scoop and sieve examination described in Section 1.0. The basis of the sample locations are as follows:

- A greater sampling density was selected at the periphery of the contamination to delineate lead and arsenic concentrations in this area at the 400 mg/kg and 12 mg/kg levels, respectively.
- Several sample locations were selected approximately 100 feet beyond the assumed periphery of the lead shot to ensure that the extent of contamination is bounded for modeling purposes.
- Several sample locations were also selected in the middle of the shot distribution pattern where high lead concentrations were detected during the RI/FS investigation. The purposes of these samples were: 1) investigate the vertical extent of contamination, 2) evaluate the soil anticipated for excavation by TCLP analysis, and 3) to add data for modeling purposes.

The PSP required that any sample location moved more than three feet from the proposed location must be documented on a Variance/Field Change Notice (V/FCN). No changes were required.

2.1 SOIL SAMPLE COLLECTION

All samples were collected with a 3" diameter hand auger, as identified in SMPL-01, *Solids Sampling*. The PSP provides additional details.

Twice the normal sample volume was collected at locations 3, 20, 21, 27, 28, and 45 for the 0"-6" and the 6"-12" samples to meet the 10% off-site analysis requirement of the Sitewide Excavation Plan (SEP) and DQO SL-036, Rev. 2. The soil was homogenized and split according to SMPL-21, Section 6.6. SMPL-21 refers to these as a split samples, but they served as the duplicate samples required by the SEP. The PSP describes the procedures used for sample identification, sample handling, and backfilling at sample locations.

2.2 SOIL SAMPLE ANALYSIS

The on-site laboratory prepared soil samples in accordance with EPA SW-846, Volume 1C, Section 8.4 and analyzed them by GFAA (lead) or ICP (arsenic) to Analytical Support Level (ASL) B. Ten percent of the samples were analyzed by an approved off-site laboratory at ASL D to fulfill the requirements of the Sitewide Excavation Plan (SEP) (DOE, July 1977) and DQO SL-036, Rev 2. An approved off-site laboratory performed all TCLP analyses for lead. Sample analysis proceeded in two phases, as described in Section 2.2.

2.2.1 Phase I

The 12 samples from the six locations (locations 2, 3, 20, 21, 27, and 28, on Figure 1-2) where the RI/FS data indicated lead concentrations above FRLs were analyzed for total lead, total arsenic, and TCLP lead. All other 0"-6" samples were analyzed by the GFAA or ICP method and the remaining sample material was archived for possible Phase II TCLP lead analysis.

2.2.2 Phase II

All Phase I samples analyzed for total lead and arsenic (but not TCLP lead) whose concentrations exceeded the FRL of 400 mg/kg were analyzed for TCLP lead in Phase II. At locations where the 0"-6" samples analyzed in Phase I revealed a lead concentration greater than the FRL, the 6"-12" samples were analyzed for total lead and arsenic to determine the vertical extent of contamination and by TCLP for lead. Table 2-1 presents the sampling and analytical requirements for Phase I and Phase II.

TABLE 2-1
SAMPLING AND ANALYTICAL REQUIREMENTS

ANALYTE	METHOD	LAB[a]	ASL	PRESERVATION METHOD	HOLDING TIME	CONTAINER
Total Lead	GFAA	On-site	B	Cool to 4°C	6 months	500 ml Glass or Plastic
Total Lead	"	Off-site	D	"	"	"
Arsenic	ICP	On-site	B	"	"	"
Arsenic	"	Off-site	D	"	"	"
TCLP Lead	TCLP	Off-site	D	"	"	"

[a] A minimum 10% of samples were analyzed off-site at ASL D.

2.3 SAMPLE IDENTIFICATION

Each sample received a unique identification number as follows:

Example:

A1P2TRAP-Sample Location-Depth ID-Suite-QC

Where:

A1P2TRAP = sample collected for the A1PII Trap Range investigation
Sample Location = location number (see Figure 2-1)
Depth ID = Sample depth, where the 0-6" interval =1 and the 6-12" interval =2.
Suite = Analytical suite. "M" = metals
QC = Quality Control sample. D indicates a duplicate sample and X indicates a rinsate blank.

The sample identification number for a 0-6" sample from sample location 12 would be A1P2TRAP-12-1-M. A duplicate of that sample would be A1P2TRAP-12-1-M-D.

