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ENVIRONMENTAL RESTORATION PROGRAM

DECONTAMINATION AND DECOMMISSIONING PROGRAM
OPERABLE UNIT SIX VERIFICATION REPORT
OU6 AREA D ACID LEACH BED AND DRAIN LINE

Mound Plant
Miamisburg, Ohio

FINAL

Prepared For:
EG&G MOUND APPLIED TECHNOLOGIES
AND
THE U.S. DEPARTMENT OF ENERGY

Prepared By:

An Employee-Owned Company

SAIC
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
4031 COLONEL GLENN HIGHWAY
SUITE 300
DAYTON, OHIO 45431-1600

MARCH 1994

REFERENCE USE ONLY

93-0020

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PREFACE

This verification report was prepared in accordance with the instructions contained in Section 5 of the Operable Unit 6 (OU6) Verification Work Plan (DOE 1992a), the OU6, Area D Sampling and Analysis Plan (DOE 1993a) and the specifications provided by EG&G Mound Applied Technologies.

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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BOA	Basic Ordering Agreement
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CCAL	Continuing Calibration
CGI	Combustible Gas Indicator
CLP	Contract Laboratory Program
COC	Contaminant of Concern
CRDL	Contract Required Detection Limit
CRQL	Contract Required Quantitation Limit
dBA	Decibels on the A Scale
DCB	Decachlorobiphenyl
D&D	Decontamination and Decommissioning (Program)
DNBP	Di-n-Butylphthalate
DOE	U.S. Department of Energy
DQO	Data Quality Objective
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
eV	Electron Volts
FFA	Federal Facility Agreement
FIDLER	Field Instrument for the Detection of Low-Energy Radiation
GC/ECD	Gas Chromatography/Electron Capture Detector
GFAA	Graphite Furnace Atomic Absorption
GPC	Gel Permeation Chromatography
GRASP	General Radiochemical Analytical Services Protocol
H&S	Health and Safety
HSP	Health and Safety Plan
ICAL	Initial Calibration
ICP	Inductively Coupled Plasma
ICS	Interference Check Sample
ICV	Initial Calibration Verification
ID	Identification
IDL	Instrument Detection Limit
IDM	Investigative Derived Material
LCS	Laboratory Control Sample
LEL	Lower Explosive Limit
MDA	Minimum Detectable Activity
MDL	Method Detection Limit
MS/MSD	Matrix Spike/Matrix Spike Duplicate
M&TE	Measuring & Test Equipment
NER	No Elevated Readings
NPL	National Priorities List
O_2	Oxygen
OEPA	Ohio Environmental Protection Agency
OSHA	Occupational Safety and Health Administration
OU6	Operable Unit Six
PAH	Polynuclear Aromatic Hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Comparability, and Completeness

ACRONYMS (cont'd)

PCB	Polychlorinated Biphenyl
PID	Photoionization Detector
PP	Plutonium Processing
PPE	Personal Protective Equipment
QA	Quality Assurance
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
QC	Quality Control
%R	Percent Recovery
RAM	Real-Time Aerosol Monitor
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RPD	Relative Percent Difference
RSD	Relative Standard Deviation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SHSC	Site Health & Safety Coordinator
SM/PP	Special Metallurgical/Plutonium Processing
SOP	Standard Operating Procedure
SOW	Statement of Work
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TCMX	Tetrachloro-m-Xylene
TIC	Tentatively Identified Compound
VOC	Volatile Organic Compound
VR	Verification Report
VWP	Verification Work Plan

ACKNOWLEDGEMENTS

This Verification Report was prepared by Science Applications International Corporation in Dayton, Ohio, under prime contract DE-ACO4-88DP43495, issued to EG&G Mound Applied Technologies, Inc., by the U.S. Department of Energy, and pursuant to Basic Ordering Agreement (BOA) Number 52264, Task Order Number 11256. The contributors to this document include J. Schultheis, J. Minard, D. Reed, J. Goyert, D. Jorgensen, M. Balmert, M. Giordano, D. Kroplin and S. Coyle.

PREFACE

This verification report was prepared in accordance with the instructions contained in Section 5 of the Operable Unit 6 (OU6) Verification Work Plan (DOE 1992a), the OU6, Area D Sampling and Analysis Plan (DOE 1993a) and the specifications provided by EG&G Mound Applied Technologies.

EXECUTIVE SUMMARY

This verification report (VR) documents the verification sampling and analysis activities conducted in Operable Unit 6 (OU6), Area D as specified in the OU6, Area D Sampling and Analysis Plan (SAP), (DOE 1993a). Based upon an analysis of the analytical data, this report concludes that the Decontamination and Decommissioning (D&D) operations conducted in OU6, Area D have met the cleanup goals of 25 pCi/g (as low as reasonably achievable (ALARA)) for plutonium-238 and 5 pCi/g at the surface and 15 pCi/g at depths greater than 15 centimeters (cm) for thorium.

The results of the analysis of the soil samples obtained from OU6, Area D also show that detectable concentrations of non-radioactive (chemical) contamination remaining in Area D following the D&D cleanup operations are either below the applicable or relevant and appropriate requirements (ARARs) specified in the OU6 Verification Work Plan (DOE 1992a) or do not exceed any known action levels available at this time.

The verification sampling and analysis activities in OU6, Area D were conducted during the period from May 17 through May 24, 1993. A total of nine soil borings were installed in four different sampling intervals along the former pipeline and in the area where the leach bed was located. Fifteen primary soil samples, plus two duplicate soil samples, were collected from these soil borings and shipped to the analytical laboratories for analysis of Target Compound List (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), Target Analyte List (TAL) metals and radiochemicals. One matrix spike/matrix spike duplicate (MS/MSD) was collected for quality control/quality assurance (QA/QC) purposes as specified in the OU6 Quality Assurance Project Plan (QAPjP). Two ambient blanks, two sample bank blanks, and two equipment rinsate blanks were also collected for QA/QC purposes and shipped to the laboratories for analysis. A trip blank and a temperature blank also accompanied each shipping container to the laboratories.

A statistical analysis of the analytical data was performed for values above the detection limit and for estimated values below the reported detection limits to determine arithmetic means and standard deviations. The upper 95 percent confidence limit was calculated and included with the results shown in this report. The statistical methodology that was applied to analyze the data is sufficiently conservative to provide a worse case evaluation of the radiological and chemical contaminant concentrations remaining in Area D.

The concentrations of radioactive isotopes detected in the soil samples obtained from Area D indicate that the 25 pCi/g (ALARA) cleanup criteria for plutonium-238, the 5 pCi/g cleanup criteria for thorium at the surface, and the 15 pCi/g for thorium at subsurface depths below 15 centimeters (cm) were achieved by the Mound Plant D&D Program. The verification data shows that cleanup levels for americium-241 (20 pCi/g), cesium-137 (80 pCi/g) and radium-226 (5 pCi/g-surface, 15 pCi/g-subsurface), specified in the OU6 Verification Work Plan, were also met by the Mound Plant D&D Program. Because no specific CERCLA cleanup levels have been established for the Mound Plant, no conclusions regarding the need for further remedial action in OU6, Area D to address residual radioactive contamination can be made at this time.

The chemical contaminants detected in Area D soils included four anions (chloride, fluoride, sulfate and nitrate-nitrite), three metals (calcium, magnesium and sodium), two pesticides (endrin ketone and methoxychlor), five SVOCs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, pyrene and an unknown polynuclear aromatic hydrocarbon (PAH)), one unknown alkane, one unknown hydrocarbon, one VOC (2-butanone), and six radiological contaminants (bismuth-207, cobalt-60, plutonium-239/240, thorium-227, americium-241 and tritium). Although these residual contaminants are not present in concentrations that are significantly above method detection limits (MDL), no conclusions regarding the need for additional remedial action can be made at this time (i.e., pending the results of a future feasibility study and risk assessment).

The verification sampling and analysis activities conducted in OU6, Area D have met the objectives of the SAP (DOE 1993a). No further verification sampling and analysis activities are required to address the post-D&D contamination in Area D. The quality and quantity of data obtained from the verification sampling of Area D should be sufficient to support future feasibility study and risk assessment actions for OU6. However, until CERCLA cleanup goals and background data are available, the need for further remedial activities in OU6, Area D cannot be determined.

1. INTRODUCTION

This Verification Report (VR) discusses the verification sampling and analysis activities that were conducted in Operable Unit 6 (OU6), Area D to determine if the Decontamination and Decommissioning (D&D) operations accomplished in the area had successfully removed all radioactively contaminated soils that contained plutonium-238 (Pu^{238}) and thorium-228/230/232 ($Th^{228/230/232}$) at concentrations above DOE cleanup criteria, other radioactive isotopes included in the analysis were uranium-234/235/238 ($U^{234/235/238}$), americium-241 (Am^{241}), cobalt-60 (Co^{60}), cesium-137 (Cs^{137}), bismuth-207/210m ($Bi^{207/210m}$), radium-226 (Ra^{226}), and tritium (H^3). This report describes the radioactive and non-radioactive (chemical) contamination that remains in the area following the D&D operations. This VR also discusses the field sampling activities, laboratory analyses, data validation, data analysis and quality assurance procedures that were employed to ensure the resulting data met the data quality objectives of the OU6, Area D Sampling and Analysis Plan (SAP) (DOE 1993a), the OU6 Verification Work Plan (VWP) (DOE 1992a) and the OU6 Quality Assurance Project Plan (QAPjP) (DOE 1992c).

1.1. PURPOSE OF THE VERIFICATION ACTIVITY

The purpose of the verification activity in OU6, Area D can be summarized as follows:

- verify that the cleanup of radioactively contaminated soils in Area D accomplished by the Mound Plant D&D Program is complete (i.e., concentrations of Pu^{238} are below 25 pCi/g (as low as reasonably achievable (ALARA) level) and $Th^{228/230/232}$ are below 5 pCi/g surface, 15 pCi/g subsurface (15 centimeters or greater beneath the land surface), respectively;

- determine if Area D soils contain radioactive and/or chemical contaminants in sufficient concentrations to be considered a source of such contaminants (i.e., contaminant concentrations high enough to pose a mobility threat to down-gradient areas);

- provide sufficient information to determine the types and concentrations (i.e., the nature) of chemical and radiological contaminants remaining in Area D soils following D&D cleanup, and determine laterally and vertically (i.e., the extent), within the sampling zone, where any detectable contaminants may exist in Area D soils following the D&D cleanup efforts; and

- provide remedial investigation (RI) quality data (data that meets CERCLA-based data quality objectives (DQOs) for the site) to address any residual radioactive and chemical contaminants remaining in Area D soils following D&D to support a future feasibility study, risk assessment and Record of Decision (ROD) for OU6.

1.2. SCOPE OF THE VERIFICATION ACTIVITY

The scope of work for the verification sampling in Area D involved the collection of sub-surface soil samples from four different sampling intervals (measured in feet from the point where the former acid

drain line exited the Plutonium Processing (PP) Building) as follows: (1) a maximum of four samples from three soil borings in the 10- to 20-foot interval; (2) an estimated four samples from a single boring in the 20- to 30-foot interval; (3) an estimated four samples from a single boring in the 30- to 40-foot interval; and (4) a maximum of four samples from the 100- to 110-foot interval. Follow-on sampling and analysis efforts were included in the scope of the verification sampling if the results indicated that additional field work was needed to determine the nature and extent of the residual contamination remaining in Area D soils following the D&D cleanup. Additional sampling/analyses activities were also included if unusual conditions, such as unusual odors or discolored or stained soils, were encountered during the verification activities.

1.3. INTRODUCTORY BACKGROUND

Established in 1946, the present Mound Plant is an integrated research, development, and production facility that operates in support of United States Department of Energy (DOE) weapons and energy programs. The Mound Plant is located partly within the city limits of Miamisburg, Ohio, approximately 15 miles southwest of Dayton, Ohio (see Figure 1.1). The plant property encompasses 306 acres and is situated on two hills separated by a northeast-southwest trending valley that is a tributary to the Great Miami River. The Mound Plant is operated by EG&G Mound Applied Technologies, under contract to DOE. The facility manufactures non-nuclear components and tritium-containing components for nuclear weapons. It also develops small heat sources, which are fueled by various radioactive isotopes, for space and defense programs.

1.3.1. Area Description

Area D consists of a former acid leach bed and associated drainpipe leading from the PP Building (Building 38) and is located on the upper slope of the Special Metallurgical/Plutonium Processing (SM/PP) Hill (see Figure 1.2.). The leach bed was constructed to treat concentrated nitric acid and dilute nitric acid solution spills from tanks (reagent-grade acid system) located in the preparation room of the PP Building. These tanks were surrounded by a metal tray to catch leaks or spills. Any spills or leaks were routed through an iron pipe that directed the liquid from beneath the building to the leach bed. The pipe was approximately 110 feet long and was buried three to nine feet below the surface. The leach bed, which was placed in service in 1967, had a surface area of approximately 10 feet by 10 feet and contained approximately one-half ton of crushed limestone to neutralize the acid solutions.

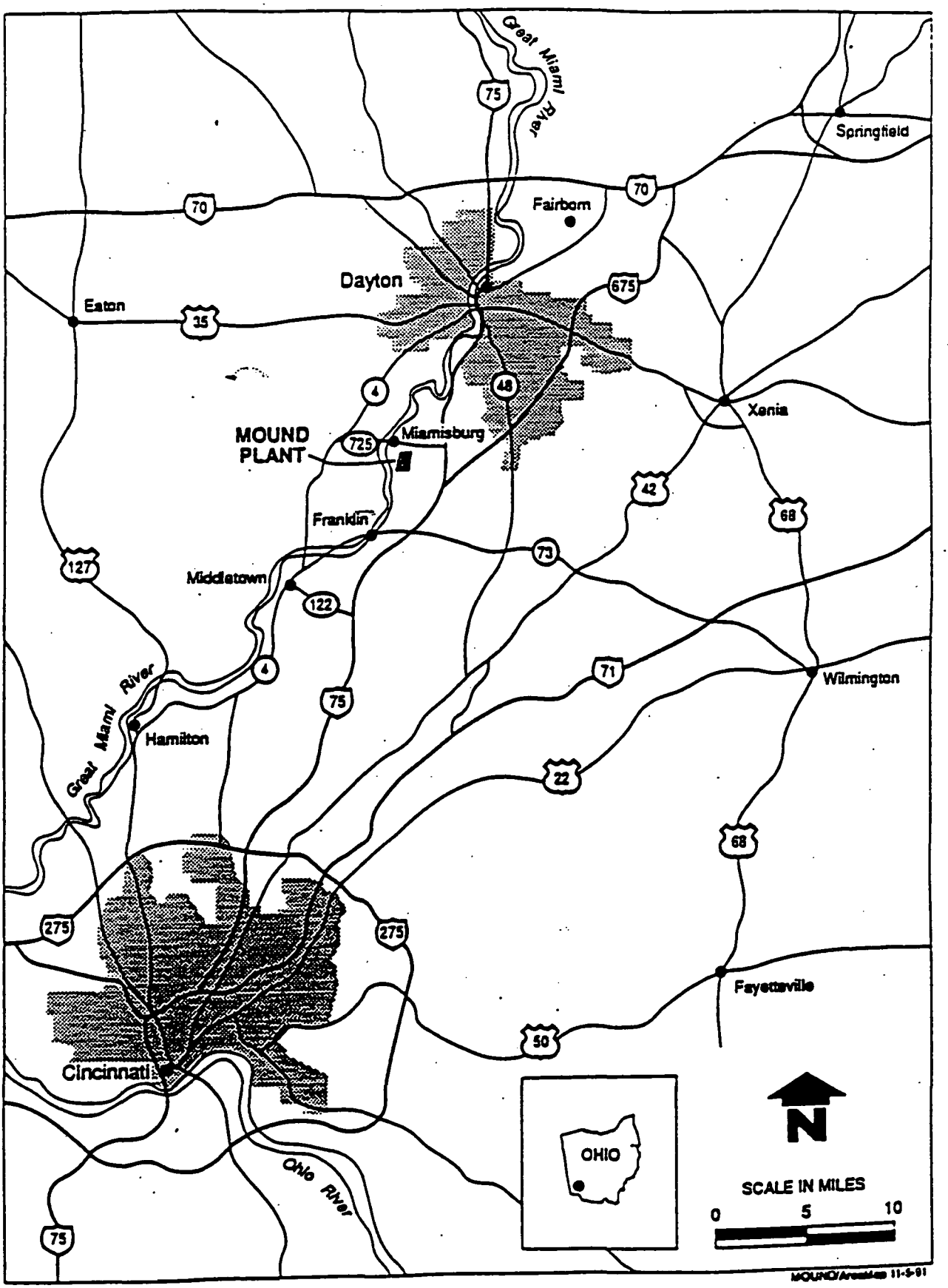

Figure 1.1. Mound Plant Location Map

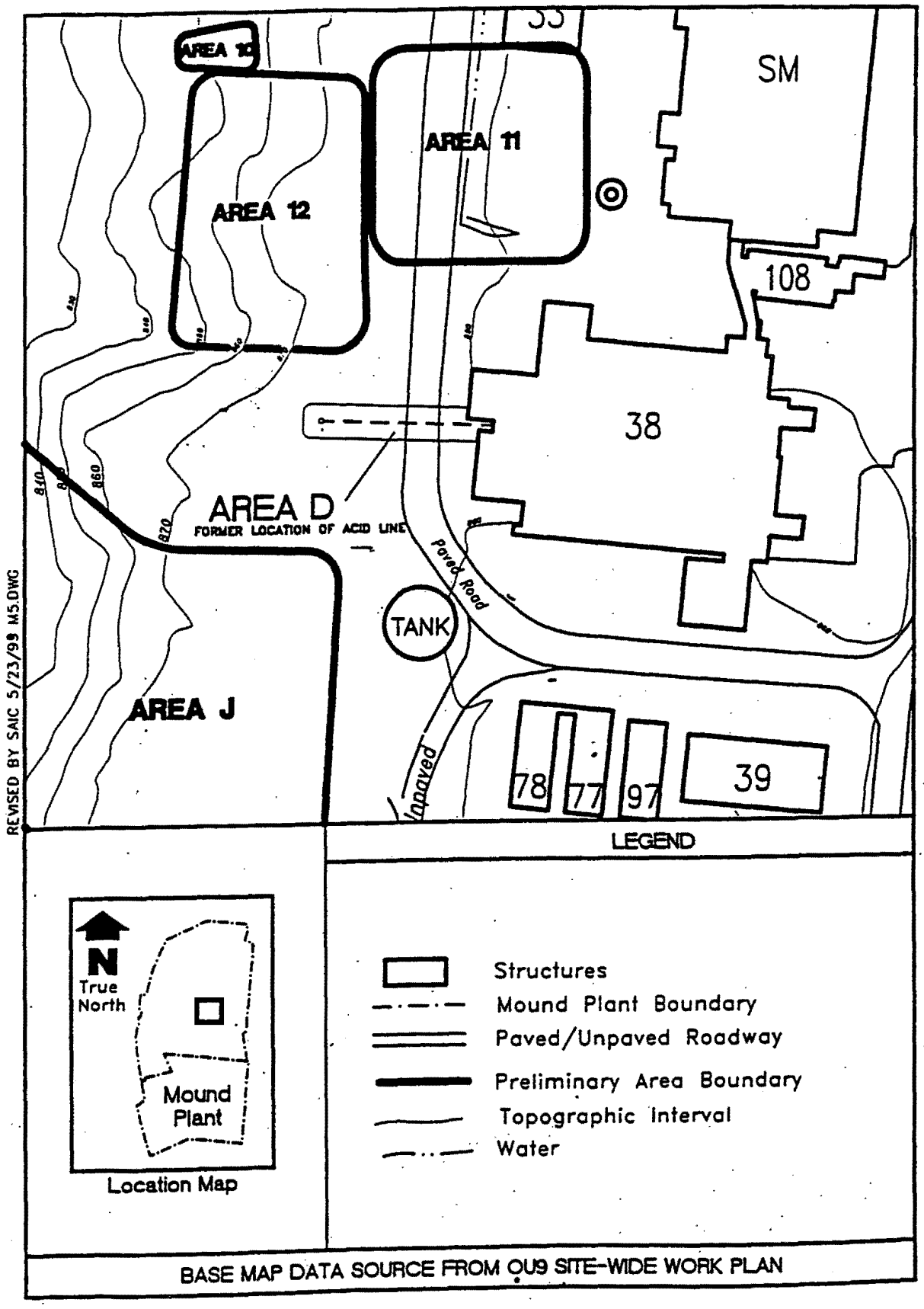

Figure 1.2. Area D Site Location Map

1.3.2. Area History

Historical waste handling and materials processing information indicates that Area D may have been affected by chemicals from adjacent contaminated sites (Areas 10, 11, 12 and J) through natural processes (wind, surface water or groundwater transport, and erosion) or by human activities (excavation, hauling, dumping, etc.). In addition, Area D may have been affected by grounds maintenance operations. These operations involved the use of fertilizers, herbicides, pesticides, and ice removal materials.