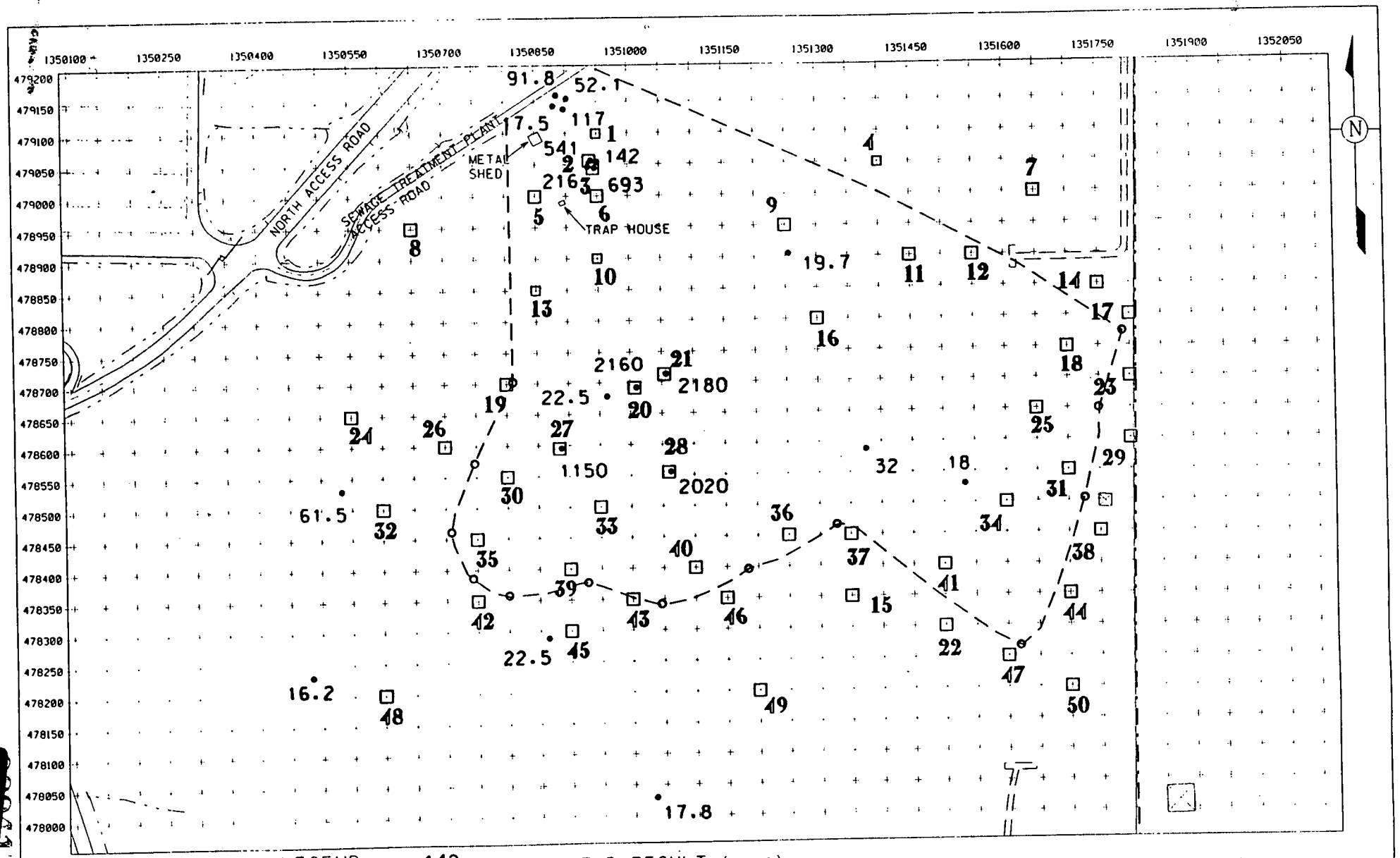

FIGURE 2-1. PROPOSED TRAP RANGE SAMPLE LOCATIONS

3.0 QUALITY ASSURANCE/QUALITY CONTROL REQUIREMENTS

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3.1 QUALITY CONTROL SAMPLES

For quality control purposes, the minimum 1 duplicate per 20 samples were collected at the locations identified in Appendix B. In addition, a minimum of 1 duplicate per 10 samples were analyzed off-site, per requirements of the SEP and DQO SL-036, Rev. 2. Samples designated for off-site analysis were split, with the split portion serving as the duplicate sample analyzed on-site. Rinsates were collected at a minimum of 1 per 20 samples analyzed at ASL D. No field or trip blanks were required because no samples were analyzed for volatile organics.

3.2 CHANGES TO THE PROJECT SPECIFIC PLAN

Any change in PSP requirements required completion of a V/FCN form and the signatures of each of the three persons who approved the PSP. No such changes were required.

3.3 PROCEDURES AND MANUALS

The SCQ (Document FD-1000) and PSP present the basic quality assurance/ quality control requirements for the project. The following documents provided additional guidance.

TABLE 3-1
QA/QC GUIDANCE DOCUMENTS

DOCUMENT NUMBER	TITLE
ADM-02	Field Project Prerequisites
DRL-02	Solids Sampling in Drilled Boreholes
EQT-05	Geodimeter 4000 Surveying System - Operation, Maintenance, and Calibration
EQT-06	Geoprobe Model 5400 - Operation and Maintenance
SMPL-01	Solids Sampling
SMPL-21	Collection of Field Quality Control Samples
SDP 766-S-1000	Shipping Samples to Offsite Laboratories
	Trimble Pathfinder Pro-XL GPS Operation Manual

4.0 FIELD OPERATIONS AND DATA MANAGEMENT

4.1 EQUIPMENT DECONTAMINATION

Field sampling personnel decontaminated all equipment that contacted sample material at Level II (Section K.11, SCQ) in the field. Lead and arsenic concentrations in rinsate blanks (Table B-2, Appendix B) were below or very near method detection limits, confirming proper use of equipment and decontamination procedures.

4.2 HEALTH AND SAFETY

All work was performed in accordance with applicable Environmental Monitoring Project Procedures. RM-0021, Safety Performance Requirements Manual, FDF Work Permit, Radiation Work Permit, Penetration Permit, and other applicable permits.

4.3 DISPOSITION OF WASTES

Investigation-derived wastes were managed as specified in accordance with SCEP Waste Disposition Support Services (WDSS) through the Project Waste Identification Document (PWID) process.

4.4 DATA MANAGEMENT

All PSP data were managed as specified in the PSP and Section 5.1 of the SCQ.

5.0 RESULTS OF INVESTIGATION

5.1 LEAD ANALYSES

Appendix A presents the boring locations, sample identification numbers, sample intervals, and analytical results for the lead sampling program. Figure 5-1 shows the sampling locations and the concentrations observed at each. Lead concentrations in four near-surface samples (0 to 6 inches) exceeded FRLs. No sample concentrations in the 6 to 12 inch range exceeded FRLs. The highest observed concentrations correspond well with the highest concentrations reported in the RI.

Samples from four sampling locations exceeded the TCLP limit of 5 mg/L, with leachate concentrations ranging from 5.3 to 61.5 mg/L. Table 5-1 shows the sampling locations, sample numbers, sample depths, and observed lead concentrations in leachate.

TABLE 5-1
TCLP LEAD CONCENTRATIONS

Sample Location	Sample Number	Sample Depth (inches)	TCLP Lead Concentration mg/L
20	A1P2TRAP-20-1	0-6	27.7
21	A1P2TRAP-21-1	0-6	15.6
21	A1P2TRAP-21-1-D	0-6	5.3
28	A1P2TRAP-28-1	0-6	46.6
28	A1P2TRAP-28-1-D	0-6	61.5
28	A1P2TRAP-28-2-D	6-12	7.2
33	A1P2TRAP-33-1-M	0-6	6.0

D = duplicate sample

5.2 ARSENIC ANALYSES

The arsenic FRL of 12 mg/kg was slightly exceeded at sampling locations 21 and 28. The reduction in concentration with depth was less marked than with the lead analyses. Likely causes include the greater solubility of lead and background contributions from native material.

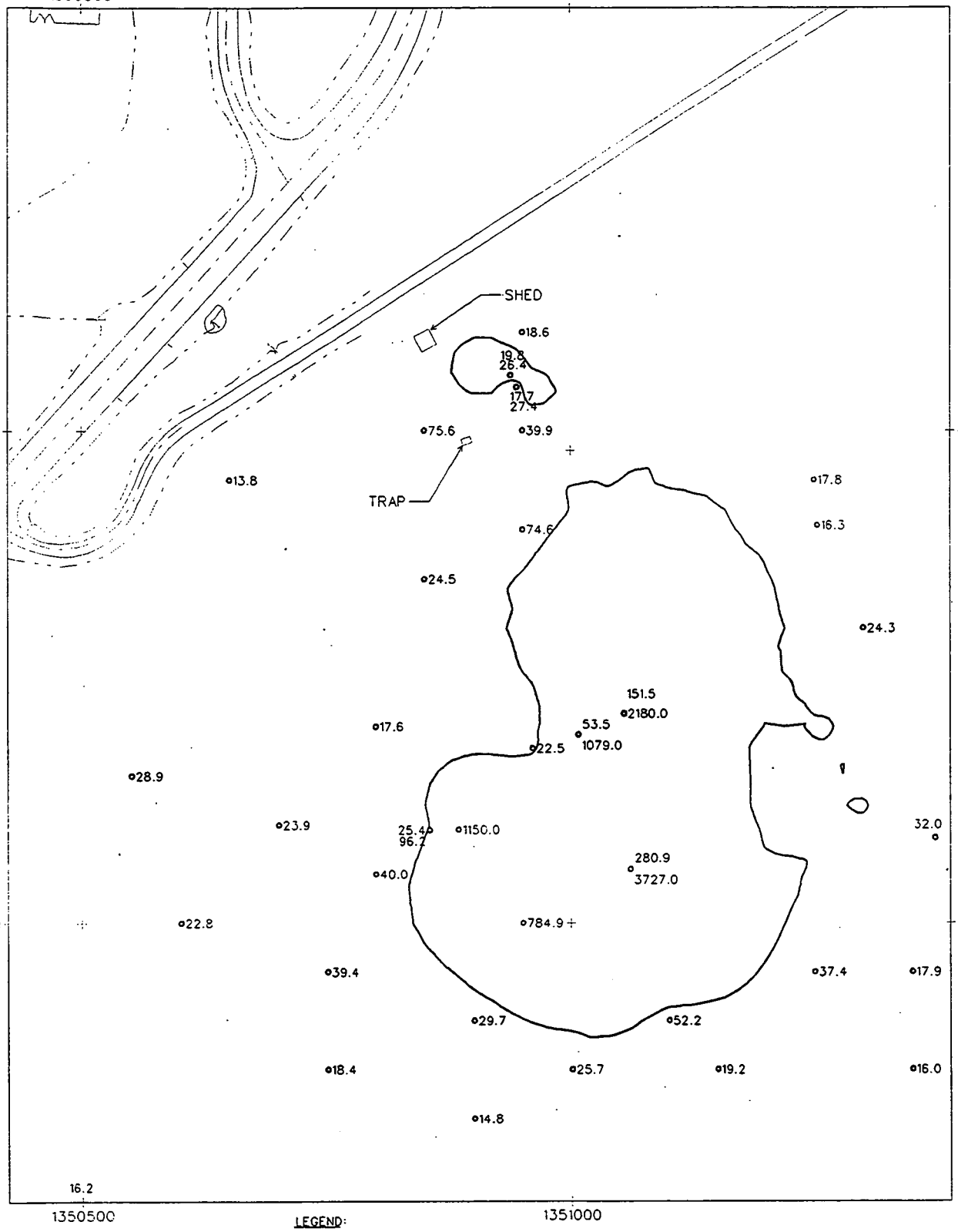
5.3 SUMMARY OF RESULTS

The results, as related to the three goals described in Section 1.1, may be summarized as follows:

- Lead concentrations exceeding FRLs occurred most frequently in a relatively small area where the RI reported the highest concentrations. Very low concentrations at the periphery of the range help define the extent of contamination. The data are important in modeling the estimated limits of excavation.

- The analyses of samples collected from two depths indicate that concentrations are greatest in the uppermost six inches of soil. Figure 5-2 shows the anticipated limits of excavation.

- TCLP analyses show that a small soil volume may be characteristically hazardous. That volume appears to be confined to a small area, at shallow depths.



LEGEND:

400 ppm Pb CONTOUR

25.4 Pb (ppm) 0-6" INTERVAL
96.2 0-12" INTERVAL

SCALE
100 50 0 100 FEET

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FIGURE 5-1. EXTENT OF EXCAVATION IN TRAP RANGE AREA

APPENDIX A

Sample Identification Numbers, Locations, Depths, and Analytical Results

APPENDIX A

Sample Identification Numbers, Locations, Depths, and Analytical Results

Sample ID	Depth (ft)	Easting	Northing	Parameter	Result	Units	Qualifier
A1P2TRAP-1-2-M-X-1	N/A	N/A	N/A	Arsenic	1.8	ug/L	U
A1P2TRAP-11-1-M-X-2	N/A	N/A	N/A	Arsenic	1.8	ug/L	U
A1P2TRAP-32-1-M-X-5	N/A	N/A	N/A	Arsenic	1.8	ug/L	U
A1P2TRAP-44-1-M-X-3	N/A	N/A	N/A	Arsenic	1.8	ug/L	U
A1P2TRAP-46-1-M-X-4	N/A	N/A	N/A	Arsenic	1.8	ug/L	U
A1P2TRAP-23-1-M	0 - 0.5	1351800	478700	Arsenic	2.9	mg/kg	
A1P2TRAP-16-1-M	0 - 0.5	1351300	478800	Arsenic	3.1	mg/kg	
A1P2TRAP-50-1-M	0 - 0.5	1351700	478200	Arsenic	3.18	mg/kg	
A1P2TRAP-31-1-M	0 - 0.5	1351700	478550	Arsenic	3.2	mg/kg	
A1P2TRAP-26-1-M	0 - 0.5	1350700	478600	Arsenic	3.3	mg/kg	
A1P2TRAP-42-1-M	0 - 0.5	1350750	478350	Arsenic	3.42	mg/kg	
A1P2TRAP-29-1-M	0 - 0.5	1351800	478600	Arsenic	3.5	mg/kg	
A1P2TRAP-15-1-M	0 - 0.5	1351350	478350	Arsenic	3.6	mg/kg	
A1P2TRAP-17-1-M	0 - 0.5	1351800	478800	Arsenic	3.7	mg/kg	
A1P2TRAP-37-1-M	0 - 0.5	1351350	478450	Arsenic	3.7	mg/kg	
A1P2TRAP-32-1-M	0 - 0.5	1350600	478500	Arsenic	3.8	mg/kg	
A1P2TRAP-44-1-M	0 - 0.5	1351700	478350	Arsenic	3.9	mg/kg	
A1P2TRAP-24-1-M	0 - 0.5	1350550	478650	Arsenic	4.1	mg/kg	
A1P2TRAP-27-1-M-D	0 - 0.5	1350855	478595	Arsenic	4.1	mg/kg	N
A1P2TRAP-39-1-M	0 - 0.5	1350900	478400	Arsenic	4.13	mg/kg	
A1P2TRAP-7-1-M	0 - 0.5	1351650	479000	Arsenic	4.2	mg/kg	
A1P2TRAP-38-1-M	0 - 0.5	1351750	478450	Arsenic	4.25	mg/kg	
A1P2TRAP-4-1-M	0 - 0.5	1351400	479050	Arsenic	4.3	mg/kg	
A1P2TRAP-22-1-M	0 - 0.5	1351500	478300	Arsenic	4.3	mg/kg	
A1P2TRAP-36-1-M	0 - 0.5	1351250	478450	Arsenic	4.3	mg/kg	
A1P2TRAP-11-1-M	0 - 0.5	1351450	478900	Arsenic	4.4	mg/kg	
A1P2TRAP-14-1-M	0 - 0.5	1351750	478850	Arsenic	4.4	mg/kg	
A1P2TRAP-25-1-M	0 - 0.5	1351650	478650	Arsenic	4.4	mg/kg	
A1P2TRAP-27-1-M	0 - 0.5	1350855	478595	Arsenic	4.4	mg/kg	N
A1P2TRAP-27-2-M-D	0.5 - 1.0	1350855	478595	Arsenic	4.4	mg/kg	N
A1P2TRAP-43-1-M	0 - 0.5	1351000	478350	Arsenic	4.42	mg/kg	
A1P2TRAP-47-1-M	0 - 0.5	1351600	478250	Arsenic	4.44	mg/kg	
A1P2TRAP-5-1-M	0 - 0.5	1350850	479000	Arsenic	4.5	mg/kg	
A1P2TRAP-13-1-M	0 - 0.5	1350850	478850	Arsenic	4.6	mg/kg	
A1P2TRAP-3-2-M-D	0.5 - 1.0	1350944	479044	Arsenic	4.7	mg/kg	N
A1P2TRAP-45-1-M-D	0 - 0.5	1350900	478300	Arsenic	4.7	mg/kg	N
A1P2TRAP-6-1-M	0 - 0.5	1350950	479000	Arsenic	4.8	mg/kg	
A1P2TRAP-45-1-M	0 - 0.5	1350900	478300	Arsenic	4.8	mg/kg	N
A1P2TRAP-46-1-M	0 - 0.5	1351150	478350	Arsenic	4.82	mg/kg	
A1P2TRAP-48-1-M	0 - 0.5	1350600	478200	Arsenic	4.84	mg/kg	
A1P2TRAP-19-1-M	0 - 0.5	1350800	478700	Arsenic	4.9	mg/kg	
A1P2TRAP-20-2-M	0.5 - 1.0	1351007	478692	Arsenic	4.9	mg/kg	
A1P2TRAP-27-2-M	0.5 - 1.0	1350855	478595	Arsenic	4.9	mg/kg	N