The engineering flow diagram for the reagent-grade acid system connected to the 3-inch duriron drain line (Drawing Number A-204) (DOE 1965) shows that spills from chemical feed tanks drained from the drip pan to the acid leach bed. These chemical feed tanks contained concentrated nitric acid (reagent-grade) and 0.35 normal, 2 normal, and 7.2 normal nitric acid solutions. Three other chemical feed tanks are shown - one contained a solution of ferrous sulfate, another contained sodium carbonate, and a third contained a 0.35 normal hydroxylamine-nitric acid solution. In 1987, the acid tanks located within Building 38 were taken out of service, and the pipeline from the building to the leach bed was capped. The acid drain line and associated leach bed were subsequently removed by the Mound Plant D&D Program in October 1991, along with any soils known to contain radioactive contamination above the DOE cleanup criteria.

1.4. PREVIOUS SAMPLING IN AREA D

Three separate sampling activities were conducted in Area D prior to the verification sampling described in this report. These previous sampling activities were as follows: (1) The Mound Site Survey Project (Stought et al. 1988); (2) The Mound Plant Reconnaissance Sampling Program (DOE 1992b); and (3) the sampling activities conducted by the Mound Plant D&D Program in 1991 (DOE 1991). No significant chemical contamination was identified during these sampling events. Some Pu^{238} and Th^{232} contamination was found during the D&D activities and subsequently removed by the Mound Plant D&D Program. A summary of these previous sampling events is contained in the Area D SAP (DOE 1993a).

1.5. SUMMARY OF D&D ACTIVITIES

The acid drain line and leach bed in Area D were removed by the Mound Plant D&D Program in October, 1991. During the D&D activities, approximately 130 soil samples were screened for Pu^{238} and Th^{232} by the Mound Plant Soil Screening Facility. The concentrations of Pu^{238} found during the soil screening ranged from 0 to 786 pCi/g and Th^{232} concentrations ranged from 0.3 to 6.5 pCi/g. The maximum plutonium and thorium contamination was found at a distance of approximately 15 feet from the location where the former acid drain

line exited the PP Building. Significant concentrations of plutonium contamination (154 to 221 pCi/g) were also found near the manhole in the former leach bed. The contaminated soils from these locations were subsequently removed by the D&D Program and the remaining soils were found to meet the D&D cleanup goals of 25 pCi/g for Pu^{238} (ALARA) and 5 pCi/g surface, 15 pCi/g subsurface for Th^{232} (indicator isotope used to screen thorium). The D&D release packages for OU6, Area D can be found in Appendix A of the SAP (DOE 1993a).

During the D&D excavations, a section of the acid drain line was found to co-exist with other utilities at a distance between 20 and 30 feet from the PP Building. Consequently, this section of the line was pulled from its buried location without further excavation. Subsequent to the D&D activities, the open excavation was backfilled by placing a layer of fine sand or pea gravel to mark the depth of the trench and the remaining original soil was used to fill the open trench. The sampling program was modified to include a boring in the 20- to 30-foot section of the former drain line to verify the attainment of cleanup in this interval, and to use the sand/pea gravel layer in other sampling intervals as a marker for subsurface soil sampling at depths below the original excavation.

2. VERIFICATION SAMPLING ACTIVITIES

2.1. SAMPLING SCOPE

The scope of work for the verification sampling in Area D was to determine what residual contamination remained in Area D soils following D&D and to provide RI quality data on any residual contaminants by the collection of subsurface soil samples at four sampling intervals. The four intervals were located along the former pipeline extending from PP Building and along the former acid leach bed. The sampling effort was based on the OU6 Area D SAP (DOE 1993a) and sampling guidance was provided in the OU6 QAPjP (DOE 1992c), OU6 Health & Safety Plan (HSP)(DOE 1992a), and the Mound Plant Standard Operating Procedures (SOPs) (DOE 1993b).

2.2. SAMPLING STRATEGY

Based on previous studies of Area D, as summarized in OU6 Area D SAP, the following sampling criteria were established:

- sampling was required in two locations - the leach bed (100-to 110-foot interval along the pipeline) and near PP Building (10- to 20-foot interval along the pipeline),
- samples were to be taken in the first one foot interval below the soil/fill interface,
- one sample of the original backfill was required at each interval, and
- additional samples were to be obtained in the 20- to 30-foot and 30- to 40-foot intervals.

2.2.1. Soil Sampling

The soil samples which were originally planned for Area D verification are summarized in Table II.1. The soil sampling actually performed in Area D is summarized in Table II.2. The actual sampling correlates closely with the planned sampling with the exception of an additional boring taken in the 100- to 110-foot interval. The sampling procedures used were in accordance with the Mound Plant SOPs listed in Table II.3. Soil samples were screened for radioactivity by Mound Plant Health Physics personnel using a field instrument for the detection of low energy radiation (FIDLER). Split samples were also measured for plutonium-238 (Pu^{238}) and thorium-232 (Th^{232}) activity by the Mound Plant Soil Screening Facility prior to sample shipment to the analytical laboratories.

To satisfy the objectives of the SAP, the samples collected in Area D were analyzed for the chemical and radiological constituents listed in Table II.4. These constituents were selected based on former SM/PP

Table II.1. Summary of Planned Area D Soil Sampling

Sample Location	Sample Type/Parameter	Sample Depths[a] (feet)	No. of Sample Depths
10- to 20-ft interval of pipeline	Soil/Radionuclides[b] Soil/All Analytes[c] Backfill/All Analytes[c]	3- to 5- 3- to 5- 1- to 3-	2 1 1
10- to 20-ft interval of pipeline	Soil Screen/Rad Screen	1- to 5-	4
20- to 30-ft interval of pipeline	Soil/Radionuclides[b] Soil/All Analytes[c] Backfill/All Analytes[c]	1- to 6- (continuous) 1- to 3-	2 (est.) 1 (est.) 1
20- to 30-ft interval of pipeline	Soil Screen/Rad Screen	1- to 6- (continuous)	4 (est.)
30- to 40-ft interval of pipeline	Soil/Radionuclides[b] Soil/All Analytes[c] Backfill/All Analytes[c]	1- to 6- (continuous) 1- to 3-	2 (est.) 1 (est.)
30- to 40-ft interval of pipeline	Soil Screen/Rad Screen	1- to 6- (continuous)	4 (est.)
100- to 110-ft interval of pipeline	Soil/Radionuclides[b] Soil/All Analytes[c] Backfill/All Analytes[c]	8- to 10- 8- to 10- 3- to 5-	2 1 1
100- to 110-ft interval of pipeline	Soil Screen/Rad Screen	3- to 10-	4

[a] Estimated depth to soil/fill interface
[b] Radionuclides listed in Table II.5.
[c] All analytes listed in Table II.5.

Table extracted from OU6 Area D SAP (DOE 1993a)

Table II.2. Summary of Actual Area D Soil Sampling

Sample Location	Borehole Number	Date Completed	Sample Number	Depth of Sample (feet)	Sample Type	Analyses Requested
10- to 20-foot interval	BS04	5-19-93	BS0401	3-4	Soil	Radiological[b]
	BS05	5-19-93	BS0501	0.5-2	Backfill	Full[a]
	BS05	5-19-93	BS0502	3-4	Soil	Full[a]
	BS05	5-19-93	BS0503	3-4	Duplicate	Full[a]
	BS06	5-19-93	BS0601	3-4	Soil	Radiological[b]
20- to 30-foot interval	BS08	5-24-93	BS0801	1-2	Backfill	Full[a]
	BS08	5-24-93	BS0802	2-4	Backfill	Radiological[b]
	BS08	5-24-93	BS0803	4-4.5	Soil	Full[a]
30- to 40-foot intervals	BS07	5-20-93	BS0701	1-3	Backfill	Full[a]
	BS07	5-20-93	BS0702	3-4	Backfill	Radiological[b]
	BS07	5-20-93	BS0703	4-4.5	Soil	Full[a]
	BS07	5-20-93	BS0704	4-4.5	Duplicate	Radiological[b]
100- to 110- foot intervals	BS01	5-18-93	BS0101	18-19.2	Soil	Radiological[b]
	BS02	5-18-93	BS0201	9-11	Soil	Full[a]
	BS03	5-18-93	BS0301	5-7	Backfill	Full[a]
	BS03	5-18-93	BS0302	7-10	Soil	Radiological[b]
	BS09	5-20-93	BS0901	8-9	Soil	Radiological[b]

[a] Analyses requested include Target Compound List volatile organics, semi-volatile organics, and pesticides/PCBs; Target Analyte List metals and cyanide (including tin, bismuth, lithium, and molybdenum); selected anions (fluoride, chloride, nitrate-nitrite, and sulfate), and the radionuclides listed in b.

[b] Analyses requested includes: $Pu^{238,239,240}$, $Th^{227,228,230,232}$, $U^{234/235,238}$, H^3, and Gamma Spectrometry (Am^{241}, Cs^{137}, Co^{60}, Bi^{207}, Bi^{210m}, Ra^{226})

Table II.3. Mound Standard Operating Procedures Used During Verification Sampling

SOP	Title
1.1	General Instruction for Field Personnel
1.3	Sample Control and Documentation
1.4	Sample Containers and Preservation
1.5	Guide to Handling, Packaging, and Shipping of Samples
1.6	General Equipment Decontamination
1.8	Personnel Decontamination - Level D Protection
1.9	Personnel Decontamination - Level C Protection
1.15	Guide to Management of Investigative Derived Material
4.1	Soil Boring
5.1	Soil and Rock Borehole Logging and Sampling
5.2	Soil Sampling with a Spade and Scoop
5.3	Subsurface Solid Sampling with Hand Auger and Thin-wall Sampler
6.1	Health & Safety Monitoring
6.2	Health & Safety Monitoring of Organic Vapors with Photoionization Detector
6.4	Total Alpha Surface Contamination Measurements
6.7	Near-Surface and Soil Sample Screening for Low Energy Gamma Radiation Using the FIDLER
6.11	Beta-Gamma Radiation Measurements

Table II.4. OU6 Area D Contaminants of Concern

Chemical Constituents	Radiological Constituents
Acetone	Americium-241
Arsenic	Bismuth-207
Benzene	Bismuth-210m
Beta-BHC	Cesium-137
Bismuth	Cobalt-60
Calcium	Plutonium-238, 239/240
Carbon Tetrachloride	Radium-226
Chloroform	Thorium-228/230/232
Cresols (phenylmethyl)	Tritium
Diethyl Benzene	Uranium-234/235/238
Endrin Ketone	
Fluoride	
Hexane	
Methyl Ethyl Ketone	
Methyl Isobutyl Ketone	
PCBs	
Phenol	
Potassium	
Sodium	
Tetrachloroethane	
Toluene	
Trichloroethane	
Trichloroethene	
Xylene	
Aluminum	
Chromium	
Cobalt	
Copper	
Iron	
Lead	
Mercury	
Nickel	
Zinc	
Nitrate-Nitrite	
Chloride	
Sulfate	

operations, previous sampling results and investigations, and D&D cleanup activities. The list of constituents was extended at the request of the Ohio Environmental Protection Agency (OEPA) to include all Target Compound List (TCL) volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and pesticides/PCBs, and all Target Analyte List (TAL) metals, as shown in Table II.5.

2.2.2. Field Quality Control

Field quality control (QC) samples were collected according to the criteria specified in the OU6 SAP, the OU6 QAPjP, and the Mound Plant SOPs to assess field conditions and sampling techniques. The field QC samples collected for this verification activity are described in detail in Section 2.5.

2.3. SAMPLE DESIGNATIONS

To assure consistency with the OU6 Verification Work Plan and the OU6 QAPjP, the Area D verification sampling program used the sample identification scheme shown in Table IV.1, Section 4 of the OU6 SAP. The sample identification system provides information on the site name, sample matrix, location, and sampling interval.

2.4. FIELD SAMPLING ACTIVITY

Field crews and field sampling equipment were mobilized to Area D on May 17, 1993 to conduct verification sampling activities. All subsurface drilling and sampling operations were conducted in accordance with the approved SAP, except for the addition of a fourth boring in the 100- to 110-foot sampling interval (see Section 3.3.2 for details). A total of nine soil borings were excavated in Area D (see Figure 2.1) and 17 soil samples were obtained for laboratory analysis. The specific sampling intervals and their associated samples are described below.

Soil borings BS01, BS02, BS03 and BS09 were excavated in the 100- to 110-foot sampling interval (distance from PP Building) and five soil samples were extracted for subsequent laboratory analysis as shown in Table II.2. The first three soil borings were drilled on May 18, 1993 by Bowser-Morner, Inc. using 4.25-inch i.d. hollow-stem augers powered by a truck-mounted Mobile B61 drill rig. Soil sampling was conducted continuously in each of these three borings by driving a 24-inch long by 2.5-inch i.d. split barrel sampler through and ahead of the hollow-stem augers to locate the sand/fill interface. After advancing borehole BS01 to a depth of 18 feet below ground surface and collecting a soil sample from 18 to 19.2 feet, it was apparent that the boring had not encountered the sand/fill interface that delineated the former acid leach bed target zone. According to historical records, the D&D activities conducted in

Table II.5. Parameter List for Laboratory Analysis of Samples
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Volatile Organic Compounds	Semivolatile Organic Compounds	Pesticides/PCBs	Inorganics	Radiological
Chloromethane	Phenol	alpha-BHC	Aluminum	Americium-241
Bromomethane	bis(2-Chloroethyl) ether	beta-BHC	Antimony	Bismuth-207
Vinyl Chloride	2-Chlorophenol	delta-BHC	Arsenic	Bismuth-210m
Chloroethane	1,3-Dichlorobenzene	gamma-BHC	Barium	Cesium-137
Methylene Chloride	1,4-Dichlorobenzene	Heptachlor	Beryllium	Cobalt-60
Acetone	Benzyl alcohol	Aldrin	Cadmium	Plutonium-238,239,240
Carbon disulfide	1,2-Dichlorobenzene	Heptachlor epoxide	Calcium	Radium-226
1,1-Dichloroethene	2-Methylphenol	Endosulfan I	Chromium	Thorium-227,228,230,232
1,1-Dichloroethane	bis(2-Chloroisopropyl) ether	Dieldrin	Cobalt	Tritium
1,2-Dichloroethene	4-Methylphenol	4,4'-DDE	Copper	Uranium-234,235,238
Chloroform	N-Nitroso-di-n-propylamine	Endrin	Iron	
1,2-Dichloroethane	Hexachloroethane	Endosulfan II	Lead	
2-Butanone	Nitrobenzene	4,4'-DDD	Magnesium	
1,1,1-Trichloroethane	Isophorone	Endosulfan sulfate	Manganese	
Carbon Tetrachloride	2-Nitrophenol	4,4'-DDT	Mercury	
Vinyl Acetate	2,4-Dimethylphenol	Methoxychlor	Nickel	
Bromodichloromethane	Benzoic Acid	Endrin ketone	Potassium	
1,2-Dichloropropane	bis(2-Chloroethoxy)methane	Endrin aldehyde	Selenium	
cis-1,3-Dichloropropene	2,4-Dichlorophenol	alpha-Chlordane	Silver	
Trichloroethene	1,2,4-Trichlorobenzene	gamma-Chlordane	Sodium	
Dibromochloromethane	Naphthalene	Toxaphene	Thallium	
1,1,2-Trichloroethane	4-Chloroaniline	Aroclor-1016	Vanadium	
Benzene	Hexachlorobutadiene	Aroclor-1221	Zinc	
trans-1,3-dichloropropene	4-Chloro-3-Methylphenol	Aroclor-1232	Molybdenum	
Tribromomethane	2-Methylnaphthalene	Aroclor-1242	Tin	
4-Methyl-2-pentanone	Hexachlorocyclopentadiene	Aroclor-1248	Bismuth	
2-Hexanone	2,4,6-Trichlorophenol	Aroclor-1254	Lithium	
Tetrachloroethene	2,4,5-Trichlorophenol	Aroclor-1260	Chloride	
Toluene	2-Chloronaphthalene		Fluoride	
1,1,2,2-Tetrachloroethane	2-Nitroaniline		Nitrate-Nitrite	
Chlorobenzene	Dimethylphthalate		Sulfate	
Ethylbenzene	Acenaphthylene			
Styrene	2,6-Dinitrotoluene			
Xylenes (total)	3-Nitroaniline			
	Acenaphthene			

Table II.5. Parameter List for Laboratory Analysis of Samples
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Volatile Organic Compounds	Semivolatile Organic Compounds	Pesticides/PCBs	Inorganics	Radiological
	2,4-Dinitrophenol			
	4-Nitrophenol			
	Benzo(k)fluoranthene			
	Benzo(a)pyrene			
	Indeno(1,2,3-cd)pyrene			
	Dibenzo(a,h)anthracene			
	Benzo(g,h,i)perylene			
	Anthracene			
	Benzo(a)anthracene			
	Chrysene			
	bis(2-Ethylhexyl) phthalate			
	Di-n-octylphthalate			
	Benzo(b)fluoranthene			
	Di-n-butylphthalate			
	Fluoranthene			
	Pyrene			
	Butylbenzylphthalate			
	3,3'-Dichlorobenzidine			
	Dibenzofuran			
	2,4-Dinitrotoluene			
	Diethylphthalate			
	Hexachlorobenzene			
	Pentachlorophenol			
	Phenanthrene			
	4,6-Dinitro-2-methylphenol			
	N-Nitroso-Diphenylamine			
	4-Bromophenyl phenyl ether			
	4-Chlorophenyl phenyl ether			
	Fluorene			
	4-Nitroaniline			

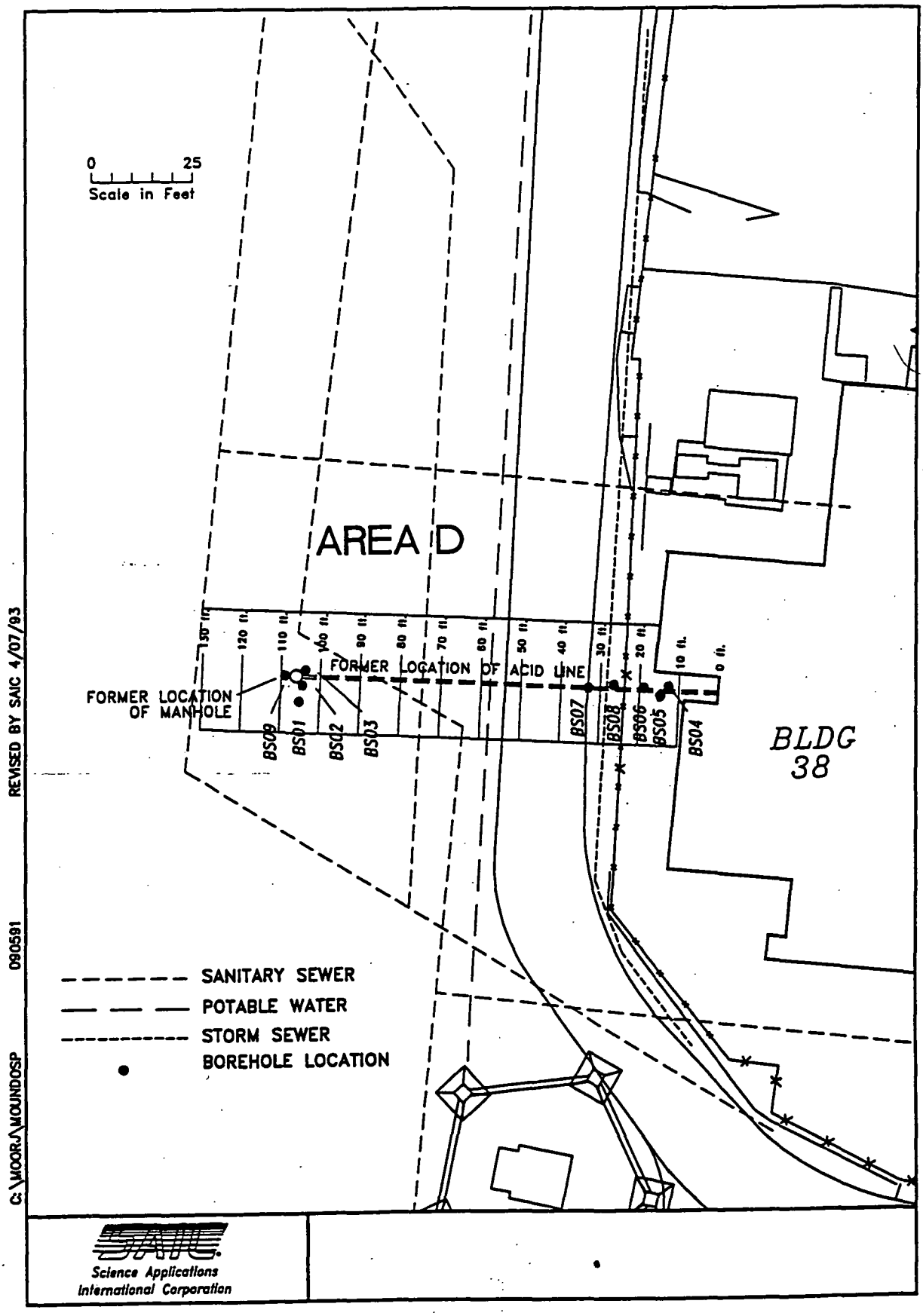

Figure 2.1. Area D Borehole Location Map

Area D removed soils from the former acid leach bed to a depth of 8- to 10-feet. A layer of sand or pea gravel was subsequently used by the D&D field crew to line the bottom of the excavation before the excavation was backfilled. However, this horizon was not detected during the continuous sampling of this borehole.