APPENDIX A

Sample Identification Numbers, Locations, Depths, and Analytical Results

Sample ID	Depth (ft)	Easting	Northing	Parameter	Result	Units	Qualifier
A1P2TRAP-3-1-M	0 - 0.5	1350944	479044	Arsenic	5	mg/kg	N
A1P2TRAP-18-1-M	0 - 0.5	1351700	478750	Arsenic	5	mg/kg	
A1P2TRAP-49-1-M	0 - 0.5	1351200	478200	Arsenic	5.09	mg/kg	
A1P2TRAP-3-1-M-D	0 - 0.5	1350944	479044	Arsenic	5.1	mg/kg	N
A1P2TRAP-41-1-M	0 - 0.5	1351500	478400	Arsenic	5.16	mg/kg	
A1P2TRAP-12-1-M	0 - 0.5	1351550	478900	Arsenic	5.2	mg/kg	
A1P2TRAP-21-2-M	0.5 - 1.0	1351054	478713	Arsenic	5.2	mg/kg	N
A1P2TRAP-40-1-M	0 - 0.5	1351100	478400	Arsenic	5.22	mg/kg	
A1P2TRAP-2-1-M	0 - 0.5	1350938	479056	Arsenic	5.3	mg/kg	
A1P2TRAP-21-2-M-D	0.5 - 1.0	1351054	478713	Arsenic	5.3	mg/kg	N
A1P2TRAP-8-1-M	0 - 0.5	1350650	478950	Arsenic	5.5	mg/kg	
A1P2TRAP-10-1-M	0 - 0.5	1350950	478900	Arsenic	5.6	mg/kg	
A1P2TRAP-34-1-M	0 - 0.5	1351600	478500	Arsenic	5.6	mg/kg	
A1P2TRAP-35-1-M	0 - 0.5	1350750	478450	Arsenic	5.8	mg/kg	
A1P2TRAP-30-1-M	0 - 0.5	1350800	478550	Arsenic	5.9	mg/kg	
A1P2TRAP-3-2-M	0.5 - 1.0	1350944	479044	Arsenic	6.2	mg/kg	N
A1P2TRAP-9-1-M	0 - 0.5	1351250	478950	Arsenic	6.2	mg/kg	
A1P2TRAP-1-1-M	0 - 0.5	1350950	479100	Arsenic	6.4	mg/kg	
A1P2TRAP-33-2-M	0.5 - 1.0	1350950	478500	Arsenic	6.49	mg/kg	
A1P2TRAP-2-2-M	0.5 - 1.0	1350938	479056	Arsenic	6.9	mg/kg	
A1P2TRAP-33-1-M	0 - 0.5	1350950	478500	Arsenic	7.4	mg/kg	
A1P2TRAP-20-1-M	0 - 0.5	1351007	478692	Arsenic	8.6	mg/kg	
A1P2TRAP-28-2-M-D	0.5 - 1.0	1351060	478555	Arsenic	10.5	mg/kg	N
A1P2TRAP-28-2-M	0.5 - 1.0	1351060	478555	Arsenic	11.2	mg/kg	N
A1P2TRAP-21-1-M	0 - 0.5	1351054	478713	Arsenic	12.5	mg/kg	N
A1P2TRAP-21-1-M-D	0 - 0.5	1351054	478713	Arsenic	12.7	mg/kg	N
A1P2TRAP-28-1-M	0 - 0.5	1351060	478555	Arsenic	14.7	mg/kg	N
A1P2TRAP-28-1-M-D	0 - 0.5	1351060	478555	Arsenic	18.1	mg/kg	N
A1P2TRAP-1-2-M-X-1	N/A	N/A	N/A	Lead	1	ug/L	U
A1P2TRAP-11-1-M-X-2	N/A	N/A	N/A	Lead	1	ug/L	U
A1P2TRAP-32-1-M-X-5	N/A	N/A	N/A	Lead	2	ug/L	U
A1P2TRAP-44-1-M-X-3	N/A	N/A	N/A	Lead	2	ug/L	U
A1P2TRAP-46-1-M-X-4	N/A	N/A	N/A	Lead	2	ug/L	U
A1P2TRAP-11-1-M	0 - 0.5	1351450	478900	Lead	10.7	mg/kg	
A1P2TRAP-48-1-M	0 - 0.5	1350600	478200	Lead	12.3	mg/kg	
A1P2TRAP-17-1-M	0 - 0.5	1351800	478800	Lead	12.4	mg/kg	
A1P2TRAP-14-1-M	0 - 0.5	1351750	478850	Lead	12.9	mg/kg	
A1P2TRAP-38-1-M	0 - 0.5	1351750	478450	Lead	13.4	mg/kg	
A1P2TRAP-4-1-M	0 - 0.5	1351400	479050	Lead	13.6	mg/kg	
A1P2TRAP-12-1-M	0 - 0.5	1351550	478900	Lead	13.6	mg/kg	
A1P2TRAP-47-1-M	0 - 0.5	1351600	478250	Lead	13.6	mg/kg	
A1P2TRAP-8-1-M	0 - 0.5	1350650	478950	Lead	13.8	mg/kg	
A1P2TRAP-34-1-M	0 - 0.5	1351600	478500	Lead	14.2	mg/kg	