Soil borings BS02 and BS03 were installed progressively northward of boring location BS01 and both of these borings penetrated the sand/fill horizon at a depth of approximately 7 feet. A soil sample was obtained beneath the sand/fill layer for laboratory analysis as indicated in Table II.2. In addition, a sample of the backfill material was obtained from soil boring BS03 for full analysis as specified in Table II.2.

Boring BS09 was hand augered in the 100- to 110-foot interval to a depth of approximately 8 feet before the sand/fill layer was encountered. A soil sample was obtained beneath this layer using a stainless steel tube sampler to complete the verification sampling requirements in this interval. Bedrock was not encountered in any of the soil borings excavated in this interval, including soil boring BS01 that penetrated to a depth of approximately 19.2 feet.

Boreholes BS04, BS05 and BS06 were installed in the 10- to 20-foot sampling interval on May 19, 1993 using a stainless steel hand auger and 2-inch i.d. by 12-inch long stainless steel tube samplers. A thin sand/gravel layer, which represented the extent of the D&D excavation, was encountered in these borings at a depth of approximately 3 to 3.5 feet. Apparent bedrock was struck at a depth of about 4 feet. As shown in Table II.2, one soil sample was obtained from borehole BS04 and BS06. Three soil samples were obtained from borehole BS05.

Soil Boring BS08 was excavated in the 20- to 30-foot sampling interval on May 24, 1993, and a total of three soil samples were obtained for laboratory analysis as shown in Table II.2.

Verification sampling in the 30- to 40-foot sampling interval was conducted on May 20, 1993. Soil boring BS07 was installed to a depth of about 4.5 feet before apparent bedrock was encountered. The sand/fill layer was encountered at a depth of approximately 4 feet. Four soil samples were collected for laboratory analysis as shown in Table II.2.

2.5. FIELD QUALITY CONTROL SAMPLES

During verification sampling, field QC samples were collected and submitted for analysis to assess field sampling techniques and field conditions. The field QC samples collected included trip blanks, ambient blanks, sample bank blanks, equipment rinsate blanks, and duplicate samples.

Rinsate blanks were used to evaluate the success of the equipment decontamination process. After decontamination, the sampling equipment was rinsed a final time with deionized/distilled water. The rinsate was collected and analyzed for the same parameters as the primary soil samples. One rinsate blank was collected for every 10 or fewer samples. Equipment rinsate, R00001, was collected on May 19, 1993 for organic, inorganic and radiological analysis, and equipment rinsate, R00002, was collected on May 21, 1993 for radiological analysis only.

Field duplicates were prepared to evaluate sample variability and sampling technique precision. Although true soil duplicates are not possible because soil is not homogeneous, thorough mixing of the soil provided a more homogeneous sample. VOC samples were collected prior to homogenization due to potential loss of VOCs during mixing. One field duplicate was collected for every 10 or fewer primary samples. One pair of duplicates, BS0502 and BS0503, was collected for organic, inorganic, and radiological analysis. A second duplicate pair, BS0703 and BS0704, was collected for radiological analysis only. Duplicate samples were analyzed for the same parameters as the primary soil samples.

Trip blanks, (40 milliliter (mL) vials of deionized water) were used to evaluate contamination that could be introduced during sample shipment. A trip blank (in duplicate) was included in each shipping cooler containing VOC samples each day sampling occurred and was analyzed for TCL VOCs. Trip blanks were prepared at the laboratory and shipped to the site. Trip blanks were shipped in duplicate at the request of the laboratory to ensure adequate sample volume for analysis in case of breakage or if re-analysis was required.

A temperature blank (a 40 mL vial of water) was used to monitor the temperature of the samples during shipment. One blank was included in each cooler containing samples that required temperature maintenance at 4 $\pm$ 2 degrees Celsius, per the OU6 QAPjP. The temperature of the blank was recorded on the chain of custody form at the time of shipment to the laboratory and was recorded again at the time of sample receipt by the laboratory. Radiological water samples did not require temperature maintenance.

An ambient blank and a sample bank blank were collected on May 19, 1993 for VOC analysis. Ambient blank, A00002, which was prepared in duplicate at the 10- to 20-foot sampling interval with deionized water, was used to monitor for VOC contamination potentially introduced to samples at the work site. Sample bank blank, SBB002, which was prepared in duplicate with deionized water inside the sample trailer where the samples were being prepared for shipment, was used to monitor for VOC contamination potentially introduced to the samples from the sample handling area.

2.6. HEALTH AND SAFETY MONITORING

The purpose of health and safety (H&S) monitoring was to identify and quantify airborne contaminants and physical agents to assist the site health and safety coordinator (SHSC) in the following:

- selecting the appropriate level of personal protective equipment (PPE);
- identifying areas where protection was needed;
- assessing the potential health effects of exposure; and
- determining the need for specific medical monitoring.

Each work location (e.g., BS01) was surveyed with the appropriate instrument before work activities began and periodically during the work. Measurement data were recorded on the appropriate SOP forms which were bound in the Health and Safety Logbook and the Soil Borings Logbook. Table II.6 summarizes the monitoring results per soil boring. The following subsections discuss the results of the H&S monitoring activity for this task.

2.6.1. Soil Borings BS01, BS02, & BS03

A hollow stem auger drill rig was used for sample locations BS01, BS02, and BS03. A photoionization detector (PID) was used to detect the presence of total concentrations of organic vapors with an ionization potential of less than 10.2 electron volts (eV). A combustible gas indicator (CGI) was used to measure the lower explosive limit (LEL) of combustible vapors. The instruments did not detect the presence of potential contaminants. The CGI also had an oxygen (O_2) sensor and was used to measure the percent of O_2 downhole to determine if a correction factor would be required for the LEL reading. The O_2 measurement was 20.9% which is the normal concentration present in ambient air. Respiratory protection was not required or worn for these sample locations. An EG&G Mound Plant health physics technician screened personnel, samples and equipment with an alpha scintillometer and a FIDLER at the exit point of the exclusion area. No elevated readings (NER) were reported for either instrument. A real-time aerosol monitor (RAM) which measures airborne particulates was not used because light rains prevented

Table II.6. Results of Health and Safety Monitoring

SAMPLE	PID	%0_2	CGI	FIDLER	ALPHA SCINTILLOMETER	SOUND LEVEL METER
BS01	ND	20.9	ND	NER	NER	< 80 dBA
BS02	ND	20.9	ND	NER	NER	< 80 dBA
BS03	ND	20.9	ND	NER	NER	< 80 dBA
BS04	ND	20.9	ND	NER	NER	100 dBA[a]
BS05	ND	20.9	ND	NER	NER	NA
BS06	ND	20.9	ND	NER	NER	NA
BS07	ND	20.9	ND	NER[b]	NER	NA[c]
BS08	ND	20.9	ND	NER	NER	NA[c]
BS09	ND	20.9	ND	NER	NER	NA

[a] - Sound level measurements were 100 dBA when the power saw was operated.

[b] - Final sample indicated 800 counts above background on the FIDLER. Sample was rescanned; however, FIDLER indicated no elevated reading. Sample was sent to soil screens lab; no elevated reading was reported.

[c] - Sound level measurements were not taken when the concrete saw was operated at these locations.

CGI - Combustible gas indicator
dBA - Decibels on the A scale
FIDLER - Field instrument for the detection of low-energy radiation
NA - Not analyzed
ND - None detected
NER - No elevated readings
PID - Photoionization detector
% 0_2 - Percent oxygen

the formation of dusts during drilling and sampling activities. A sound level meter was used to record the level of sound during drilling activities. The sound measurement was less than 80 decibels on the A scale (dBA). Since the sound level measurement was less than the Occupational Safety and Health Administration (OSHA) action level of 85 dBA, hearing protection was not utilized.

2.6.2. Soil Borings BS04, BS07, & BS08

A power saw was used to cut through the asphalt pavement to gain access to the soil for sample locations BS04, BS07, and BS08. BS07 and BS08 required the use of a pick in addition to the saw due to the thickness of the pavement. Hand augering was required for the three locations due to BS04 located within the security island, the high voltage lines directly above the sample locations and the congestion of utilities near the sampling locations. The PID and CGI instruments did not detect the presence of potential contaminants. The O_2 measurement was 20.9%. Respiratory protection was not required or worn for these sample locations. An EG&G Mound Plant health physics technician screened personnel, samples and equipment with an alpha scintillometer and a FIDLER at the exit point of the exclusion area. NERs were reported for either instrument except at borehole BS07. When the last sample from this boring location was screened with a FIDLER, the instrument indicated approximately 800 counts above the background. Work was immediately stopped while the health physics technician rescanned the sample. The second scan produced NER. The sample was sent to the Mound Plant soil screens lab to be checked further. The lab reported NER. Work was resumed after the health physics technician presumed the FIDLER produced an erroneous reading. The RAM was not used because hand augering produces very little if any dusts. The sound level meter indicated readings of 100 dBA during power saw operations to gain access through the asphalt which required the use of hearing protection in the exclusion area.

2.6.3. Soil Borings BS05, BS06, & BS09

A power saw and pick were used to cut through the asphalt pavement to gain access to the soil for BS05 and BS06 due to the thickness of the pavement. Hand augering was required for these two locations due to overhead high voltage lines and the congestion of utilities near the sampling locations. The EG&G Mound Plant construction inspector required BS09 to be hand augered to a minimum depth of 5 feet to ensure all potentially present utilities were cleared. Once clear of potential utilities the Field Team Leader decided to continue with the hand auger until the sand/fill layer was encountered at a sampling depth of approximately 8 feet. Several core samplers were broken during this effort due to the soil content (i.e., rocks). The PID and CGI instruments did not detect the presence of potential contaminants. The O_2 measurement was 20.9%. Respiratory protection was not required or worn for these sample locations.

An EG&G Mound Plant health physics technician screened personnel, samples and equipment with an alpha scintillometer and a FIDLER at the exit point of the exclusion area. NERs were reported for both instruments. The RAM was not used because hand augering produces very little if any dust. Hearing protection was worn when the saw was used on the asphalt pavement; however, a sound level reading was not taken since previous readings were 100 dBA for sawing activities.

2.7. AUDIT AND SURVEILLANCES

2.7.1. Health and Safety Audit

An initial audit of the work areas and required documentation was conducted prior to the field work. Safety equipment (i.e., traffic cones, construction barrels) were required for sampling conducted on the roadway. All necessary training and medical surveillance requirements were complete. All monitoring equipment was calibrated prior to field sampling activities.

There were no H&S discrepancies noted during the field activities. A calibration check was performed daily on all monitoring equipment. All soil samples were screened using the appropriate monitoring equipment. No organic vapors or combustible gases were detected above normal background levels in any of the soils screened. One sample elicited a FIDLER response above background, however, after further screenings, no appreciable radioactivity above background was found (see Section 4, Table IV.1.). Refer to Appendix A for further details of the H&S Audit.

2.7.2 Quality Assurance Surveillance

Quality assurance (QA) surveillances were completed on May 17, 18, and 20, 1993 for the Area D verification sampling. The purpose of the surveillance was to observe sampling, decontamination, sample management, and project documentation for the D&D verification sampling. No problems requiring corrective action were encountered. Refer to Appendix A for further details of the QA surveillance.

2.7.3 Quality Assurance Laboratory Audit of PACE, Inc.

PACE, Inc. was audited on June 30 - July 1, 1993. The purpose of the audit was to facilitate coordination of SAIC analytical project work, to assess the implementation of the PACE, Inc. Golden, Colorado QAPjP, and to determine the general performance of PACE, Inc. Golden, Colorado in providing analytical services support. It was the conclusion of the audit team that PACE, Inc., Golden, Colorado is staffed by qualified personnel and has the expertise, instrumentation, and capacity to support the Basic Ordering Agreement for Radiological Analysis. Refer to Appendix A for details of the audit findings.

3. QUALITY ASSURANCE/QUALITY CONTROL

3.1. DATA QUALITY OBJECTIVES

The data quality objectives (DQOs) for Area D verification sampling and analysis activities were established in accordance with the OU6 QAPjP (DOE 1992c) and were:

- to obtain radiochemical analytical data at or above the levels of detection specified in the OU6 QAPjP from surface and subsurface soil samples collected in Area D for each radioisotope listed in the SAP;

- to obtain organic and inorganic analytical data at or above the levels of detection specified in the OU6 QAPjP from surface and subsurface soil samples collected in Area D for each organic and inorganic analyte listed in the SAP;

- to obtain radiological and chemical data at or above the levels of detection specified in the OU6 QAPjP from surface and subsurface water samples collected in Area D for each contaminant of concern listed in the SAP, if surface water or ground water was encountered during the verification sampling activities.

Based on the above DQOs, the verification sampling effort and subsequent sample analysis was conducted using EPA level IV analytical requirements for data use. Sampling and analysis was completed with rigorous quality assurance/quality control (QA/QC) and complete data validation according to U.S. Environmental Protection Agency (EPA) and Mound Plant guidelines. A summary of analytical levels appropriate to data uses is contained in the OU6 QAPjP (Section 1, Table I.2).

The sampling and analysis was completed in accordance with the QA/QC requirements established in the OU6 QAPjP to ensure that the analytical results were representative of the environmental conditions in Area D. A summary of the soil samples collected during the verification sampling effort, the methods of analysis, and the numbers of field QC samples collected is presented in Section 4, Table IV.2 of this report. Appropriate procedures and QC checks are used in the field and laboratory so that known and acceptable levels of accuracy and precision are maintained for each data set. The field and laboratory quality control checks planned for this sampling are presented in the OU6 QAPjP (Section 3, Tables III.2 and III.3).

The following sections describe the quality assurance (QA) objectives for precision, accuracy, representativeness, comparability, and completeness (PARCC) of measurement data. The PARCC parameters are discussed for both chemical and radiological analyses.

3.1.1. Precision

Precision is a measure of agreement, or reproducibility, among individual measurements of the same property under similar conditions. Analytical precision is expressed as a standard deviation among a group of measurements or as a relative percent difference (RPD) between two measurements. RPD is defined as:

$$RPD = \frac{C1 - C2}{(C1+C2)/2} \times 100\ \%$$

where C1 is the concentration of analyte in the primary sample, and C2 is the concentration of analyte in the duplicate sample.

Precision was determined using matrix spike/matrix spike duplicate (MS/MSD) sample analyses conducted on samples analyzed for VOCs, SVOCs, anions, and pesticide/PCBs. Duplicate samples were used to determine precision for the inorganic and radiochemical analyses. One sample in 20 (or one sample per Sample Delivery Group (SDG)) was selected by the analytical laboratory for MS/MSD analysis. For the matrix spike, an aliquot of the matrix was spiked with known quantities of compounds and subjected to the analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery. For the matrix spike duplicate, a second aliquot of the same matrix as the matrix spike was spiked in order to determine the precision of the method. The RPD between the spiked results was calculated and reported as an indication of analytical precision for the VOC, SVOC, anions, and pesticide/PCB analyses performed. For MS/MSD analysis, all RPD values were within the EPA Contract Laboratory Program (CLP) advisory control limits for analytical precision except one of four RPD values for anions and one of six RPD values for pesticides/PCBs. Five of five RPD values for VOC analysis were slightly outside the EPA CLP control limits. The variation was attributed to a slight matrix affect in the MS/MSD sample (BS0301).

Precision of inorganic and radiochemical analyses was determined by duplicate analysis. For inorganic analytes, duplicate samples were prepared in the laboratory by splitting 1 sample of every 20 and analyzing both samples of the duplicate pair. The RPD between the two detected concentrations was calculated and used as an indication of the analytical precision for the analyses. For duplicate sample analyses, all RPD values from the inorganic analyses were within the EPA CLP advisory control limits. At least 1 duplicate per SDG (or 1 per 20 samples) was analyzed for radiological analysis. None of the RPD values calculated for radiological analyses were outside of the control limits.

Because each analysis was evaluated according to the required QC criteria (which were met for the samples analyzed), the RPD values are representative of the variability of the environmental conditions in OU6 Area D. As a result, the QA objectives of precision for the VOC, SVOC, pesticide/PCB, inorganic, and radiological analyses were achieved.

Sample collection reproducibility was measured in the laboratory by the analysis of field duplicates, which were collected using the same technique as primary samples. One field duplicate was collected for organic, inorganic, and radiological analysis, and one field duplicate was collected for radiological analysis only.

3.1.2. Accuracy

Accuracy is defined as the degree of difference between measured or calculated values and the true value. The closer the numerical value of the measurement approaches the true value, the more accurate the measurement. Analytical accuracy is expressed as the percent recovery of a compound or element that has been added to the environmental sample at a known concentration before analysis. The percent recovery values were calculated with the following equation:

$$\text{Percent Recovery} = \frac{A_r - A_o}{A_f} \times 100\%$$

where A_r is the total analyte concentration detected in the spiked sample, A_o is the concentration of the analyte detected in the unspiked sample, and A_f is the concentration of the analyte added to the sample. Laboratory accuracy was also qualitatively assessed by evaluating laboratory QC information. This information is discussed in Section 4 of this report.

For matrix spike analysis, the percent recovery (%R) values calculated were within the EPA CLP control limits for analytical accuracy except three of eleven %R values for SVOCs, one of six %R values for pesticides/PCBs, and seven of twenty-eight %R values for metals and cyanide.

None of the %R values for VOCs or radiological isotopes were outside control limits. Based on the evaluation of the MS/MSD results and the associated QC results summarized in Appendix C, the laboratory accuracy is acceptable and the QA objective for accuracy was met.

Sample accuracy during the verification sampling was maximized by adherence to Mound sampling procedures, specifically Mound SOPs. Preparation of the field QC blanks (trip blanks, ambient blanks, sample bank blanks, and equipment rinsate blanks) is discussed in Section 3.2.3 (Field Quality Assurance) and Appendix C. Based on the evaluation of the compounds detected in the field QC blanks, the overall field accuracy is acceptable and the field QA objective for accuracy was met.

3.1.3. Representativeness

Representativeness expresses the degree to which the data accurately and precisely represents a characteristic of a population, parameter, variation at a sampling point, process condition, or environmental condition. Sampling representativeness for this project was accomplished by collecting sufficient samples for the population medium, properly distributed with respect to location and depth. Representativeness was assessed by reviewing the drilling techniques and equipment, the sample collection method, equipment, and sample containers used during the verification sampling. Representativeness was also assessed by evaluating the RPD values calculated from the duplicate samples. The reproducibility of a representative set of samples reflects the degree of heterogeneity of the sampled medium, as well as the effectiveness of the sample collection technique. All soil samples were collected from borings using a split spoon sampler or core sampler.

Based on the factors evaluated above, the samples collected during the Area D verification sampling are considered to be representative of the environmental condition in Area D and, therefore, the field QA objective for representativeness was met.

3.1.4. Comparability

Comparability expresses confidence with which one data set can be compared to another. Comparability for this project was obtained through the implementation of the specific methods and protocols for sampling and analysis of samples specified in the OU6, Area D SAP (DOE 1993a). By using consistent sampling and analysis procedures, the data generated in this project are comparable to other data collected and analyzed following the OU6 QAPjP. This ensures that remedial action decisions and process options are based on a consistent data base. All results for the data set were expressed in comparable concentration units. The use of EPA reference documents also ensured comparability by establishing analytical procedures that generated consistent data.

All samples analyzed for TCL, VOCs, SVOCs, pesticides/PCBs were analyzed using the EPA CLP Statement of Work (SOW) Document No. OLM01.8, and TAL metals and cyanide were analyzed using EPA CLP SOW Document No. ILM02.0. All samples collected for isotopic uranium, isotopic plutonium, and isotopic thorium were analyzed using the methods specified in Section 4 of this report. Tritium was analyzed using liquid scintillation EPA Method 906.0 and radiation from gamma-emitting radionuclides were analyzed using gamma spectrometry EPA Method 901.1. These methods are consistent with the General Radiological Analytical Services Protocol (GRASP) SOW specified in the SAP.

Based on the above assessment and the precision and accuracy assessments, the data collected during the verification sampling are considered to be comparable with other data collected using the protocols specified above. As a result, the field QA objective for comparability was met.

3.1.5. Completeness

Completeness is a measure of the percentage of valid data obtained from a measurement system to achieve the project goals. Data are considered valid if they meet all acceptance criteria, including accuracy and precision, as well as other required criteria specified by the analytical method. The completeness goal for sample collection is 90 percent. The completeness goal for the laboratory analysis is 95 percent for each laboratory analysis. If the field completeness goal is not met, resampling may be required. The following equations were used for calculating completeness:

Sample Collection:

$$\text{Completeness} = \frac{\text{Number of sample points collected}}{\text{Number of sample points planned}} \times 100\%$$

Laboratory Analysis:

$$\text{Completeness} = \frac{\text{Number of valid data points}}{\text{Number of data points collected}} \times 100\%$$

Based on the evaluation of the samples collected, the sample collection completeness was 93 percent.

Analytical data considered to be usable to verify the achievement of the D&D cleanup goals and other QA objectives must be satisfactorily validated. Rejected values for concentrations reported for chemical

analyses were not used for evaluation of achievement of D&D cleanup goals. A complete list of rejected data is presented in Table III.1.

Based on the evaluation of the laboratory analysis and subsequent data validation, the laboratory analysis completeness was as follows:

99.8 percent of the VOCs;
99.7 percent of the SVOCs;
95.3 percent of the TAL metals;
100 percent of the anions; and
100 percent of the radiological isotopes.

From the above assessment, the sample collection and the laboratory analysis completeness QA objectives were met.

3.2. QUALITY ASSURANCE/QUALITY CONTROL

3.2.1. Guidance Documents

All sampling and analysis was conducted in accordance with the requirements in the OU9 QAPjP (DOE 1993b). Other documents providing guidance were the Mound Plant SOPs, as listed in Table II.3. All documents were approved by Mound for use during the sampling activities.

3.2.2. Sample Control and Documentation

From the time of collection through laboratory analysis, samples were handled and controlled in accordance with the criteria established in the OU6 QAPjP and in the following Mound Plant Environmental SOPs:

- SOP 1.3 Sample Control and Documentation
- SOP 1.4 Sample Containers and Preservation
- SOP 1.5 Guide to Handling, Packaging, and Shipping of Samples.

Specific controls incorporated into the program included the use of sample containers certified as being precleaned to EPA specifications, proper completion of sample labels and chain of custody documentation, and adherence to temperature requirements during shipment and specified holding times.

Table III.1. Summary of Rejected Data From OU6 Area D
page 1 of 3

Sample ID	Analysis Type	Parameter	Results	Units	Cause for Rejection
BS0201	Inorganics	Antimony	1.9	mg/kg	R-S
		Sodium	401	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	4100	ug/kg	R
		Unknown	120	ug/kg	R
		Unknown	81	ug/kg	R
		Unknown Carboxylic Acid	200	ug/kg	R
		Unknown Ester Carboxylic Acid	120	ug/kg	R
		Unknown Ester Hexanedioic Acid	160	ug/kg	R-B
		Unknown Phthalate Ester	570	ug/kg	R
BS0301	Inorganics	Antimony	8.8	mg/kg	R-S
		Silver	1.1	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	860	ug/kg	R-B
		Methylbenzene	110	ug/kg	R-B
		1-Phenylethanone	110	ug/kg	R-B
		Unknown Carboxylic Acid	190	ug/kg	R-B
		Unknown Ester Carboxylic Acid	110	ug/kg	R-B
		Unknown Ester Carboxylic Acid	74	ug/kg	R-B
		Unknown Ester Hexanedioic Acid	110	ug/kg	R-B
		Unknown Phthalate Ester	480	ug/kg	R-B
	VOCs	2-Butanone	11	ug/kg	R-C

Table III.1. Summary of Rejected Data From OU6 Area D
page 2 of 3

Sample ID	Analysis Type	Parameter	Results	Units	Cause for Rejection
BS0501	Inorganics	Antimony	16.5	mg/kg	R-S
		Silver	2.1	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	1100	ug/kg	R
		Methylbenzene	100	ug/kg	R
		1-Phenylethanone	70	ug/kg	R
		Unknown Carboxylic Acid	210	ug/kg	R
		Unknown Ester Carboxylic Acid	100	ug/kg	R
		Unknown Ester Carboxylic Acid	70	ug/kg	R
		Unknown Ester Hexanedioic Acid	490	ug/kg	R
BS0502	Inorganics	Antimony	17.8	mg/kg	R-S
		Silver	2.3	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	1200	ug/kg	R
		1-Phenylethanone	110	ug/kg	R
		Indeno(1,2,3-c,d)pyrene	260	ug/kg	R
		Unknown Carboxylic Acid	180	ug/kg	R
		Unknown Ester Carboxylic Acid	73	ug/kg	R
		Unknown Ester Carboxylic Acid	73	ug/kg	R
		Unknown Phthalate Ester	580	ug/kg	R

Table III.1. Summary of Rejected Data From OU6 Area D
page 3 of 3

Sample ID	Analysis Type	Parameter	Results	Units	Cause for Rejection
BS0503	Inorganics	Antimony	17.7	mg/kg	R-S
		Silver	2.3	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	470	ug/kg	R
		1-Phenylethanone	110	ug/kg	R
		Indeno(1,2,3-c,d)pyrene	260	ug/kg	R-(+)
		Unknown Ester Carboxylic Acid	72	ug/kg	R
		Unknown Ester Hexanedioic Acid	72	ug/kg	R
		Unknown Phthalate Ester	470	ug/kg	R
BS0701	Inorganics	Silver	2.1	mg/kg	R-S
	SVOCs	Pyrene	38	ug/kg	R-(+)
BS0703	Inorganics	Silver	2.3	mg/kg	R-S
BS0801	Inorganics	Silver	2.1	mg/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	1500	ug/kg	R
		Unknown Carboxylic Acid	170	ug/kg	R
		Unknown Ester Hexanedioic Acid	6600	ug/kg	R
		Unknown Phthalate	380	ug/kg	R
BS0803	Inorganics	Silver	2.1	ug/kg	R-S
	SVOCs	4-Hydroxy-4-Methyl-2-Pentanone	1000	ug/kg	R-(+)
		Unknown Carboxylic Acid	180	ug/kg	R-(+)
		Unknown Ester Hexanedioic Acid	6800	ug/kg	R-(+)

Cause for data Rejection

R - Mass spectra did not meet identification criteria.
R-(+) - Mass spectra did not meet identification criteria; potential positive bias.
R-S - Data are unusable due to matrix spike recovery outside of QC limits.
R-B - Data are unusable due to constituents being identified in method blank.
R-C - Data are unusable due to calibration outside of QC limits.

ID - Identification
SVOC - Semivolatile organic compound
VOC - Volatile Organic Compound

3.2.3. Field Quality Control Samples

The collection and analysis of field quality control samples provides a mechanism for assessing field conditions and sampling techniques. Four trip blanks, one ambient blank, one sample bank blank, one equipment rinsate blank and one duplicate for organics, inorganics, and radionuclides, and one equipment rinsate blank and one duplicate for radiological analysis only were collected and shipped to the chemical laboratories for analysis. The analytical results obtained from the field were used to assess the effectiveness and efficiency of the collection procedure and equipment decontamination process.

Trip blank, TB0001, displayed a low level of methylene chloride which was also present in the laboratory's method blank. TB0002 displayed a concentration of 14 ppb methylene chloride. Since TB0002 affected all samples collected on May 19, 1993 initially, the methylene chloride action level of 140 ppb negated all methylene chloride in the associated samples (A00002, SBB002, BS0501, BS0502, and BS0503). Methylene chloride is a lab contaminant and not attributable to Area D.

Equipment rinsate blank, R00001, displayed a low level of methylene chloride which was also present in the laboratory's method blank. No compounds were detected in R00002. The equipment decontamination process was acceptable due to the lack of contaminants in the rinsates, with the exception of methylene chloride (a laboratory contaminant). Ambient blank (A00002) and sample bank blank (SBB002) displayed low levels of methylene chloride and chloroform. These two constituents are recognized as laboratory contaminants and are therefore, not attributable to Area D.

Field duplicates, BS0502 and BS0503, were collected for organics, inorganics, and radiological analysis and field duplicates, BS0703 and BS0704, for radiological analysis only. BS0502 and BS0503 were free of any VOCs, pesticide/PCB, inorganic, or radiological compounds. Numerous SVOCs were detected, however, all RPDs were less than the control limit. Duplicates BS0703 and BS0704 were free of any contaminants. Due to duplicate sample analysis results, sample collection techniques were acceptable.

3.3. DEVIATIONS FROM PLANNED ACTIVITIES

3.3.1. Planned Deviations

The following items deviated from the activities planned on the Area D SAP:

1. In response to a request from OEPA and the client, the analyte list was expanded from the original list in the SAP to include all TCL VOCs, SVOCs, and Pesticides/PCBs and all TAL metals, including tin, bismuth, lithium, and molybdenum. This expansion of the

analyte list did not extend to the analytes added by Modification D of the CLP SOW for organic analysis.

2. Chain of custody forms enclosed in a ziploc bag were not taped to the inside of the sample cooler per Mound SOP 1.5. This procedure was not followed due to the possible introduction of contaminants to the samples from the duct tape. The chain of custody was placed on the top of the samples inside the cooler. A field change request was prepared for this deviation.

3. Sample coolers were delivered to the Federal Express already sealed with custody seals for SOP 1.5, which requires coolers to be taken to the shipping office open for inspection. A verbal consent from Federal Express was obtained to allow the coolers to be sealed prior to delivery to the shipping office, assuming all samples were environmental samples and were packaged correctly. A field change request was prepared for this deviation.

3.3.2. Unplanned Deviations

The following items deviated from the activities planned in the OU6 Area D SAP:

1. An additional soil boring (BS0901) was completed in the 100-110 foot interval to obtain a primary soil sample in the sand/fill layer. This additional soil boring was installed to obtain the third primary sample at the sand/fill interface described in the SAP. The first boring excavated in this sampling interval did not encounter the requisite sand/fill interface.

2. Ambient blank, A00001, collected on May 18, 1993, was apparently frozen and broken during shipment to the analytical laboratory. Because this incident occurred early in the sampling program and the laboratory provided prompt notice of the broken sample, a second ambient blank was collected in duplicate the following day to fulfill the QC requirements specified in the SAP and the OU6 QAPjP.

4. LABORATORY ANALYSIS AND DATA VALIDATION

4.1. LABORATORY ANALYSIS

After sample collection in the field, soil samples were analyzed at the Mound Plant Soil Screening facility for Pu^{238} and Th^{232}. The results of the screening are included in Table IV.1., which summarizes the samples collected, date of collection, analysis requested and laboratory SDG number. Environmental soil samples and associated field quality control samples (equipment, trip, ambient, sample bank blanks, and duplicates) were shipped to two laboratories for analysis as follows:

- The TCL VOCs, SVOCs, and pesticides/PCBs were analyzed at TMA Skinner & Sherman by gas chromatography/mass spectroscopy, according to EPA CLP SOW 3/90 Revision OLM01.8 (EPA 1991). EPA CLP SOW Modification D was not utilized as specified in the OU9 QAPjP because the Modification D analytes had been eliminated from the analyte list.

- The TAL metals, including bismuth, lithium, tin, molybdenum, were analyzed by PACE, Inc. according to EPA CLP SOW Modification A ILM02.0 (EPA 1990a).

- Selected anions (fluoride, chloride, sulfate, and nitrate-nitrite) were analyzed by PACE, Inc. in accordance with EPA Methods 325.1 and SW9250 for chloride, 353.2 for nitrate-nitrite, 340.2 for fluoride, and 375.2 for sulfate.

- The radionuclides were analyzed by PACE, Inc. using the following methods:

  - Isotopic Plutonium ($Pu^{238,239/240}$) - HASL-300, E-Pu-06-01*
  - Isotopic Thorium ($Th^{227,228,230,232}$) - EERF-00-07*
  - Isotopic Uranium ($U^{234,235,238}$) - Method 908.0, EPA 600/4-80-032*
  - Tritium - Method 906.0
  - Gamma Spectrometry - Method 901.1, EPA 600/4-80-032

  * Method equivalent to and/or consistent with EPA Method 907.0.

The total number of samples collected per analysis and the method of analysis is presented in Table IV.2. The analytical methods and quantitation limits for each analysis are summarized in Appendix B.

As shown in Table IV.1, four SDGs were received from TMA/Skinner & Sherman with data for TCL VOCs, SVOCs, and pesticide/PCBs analysis in CLP hard copy and electronic media (BS0201, BS0301, TB0002, and TB0003). Two SDGs were received from PACE, Inc. for TAL inorganic analysis (519.500 and 519.501) and two SDGs for radiological analysis (D30519.500 and D30519.501). All electronic data were loaded into an environmental information management system for data tracking and analysis. Data for each sample are presented in Appendix C, along with the associated qualifiers.

Table IV.1. Operable Unit 6 Area D, Sample and Laboratory Sample Delivery Group Identification
page 1 of 2

SAIC Sample ID	Mound Sample ID	Date Collected	Activity[a] pCi/g	Analysis Requested	Laboratory and Sample Delivery Group Number
BS0101	MND15-1101-0018	5/18/93	10/0.8	Radionuclides[b]	PACE - D30519.500
BS0201	MND15-1102-0009	5/18/93	17/1.3	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - BS0201 PACE - 519.500
BS0301	MND15-1103-0005	5/18/93	8/0.1	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - BS0201 PACE - 519.500
BS0302	MND15-1103-0010	5/18/93	11/0.3	Radionuclides[b]	PACE - D30519.500
BS0401	MND15-0104-0003	5/19/93	26/4.4	Radionuclides[b]	PACE - D30519.500
BS0501	MND15-0105-0001	5/19/93	12/0	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - TB0002 PACE - 519.500
BS0502	MND15-0105-0003	5/19/93	16/1.6	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - TB0002 PACE - 519.500
BS0503	MND15-0105-1003	5/19/93	16/1.6	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE -D30519.500 TMA/S&S - TB0002 PACE - 519.500
BS0601	MND15-0106-0003	5/19/93	10/0	Radionuclides[b]	PACE - D30519.500
BS0701	MND15-0307-0001	5/20/93	3/0.1	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - TB0003 PACE - 519.500
BS0702	MND15-0307-0003	5/20/93	2/0.1	Radionuclides[b]	PACE - D30519.500
BS0703	MND15-0307-0004	5/20/93	14/0.4	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - TB0003 PACE - 519.500
BS0704	MND15-0307-1004	5/20/93	14/0.4	Radionuclides[b]	PACE -D30519.500

Table IV.1. Operable Unit 6 Area D, Sample and Laboratory Sample Delivery Group Identification
page 2 of 2

SAIC Sample ID	Mound Sample ID	Date Collected	Activity[a] pCi/g	Analysis Requested	Laboratory and Sample Delivery Group Number
BS0801	MND15-0208-0001	5/24/93	0/0.4	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE - D30519.500 TMA/S&S - BS0801 PACE - 519.500
BS0802	MND15-0208-0002	5/24/93	0/0.4	Radionuclides[b]	PACE -D30519.500
BS0803	MND15-0208-0004	5/24/93	7/0.2	Radionuclides[b] TCL VOCs, SVOCs, and Pest/PCBs TAL Inorganics[c] and Anions[d]	PACE -D30519.500 TMA/S&S - BS0801 PACE - 519.500
BS0901	MND15-1109-0008	5/20/93	9/0.7	Radionuclides	PACE -D30519.500

[a] The first number represents the plutonium-238 activity in pCi/g and the second number represents the thorium-232 activity in pCi/g. Results obtained from the Mound Plant Radiological Soil Screening Facility.
[b] $Pu^{238,239,240}$, $Th^{227,228,230,232}$, $U^{234/235,238}$, Tritium, and Gamma Spectrometry (Am^{241}, Cs^{137}, Co^{60}, Bi^{207}, Bi^{210m}, Ra^{226}).
[c] TAL Metals + cyanide, bismuth, lithium, molybdenum, and tin.
[d] Nitrate-nitrite/fluoride/chloride/sulfate only

ID - Identification
PCB - Polychlorinated Biphenyl
SVOC - Semivolatile Organic Compound
TAL - Target Analyte List
TCL - Target Compound List
VOC - Volatile Organic Compound

Table IV.2. Summary of Samples Collected Per Analysis

Parameter	Analytical Method	Soil/ Sediment Samples	Duplicates	Trip Blanks	Ambient Blanks	Sample Bank Blanks	Rinsate Blanks	Total Analyses
TCL VOCs	CLP SOW[a]	8	1	4	1	1	1	16
TCL SVOCs	CLP SOW[a]	8	1	-	-	-	1	10
Pesticides/PCBs	CLP SOW[a]	8	1	-	-	-	1	10
TAL Metals & Cyanide	CLP SOW[b]	8	1	-	-	-	1	10
Isotopic Plutonium	HASL-300[c], E-Pu-06-00[c]	15	2	-	-	-	2	19
Isotopic Thorium	EERF-00-07[c]	15	2	-	-	-	2	19
Isotopic Uranium	EPA 908.0[d],	15	2	-	-	-	2	19
	EPA 600/4-80-032[c]	15	2	-	-	-	2	19
Tritium	E906.0[d]	15	2	-	-	-	2	19
Gamma Spectroscopy	E901.1[d]							

a U.S. EPA Contract Laboratory Program Statement of Work for Organic Analysis, Document No. OLM01.8, August 1991.
b U.S. EPA Contract Laboratory Program Statement of Work for Inorganic Analysis, Document No. ILMO2.0, August 1990.
c Isotopic plutonium, thorium, and uranium were analyzed by approved laboratory developed SOPs (Based on EPA Method 907.0).
d "Prescribed Procedures for Measurement of Radioactivity in Drinking Water." U.S. EPA, EPA-600/4-80-032, latest version.

CLP - Contract Laboratory Program
EPA - U.S. Environmental Protection Agency
PCB - Polychlorinated biphenyl
SOW - Statement of Work
TAL - Target Analyte List
TCL - Target Compound List

4.2. DATA VALIDATION

Environmental data obtained from the laboratory analysis were validated and qualified using the following guidelines:

- Laboratory Data Validation Guidelines for Chemical and Radiological Analyses, Appendix H of the OU9 QAPjP (DOE 1993b);
- Laboratory Data Validation-Functional Guidelines for Evaluation of Organic Analyses, (EPA 1988a); and
- Laboratory Data Validation-Functional Guidelines for Evaluation of Inorganic Analyses, (EPA 1988b).

All descriptive primary data validation qualifiers applied to the concentrations are listed below:

U	The analyte was not detected. The reported concentration is the sample quantitation limit.
UJ	The analyte was not detected. The reported concentration is an estimated value.
J	The reported value is an estimated quantity.
R	The data are unusable. The analyte may or may not be present.
N	Presumptive evidence of presence of material.
NJ	Presumptive evidence of the presence of the material at an estimated quantity.

Subqualifiers were used to assist in the data assessment by indicating the source of the primary qualifier. These subqualifiers were attached to the primary qualifier, separated by a hyphen. The following is a list of allowable subqualifiers:

SUBQUALIFIERS - ORGANIC

B - Qualified due to method blank or a field blank
C - Qualified due to calibration
H - Holding time exceeded
K - Qualified due to surrogate recovery
S - Qualified due to matrix spike recovery
I - Qualified due to internal standard
P - Pesticide/PCB results have >25% difference on two different columns
(+) - Potential positive bias (added after subqualifier with a parentheses)
(-) - Potential negative bias (added after subqualifier with a parentheses)

SUBQUALIFIERS - INORGANICS

B - Qualified due to method blank or field blank
C - Qualified due to calibration
H - Holding time exceeded
S - Qualified due to matrix spike recovery
I - Interference
D - Duplicate (replicate) limits exceeded
L - Qualified due to Laboratory Control Sample (LCS)
(+) - Potential positive bias (added after subqualifier with a parentheses)
(-) - Potential negative bias (added after subqualifier with a parentheses).

Radiological data qualifiers were consistent with the organic and inorganic primary and subqualifiers. In addition to the data validation guidelines for radiological analyses previously listed, the following criteria were established to address the qualification of low (or even negative) radiological results. Negative results were qualified as "UJ" and results less than uncertainty as "J".

Each data point was reviewed and assessed to determine whether the value was considered usable (no qualifiers), usable but estimated (qualifier J) or not usable (qualifier R). Laboratory and data validation qualifiers were applied to all data, detected and non-detected, as necessary. For the purpose of the verification sampling, VOC and SVOC Tentatively Identified Compounds (TICs) were used to indicate additional contamination present that was not included on the TCL list.