APPENDIX A

Sample Identification Numbers, Locations, Depths, and Analytical Results

Sample ID	Depth (ft)	Easting	Northing	Parameter	Result	Units	Qualifier
A1P2TRAP-50-1-M	0 - 0.5	1351700	478200	Lead	14.5	mg/kg	
A1P2TRAP-7-1-M	0 - 0.5	1351650	479000	Lead	14.8	mg/kg	
A1P2TRAP-45-1-M	0 - 0.5	1350900	478300	Lead	14.8	mg/kg	*
A1P2TRAP-23-1-M	0 - 0.5	1351800	478700	Lead	14.9	mg/kg	
A1P2TRAP-44-1-M	0 - 0.5	1351700	478350	Lead	15.4	mg/kg	
A1P2TRAP-31-1-M	0 - 0.5	1351700	478550	Lead	15.7	mg/kg	
A1P2TRAP-15-1-M	0 - 0.5	1351350	478350	Lead	16	mg/kg	
A1P2TRAP-19-1-M	0 - 0.5	1350800	478700	Lead	17.6	mg/kg	
A1P2TRAP-3-2-M	0.5 - 1.0	1350944	479044	Lead	17.7	mg/kg	
A1P2TRAP-9-1-M	0 - 0.5	1351250	478950	Lead	17.8	mg/kg	
A1P2TRAP-37-1-M	0 - 0.5	1351350	478450	Lead	17.9	mg/kg	
A1P2TRAP-45-1-M-D	0 - 0.5	1350900	478300	Lead	18.2	mg/kg	*
A1P2TRAP-41-1-M	0 - 0.5	1351500	478400	Lead	18.4	mg/kg	
A1P2TRAP-42-1-M	0 - 0.5	1350750	478350	Lead	18.4	mg/kg	
A1P2TRAP-1-1-M	0 - 0.5	1350950	479100	Lead	18.6	mg/kg	
A1P2TRAP-46-1-M	0 - 0.5	1351150	478350	Lead	19.2	mg/kg	
A1P2TRAP-25-1-M	0 - 0.5	1351650	478650	Lead	19.4	mg/kg	
A1P2TRAP-2-2-M	0.5 - 1.0	1350938	479056	Lead	19.8	mg/kg	
A1P2TRAP-49-1-M	0 - 0.5	1351200	478200	Lead	19.9	mg/kg	
A1P2TRAP-18-1-M	0 - 0.5	1351700	478750	Lead	22.5	mg/kg	
A1P2TRAP-3-2-M-D	0.5 - 1.0	1350944	479044	Lead	22.6	mg/kg	
A1P2TRAP-27-2-M-D	0.5 - 1.0	1350855	478595	Lead	22.7	mg/kg	*
A1P2TRAP-32-1-M	0 - 0.5	1350600	478500	Lead	22.8	mg/kg	
A1P2TRAP-26-1-M	0 - 0.5	1350700	478600	Lead	23.9	mg/kg	
A1P2TRAP-16-1-M	0 - 0.5	1351300	478800	Lead	24.3	mg/kg	
A1P2TRAP-13-1-M	0 - 0.5	1350850	478850	Lead	24.5	mg/kg	
A1P2TRAP-29-1-M	0 - 0.5	1351800	478600	Lead	24.5	mg/kg	
A1P2TRAP-27-2-M	0.5 - 1.0	1350855	478595	Lead	25.4	mg/kg	
A1P2TRAP-43-1-M	0 - 0.5	1351000	478350	Lead	25.7	mg/kg	
A1P2TRAP-2-1-M	0 - 0.5	1350938	479056	Lead	26.4	mg/kg	
A1P2TRAP-3-1-M	0 - 0.5	1350944	479044	Lead	27.4	mg/kg	
A1P2TRAP-3-1-M-D	0 - 0.5	1350944	479044	Lead	28.1	mg/kg	
A1P2TRAP-22-1-M	0 - 0.5	1351500	478300	Lead	28.3	mg/kg	
A1P2TRAP-24-1-M	0 - 0.5	1350550	478650	Lead	28.9	mg/kg	
A1P2TRAP-39-1-M	0 - 0.5	1350900	478400	Lead	29.7	mg/kg	
A1P2TRAP-36-1-M	0 - 0.5	1351250	478450	Lead	37.4	mg/kg	
A1P2TRAP-35-1-M	0 - 0.5	1350750	478450	Lead	39.4	mg/kg	
A1P2TRAP-6-1-M	0 - 0.5	1350950	479000	Lead	39.9	mg/kg	
A1P2TRAP-30-1-M	0 - 0.5	1350800	478550	Lead	40	mg/kg	
A1P2TRAP-40-1-M	0 - 0.5	1351100	478400	Lead	52.2	mg/kg	
A1P2TRAP-33-2-M	0.5 - 1.0	1350950	478500	Lead	52.8	mg/kg	
A1P2TRAP-20-2-M	0.5 - 1.0	1351007	478692	Lead	53.5	mg/kg	
A1P2TRAP-10-1-M	0 - 0.5	1350950	478900	Lead	74.6	mg/kg	

APPENDIX A
Sample Identification Numbers, Locations, Depths, and Analytical Results

Sample ID	Depth (ft)	Easting	Northing	Parameter	Result	Units	Qualifier
A1P2TRAP-5-1-M	0 - 0.5	1350850	479000	Lead	75.6	mg/kg	
A1P2TRAP-21-2-M-D	0.5 - 1.0	1351054	478713	Lead	77.3	mg/kg	*
A1P2TRAP-27-1-M	0 - 0.5	1350855	478595	Lead	96.2	mg/kg	*
A1P2TRAP-27-1-M-D	0 - 0.5	1350855	478595	Lead	112	mg/kg	*
A1P2TRAP-21-2-M	0.5 - 1.0	1351054	478713	Lead	151	mg/kg	*
A1P2TRAP-28-2-M-D	0.5 - 1.0	1351060	478555	Lead	239	mg/kg	*
A1P2TRAP-28-2-M	0.5 - 1.0	1351060	478555	Lead	281	mg/kg	*
A1P2TRAP-33-1-M	0 - 0.5	1350950	478500	Lead	784.9	mg/kg	
A1P2TRAP-21-1-M	0 - 0.5	1351054	478713	Lead	895	mg/kg	*
A1P2TRAP-20-1-M	0 - 0.5	1351007	478692	Lead	1079	mg/kg	
A1P2TRAP-21-1-M-D	0 - 0.5	1351054	478713	Lead	1150	mg/kg	*
A1P2TRAP-28-1-M-D	0 - 0.5	1351060	478555	Lead	2960	mg/kg	*
A1P2TRAP-28-1-M	0 - 0.5	1351060	478555	Lead	3730	mg/kg	*
A1P2TRAP-2-2-M	0.5 - 1.0	1350938	479056	TCLP Lead	1.8	ug/L	BW*
A1P2TRAP-3-1-M	0 - 0.5	1350944	479044	TCLP Lead	2.1	ug/L	BW*
A1P2TRAP-2-1-M	0 - 0.5	1350938	479056	TCLP Lead	2.2	ug/L	BW*
A1P2TRAP-3-1-M-D	0 - 0.5	1350944	479044	TCLP Lead	2.5	ug/L	BW*
A1P2TRAP-3-2-M	0.5 - 1.0	1350944	479044	TCLP Lead	6	ug/L	W*
A1P2TRAP-3-2-M-D	0.5 - 1.0	1350944	479044	TCLP Lead	6.6	ug/L	
A1P2TRAP-27-2-M	0.5 - 1.0	1350855	478595	TCLP Lead	25.4	ug/L	*
A1P2TRAP-20-2-M	0.5 - 1.0	1351007	478692	TCLP Lead	31.2	ug/L	U
A1P2TRAP-21-2-M	0.5 - 1.0	1351054	478713	TCLP Lead	31.2	ug/L	U
A1P2TRAP-21-2-M-D	0.5 - 1.0	1351054	478713	TCLP Lead	31.2	ug/L	U
A1P2TRAP-27-1-M-D	0 - 0.5	1350855	478595	TCLP Lead	80.6	ug/L	
A1P2TRAP-27-2-M-D	0.5 - 1.0	1350855	478595	TCLP Lead	97.5	ug/L	
A1P2TRAP-27-1-M	0 - 0.5	1350855	478595	TCLP Lead	107	ug/L	
A1P2TRAP-33-2-M	0.5 - 1.0	1350950	478500	TCLP Lead	130	ug/L	
A1P2TRAP-28-2-M-D	0.5 - 1.0	1351060	478555	TCLP Lead	1630	ug/L	
A1P2TRAP-20-1-M	0 - 0.5	1351007	478692	TCLP Lead	26700	ug/L	
A1P2TRAP-21-1-M	0 - 0.5	1351054	478713	TCLP Lead	15600	ug/L	
A1P2TRAP-21-1-M-D	0 - 0.5	1351054	478713	TCLP Lead	5280	ug/L	
A1P2TRAP-28-1-M	0 - 0.5	1351060	478555	TCLP Lead	46600	ug/L	
A1P2TRAP-28-1-M-D	0 - 0.5	1351060	478555	TCLP Lead	61500	ug/L	
A1P2TRAP-28-2-M	0.5 - 1.0	1351060	478555	TCLP Lead	7220	ug/L	
A1P2TRAP-33-1-M	0 - 0.5	1350950	478500	TCLP Lead	6000	ug/L	

APPENDIX B-5

LETTER REPORT FOR THE PREDESIGN INVESTIGATION OF TECHNETIUM-99 IN SOIL IN THE SEWAGE TREATMENT PLANT AREA

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LETTER REPORT FOR PRE-DESIGN INVESTIGATION OF TECHNETIUM-99 IN SOIL IN THE SEWAGE TREATMENT PLANT AREA

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

NOVEMBER 1997

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

20710-RP-0003
REVISION A
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Figure 1-1 Sampling Locations