Data validation reports were completed in the required EG&G data validation report format as presented in Appendix D. Data quality was evaluated using the guidelines and control limits specified for holding times, initial and continuing calibration verification, method field QC blanks, interference check sample analysis, spiked sample analysis, laboratory and field duplicate sample analysis, laboratory control sample analysis, serial dilution analysis, and furnace atomic absorption results.

4.2.1. Inorganic Analysis

All holding times were met except for cyanide in one equipment rinsate and seven environmental samples. As a result, all undetected cyanide results were considered estimated ("UJ") due to the possibility that the detection limit reported for cyanide in all samples may be biased low. Numerous contaminants (aluminum, arsenic, calcium, iron, lead, sodium, thallium, and zinc) were detected in the method blanks. Based on an evaluation of the interference check sample (ICS) analyses conducted for all metals analyzed, all recovery criteria were within control limits. Each analytical result was also evaluated for contaminant interferences caused by aluminum, calcium, iron, and magnesium. The contaminants, depending on the

affected element and the contaminant concentration, may potentially produce false positive values. Therefore, barium, copper, nickel, and zinc detected in BS0501 and BS0801 were considered estimated "J" due to calcium interference and in BS0201 due to iron interferences. All detected iron concentrations in soil samples were estimated "J" due to serial dilution results outside QC criteria. Other metals (chromium, copper, lead, nickel, and thallium) were estimated ("J" or "UJ") because of matrix spike analysis results being out of QC limits and the possibility of false positives. Selenium and thallium results were estimated ("J" or "UJ") due to analytical spike results outside the control limits. Antimony and silver undetected results in soil samples have been rejected (i.e., all undetected results are flagged as "R") because of low percent recovery in the spike sample analysis. All chloride and sulfate detected results in all soil samples were considered estimated ("J" or "UJ") due to low correlation coefficients for the linear calibration curves. No contaminants were detected in the method blank or the rinsate blank. All MS/MSD percent recoveries for anions were within control limits except for sulfate. See Appendix D for an expanded discussion of inorganic analysis.

4.2.2 Organic Analysis

Samples BS0801 and BS0803 were qualified due to a low level of methylene chloride in method blank VBLK0528. There appears to be a slight matrix effect based on MS/MSD results, but only the MS/MSD sample (BS0301) was flagged "J". Methylene chloride detections in A00002, SBB002, and TB0002 were flagged as unusable "R" due to failure to meet QC spectral criteria. TICS were reported for all four SDGs. The compound 2-butanone for calibration was consistently out of the QC limits for SDG BS0801. See Appendix D for an expanded discussion of volatile organics analysis.

Three holding time deviations for re-extractions occurred for SVOCs. Numerous compounds did not meet the QC criteria for continuing calibration verification. These compounds are noted "poor performers". Overall, the continuing calibration assessment was acceptable. Method blanks contain phthalates and pyrene. All surrogate recoveries were within the specified QC limits except for three compounds. Associated acidic compounds were flagged "J" or "R" due to the low surrogate recoveries. Internal standards chrysene and perylene were outside the QC limits. Several polynuclear aromatic hydrocarbons (PAHs) did not meet the required QC criteria for spectral identification. Numerous TICs were identified in all SDGs. See Appendix D for an expanded discussion of SVOC analysis.

All compound recoveries and RPD's for pesticides/PCBs were within the QC limits except for four compounds, which were flagged "J" or "UJ". For continuing calibration verification, the percent

differences for the target compounds were below the maximum limit in two SDGs. No qualifiers were assigned because the compounds were not detected in the samples. Method blanks were clean. Surrogate recoveries for tetrachloro-m-xylene (TCMX) and dichlorobenzene were outside required QC limits; all samples were flagged "J" or "UJ" as necessary. Gel permeation chromatography (GPC) information was not included on the data packages, however, no qualifiers were assigned. The recoveries from the florisil cleanup were within the prescribed QC limits except alpha-BHC, gamma-BHC, and heptachlor. A few target compounds were detected in SDG BS0201 with good confirmation. See Appendix D for an expanded discussion of pesticide/PCB analysis.

4.2.3. Radiological Analysis

All tritium results for R00001 and R00002 were qualified "J" or "UJ" due to insufficient calibration information. All positive tritium results were flagged "J" because no source check information was included in the package. All background checks and efficiencies were accurate. Co^{60} was flagged "J" in several samples due to the Laboratory Control Sample (LCS) %R being slightly outside QC limits. All gamma results were flagged "J" or "UJ" because no LCS concentrations were included in the package. Negative results were flagged "UJ" and results less than uncertainty as "J".

4.3. DATA USABILITY

4.3.1. Inorganic Analysis

The overall assessment of the inorganic analysis is that the quality of the data was acceptable; however, undetected antimony and silver values were rejected due to matrix spike recoveries. Aluminum, iron, sodium, and zinc in R00001, and arsenic, lead, and chromium in selected soil samples were considered undetected with the detection limits raised to each quantitated value due to blanks contaminants. Barium, copper, iron, selenium, nickel, thallium, zinc, and cyanide results in selected soil samples were estimated due to poor QC results. For anion data, the quality of the submitted data was acceptable; however, chloride and sulfate results were considered estimated due to low calibration curve correlation coefficients that were based on a linear calibration.

4.3.2. Organic Analysis

The general quality of the VOC data is very good as the qualifications needed were typical in nature. Some of the data was qualified due to blank contamination and field QC contamination. Methylene chloride was qualified as unusable "R" because it did not meet the mass spectra criteria.

Overall the SVOC data is acceptable. The surrogate 2-fluorphenol recoveries were consistently out of limits, and internal standard chryene and perylene were low in area counts. Qualifiers were assigned to acidic compounds because of the 2-fluorphenol outliers. Compounds associated with the two internal standards, chrysene and perylene, were also qualified due to the low area counts.

The overall quality of the pesticide/PCB data is good. The data has been qualified due only to minor QC problems. The GPC recovery sample was not analyzed and poses a question as to how the data are affected. Since no compounds were detected, and recoveries for the compounds used to monitor the GPC process (bis-(2-ethylhexyl)phthalate, methoxychlor, perylene, corn oil) seemed to be in order, no qualifiers were issued. The surrogate decachlorobiphenyl (DCB) was repeatedly out of QC limits for retention on the continuing calibration verification samples. However, this did not pose a problem since no additional peaks were close to the retention time window of dichlorobenzene.

4.3.3. Radiological Analysis

The overall quality of the radiological data is good. Some data has been qualified due to minor QC problems, negative results, and results less than uncertainty.

5. DATA ANALYSIS

5.1. PLUTONIUM-238 AND THORIUM-232

As discussed in Section 1 of this report, the primary purpose of the verification study in Area D was to verify that the cleanup of radioactively contaminated soils in Area D carried out by the Mound Plant D&D program met the cleanup standards required by DOE. The cleanup for plutonium and thorium would be considered complete if the concentrations of Pu^{238} were below 25 pCi/g for both surface and subsurface soil and Th^{232} concentrations were below 5 pCi/g for surface soils and 15 pCi/g for subsurface soils. To meet this objective, the statistical procedures in EPA's Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Soils and Solid Media (EPA 1989) guidance were used for determining whether the mean concentration in Area D attained the cleanup standards.

Since the mean of the sampling data from Area D is only an estimate of the true population mean of the entire sample area, EPA's guidance requires the calculation of an upper one-sided confidence interval. This upper confidence interval provides a range of values within which the true population mean concentration is located. A one-sided confidence interval and the following four-part decision rule was used to test whether Area D attained the cleanup standards for Pu^{238} and Th^{232}.

Area D can be declared clean from a D&D perspective, if: 1) the upper 95 percent confidence interval is less than the cleanup standard of 25 pCi/g Pu^{238} for all soils; and 2) the upper 95 percent confidence interval is less than the cleanup standard of 5 pCi/g Th^{232} for surface soils; and 3) the upper 95 percent confidence interval is less than the cleanup standard of 15 pCi/g Th^{232} for subsurface soils.

Following EPA's guidance, the following summary statistics (displayed in Table V.1.) were calculated for both Pu^{238} and Th^{232}:

- the number of samples collected,
- the minimum value,
- the maximum value,
- the mean concentration,
- the standard error of the mean, and
- the upper one-sided 95 percent confidence limit.

Table V.1. Plutonium and Thorium Summary Statistics

Parameter	Number of Detections	Concentration (pCi/g)			Standard Error (pCi/g)	Upper 95 C.I. (pCi/g)
		Minimum	Maximum	Mean		
Pu^{238}	17	0.00	21.0	4.27	1.70	8.66
Th^{232}	17	0.12	5.4	0.90	0.30	1.67

As evidenced in Table V.1., the maximum concentrations for both Pu^{238} and Th^{232} (21.0 and 5.4 pCi/g respectively) were less than the required cleanup levels (note: the 5.4 pCi/g for Th^{232} was found in a subsurface sample - 3 feet below the surface). In addition, the upper 95% confidence intervals (C.I.) for both Pu^{238} and Th^{232} (8.66 and 1.67 pCi/g, respectively) are less than the cleanup standards regardless of the sampling depth. Therefore, the mean concentrations for Pu^{238} and Th^{232} in Area D attained the required cleanup standards.

5.2. OTHER POTENTIAL AREA D CONTAMINATION

As discussed in Section 1 of this report, a second purpose of the verification study was to determine if Area D contains radioactive and/or chemical contaminants in sufficient concentrations to be considered a source of such contamination (i.e., contaminant concentrations high enough to pose a mobility threat to down-gradient areas). To meet this objective, EPA's Risk Assessment Guidance for Superfund Volume 1 (1989) was used for determining whether the concentration of other potential contaminants of concern (COC) in the samples collected in Area D exceeded established detection limits, background concentrations (if known), or established actions levels.

A list of potential COCs was developed using the following four-part decision rule (EPA 1989). Potential COCs were considered for further evaluation if:

1) the COC was positively detected (above the analytical method detection limit) in at least one environmental soil sample; or

2) the mean COC concentration was significantly higher than naturally occurring levels of the same chemical (background); or

3) the mean COC concentration exceeded established action levels for soils; or

4) the COC was quantified at concentrations significantly above method detection levels (examination of "J" versus "U" qualified data).

After the chemical and other radiological sample data were collected, validated and stored in a centralized data base, the following summary statistics were calculated for each analyte: 1) the number of samples collected, 2) the number of detections, 3) the maximum value, and 4) the mean concentration.

5.2.1. Analyte Concentrations Compared to Method Detection Limits

A systematic process, following the decision rule discussed above, was used to narrow the list of potential COCs. Table V.2. displays the total number of environmental samples (excluding QC samples - trip blanks, rinsates, and rejected results) that were collected for each chemical and radiological analyte sampled in Area D. Also included in Table V.2. is the number of times the particular analyte was detected (hits), the number of times it was not detected (misses) and the percentage of detections. The analytes detected (see Table V.2) are a combination of those analytes whose concentrations were measured above method detection limits (true hits) and those analytes whose concentrations were measured near or below the method detection level and were, therefore estimated values (designated with a "J" data qualifier).

As indicated in Table V.2., over 1700 sample analysis results were measured in Area D for a total of 183 different analytes. Of the 183 analytes measured, a total of 110 analytes were sampled for in Area D but were never detected in any of the environmental samples.

Following decision rule number 1 discussed above, the list of potential COC was reduced to 73 by deleting all analytes that were never detected in any of the environmental samples. For this reduction, a detection was assumed if there was: 1) no data qualifier attached to the sample result (true hit), or 2) a "J" data qualifier was attached to the sample result (an estimated value).

5.2.2. Analyte Concentrations Compared to Background

The next reduction in potential COCs was conducted following decision rule number 2, comparison of analyte means to background concentrations. According to DOE, background data should be used in site characterization studies for differentiating between naturally occurring constituents (including global or regional fallout) and specific site contamination. If sufficient background data are not available, no constituent known to be a potential contaminant can be eliminated from an assessment even if the sampled concentration is measured at a minimum level. At the Mound Plant and surrounding areas, many potential COCs occur naturally at low concentrations in background soils. However, at this time a complete list of background levels for potential contaminants of concern does not exist for the Mound plant. A study

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
Anion	Chloride	9	9	0	100.0
Anion	Fluoride	9	9	0	100.0
Anion	Sulfate	9	8	1	88.8
Anion	Nitrate/Nitrite	9	8	1	88.8
Metal	Arsenic	9	4	5	44.4
Anion	Cyanide	9	0	9	0.0
Metal	Mercury	9	2	7	22.2
Metal	Aluminum	9	9	0	100.0
Metal	Antimony	4	2	2	50.0
Metal	Bismuth	9	2	7	22.2
Metal	Barium	9	9	0	100.0
Metal	Beryllium	9	4	5	44.4
Metal	Cadmium	9	3	6	33.3
Metal	Calcium	9	5	4	55.5
Metal	Chromium	9	5	4	55.5
Metal	Cobalt	9	4	5	44.4
Metal	Copper	9	9	0	100.0
Metal	Iron	9	9	0	100.0
Metal	Lithium	9	7	2	77.7
Metal	Molybdenum	9	3	6	33.3
Metal	Magnesium	9	9	0	100.0
Metal	Manganese	9	9	0	100.0
Metal	Nickel	9	3	6	33.3
Metal	Potassium	9	9	0	100.0
Metal	Silver	1	0	1	0.0
Metal	Sodium	8	8	0	100.0
Metal	Tin	9	2	7	22.2

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
Metal	Vanadium	9	9	0	100.0
Metal	Zinc	9	9	0	100.0
Metal	Lead	9	7	2	77.7
Metal	Selenium	9	9	0	100.0
Metal	Thallium	9	0	9	0.0
Pesticide	4,4'-DDD	9	0	9	0.0
Pesticide	4,4'-DDE	9	1	8	11.1
Pesticide	4,4'-DDT	9	1	8	11.1
Pesticide	Aldrin	9	0	9	0.0
PCB	Aroclor-1016	9	0	9	0.0
PCB	Aroclor-1221	9	0	9	0.0
PCB	Aroclor-1232	9	0	9	0.0
PCB	Aroclor-1242	9	0	9	0.0
PCB	Aroclor-1248	9	0	9	0.0
PCB	Aroclor-1254	9	0	9	0.0
PCB	Aroclor-1260	9	0	9	0.0
Pesticide	Dieldrin	9	0	9	0.0
Pesticide	Endosulfan I	9	0	9	0.0
Pesticide	Endosulfan II	9	0	9	0.0
Pesticide	Endosulfan sulfate	9	0	9	0.0
Pesticide	Endrin	9	0	9	0.0
Pesticide	Endrin Aldehyde	9	0	9	0.0
Pesticide	Endrin Ketone	9	1	8	11.1
Pesticide	Heptachlor	9	0	9	0.0
Pesticide	Heptachlor epoxide	9	0	9	0.0
Pesticide	Methoxychlor	9	1	8	11.1
Pesticide	Toxaphene	9	0	9	0.0

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
Pesticide	alpha-BHC	9	0	9	0.0
Pesticide	alpha-Chlordane	9	1	8	11.1
Pesticide	beta-BHC	9	0	9	0.0
Pesticide	delta-BHC	9	0	9	0.0
Pesticide	gamma-BHC (Lindane)	9	0	9	0.0
Pesticide	gamma-Chlordane	9	1	8	11.1
SVOC	1,2,4-Trichlorobenzene	9	0	9	0.0
SVOC	1,2-Dichlorobenzene	9	0	9	0.0
SVOC	1,3-Dichlorobenzene	9	0	9	0.0
SVOC	1,4-Dichlorobenzene	9	0	9	0.0
SVOC	2,2'-oxybis (1-Chloropropane)	9	0	9	0.0
SVOC	2,4,5-Trichlorophenol	9	0	9	0.0
SVOC	2,4,6-Trichlorophenol	9	0	9	0.0
SVOC	2,4-Dichlorophenol	9	0	9	0.0
SVOC	2,4-Dimethylphenol	9	0	9	0.0
SVOC	2,4-Dinitrophenol	9	0	9	0.0
SVOC	2,4-Dinitrotoluene	9	0	9	0.0
SVOC	2,6-Dinitrotoluene	9	0	9	0.0
SVOC	2-Chloronaphthalene	9	0	9	0.0
SVOC	2-Chlorophenol	9	0	9	0.0
SVOC	2-Methylnaphthalene	9	0	9	0.0
SVOC	2-Methylphenol	9	0	9	0.0
SVOC	2-Nitroaniline	9	0	9	0.0
SVOC	2-Nitrophenol	9	0	9	0.0
SVOC	4-Hydroxy-4-methyl-2-pentanone	2	0	2	0.0
SVOC	3,3'-Dichlorobenzene	9	1	8	11.1

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
SVOC	3-Nitroaniline	9	0	9	0.0
SVOC	4,6-Dinitro-2-methylphenol	9	0	9	0.0
SVOC	4-Bromophenyl-phenyl ether	9	0	9	0.0
SVOC	4-Chloro-3-methylphenol	9	0	9	0.0
SVOC	4-Chloroaniline	9	0	9	0.0
SVOC	4-Chlorophenyl-phenyl ether	9	0	9	0.0
SVOC	4-Methylphenol	9	0	9	0.0
SVOC	4-Nitroaniline	9	0	9	0.0
SVOC	4-Nitrophenol	9	0	9	0.0
SVOC	Acenaphthene	9	0	9	0.0
SVOC	Acenaphthylene	9	2	7	22.2
SVOC	Anthracene	9	0	9	0.0
SVOC	Benzo(a)anthracene	9	5	4	55.5
SVOC	Benzo(a)pyrene	9	5	4	55.5
SVOC	Benzo(b)fluoranthene	9	5	4	55.5
SVOC	Benzo(g,h,i)perylene	9	4	5	44.4
SVOC	Benzo(k)fluoranthene	9	4	5	44.4
SVOC	Butylbenzylphthalate	9	0	9	0.0
SVOC	Carbazole	9	0	9	0.0
SVOC	Chrysene	9	5	4	55.5
SVOC	Di-n-butylphthalate	9	1	8	11.1
SVOC	Di-n-octylphthalate	9	0	9	0.0
SVOC	Dibenzo(a,h)anthracene	9	0	9	0.0
SVOC	Dibenzofuran	9	0	9	0.0
SVOC	Diethylphthalate	9	0	9	0.0
SVOC	Dimethylphthalate	9	0	9	0.0

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
SVOC	Fluoranthene	9	6	3	66.6
SVOC	Fluorene	9	0	9	0.0
SVOC	Hexachlorobenzene	9	0	9	0.0
SVOC	Hexachlorobutadiene	9	0	9	0.0
SVOC	Hexachlorocyclopentadiene	9	0	9	0.0
SVOC	Hexachloroethane	9	0	9	0.0
SVOC	Indeno(1,2,3-c,d)pyrene	7	2	5	28.5
SVOC	Isophorone	9	0	9	0.0
SVOC	N-Nitroso-di-n-propylamine	9	0	9	0.0
SVOC	N-Nitroso-diphenylamine	9	0	9	0.0
SVOC	Naphthalene	9	0	9	0.0
SVOC	Nitrobenzene	9	0	9	0.0
SVOC	Pentachlorophenol	9	0	9	0.0
SVOC	Phenanthrene	9	4	5	44.4
SVOC	Phenol	9	0	9	0.0
SVOC	Pyrene	8	4	4	50.0
SVOC	Unknown	5	4	1	80.0
SVOC	Unknown Alkane	2	2	0	100.0
SVOC	Unknown Carboxylic Acid	4	1	3	25.0
SVOC	Unknown Ester Carboxylic Acid	4	1	3	25.0
SVOC	Unknown Ester Hexanedioic Acid	3	1	2	33.3
SVOC	Unknown Hydrocarbon	4	4	0	100.0
SVOC	Unknown Phthalate	2	0	2	0.0
SVOC	Unknown PAH	1	1	0	100.0
SVOC	bis(2-Chloroethoxy) methane	9	0	9	0.0

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
SVOC	bis(2-Chloroethyl)ether	9	0	9	0.0
SVOC	bis(2-Ethylhexyl)phthalate	9	3	6	33.3
VOC	1,1,1-Trichloroethane	9	0	9	0.0
VOC	1,1,2,2-Tetrachloroethane	9	0	9	0.0
VOC	1,1,2-Trichloroethane	9	0	9	0.0
VOC	1,1-Dichloroethane	9	0	9	0.0
VOC	1,1-Dichloroethene	9	0	9	0.0
VOC	1,2-Dichloroethane	9	0	9	0.0
VOC	1,2-Dichloroethene	9	0	9	0.0
VOC	1,2-Dichloropropane	9	0	9	0.0
VOC	2-Butanone	8	1	7	12.5
VOC	2-Hexanone	9	0	9	0.0
VOC	4-Methyl-2-pentanone	9	0	9	0.0
VOC	Acetone	9	5	4	55.5
VOC	Benzene	9	0	9	0.0
VOC	Bromodichloromethane	9	0	9	0.0
VOC	Bromoform	9	0	9	0.0
VOC	Bromomethane	9	0	9	0.0
VOC	Carbon Disulfide	9	0	9	0.0
VOC	Carbon Tetrachloroethane	9	0	9	0.0
VOC	Chlorobenzene	9	0	9	0.0
VOC	Chloroethane	9	0	9	0.0
VOC	Chloroform	9	0	9	0.0
VOC	Chloromethane	9	0	9	0.0
VOC	Dibromochloromethane	9	0	9	0.0
VOC	Diethylbenzene,Total	9	0	9	0.0
VOC	Ethylbenzene	9	0	9	0.0

Table V.2 Area D Environmental Samples Summary Statistics - Set 1
Analytical Detects (Hits) Versus Analytical Non-Detects (Misses)
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Analyte Type	Parameter	Total Number of Samples	Number Of Hits	Number Of Misses	Percentage Of Hits
VOC	Methylene Chloride	9	1	8	11.1
VOC	Styrene	9	0	9	0.0
VOC	Tetrachloroethene	9	0	9	0.0
VOC	Toluene	9	0	9	0.0
VOC	Trichloroethene	9	0	9	0.0
VOC	Vinyl Chloride	9	0	9	0.0
VOC	Xylene, Total	9	0	9	0.0
VOC	cis-1,3-Dichloropropane	9	0	9	0.0
VOC	trans-1,3-Dichloropropane	9	0	9	0.0
RADS	Bismuth-207	17	17	0	100.0
RADS	Bismuth-210	17	17	0	100.0
RADS	Cobalt-60	17	17	0	100.0
RADS	Cesium-137	17	17	0	100.0
RADS	Plutonium-238	17	17	0	100.0
RADS	Plutonium-239/240	17	17	0	100.0
RADS	Thorium-227	17	17	0	100.0
RADS	Thorium-228	17	17	0	100.0
RADS	Thorium-230	17	17	0	100.0
RADS	Thorium-232	17	17	0	100.0
RADS	Uranium-234	17	17	0	100.0
RADS	Uranium-235	17	17	0	100.0
RADS	Uranium-238	17	17	0	100.0
RADS	Americium-241	17	17	0	100.0
RADS	Tritium	17	17	0	100.0
RADS	Radium-226	17	17	0	100.0

is currently being conducted by Mound to determine average background values and associated confidence levels. That study will be completed in 1994.