LIST OF ACRONYMS AND ABBREVIATIONS

CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
DOE	US Department of Energy
DQO	data quality objective
FACTS	Fernald Analytical Customer Tracking System
FEMP	Fernald Environmental Management Project
FRL	final remediation level
g	gram
K_d	soil/water partitioning coefficient
OSDF	On-Site Disposal Facility
OU5	Operable Unit 5
pCi	picocuries
PSP	project specific plan
PWID	Project Waste Identification Document
QA/QC	quality assurance/quality control
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
SCEP	Sitewide Characterization Excavation Plan
SCQ	Sitewide CERCLA Quality Assurance Project Plan
SMMP	Soils and Miscellaneous Media Projects
STP	Sewage Treatment Plant
Tc-99	Technetium-99
V/FCN	Variance/Field Change Notice
WAC	waste acceptance criteria
WDSS	Waste Disposal Support Services

EXECUTIVE SUMMARY

Remedial activities at the Fernald Environmental Management Project (FEMP) are divided among five Operable Units. Operable Unit 5 includes soil, groundwater, and other environmental media within the FEMP boundaries and in small areas outside the boundaries. This document describes an investigation of possible technetium-99 soil contamination at the sewage treatment plant. The Sewage Treatment Plant lies along FEMP eastern boundary, in a portion of the site known as Area 1, Phase II.

A Remedial Investigation of Operable Unit 5 reported the presence of technetium-99 and other radioactive materials in soil at the Sewage Treatment Plant. Studies of former plant processes and analytical methods employed during the Remedial Investigation suggest that the detections of technetium-99 may be erroneous.

A Record of Decision established Final Remediation Levels for each constituent of concern detected in the Operable Unit. The Final Remediation Level for technetium-99 is 30 picoCuries per gram. The On Site Disposal Facility may not accept materials whose technetium-99 activity exceeds 29.1 picoCuries per gram.

Uranium is the predominant constituent of concern in Operable Unit 5. A Feasibility Study examined numerous remedial alternatives, concluding that excavation and removal of contaminated soils is the preferred remedy. Further analysis showed that removal of soils containing unacceptable concentrations of total uranium would also remove other radioactive, organic, and inorganic constituents of concern, including technetium-99.

Technetium-99 activities reported in the Remedial Investigation Report exceeded final remediation levels and the OSDF's Waste Acceptance Criteria. This pre-design investigation was initiated for the following reasons:

- Technetium-99 does not occur in nature and no former plant process was thought to produce widespread technetium-99 contamination.
- Remedial Investigation analytical procedures for technetium-99 may have included counts of activity from related radionuclides including, including uranium daughter products.

- Rainfall quickly leaches technetium-99 into subsurface soils. Surface concentrations like those reported in the Remedial Investigation Report are unlikely to accumulate or remain in place.

The Project Specific Plan for this investigation specified:

- Resampling at three locations where the Remedial Investigation reported technetium-99 activity above the Final Remediation Level and Waste Acceptance Criterion.
- Advancing four additional borings surrounding each of the locations of the original detections. Each boring was to be advanced to a depth of 42 inches below grade or below any concrete or other structures.
- Advancing a second round of borings if samples from the first round yielded activities exceeding the final remediation level of 30 picoCuries per gram.

Boring and sampling proceeded as planned except for minor changes to avoid utilities and bedrock. Figure 1-1 shows the sampling locations. Using newer analytical methods that distinguish between technetium-99 and other radionuclides, analyzed samples from the initial sampling round and found no evidence of technetium-99. However, this data should be considered preliminary.

An undated version of this letter report will be forwarded upon receipt of the final data associated with this project.

1.0 INTRODUCTION

US Department of Energy (DOE) operations at Fernald may have produced small quantities of technetium-99 (Tc-99), a radionuclide that does not occur in nature. The Fernald Environmental Management Project (FEMP) conducted the project described below to determine if Tc-99 exists in soils at the sewage treatment plant (STP) and, if so, determine the levels of activity present. The *Project Specific Plan for Pre-Design Investigation of Technetium-99 in Soil in the Sewage Treatment Plant Area* contains additional details and references (DOE 1997). Except where noted, the investigation proceeded in accordance with the Project Specific Plan (PSP).

1.1 PURPOSE

The Operable Unit 5 (OU5) Remedial Investigation/Feasibility Study (RI/FS) reported the presence of Tc-99 within the STP compound and listed the element as a constituent of concern (DOE 1994). In a Record of Decision (ROD), DOE, the Ohio Environmental Protection Agency, and FEMP established a Final Remediation Level (FRL) of 30 picoCuries/gram (pCi/g) in OU5 soils and a Waste Acceptance Criterion (WAC) of 29.1 pCi/g for placement of soils containing Tc-99 in the On-Site Disposal Facility (OSDF) (DOE 1996).

The RI/FS reported concentrations of Tc-99 at the STP that exceeded the FRL and WAC. This project was initiated for the following reasons:

- Process knowledge suggests that Tc-99 contamination should not be widespread at the FEMP, especially in the STP area.
- During the RI/FS, Batch Recovery Proportional Counting was the primary analytical method used to determine Tc-99 concentrations for soil and sediment samples. This method allowed beta emitting uranium daughter products to be counted as technetium-99, potentially contributing to false positive detections. FEMP radiochemists abandoned this method as obsolete in 1995. FEMP now uses a newer, more accurate Tc-99 analysis that is unaffected by uranium daughters. It, too, is a proportional counting method, but it incorporates a sample-specific, chemical recovery metastable tracer to improve accuracy.
- A mechanistic argument casts doubt on the reliability of technetium-99 concentrations measured during the RI/FS. Technetium-99 is extremely mobile in soil (K_d=0.118), so elevated activities are unlikely to occur in surface soils.

1.2 PREVIOUS INVESTIGATIONS

Figure 1-1 shows the location of the STP and sample points at which previous investigations identified the presence of Tc-99. The activity in samples from three locations, Boring 1441, Zone 1-80, and Manhole 175, exceeded the FRL and WAC. Figure 1-1 shows these locations, the depths, and the associated results in pCi/g. The figure also shows other sampling locations and an estimated extent of Tc-99 activity produced by a kriging model. The model predicted that a large volume of excavated soil could not be placed in the OSDF because of Tc-99 activity exceeding WAC and the FRL.

1.3 SCOPE

The scope, as stated in the PSP, was to confirm the results of the previous investigations and further delineate the extent of technetium-99. The PSP described a two-phase investigation:

- In Phase 1, samples were to be collected at the original locations of detections above the WAC and FRL and at four additional locations in a symmetrical pattern around each of the original points. At each location, samples were to be collected at the 0-0.5, 1.0-1.5, 2.0-2.5, and 3.0-3.5 foot intervals and submitted to the laboratory for Tc-99 analysis. While previous data indicated that the contamination lay near the surface, the mobility of Tc-99 suggested that sampling at greater depths would provide additional confidence in the kriging model. Tc-99 detections exceeding the FRL or WAC would lead to Phase 2.

- In Phase 2, additional sampling would be conducted to further refine the vertical and horizontal extent of activity exceeding the WAC or FRL.

All sampling and analysis activities were consistent with the PSP, Sitewide Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Quality Assurance Project Plan (SCQ), and Data Quality Objectives (DQO) SL-036, Revision 0 (Appendix A).

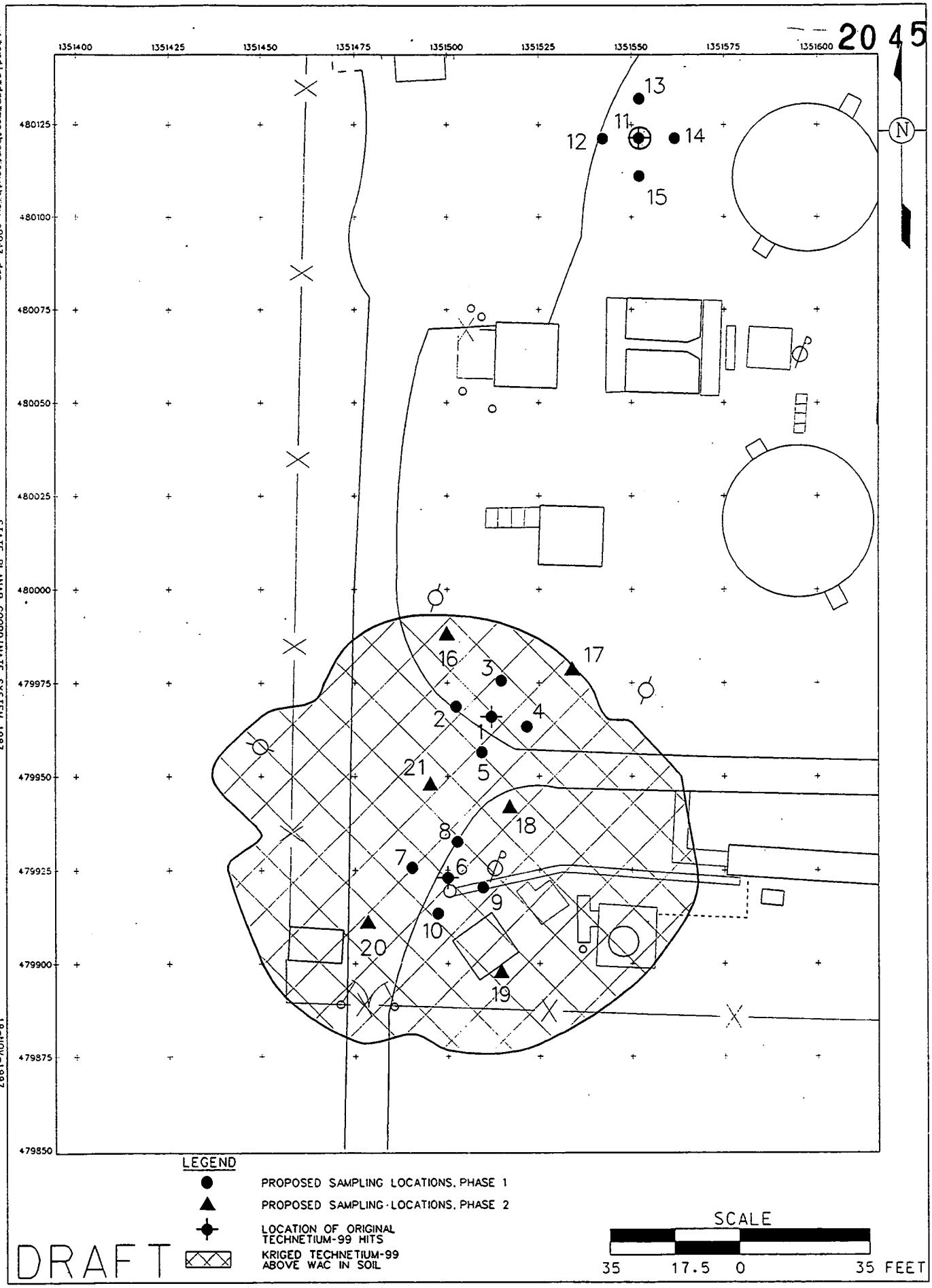

FIGURE 1-1. TC 99 SAMPLING LOCATIONS

2.0 FIELD ACTIVITIES AND DATA MANAGEMENT

2.1 SAMPLE LOCATIONS

2.1.1 Sample Location Strategy

Sample locations were selected to provide additional soil samples from locations where previous investigations reported detections exceeding the WAC or FRL. The sampling program consisted of two phases. Phase 1 included sampling at the original locations of the FRL or WAC exceedances and at four additional locations in a symmetrical pattern around each of the original technetium-99 detections (see Table 2-1).

TABLE 2-1
LOCATIONS OF ORIGINAL Tc-99 DETECTIONS EXCEEDING FRL AND WAC

Original Sample Points	Location
1	Zone 1-80
6	Manhole 175
11	Boring 1441

Four new sample points surrounded each of the above locations at a distance of 10 feet. The 10-foot interval was selected as the distance that would best increase the confidence in the kriging model. The relative positions of additional new sample points were as follows:

- Sample points 2, 3, 4, and 5 surrounded the Zone 1-80 location.
- Sample points 7, 8, 9, 10 surrounded Manhole 175.
- Sample points 12, 13, 14, 15 surrounded Boring 1441.

Figure 1-1 shows the proposed sampling locations.

Investigators planned the Phase II contingency locations, also shown in Figure 1-1, to provide data needed to further refine the kriging model. Phase 2 sampling was to occur only if the results from the Phase I analyses exceeded the FRL / WAC limit. These contingency locations were based on the

possible need for additional data around the original Zone 1-80 and Manhole 175 detections to better define the limit of excavation.

The Phase II locations were selected by placing 25-foot circles around the original two points. Sampling points were placed at the intersection of the two circles (sample points 18 and 21) and at four more locations around the periphery of the area (sample points 16, 17, 19, and 20). No Phase 2 samples were planned around Boring 1441 because the kriging model indicated very limited Tc-99 activity at that location.

At each location, samples were collected at the 0 - 0.5, 1.0 -1.5, 2.0 -2.5 and 3.0 -3.5 ft intervals and submitted to the laboratory for technetium-99 analysis. (One exception is discussed in Section 4.3, Field Changes.) Section 5 and Appendix A will present the analytical results. This information is currently unavailable.

2.1.2 Surveying

Prior to sample collection, sample locations were identified and flagged using a Geodimeter survey instrument in accordance with procedure EQT-05, *Geodimeter® 4000 Survey System - Operation, Maintenance, and Calibration*. The PSP presents the proposed sampling location coordinates. Exceptions are discussed in Section 4.3, Field Changes. Appendix A of this report will shows the "as sampled" NAD83 State Planar coordinates and sampling elevations for each sample location. This information is currently unavailable.

2.2 PHYSICAL SAMPLE COLLECTION

Samples were collected with a Geoprobe® Model 5400 in accordance with Procedure EQT-06, *Geoprobe Model 5400-Operation and Maintenance*. All existing surface vegetation was removed within a six-inch radius of the sample point. At each sampling location, one push was performed to a depth of 42 inches using the Macro-Core sampler with a plastic liner insert. (Boring location 6, where the probe encountered bed rock, is an exception.) Field workers divided each sample core into six-inch sample increments and submitted the 0 - 6", 12" -18", 24" - 30", and 36"- 42" increments for technetium-99 analysis.

Duplicate samples, collected at a frequency of 1 for every 10 field samples, were prepared by two adjacent pushes (side by side within a 6" radius) and throughly compositing and mixing the increments.

The PSP specified on-site analysis for all samples except the duplicates, which were to be analyzed off site as splits. A lack of on site laboratory capacity resulted in all samples except rinsates being analyzed off site. Variance/Field Change Notice (V/FCN) Number 50.03.59.02-1 (Appendix C) documents the change.