In order to estimate background concentrations while the Mound study is being completed, the information recently collected by DOE in two background studies (one near the Fernald Plant and one near the Oak Ridge Facility) was used. The Fernald study was entitled CERCLA/RCRA Background Soil Study Fernald Environmental Management Project, Fernald, Ohio (DOE 1993c). The Oak Ridge study was entitled Annual Report on Background Soil Characterization Project on the Oak Ridge Reservation, Oak Ridge, TN. (DOE 1993d).

The objective of both DOE background soil characterization projects was to determine background concentrations of organics, metals, and radionuclides in natural soils. These studies were key to environmental restoration projects because they provide remediation projects with 100% validated data on background concentrations which were technically and legally defensible. In both DOE studies, background concentrations (including upper 95% confidence bounds) for a number of different soil areas were calculated and reported. Background data from the Fernald and Oak Ridge studies were combined with the resultant analyte "hit" list generated above (73 analytes) to produce Table V.3.

The MEAN value in Table V.3. represents the average concentration of each analyte from Area D. The FEMP95 value is the 95% upper bound on the soil area that exhibited the highest background concentration in the Fernald study, and the ORR95 is the 95% upper bound on the soil area that exhibited the highest background concentration in Oak Ridge study. Following decision rule number 2 (detection at levels significantly higher than naturally occurring background levels), the FEMP95 background statistics were compared against Area D mean concentrations. Table V.4. lists the 21 analytes that were removed from the list of potential COCs because their mean value in Area D was less than the Fernald background concentrations. Table V.5. lists an additional 4 analytes that were removed from the list of potential COCs because their mean value in Area D was less than the Oak Ridge background concentrations.

After removing analytes whose mean value was less than background, the list of potential COC was reduced by a total of 25 analytes leaving 48 remaining potential COCs. Analytes with relatively low mean concentrations in Area D (i.e., chloride, sulfate, nitrate/nitrite, and cadmium) were not measured in either of the DOE background soil investigations and could not be removed from the potential COC list.

Table V.3. Area D Environmental Samples Summary Statistics
A Comparison of Analytical Detects Versus FEMP and ORR Background Statistics
page 1 of 3

Analyte Type	Parameter	Concentration			RCRA Limit	Units
		Mean	FEMP95	ORR95		
Anion	Chloride	262.33	•	•	•	µg/kg
Anion	Fluoride	3.72	•	•	•	µg/kg
Anion	Sulfate	75.00	•	•	•	µg/kg
Anion	Nitrate/Nitrite	3.25	•	•	•	µg/kg
Metal	Arsenic	3.53	6.95	17.00	•	mg/kg
Metal	Mercury	0.11	0.30	0.34	•	mg/kg
Metal	Aluminum	21772.89	11071.00	41900.00	•	mg/kg
Metal	Antimony	16.54	1.10	1.10	•	mg/kg
Metal	Barium	36.46	81.50	125.00	•	mg/kg
Metal	Beryllium	0.60	0.43	1.48	•	mg/kg
Metal	Bismuth	32.51	•	•	•	mg/kg
Metal	Cadmium	1.86	0.41	•	40	mg/kg
Metal	Calcium	200191.11	115693.00	1930.00	•	mg/kg
Metal	Chromium	7.74	14.30	88.10	•	mg/kg
Metal	Cobalt	5.66	11.50	28.50	•	mg/kg
Metal	Copper	7.97	14.90	33.70	•	mg/kg
Metal	Iron	10802.22	22944.00	47800.00	•	mg/kg
Metal	Lithium	5.93	•	32.40	•	mg/kg
Metal	Magnesium	61984.44	31005.00	5030.00	•	mg/kg
Metal	Manganese	375.33	1035.00	2330.00	•	mg/kg
Metal	Molybdenum	3.37	•	•	•	mg/kg
Metal	Nickel	12.89	25.90	33.50	•	mg/kg
Metal	Potassium	713.56	1400.00	5780.00	•	mg/kg
Metal	Sodium	243.00	158.30	•	•	mg/kg
Metal	Tin	16.71	•	•	•	mg/kg
Metal	Vanadium	9.04	25.10	65.80	•	mg/kg
Metal	Zinc	24.48	58.30	68.10	•	mg/kg

Table V.3. Environmental Samples Summary Statistics
A Comparison of Analytical Detects Versus FEMP and ORR Background Statistics
page 2 of 3

Analyte Type	Parameter	Concentration			RCRA Limit	Units
		Mean	FEMP95	ORR95		
Metal	Lead	18.06	19.50	67.70	•	mg/kg
Metal	Selenium	0.72	0.39	1.06	•	mg/kg
Pesticide	4,4'-DDE	3.66	•	•	2000	µg/kg
Pesticide	4,4'-DDT	4.04	•	•	2000	µg/kg
Pesticide	Endrin Ketone	4.83	•	•	•	µg/kg
Pesticide	Methoxychlor	24.89	•	•	•	µg/kg
Pesticide	alpha-Chlordane	6.31	•	•	500	µg/kg
Pesticide	gamma-Chlordane	7.20	•	•	500	µg/kg
Pesticide	3,3'-Dichlorobenzidine	360.00	•	•	•	µg/kg
SVOC	Acenaphthylene	300.33	•	53.00	•	µg/kg
SVOC	Benzo(a)anthracene	269.44	•	2.39	•	µg/kg
SVOC	Benzo(a)pyrene	298.44	•	3.08	•	µg/kg
SVOC	Benzo(b)fluoranthene	300.00	•	1.6	•	µg/kg
SVOC	Benzo(g,h,i)perylene	284.22	•	•	•	µg/kg
SVOC	Benzo(k)fluoranthene	286.22	•	•	•	µg/kg
SVOC	Chrysene	263.77	•	•	•	µg/kg
SVOC	Di-n-butylphthalate	281.11	•	•	•	µg/kg
SVOC	Fluoranthene	286.67	•	20.3	•	µg/kg
SVOC	Indeno(1,2,3-c,d)pyrene	281.71	•	•	•	µg/kg
SVOC	Phenanthrene	256.44	•	112.0	•	µg/kg
SVOC	Pyrene	432.50	•	11.1	•	µg/kg
SVOC	Unknown	85.00	•	•	•	µg/kg
SVOC	Unknown Alkane	150.00	•	•	•	µg/kg
SVOC	Unknown Carboxylic Acid	212.75	•	•	•	µg/kg
SVOC	Unknown Ester Carboxylic Acid	90.25	•	•	•	µg/kg

Table V.3. Area D Environmental Samples Summary Statistics
A Comparison of Analytical Detects Versus FEMP and ORR Background Statistics
page 3 of 3

Analyte Type	Parameter	Concentration			RCRA Limit	Units
		Mean	FEMP95	ORR95		
SVOC	Unknown Ester Hexanedioic Acid	516.67	•	•	•	µg/kg
SVOC	Unknown Hydrocarbon	143.00	•	•	•	µg/kg
SVOC	Unknown Phthalate Ester	120.00	•	•	•	µg/kg
SVOC	bis(2-Ethylhexyl) phthalate	258.66	•	•	50000	µg/kg
VOC	2-Butanone	13.25	•	•	•	µg/kg
VOC	Acetone	39.00	•	•	8,000,000	µg/kg
VOC	Methylene Chloride	23.33	•	•	90000	µg/kg
RADS	Bismuth-207	0.56	•	•	•	pCi/g
RADS	Bismuth-210	0.02	1.72	•	•	pCi/g
RADS	Cobalt-60	0.02	•	•	•	pCi/g
RADS	Cesium-137	0.02	0.45	2.47	•	pCi/g
RADS	Plutonium-239/240	0.08	•	0.04	•	pCi/g
RADS	Thorium-227	0.09	•	•	•	pCi/g
RADS	Thorium-230	0.88	1.51	1.39	•	pCi/g
RADS	Thorium-232	0.90	1.09	2.10	•	pCi/g
RADS	Uranium-234	0.67	1.04	1.59	•	pCi/g
RADS	Uranium-235	0.03	0.09	0.12	•	pCi/g
RADS	Uranium-238	0.71	1.08	1.50	•	pCi/g
RADS	Americium-241	0.03	•	•	•	pCi/g
RADS	Tritium	1.95	•	0.04	•	pCi/g
RADS	Radium-226	1.12	1.20	2.20	•	pCi/g

VOC - Volatile Organic Compounds
SVOC - Semivolatile Organic Compounds
RADS - Radionuclides
• Data Not Available

Table V.4. Area D Environmental Samples Summary Statistics
Parameters Whose Mean Was Less Than The Highest FEMP Background Limits
Parameters Removed From The Potential Contaminants of Concern List

Parameter	Mean	FEMP95	ORR95	RCRA Limit	Units
Arsenic	3.53	6.95	17.00	•	mg/kg
Mercury	0.11	0.30	0.34	•	mg/kg
Barium	36.46	81.50	125.00	•	mg/kg
Chromium	7.74	14.30	88.10	•	mg/kg
Cobalt	5.66	11.50	28.50	•	mg/kg
Copper	7.97	14.90	33.70	•	mg/kg
Iron	10802.22	22944.00	47800.00	•	mg/kg
Manganese	375.33	1035.00	2330.00	•	mg/kg
Nickel	12.89	25.90	33.50	•	mg/kg
Potassium	713.56	1400.00	5780.00	•	mg/kg
Vanadium	9.04	25.10	65.80	•	mg/kg
Zinc	24.48	58.30	68.10	•	mg/kg
Lead	18.06	19.50	67.70	•	mg/kg
Bismuth-210	0.02	1.72	•	•	pCi/g
Cesium-137	0.02	0.46	2.47	•	pCi/g
Thorium-230	0.88	1.51	1.39	•	pCi/g
Thorium-232	0.90	1.09	2.10	•	pCi/g
Uranium-234	0.67	1.04	1.59	•	pCi/g
Uranium-235	0.03	0.09	0.12	•	pCi/g
Uranium-238	0.71	1.08	1.50	•	pCi/g
Radium-226	1.12	1.20	2.20	•	pCi/g

• Data Not Available

Table V.5. Area D Environmental Samples Summary Statistics
Parameters Whose Mean Was Less Than The Highest ORR Background Limits

Parameter	Mean (mg/kg)	FEMP95 (mg/kg)	ORR95 (mg/kg)	RCRA Limit (mg/kg)
Aluminum	21772.89	11071.00	41900.00	•
Beryllium	0.60	0.43	1.48	•
Lithium	5.93	•	32.40	•
Selenium	0.72	0.39	1.06	•

• Data Not Available

5.2.3. Analyte Concentrations Compared to Action Levels

A further reduction in potential COCs was conducted following decision rule number 3 - comparison of analyte means to established action levels (ARARs). The action levels used for this comparison were obtained from EPA's Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities; Proposed Rule, (EPA 1990b). EPA's maximum RCRA action levels for soils are also displayed in Table V.3. (RCRA Limit). All Area D analytes whose mean concentration was less then the RCRA action level were removed as potential COCs. Table V.6. lists an additional 8 analytes that were removed from the list of potential COCs because their mean value in Area D was less than the RCRA action limit for contaminants in soils. After removing analytes whose mean value was less than RCRA limit, the list of remaining potential COC was reduced to 40.

5.2.4. Estimated Analyte Concentrations

The last reduction in potential COCs was conducted following decision rule number 4 - comparison of estimated analyte values ("J" data qualifiers) with non-detected values ("U" data qualifiers). When analyte concentrations are very close to method detection limits, the analytical chemist will often specify that the analyte was probably present in the sample but could not quantify the specific analyte concentration. In addition, the laboratory data qualifier may also designate a sample result as being estimated because of potential QC problems (e.g., blank concentration, poor surrogate recoveries, or matrix spike problems) encountered during the laboratory analysis. In both these cases, specific laboratory analyte measurements will be considered estimates and have "J" data qualifiers attached to their results.

Table V.7. displays the data qualifier results for the remaining 40 potential COCs. Note that only 17 of the 40 analytes had positive hits (Number of Hit values that are not equal to zero). To remove those analytes whose estimated values were below method detection limits, the maximum non-detect value ("U" data qualifier) for each analyte was compared to each sample result. If the sample analyte concentration was below the maximum non-detect value, it was deleted from the list of potential COCs.

After removing the analytes following decision rule number 4, the remaining potential COCs are displayed in Table V.8. The total number of potential COCs has been reduced to 23 from an original of 183. The relative importance of these potential COC will be discussed in Section 6.

Table V.6. Area D Environmental Samples Summary Statistics Parameters Whose Mean Was Less Than The RCRA Limit

Parameter	Mean	FEMP95	ORR95	RCRA Limit	Units
Cadmium	1.86	0.41	•	40	mg/kg
4,4'-DDE	3.65	•	•	2,000	µg/kg
4,4'-DDT	4.04	•	•	2,000	µg/kg
alpha-Chlordane	6.31	•	•	500	µg/kg
gamma-Chlordane	7.20	•	•	500	µg/kg
bis(2-Ethylhexyl) phthalate	258.66	•	•	50,000	µg/kg
Acetone	39.00	•	•	8,000,000	µg/kg
Methylene chloride	23.33	•	•	90,000	µg/kg

• Data Not Available

Table V.7. Area D Environmental Samples Summary Statistics
Distribution of Detects (Hits), Non-Detects (Misses), and Estimated Values
Page 1 of 2

Parameter	Number of Hits	Number of Misses	Number of Estimated Values
2-Butanone	0	7	1
3,3'-Dichlorobenzene	0	8	1
Acenaphthylene	0	7	2
Americium-241	17	0	0
Antimony	2	2	0
Benzo(a)anthracene	0	4	5
Benzo(a)pyrene	0	4	5
Benzo(b)fluoranthene	0	4	5
Benzo(g,h,i)perylene	0	5	4
Benzo(k)fluoranthene	0	5	4
Bismuth-207	17	0	0
Bismuth-210m	2	7	0
Calcium	5	4	0
Chloride	0	0	9
Chrysene	0	4	5
Cobalt-60	5	0	12
Di-n-butylphthalate	0	8	1
Endrin Ketone	0	8	1
Fluoranthene	1	3	5
Fluoride	9	0	0
Tritium	4	0	13
Indeno(1,2,3-c,d)pyrene	0	5	2
Magnesium	9	0	0
Methoxychlor	0	8	1
Molybdenum	3	6	0

Table V.7. Area D Environmental Samples Summary Statistics
Distribution of Detects (Hits), Non-Detects (Misses), and Estimated Values
Page 2 of 2

Parameter	Number of Hits	Number of Misses	Number of Estimated Values
Nitrate/Nitrite	8	1	0
Phenanthrene	0	5	4
Plutonium-239/240	17	0	0
Pyrene	1	4	3
Sodium	8	0	0
Sulfate	0	5	4
Thorium-227	17	0	0
Tin	2	7	0
Unknown	0	1	4
Unknown Alkane	0	0	2
Unknown Carboxylic Acid	0	3	1
Unknown Ester Carboxylic Acid	0	3	1
Unknown Ester Hexanedioic Acid	0	2	1
Unknown Hydrocarbon	0	0	4
Unknown PAH	0	0	1

Table V.8. Area D Environmental Samples Summary Statistics
Final Hit List Statistics

Parameter	Total Number of Hits	Maximum Hit	Mean Hit	Units
Chloride	9	1100.00	262.33	µg/g
Fluoride	9	6.20	3.72	µg/g
Sulfate	9	190.00	75.00	µg/g
Nitrate/Nitrite	9	5.50	3.25	µg/g
Calcium	9	309000.00	234100.00	mg/kg
Magnesium	9	127000.00	61984.44	mg/kg
Sodium	8	486.00	243.00	mg/kg
Endrin Ketone	9	15.00	6.07	mg/kg
Methoxychlor	9	76.00	31.11	µg/kg
Benzo(a)pyrene	9	430.00	320.67	µg/kg
Benzo(b)fluoranthene	9	410.00	318.89	µg/kg
Benzo(k)fluoranthene	9	430.00	314.00	µg/kg
Pyrene	8	580.00	432.50	µg/kg
Unknown Alkane	2	150.00	150.00	µg/kg
Unknown Hydrocarbon	4	280.00	143.00	µg/kg
Unknown PAH	1	120.00	120.00	µg/kg
2-Butanone	8	29.00	13.25	µg/kg
Bismuth-207	17	0.20	0.06	pCI/g
Cobalt-60	17	0.08	0.02	pCI/g
Plutonium-239/240	17	0.46	0.08	pCI/g
Thorium-227	17	0.16	0.09	pCI/g
Americium-241	17	0.14	0.03	pCI/g
Tritium	17	4.10	1.95	pCI/g

5.2.5. Comparison of Results with Previous Studies

As discussed in the Verification Sampling and Analysis Plan (DOE, 1993a), during the 1989 study of Area D, soil samples were analyzed for TAL metals, TCL VOCs and SVOCs, pesticides, and polychlorinated biphenyls. The results from the 1989 study (DOE, 1992b), in which a total of 38 surface and subsurface soil samples were collected, indicated that there was no significant chemical contamination. Specifically, of the 4000+ chemical analyses conducted on the soil samples obtained in this investigation, only two organic compounds were identified above detection levels, beta-BHC (12 ppb) and endrin ketone (20 ppb). In the verification study completed in 1993, endrin ketone was also measured in Area D with a maximum value of 15 ppb and a mean value of 6.07 ppb - very close agreement with the 1989 study. Beta-BHC was not found in any of the environmental samples collected during the 1993 study.

The plutonium concentrations from the 1989 reconnaissance investigation varied from a low of 0 pCi/g to a high of 18 pCi/g with a mean of 5.5 pCi/g. In the 1993 study, plutonium concentrations ranged from a low of 0 pCi/g to a high of 21 pCi/g with a mean of 4.26 pCi/g - very close agreement with the results from the 1989 study. The thorium concentrations from the 1989 reconnaissance investigation varied from a low of 0.3 pCi/g to a high of 1.5 pCi/g with a mean of 0.66 pCi/g. In the 1993 study, thorium concentrations ranged from a low of 0.12 pCi/g to a high of 5.4 pCi/g with a mean of 0.9 pCi/g -very close agreement with the results from the 1989 study.

The results of the 1993 verification study for radiological contamination closely agree with the radiological results of the 1989 study. The chemical results are similar - both studies identified endrin ketone as a potential contaminant; however the 1993 study indicated that there were other potential COCs at very low concentrations that were not found in the 1989 study.