One rinsate sample was collected from the cutting shoe at a frequency of 1 for every 20 shoes decontaminated. Each rinsate sample was collected prior to sample collection and associated with the subsequently-collected soil samples. Rinsate samples were analyzed on-site to ASL D.

Drill cuttings were containerized and disposed of in according with the Waste Disposition Contact. Those wastes were coordinated with SCEP Waste Disposition Support Services (WDSS), through the Project Waste Identification Document (PWID) process. All waste handling was conducted in accordance with the PSP and SCQ. No wastes exceeded the FRL or WAC for Tc-99. Boreholes were backfilled with bentonite pellets and hydrated.

2.3 SAMPLE IDENTIFICATION

All physical soil samples collected for laboratory analysis received a unique sample identifier as described below.

Example: A1P2Tc-*sample location - Depth - QC,* where:

A1P2 = Area I, Phase II
Tc = Investigation Sample Activity for technetium-99
Sample Location = Location as shown in Figure 2-2
Depth = 0" - 6" interval = 1
12" - 18" interval = 3
24" - 30" interval = 5
36" - 42" interval = 7
QC = "D" indicates duplicate, "X" indicates rinsate.

Rinsates were identified as A1P2Tc-X-1, A1P2Tc-X-2, A1P2Tc-X-3, and so on. Appendix A will provide a list of all the samples associated with this project, including sample ID and locations. This information is currently unavailable.

2.4 EQUIPMENT DECONTAMINATION

Sampling equipment decontamination was conducted in accordance with the PSP, Section K.11 of the Sitewide CERCLA Quality Assurance Plan, and SMPL-01, Solids Sampling.

2.5 SAMPLE HANDLING, SHIPPING, AND ARCHIVAL

2.5.1 Sample Handling

Sample collection and custody was in accordance with the PSP and SCQ. A Fernald Analytical Customer Tracking System (FACTS)-generated label was affixed to each sample liner/container.

2.5.2 Sample Shipping

Technicians promptly delivered samples to the on-site laboratory in adequately-constructed containers. No special sample shipping or handling instructions were necessary.

2.6 DISPOSITION OF WASTES

Field personnel generated small amounts of soils, waters, and contact waste during sampling activities. Those wastes were coordinated with the SCEP WDSS through the PWID process. All waste handling was conducted in accordance with the PSP and SCQ. No wastes exceeded the FRL or WAC for Tc-99.

2.7 HEALTH AND SAFETY

All work was performed in accordance with the PSP, applicable Environmental Monitoring Project Procedures, the Safety Performance Requirements Manual, FDF Work Permit, Radiation Work Permit, Penetration Permit, and other applicable permits. Each team member indicated concurrence with applicable safety permits by signing the briefing record.

2.8 DATA MANAGEMENT

The PSP and the SCQ describe the requirement for written documentation of all field activities. The documentation was reviewed by sampling and FEMP personnel before submission for inclusion in the Sitewide Environmental Database (SED). Electronic data, such as that developed by the Geodimeter® 4000 Survey System, were downloaded to the FEMP local area network, where it is available through the Graphical Information System and Microsoft Access Software.

3.0 LABORATORY ANALYSIS AND VALIDATION

3.1 ANALYTICAL REQUIREMENTS

Sixty-five Phase 1 soil samples were submitted to an off site laboratory as documented in V/FCN Number 50.03.59.02-1. Table 3-1 summarizes the sampling and analytical requirements.

TABLE 3-1
SAMPLING AND ANALYTICAL REQUIREMENTS

Analyte / TAL	Sample Matrix	Sample Type	Preser-vative	Lab	ASL	Holding Time	Container
Tc-99 / 50.03.59.02-A	Solid	Grab	None	Off-site	B	6 Months	Capped plastic liner or 500 ml glass or plastic container
Tc-99 / 50.03.59.02-B	Solid	Duplicate / Grab	None	Off-site	D	6 Months	Capped plastic liner or 500 ml glass or plastic container
Tc-99 / 50.03.59.02-B	D.I. Water	Rinsate	None	On-site	D	6 Months	1 liter polyethylene

4.0 QUALITY ASSURANCE - QUALITY CONTROL REQUIREMENTS

The PSP, Section 4 of the SCQ, and additional documents listed in Section 4.2 describe the Quality Assurance/Quality Control (QA/QC) protocols for the project.

4.1 DATA QUALITY OBJECTIVE

DQO SL-036, Rev. 2 describes the data quality objective for this project.

4.2 PROJECT-SPECIFIC PROCEDURES AND MANUALS

The following procedures and manuals contain additional applicable requirements:

TABLE 4-1
QA/QC GUIDANCE DOCUMENTS

DOCUMENT NUMBER	TITLE
EQT-05	Geodimeter 4000 Surveying System - Operation, Maintenance, and Calibration
EQT-06	Geoprobe Model 5400 - Operation and Maintenance
SMPL-01	Solids Sampling
SMPL-21	Collection of Field Quality Control Samples
CIO AC97-0033	Radiometric Determination of Technetium-99 in Various Matrices

4.3 FIELD CHANGES

The PSP allows field changes with the verbal approval of the Project Lead. The Project Sampling Lead, Characterization Lead, Sampling and Characterization Manager, and QA Representative must sign a Variance Request/Field Change Notice Form (V/FCN) to document approval of the change. Table 4-1 summarizes the two field changes approved for this project.

TABLE 4-2
SUMMARY OF VARIANCES/FIELD CHANGES

V/F Number	Variance or Change
50.03.59.02-1	1) All soil samples were shipped to an off site laboratory due to a lack of capacity at the on site laboratory. 2) Duplicate samples were designated "D". 3) The suffix "R" was added to the sample ID numbers in PSP Appendix B.
50.03.59.02-2	1) Documented the relocation of six sampling locations necessitated by underground utilities. Appendix B shows the "as sampled" locations. 2) Documented a change of sampling interval at location 6 due to refusal at a depth of 31 inches.

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TABLE 4-2
SUMMARY OF VARIANCES/FIELD CHANGES

V/F Number	Variance or Change
50.03.59.02-1	1) All soil samples were shipped to an off site laboratory due to a lack of capacity at the on site laboratory. 2) Duplicate samples were designated "D". 3) The suffix "R" was added to the sample ID numbers in PSP Appendix B.
50.03.59.02-2	1) Documented the relocation of six sampling locations necessitated by underground utilities. Appendix B shows the "as sampled" locations. 2) Documented a change of sampling interval at location 6 due to refusal at a depth of 31 inches.

5.0 RESULTS OF INVESTIGATION

The off site laboratory analyzed 65 soil samples collected during Phase 1 as specified in CIO AC97-0033, Radiometric Determination of Technetium-99 in Various Matrices. Figure 1-1 shows proposed sampling locations, as revised to avoid underground utilities. Appendix A, which is unavailable at the time of this report, will present the analytical results.

5.0 RESULTS OF INVESTIGATION

The off site laboratory analyzed 65 soil samples collected during Phase 1 as specified in CIO AC97-0033, Radiometric Determination of Technetium-99 in Various Matrices. Figure 1-1 shows proposed sampling locations, as revised to avoid underground utilities. Appendix A, which is unavailable at the time of this report, will present the analytical results.

APPENDIX A

SAMPLE IDENTIFICATION NUMBERS, LOCATIONS, AND ANALYTICAL RESULTS

UNAVAILABLE AT THE TIME OF THIS REPORT

APPENDIX B-6

LETTER REPORT FOR PERCHED WATER SAMPLING AT THE SEWAGE TREATMENT PLANT