6. CONCLUSIONS AND RECOMMENDATIONS

6.1. CHEMICAL CONTAMINATION

The results of the verification sampling and analysis activities conducted in OU6, Area D show that most (more than 87 percent) of the TCL VOCs, SVOCs, pesticides/PCBs and TAL compounds included in the laboratory analysis were either not detected in site soils or were present at concentrations below known action levels. Four anions (chloride, fluoride, sulfate and nitrate-nitrite) were determined to be present at concentrations that exceeded the four-part decision rule criteria described in Section 5 of this report. Three metals (calcium, magnesium and sodium), two pesticides (endrin ketone and methoxychlor), five SVOCs (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, pyrene and an unknown PAH), one VOC (2-butanone), one unknown alkane and one unknown hydrocarbon were also found to be present in Area D soils at concentrations that exceeded the four part decision rule criteria.

The elevated anion concentrations are probably due to the release of chemical reagents used in the PP Building (reagent grade nitric acid solutions and ferrous sulfate solutions), as described in the OU6, Area D SAP (DOE, 1993a). The localized use of road salts to control icing conditions during cold weather along the access road that passes over Area D is a likely source of the chloride and fluoride anions. The use of road salts may also be the source of the elevated calcium, magnesium and sodium concentrations found in Area D soils.

Four of the five SVOCs that met the four-part decision rule criteria (benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and pyrene) were detected in all soil samples, while the fifth, an unknown PAH, was detected only in BS0201. These SVOCs are common to the asphalt and road tar materials used to surface the access road that passes over the former acid drain line in Area D and is the most likely source for these organic constituents. The VOC determined to be present in Area D soils (2-Butanone) is a common solvent used in a variety of paints and thinners. This compound is also used in a variety of adhesives, including the adhesive commonly used in the duct tape applied to the outside of the shipping containers. This compound is also a common laboratory contaminant and its presence may be an artifact of the laboratory analysis activities. The source or sources of the unknown alkane and the unknown hydrocarbon reported by the analytical laboratory cannot be surmised as this time.

One of the two pesticides detected in Area D (endrin ketone) was also detected during a previous study conducted in this area (DOE 1992b). As discussed in the SAP (DOE, 1993a), this contaminant was probably discharged through the former acid drain line during routine water rinses of the drip pan in the PP Building. The other pesticide (methoxychlor) is a common ingredient in aerosol sprays that are routinely used to control insect pests and may also have been discharged through the former acid drain line during drip pan rinsing or flushing activities.

6.2. RADIOLOGICAL CONTAMINATION

Six radiological contaminants (bismuth-207, cobalt-60, plutonium-239/240, thorium-227, americium-241 and tritium) were found to be present in Area D soils at concentrations that exceeded the four-part decision rule criteria described in Section 5 of this report. The maximum concentration of americium-241 detected in Area D (0.14 pCi/g) is more than two orders of magnitude below the cleanup level (20 pCi/g) specified in the OU6 VWP. All other isotopes listed above were found at maximum concentrations less than 1 pCi/g, with the exception of tritium (maximum concentration found was 4.10 pCi/g).

The presence of these radioactive materials may be the result of historical releases in adjacent areas (primarily Area 12 and Area J) because they were not common to the PP operations conducted in Building 38. However, the relatively small concentrations of these radiological contaminants in Area D soils suggests their presence may be the result of a variety of other releases, including the use of contaminated process waters or rinse waters in the PP operations.

6.3. CONCLUSIONS

The concentrations of plutonium-238 and thorium in Area D soils are less than the cleanup criteria established by the Mound Plant D&D Program. The concentrations of americium-241, cesium-137, and radium-226 found in Area D soils are also below the cleanup criteria specified in the OU6 VWP (20 pCi/g, 80 pCi/g and 5/15 pCi/g suface/subsurface, respectively). Based upon the results of the verification sampling and analysis activities described in this report, Area D can be considered clean from a D&D perspective. Some residual radiological and chemical contamination remains in Area D soils at relatively low concentrations. Consequently, Area D does not appear to be a source of chemical or radiological contamination (i.e., measured concentations do not appear to be sufficient to impact downgradient areas).

6.4. RECOMMENDATIONS

- On the basis of the results of the verification sampling and analysis activities in OU6, Area D, no further remedial action by the Mound Plant D&D Program is required.

- The verification sampling and analysis results indicate that OU6, Area D soils are not a source of chemical or radiological contamination (i.e., measured concentations do not appear to be sufficient to impact downgradient areas). Therfore, no further verification sampling and analysis activities are needed to address the objectives specified in the OU6, Area D SAP.

- The data obtained from the verification sampling and analysis activities in Area D met the DQOs set forth in the OU6, Area D SAP and the OU6 QAPjP. This data should be used to support the future feasibility study, risk assessment and ROD for OU6.

- The Mound Plant Environmental Restoration Program should review the OU6, Area D verification sampling and analysis data to determine the need for any further remedial action, when background data and cleanup goals are available.

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APPENDIX A

AUDITS AND SURVEILLANCES

Health and Safety Audit

Quality Assurance Surveillance

Quality Assurance Laboratory Audit of PACE, Inc.

A-1. HEALTH AND SAFETY AUDIT

An initial audit of the work areas and required documentation was conducted prior to the field work. It was noted that caution signs, construction barrels and traffic cones would be necessary to alert vehicular traffic that work would be conducted on the road. An EG&G Mound Plant construction safety official requested orange construction fencing to be placed around the exclusion area to prevent individuals from entering the work area. Tape, traffic cones, "Men Working" signs, construction barrels, and orange fencing were used to protect the exclusion and work areas in the road. The presence of high voltage utilities and the congestion of other utilities in the vicinity of the work area made it necessary to use a hand auger instead of a drill rig. A review of the required documentation revealed missing information from the drilling subcontractors' training and medical clearance files. The subcontractor produced the information prior to field work. All necessary training and medical surveillance requirements (e.g., 40 hour OSHA training) were completed. Personnel read the Health and Safety Plans and signed approval sheets. Necessary information such as emergency phone numbers and the OSHA poster were hung in conspicuous locations. A spill kit was available to contain spills of chemicals used for decontamination activities. Monitoring equipment was calibrated each day before use and information was recorded on the equipment calibration log sheets. There were no other health or safety discrepancies noted during the field activities.

The EG&G Mound Plant construction inspector conducted an audit of the work area during the field activities. This audit produced only one recommendation to replace a metal can with an UL[R] approved gasoline container. The gasoline was immediately removed from the Mound Plant property.

During all drilling operations the soil cuttings removed from the boreholes and all soil samples were screened in the field using an HNu organic vapor detector, a combustible gas indicator and a FIDLER radiation survey instrument. All instruments were calibrated before the field sampling activities were initiated and a calibration check was performed on each instrument at the beginning of each day of sampling. No organic vapors were detected above normal background levels in any of the soils screened and no combustible gases or vapors were detected. Only once did a soil sample elicit a FIDLER response above background. The soil sample obtained from the 4- to 4.5-foot interval in borehole BS07 was screened three times by onsite health physics personnel. During the third screening a reading of 800 above background was observed on the FIDLER instrument. A sample of this soil was immediately transported to the Mound Plant Soil Screening Facility for analysis. However, no appreciable radioactivity above background was found in the sample (see Table IV.1).

A-2. QUALITY ASSURANCE SURVEILLANCE

Quality assurance surveillances were completed on May 17, 18, and 20, 1993 for the OU6 Area D verification sampling. The purpose of the surveillances was to observe sampling, decontamination, sample management, and project documentation for the D&D verification sampling. The results of the surveillances are detailed below.

5/17/93

The field team began arriving on site at 0900 to complete mobilization and site set-up. All required site notifications were completed in accordance with SOP 1.1. Required training certification, logbooks, and forms for SAIC field team were present on site in accordance with SOP 1.1, however some drilling subcontractor H&S records were pending. The sampling equipment decontamination area was set up in accordance with the requirements of SOP 1.6 on clean plastic which was bermed to contain spills and had six stations (labeled pans, solutions, and sprayers at each). The decontamination work area was upwind of cleaning solutions. All sampling equipment was properly decontaminated and wrapped in accordance with SOP 1.6, and personnel wore appropriate PPE and changed gloves between stations. The drilling rig was decontaminated in accordance with SOP 1.6 at a separate facility on the Mound site. Preparations for sample management (sample documentation, containers, and packaging and shipping materials) were present and complete in accordance with the requirements of SOPs 1.3, 1.4, and 1.5. Notification/permission from the adjacent Building Manager (Mound requirement) was not available, and no sampling was conducted on this date. No problems were encountered.

5/18/93

The field team began preparations for drilling and sampling at 0720. A review of sampling and H&S logbooks demonstrated all required forms were in place, however equipment checklists required by SOPs 1.1, 1.4, 1.6, 4.1, 5.1, and 6.2 were not in use (all necessary equipment was available and the checklists were to be completed). EG&G Mound provided Health Physics/radiological monitoring for the task. A tailgate/pre-entry briefing was performed which reviewed the project objectives and H&S considerations. Exclusion and contamination reduction zone boundaries and traffic/access control barricades were established in accordance with SOP 1.1. Workers donned and doffed Level D-modified PPE in accordance with SOP 1.8 throughout drilling and sampling operations. Drilling and sampling for BS01 commenced at 0915, and operations proceeded in accordance with SOPs 4.1 and 5.1 (clean gloves and sampling equipment, sample scans, proper sampling order and process, and documentation). A teflon-based lubricant was used on the threads of the split-spoon sampler (not restricted in the SOPs and reported

to be acceptable with CLP analysis). Ongoing H&S monitoring in accordance with SOPs 6.2, 6.4 and 6.11 demonstrated no detectable levels above background. The combustible gas indicator (CGI) was used to measure the percent O_2 downhole to determine if a correction factor would be required for the LEL readings. Sampling equipment was decontaminated as needed or between holes following SOP 1.6 (as above).

Boreholes BS02 and BS03 were drilled and sampled in the same manner as BS01, no problems with procedural implementation were observed. Each borehole was plugged and abandoned with a proper grout mixture using a tremmie, and each location was topped with bentonite and staked in accordance with SOP 4.1. The drill sites were cleaned up (cuttings and used PPE were drummed and labeled) and restored to pre-sampling condition in accordance with SOPs 1.15 and 4.1. Samples were transferred to the field office for documentation, packaging, and shipping. All samples were properly sealed, custody was maintained, temperature was controlled through the use of temperature blanks, samples were packaged for shipment in coolers, and documentation was completed in accordance with SOPs 1.3, 1.4, and 1.5, with two exceptions: chain-of-custody forms were not taped to inner cooler lids (due to potential for thalates in tape adhesive); and the cooler was sealed before leaving the site for security, rather than at the shipping office (this approach was approved by Federal Express). These changes were to be documented and approved as field changes. No problems requiring corrective action were encountered.

5/20/93

The logbooks completed to date were reviewed for completeness and conformance with procedural requirements. The materials and testing equipment (M&TE) logbook was complete with the following exceptions: factory calibration recall dates were missing for several instruments, no reference file of calibration certificates was on site, and the calibration log had not been completed for this day's activities. Calibration information was available at the SAIC office and would be added prior to project completion, and daily calibration log data would be transferred from the H&S logbook. The Sample Management logbook was complete with the exception of some QA checks, which were subsequently completed. The Subsurface Soil Sampling logbook was complete for BS01 with the following exceptions: blank spaces were not lined out and QA checks had not been completed. These deficiencies were immediately corrected. The H&S logbook was complete with the following exceptions: sections of the logbook not used (considered not applicable for this task by the SHSO) had not been lined out and explained in narrative. These sections were to be lined out following completion of sample activities. The Site Manager's logbook was complete. The logbooks for this task conform to and fulfill the requirements of

SOPs 1.1, 1.3, 1.4, 1.5, 1.6, 1.8, 1.15, 4.1, 5.1, 6.2, 6.4, and 6.11. No problems requiring corrective action were encountered.

A-3. QUALITY ASSURANCE LABORATORY AUDIT OF PACE, INC.

PACE, Inc. was audited on June 30 - July 1, 1993. The purpose of the audit was to facilitate coordination of SAIC analytical project work, to assess the implementation of the PACE, Inc. Golden, Colorado QAPjP and to determine the general performance of PACE, Inc. Golden, Colorado in providing analytical services in support of the SAIC Environmental Compliance Group. The following provides details on the audit proceedings.

A-3.1. GENERAL INFORMATION

A-3.1.1. Organization Visited:

Pace Incorporated
5930 McIntyre Street
Golden, Colorado 80403

Telephone: TEL (303) 278-3400
FAX (303) 278-2121

Primary Contacts: Ms. Sandra L. McCarty, Quality Assurance Officer
Mr. Doug Scott, Project Manager
Mr. Greg Anderson, Pace Regional Manager

A-3.1.2. Dates of Audit:

June 30 and July 1, 1993.

A-3.1.3. Audit Team Members:

Nile Luedtke, SAIC - Oak Ridge
Amy Meyer, SAIC - Dayton

A-3.1.4. Purpose of Audit:

The purpose of the audit was to facilitate coordination of SAIC analytical project work (past and present), to assess the implementation of the Pace, Inc. Golden, Colorado Quality Assurance Plan, and to determine the general performance of Pace, Inc. Golden, Colorado in providing analytical services in support of the SAIC Environmental Compliance Group (ECG). The audit was to also evaluate the capability of the facility to perform and comply with requirements and criteria of past and present SAIC projects and protocols.

A-3.1.5. Organization:

Approximately two years ago Pace, Inc. acquired this facility from Hager Laboratories and it became part of Pace's 15 laboratory network. The Golden facility is the networks primary radioanalytical laboratory and industrial hygiene laboratory. Analytical activities include a full range of environmental organic, inorganic, and radiochemical parameters, including air determinations. The facility also provides a range of Industrial Hygiene analysis. The laboratory currently serves a broad range of industries, engineering firms, and state or federal agencies, however, their primary customers are environmental engineering firms, such as SAIC. The laboratory is currently staffed by approximately 47 employees.

A-3.2.0. COORDINATION MEETING

An SAIC - Pace coordination meeting was held during the morning of June 30, 1993. After introductions, the laboratory management presented a brief overview of the laboratory operational history, size of the facility, number of employees, types of services, and analytical capabilities.

Topics of discussion covered the relationships between SAIC and Pace as an environmental team. The SAIC Basic Ordering Agreement (BOA) Scope of Work (SOW) for Radiological Analysis was discussed relative to current projects. Other topics included brief reviews of past projects (Mound OU4 Canal Special Sampling and Y-12 Abandoned Nitric Acid Pipeline) and present projects (Mound OU6 Area D and Wright-Patterson Air Force Base OU3). Several issues should be highlighted from these discussions:

1. As individual projects are identified, the laboratory and the SAIC project management must communicate clearly to obtain a quality product. In all cases, SAIC should identify a project specific laboratory interface (i.e., Amy Meyer for WPAFB, Joletta Minard for Mound OU6 Area D, etc.). Pace has assigned Doug Scott as its primary SAIC project manager and interface.

2. It was indicated to the laboratory, that their primary direction should be the project specific SOW, utilizing the project Work Plan (QAPjP) and the BOA SOW as reference and backup information.

3. SAIC Analytical Data Non-Conformance Reports (ADNCRs) are used to assist the laboratory in improving the data deliverable. SAIC will periodically provide all the ADNCR information to the laboratory. In this context, information was provided to the laboratory regarding both the Mound Canal Project Data Validation and the ANAP Project Data Validation.

4. The laboratory has continued to employ the I-Chrom method for Sr-90 analysis, and is obtaining more consistent and reliable information.

5. Current Canberra and most other gamma spectroscopy systems do not allow direct reporting of negative isotopic results with their uncertainties. This information has to be generated individually through less automated means. Reporting an MDA and positive results with uncertainties would be preferable to the laboratory. SAIC indicated it would investigate this issue.

6. The current 30 to 37 calendar day turnaround time for radiochemical analysis is too short. A 45 calendar day turnaround would be more amenable to the analytical methodologies and counting times. SAIC indicated this issue would also be taken into consideration.

7. Conditions in the BOA require re-preparation and re-analysis when radiochemical tracer recoveries fall outside 50-110%. This is a continuous "do loop" with no resolution when this window can not be achieved. The laboratory was instructed to re-analyze one time and then report all data including Laboratory Control Sample analysis. Project data validation will have to determine the useability of the results. The laboratory should provide all relevant information and a comprehensive case narrative. Certain project QAPjPs (Mound) may identify alternate criteria, such as plus or minus three sigma windows. When such projects are being performed the project QAPjP criteria takes precedence.

At the conclusion of the meeting the purpose, scope, and schedule for the audit were discussed.

Pace personnel attending the meeting were:

Sandra McCarty, Quality Assurance Officer
Doug Scott, Project Manager (SAIC Project Contact)
Henry Meyer, Radiochemistry Supervisor
Diane Boykin, Sample Receiving Supervisor
Bib DiRienzo, Organic Laboratory Manager

A-3.3. LABORATORY INSPECTION

Following the coordination meeting, the audit team proceeded to an inspection of the facility starting at Sample Receiving. Review of Radiological Preparation and Radiological Analysis followed. The second day's activities concluded review of Radiological Analysis and continued with reviews of Metals Preparation and Analysis, Inorganic Preparation and Analysis, Waste Management procedures, and laboratory QA functions. An overview tour of the Organic Analytical capabilities and capacity completed the laboratory review. Pace is not currently performing organic analysis for any SAIC projects, therefore, the organic portions of the laboratory were not included as part of the audit.

The assessment was structured to follow the route of samples submitted to the laboratory for analysis through to final reporting of results. Each operational area was reviewed for adequacy of facilities and work space. PACE, Inc. SOPs were reviewed throughout the facility. Interviews were conducted with individuals from each area. Equipment and instrumentation which were in place and operational were reviewed for appropriateness. In addition, documentation of the

requirements for daily operation of equipment and instrumentation was a subject of review. Standards used throughout the laboratory were checked for traceability and record keeping. Associated QC requirements for standards use and specific laboratory QC practices were discussed. Training requirements and documentation, data review, data reporting, and general QA practices employed in the laboratory were discussed.

SAIC has not submitted performance evaluation (PE) samples to the laboratory and therefore requested copies of laboratory results from other PE programs. The laboratory previously provided summary and original reports of several studies including EPA Environmental Monitoring Systems Laboratory (EMSL) and DOE Environmental Measurements Laboratory QAP Samples. March 1993 EPA EMSL Radium in Water results were provided during the audit. The laboratory has performed satisfactorily in all cases.

A-3.4. POST-AUDIT MEETING

A post-audit meeting was held on July 1, 1993. Pace personnel met with the audit team for a debriefing and discussion of the results.

The audit team commended the Pace staff for its cooperation and willingness to respond to questions during the assessment. The assessment revealed a staff with analytical knowledge and commitment to their work. Significant improvement has been made in records documentation since the previous audit. The radiochemistry staff exhibited a good understanding of methodologies and instrumentation.

A-3.5. CONCLUSIONS

The laboratory demonstrated a strong pro-active commitment to quality. All employees supported and implemented the QA program throughout the laboratory. The organization was organized and equipped with available analytical service capacity to cover a broad spectrum of analytical methods and protocols. The staff has demonstrated awareness of different environmental programs including mixed waste handling and analysis.

The audit team considered the employment of the Pace, Inc., Golden, Colorado Laboratory for analytical support to SAIC projects to be appropriate. The findings identified must reach satisfactory conclusion for the laboratory to continue to perform analysis.

APPENDIX B

ANALYTICAL METHODS, PARAMETERS, AND QUANTITATION LIMITS

TABLE B.1. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
ORGANIC PARAMETERS
PAGE 1 OF 5

Laboratory Parameters	Analytical Method	Analytical Level	Quant.limit water (ug/L)	Quant.limit soil (ug/kg)
Volatile Organic Compounds				
Chloromethane	CLP SOW	IV	10	10
Bromomethane		IV	10	10
Vinyl Chloride		IV	10	10
Chloroethane		IV	10	10
Methylene Chloride		IV	5	5
Acetone		IV	10	10
Carbon Disulfide		IV	5	5
1,1-Dichloroethene		IV	5	5
1,1-Dichloroethane		IV	5	5
1,2-Dichloroethene		IV	5	5
Chloroform		IV	5	5
1,2-Dichloroethane		IV	5	5
2-Butanone		IV	10	10
1,1,1-Trichloroethane		IV	5	5
Carbon Tetrachloride		IV	5	5
Vinyl Acetate		IV	10	10
Bromodichloromethane		IV	5	5
1,2-Dichloropropane		IV	5	5
cis-1,3-Dichloropropene		IV	5	5
Trichloroethene		IV	5	5
Dibromochloromethane		IV	5	5
1,1,2-Trichloroethane		IV	5	5
Benzene		IV	5	5
trans-1,3-Dichloropropene		IV	5	5
Tribromomethane		IV	5	5
4-Methyl-2-Pentanone		IV	10	10
2-Hexanone		IV	10	10
Tetrachloroethene		IV	5	5
Toluene		IV	5	5
1,1,2,2-Tetrachloroethane		IV	5	5

TABLE B.1. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
ORGANIC PARAMETERS
PAGE 2 OF 5

Laboratory Parameters	Analytical Method	Analytical Level	Quant.limit water (ug/L)	Quant.limit soil (ug/kg)
Volatile Organic Compounds (cont'd.)				
Chlorobenzene		IV	5	5
Ethylbenzene		IV	5	5
Styrene		IV	5	5
Xylenes (total)		IV	5	5
Additional Compounds:				
Diethylbenzene		IV	5	20
Hexane		IV	10	10
Semivolatile Organic Compounds				
Phenol	CLP SOW	IV	10	330
bis(2-Chloroethyl) ether		IV	10	330
2-Chlorophenol		IV	10	330
1,3-Dichlorobenzene		IV	10	330
1,4-Dichlorobenzene		IV	10	330
Benzyl alcohol		IV	10	330
1,2-Dichlorobenzene		IV	10	330
2-Methylphenol		IV	10	330
bis(2-Chloroisopropyl) ether		IV	10	330
4-Methylphenol		IV	10	330
N-nitroso-di-n-Dipropylamine		IV	10	330
Hexachloroethane		IV	10	330
Nitrobenzene		IV	10	330
Isophorone		IV	10	330
2-Nitrophenol		IV	10	330
2,4-Dimethylphenol		IV	10	330
Benzoic Acid		IV	50	1600
bis(2-Chloroethoxy)methane		IV	10	330
2,4-Dichlorophenol		IV	10	330
1,2,4-Trichlorobenzene		IV	10	330
Naphthalene		IV	10	330
4-Chloroaniline		IV	10	330

TABLE B.1. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
ORGANIC PARAMETERS
PAGE 3 OF 5

Laboratory Parameters	Analytical Method	Analytical Level	Quant.limit water (ug/L)	Quant.limit soil (ug/kg)
Semivolatile Organic Compounds (cont'd.)				
Hexachlorobutadiene		IV	10	330
4-Chloro-3-Methylphenol		IV	10	330
2-Methylnaphthalene		IV	10	330
Hexachlorocyclopentadiene		IV	10	330
2,4,6-Trichlorophenol		IV	10	330
2,4,5-Trichlorophenol		IV	50	1600
2-Chloronaphthalene		IV	10	330
2-Nitroaniline		IV	50	1600
Dimethylphthalate		IV	10	330
Acenaphthylene		IV	10	330
2,6-Dinitrotoluene		IV	10	330
3-Nitroaniline		IV	50	1600
Acenaphthene		IV	10	330
2,4-Dinitrophenol		IV	50	1600
4-Nitrophenol		IV	50	1600
Dibenzofuran		IV	10	330
2,4-Dinitrotoluene		IV	10	330
Diethylphthalate		IV	10	330
4-Chlorophenyl phenyl ether		IV	10	330
Fluorene		IV	10	330
4-Nitroaniline		IV	50	1600
4,6-Dinitro-2-Methylphenol		IV	50	1600
N-nitroso-di-phenylamine		IV	10	330
4-Bromophenyl phenyl ether		IV	10	330
Hexachlorobenzene		IV	10	330
Pentachlorophenol		IV	50	1600
Phenanthrene		IV	10	330
Anthracene		IV	10	330
Di-n-Butylphthalate		IV	10	330
Fluoranthene		IV	10	330

TABLE B.1. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
ORGANIC PARAMETERS
PAGE 4 OF 5

Laboratory Parameters	Analytical Method	Analytical Level	Quant.limit water (ug/L)	Quant.limit soil (ug/kg)
Semivolatile Organic Compounds (cont'd.)				
Pyrene		IV	10	330
Butylbenzylphthalate		IV	10	330
3,3'-Dichlorobenzidine		IV	20	660
Benzo(a)anthracene		IV	10	330
Chrysene		IV	10	330
bis(2-Ethylhexyl) phthalate		IV	10	330
Di-n-Octylphthalate		IV	10	330
Benzo(b)fluoranthene		IV	10	330
Benzo(k)fluoranthene		IV	10	330
Benzo(a)pyrene		IV	10	330
Indeno(1,2,3-cd)pyrene		IV	10	330
Dibenzo(a,h)anthracene		IV	10	330
Benzo(g,h,i)perylene		IV	10	330
Pesticides/PCBs				
alpha-BHC	CLP SOW	IV	0.05	1.7
beta-BHC		IV	0.05	1.7
delta-BHC		IV	0.05	1.7
gamma-BHC		IV	0.05	1.7
Heptachlor		IV	0.05	1.7
Aldrin		IV	0.05	1.7
Heptachlor epoxide		IV	0.05	1.7
Endosulfan I		IV	0.05	1.7
Dieldrin		IV	0.10	3.3
4,4'-DDE		IV	0.10	3.3
Endrin		IV	0.10	3.3
Endosulfan II		IV	0.10	3.3
4,4'-DDD		IV	0.10	3.3
Endosulfan sulfate		IV	0.10	3.3
4,4'-DDT		IV	0.10	3.3
Methoxychlor		IV	0.5	17.0

TABLE B.1. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
ORGANIC PARAMETERS
PAGE 5 OF 5

Laboratory Parameters	Analytical Method	Analytical Level	Quant.limit water (ug/L)	Quant.limit soil (ug/kg)
Pesticides/PCBs (cont'd.)				
Endrin ketone		IV	0.10	3.3
Endrin aldehyde		IV	0.10	3.3
alpha-Chlordane		IV	0.05	1.7
gamma-Chlordane		IV	0.05	1.7
Toxaphene		IV	5.0	170.0
Aroclor-1016		IV	0.5	33.0
Aroclor-1221		IV	0.5	67.0
Aroclor-1232		IV	0.5	33.0
Aroclor-1242		IV	0.5	33.0
Aroclor-1248		IV	0.5	33.0
Aroclor-1254		IV	0.5	33.0
Aroclor-1260		IV	0.5	33.0

TABLE B.2. OU6 AREA D
ANALYTICAL LEVEL AND QUANTITATION LIMITS
INORGANIC PARAMETERS

Laboratory Parameters	Analytical Level	Quantitation Limit Water (ug/L)	Quantitation Limit Soil (mg/kg)
Aluminum	IV	20	4
Antimony	IV	10	2
Arsenic	IV	10	2
Barium	IV	200	40
Beryllium	IV	1	0.2
Cadmium	IV	5	1
Calcium	IV	5000	1000
Chromium	IV	10	2
Cobalt	IV	50	10
Copper	IV	25	5
Iron	IV	100	20
Lead	IV	3	0.6
Magnesium	IV	5000	1000
Manganese	IV	15	3
Mercury	IV	0.2	0.04
Nickel	IV	40	8
Potassium	IV	5000	1000
Selenium	IV	5	1
Silver	IV	10	2
Sodium	IV	5000	1000
Thallium	IV	10	2
Vanadium	IV	10	2
Zinc	IV	20	4
Additional Elements:			
Molybdenum	IV	20	2
Tin	IV	50	10
Bismuth	IV	150	30
Lithium	IV	100	10

TABLE B.3. MOUND - OU6 AREA
ANALYTICAL LEVEL AND QUANTITATION LIMITS
RADIOLOGICAL PARAMETERS

Laboratory Parameters	Analytical Level	QUANTITATION LIMITS WATER (pCi/L)	SOIL (pCi/g dry)
RADIOISOTOPES			
Americium-241	V	1	1[a]
Bismuth-207	V	15[b]	1[a]
Bismuth-210m	V	15[b]	1[a]
Cesium-137	V	20[b]	1[a]
Cobalt-60	V	20[b]	1[a]
Plutonium-238,239,240	V	1[b]	1.0[e]
Radium-226	V	1[c]	0.3[a]
Thorium-227, 228, 230, 232	V	1	1.0[e]
Tritium	V	500	50 pCi/g[d]
Uranium-234/235, 238	V	1	0.6

Notes:
[a]Based on 650-gram dry sample.
[b]Based on 900-mL sample size.
[c]Based on 1,000 mL sample size.
[d]Dependent upon percent moisture in sample, based on 10 grams.
[e]Based in 2-gram dry sample.

APPENDIX C

ANALYTICAL RESULTS

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0101	597555.28120	1497114.26120	876.32000
Depth: 18.0 TO 19.2 FT	MND15-1101-0018			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	-0.40	PCI/G	UJ
	H-3	0.02	PCI/G	J
	Ra-226	0.98	PCI/G	
	Bi-207	0.010	PCI/G	J
	Bi-210	0.10	PCI/G	
	Co-60	-0.010	PCI/G	UJ
	Cs-137	-0.010	PCI/G	UJ
	Pu-238	0.017	PCI/G	J
	Pu-239/240	0.013	PCI/G	J
	Th-227	0.023	PCI/G	J
	Th-228	0.84	PCI/G	
	Th-230	0.61	PCI/G	
	Th-232	0.78	PCI/G	
	U-234	0.73	PCI/G	
	U-235	0.030	PCI/G	J
	U-238	0.47	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0101

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	1100	UG/G	J - C
	Sulfate	190	UG/G	J - C
	Nitrate/Nitrite (NO3/	2.3	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	5.7	MG/KG	
	Cyanide	3.1	MG/KG	UJ - HC(-)
	Mercury	.12	MG/KG	U
	Aluminum	16500	MG/KG	
	Antimony	1.9	MG/KG	R - S
	Barium	101	MG/KG	J - I(+)
	Beryllium	.95	MG/KG	
	Bismuth	4.30	MG/KG	U
	Cadmium	.48	MG/KG	
	Calcium	3820	MG/KG	
	Chromium	19.3	MG/KG	J - S(-)
	Cobalt	14.7	MG/KG	
	Copper	17.5	MG/KG	J - SI(-)
	Iron	29700	MG/KG	J - I(+)
	Lithium	15.50	MG/KG	
	Manganese	890	MG/KG	
	Molybdenu	1.50	MG/KG	
	Nickel	21.7	MG/KG	J - SI(+)
	Potassium	1500	MG/KG	
	Silver	0.25	MG/KG	R - S
	Sodium	401	MG/KG	
	Tin	2.20	MG/KG	U
	Vanadium	26.1	MG/KG	
	Zinc	60.7	MG/KG	J - I (+)
	Magnesium	3660	MG/KG	
	Lead	16.2	MG/KG	J - S(+)
	Selenium	0.69	MG/KG	J - I(+)
	Thallium	0.25	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.9	UG/KG	UJ - K
	4,4'-DDE	3.9	UG/KG	UJ - K
	4,4'-DDT	3.9	UG/KG	UJ - KC

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	2.0	UG/KG	UJ - K
	alpha-BHC	2.0	UG/KG	UJ - K
	alpha-Chlordane	2.0	UG/KG	UJ - K
	Aroclor-1016	39.0	UG/KG	UJ - K
	Aroclor-1221	79.0	UG/KG	UJ - K
	Aroclor-1232	39.0	UG/KG	UJ - K
	Aroclor-1242	39.0	UG/KG	UJ - K
	Aroclor-1248	39.0	UG/KG	UJ - K
	Aroclor-1254	39.0	UG/KG	UJ - K
	Aroclor-1260	39.0	UG/KG	UJ - K
	beta-BHC	2.0	UG/KG	UJ - K
	delta-BHC	2.0	UG/KG	UJ - K
	Dieldrin	3.9	UG/KG	UJ - K
	Endosulfan I	2.0	UG/KG	UJ - K
	Endosulfan II	3.9	UG/KG	UJ - K
	Endosulfan sulfate	3.9	UG/KG	UJ - K
	Endrin	3.9	UG/KG	UJ - K
	Endrin Aldehyde	3.9	UG/KG	UJ - K
	Endrin Ketone	3.9	UG/KG	UJ - KC
	gamma-BHC (Lindane)	2.0	UG/KG	UJ - K
	gamma-Chlordane	2.0	UG/KG	UJ - K
	Heptachlor	2.0	UG/KG	UJ - K
	Heptachlor epoxide	2.0	UG/KG	UJ - K
	Methoxychlor	20.0	UG/KG	UJ - KC
	Toxaphene	200.0	UG/KG	UJ - K
RADIOLOGIC	Am-241	-0.11	PCI/G	UJ
	H-3	0.01	PCI/G	J
	Ra-226	2.0	PCI/G	
	Bi-207	0.19	PCI/G	
	Bi-210	0.00	PCI/G	J
	Co-60	0.010	PCI/G	J
	Cs-137	-0.050	PCI/G	UJ
	Pu-238	-0.022	PCI/G	UJ
	Pu-239/240	0.000	PCI/G	
	Th-227	0.086	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.85	PCI/G	
	Th-230	1.20	PCI/G	
	Th-232	0.75	PCI/G	
	U-234	0.80	PCI/G	
	U-235	0.040	PCI/G	J
	U-238	1.00	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	400	UG/KG	UJ - C
	1,2-Dichlorobenzene	400	UG/KG	UJ - H
	1,3-Dichlorobenzene	400	UG/KG	UJ - H
	1,4-Dichlorobenzene	400	UG/KG	UJ - H
	2,2'-oxybis(1-Chlorop	400	UG/KG	UJ - H
	2,4,5-Trichlorophenol	970	UG/KG	UJ - H
	2,4,6-Trichlorophenol	400	UG/KG	UJ - C
	2,4-Dichlorophenol	400	UG/KG	UJ - H
	2,4-Dimethylphenol	400	UG/KG	UJ - H
	2,4-Dinitrophenol	970	UG/KG	UJ - H
	2,4-Dinitrotoluene	400	UG/KG	UJ - H
	2,6-Dinitrotoluene	400	UG/KG	UJ - H
	2-Chloronaphthalene	400	UG/KG	UJ - H
	2-Chlorophenol	400	UG/KG	UJ - H
	2-Methylnaphthalene	400	UG/KG	UJ - H
	2-Methylphenol	400	UG/KG	UJ - H
	2-Nitroaniline	970	UG/KG	UJ - H
	2-Nitrophenol	400	UG/KG	UJ - H
	2-Pentanone, 4-Hydrox	4100	UG/KG	R
	3,3'-Dichlorobenzidin	400	UG/KG	UJ - H
	3-Nitroaniline	970	UG/KG	UJ - H
	4,6-Dinitro-2-methylp	970	UG/KG	UJ - H
	4-Bromophenyl-phenyle	400	UG/KG	UJ - H
	4-Chloro-3-methylphen	400	UG/KG	UJ - H
	4-Chloroaniline	400	UG/KG	UJ - H
	4-Chlorophenyl-phenyl	400	UG/KG	UJ - H
	4-Methylphenol	400	UG/KG	UJ - H
	4-Nitroaniline	970	UG/KG	UJ - H
	4-Nitrophenol	970	UG/KG	UJ - H

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	400	UG/KG	UJ - H
	Acenaphthylene	400	UG/KG	UJ - H
	Anthracene	400	UG/KG	UJ - H
	Benzo(a)anthracene	210	UG/KG	J - H
	Benzo(a)pyrene	230	UG/KG	J - I (+)
	Benzo(b)fluoranthene	230	UG/KG	J - I (+)
	Benzo(g,h,i)perylene	140	UG/KG	J - I (+)
	Benzo(k)fluoranthene	180	UG/KG	J - I (+)
	bis(2-Chloroethoxy)me	400	UG/KG	UJ - H
	bis(2-Chloroethyl)eth	400	UG/KG	UJ - H
	bis(2-Ethylhexyl)phth	140	UG/KG	J - H
	Butylbenzylphthalate	400	UG/KG	UJ - H
	Carbazole	400	UG/KG	U
	Chrysene	200	UG/KG	J - H
	Di-n-butylphthalate	140	UG/KG	UJ - H
	Di-n-octylphthalate	400	UG/KG	UJ - H
	Dibenzo(a,h)anthracen	400	UG/KG	UJ - H
	Dibenzofuran	400	UG/KG	UJ - H
	Diethylphthalate	400	UG/KG	UJ - H
	Dimethylphthalate	400	UG/KG	UJ - H
	Fluoranthene	320	UG/KG	J - H
	Fluorene	400	UG/KG	UJ - H
	Hexachlorobenzene	400	UG/KG	UJ - H
	Hexachlorobutadiene	400	UG/KG	UJ - C
	Hexachlorocyclopentad	400	UG/KG	UJ - H
	Hexachloroethane	400	UG/KG	UJ - H
	Indeno(1,2,3-c,d)pyre	140	UG/KG	J - I (+)
	Isophorone	400	UG/KG	UJ - H
	N-Nitroso-di-n-propyl	400	UG/KG	UJ - H
	N-Nitrosodiphenylamin	400	UG/KG	UJ - H
	Naphthalene	400	UG/KG	UJ - H
	Nitrobenzene	400	UG/KG	UJ - H
	Pentachlorophenol	970	UG/KG	UJ - H
	Phenanthrene	190	UG/KG	J - H
	Phenol	400	UG/KG	UJ - H

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Pyrene	580	UG/KG	J - H
	Unknown	120	UG/KG	R
	Unknown	81	UG/KG	R
	Unknown Carboxylic Acid	200	UG/KG	R
	Unknown Ester Cabroxylic	120	UG/KG	R
	Unknown Ester Hexanedioic	160	UG/KG	R - B
	Unknown Hydrocarbon	280	UG/KG	JN
	Unknown PAH	120	UG/KG	JN
	Unknown Phthalate Est	570	UG/KG	R
VOLATILE	1,1,1-Trichloroethane	12	UG/KG	U
	1,1,2,2-Tetrachloroet	12	UG/KG	U
	1,1,2-Trichloroethane	12	UG/KG	U
	1,1-Dichloroethane	12	UG/KG	U
	1,1-Dichloroethene	12	UG/KG	U
	1,2-Dichloroethane	12	UG/KG	U
	1,2-Dichloroethene	12	UG/KG	U
	1,2-Dichloropropane	12	UG/KG	U
	2-Butanone	29	UG/KG	J - C
	2-Hexanone	12	UG/KG	U
	4-Methyl-2-pentanone	12	UG/KG	U
	Acetone	220	UG/KG	
	Benzene	12	UG/KG	U
	Bromodichloromethane	12	UG/KG	U
	Bromoform	12	UG/KG	U
	Bromomethane	12	UG/KG	U
	Carbon Disulfide	12	UG/KG	U
	Carbon Tetrachloride	12	UG/KG	U
	Chlorobenzene	12	UG/KG	U
	Chloroethane	12	UG/KG	UJ - C
	Chloroform	12	UG/KG	U
	Chloromethane	12	UG/KG	U
	cis-1,3-Dichloropropene	12	UG/KG	U
	Dibromochloromethane	12	UG/KG	U
	Diethylbenzene, Total	12	UG/KG	U
	Ethylbenzene	12	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0201	597559.33790	1497115.04990	876.26000
Depth: 9.0 TO 11.0 FT	MND15-1102-0009			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Methylene Chloride	35	UG/KG	U - B
	Styrene	12	UG/KG	U
	Tetrachloroethene	12	UG/KG	U
	Toluene	12	UG/KG	U
	trans-1,3-Dichloropro	12	UG/KG	U
	Trichloroethene	12	UG/KG	U
	Vinyl Chloride	12	UG/KG	U
	Xylene, Total	12	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0201

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	350	UG/G	J - C
	Sulfate	110	UG/G	J - C
	Nitrate/Nitrite (NO3/	5.2	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	4.9	MG/KG	
	Cyanide	2.8	MG/KG	UJ - HC(-)
	Mercury	.11	MG/KG	U
	Aluminum	11600	MG/KG	
	Antimony	8.8	MG/KG	R - S
	Barium	65.9	MG/KG	
	Beryllium	.60	MG/KG	
	Bismuth	19.80	MG/KG	U
	Cadmium	1.1	MG/KG	U
	Calcium	84900	MG/KG	
	Chromium	13.6	MG/KG	J - S(-)
	Cobalt	9.1	MG/KG	
	Copper	13.1	MG/KG	J - S(+)
	Iron	21600	MG/KG	J - I(+)
	Lithium	12.70	MG/KG	
	Magnesium	19800	MG/KG	
	Manganese	551	MG/KG	
	Molybdenu	2.00	MG/KG	U
	Nickel	17.1	MG/KG	J - S(-)
	Potassium	1340	MG/KG	
	Silver	1.1	MG/KG	R - S
	Sodium	233	MG/KG	
	Tin	10.20	MG/KG	U
	Vanadium	19.2	MG/KG	
	Zinc	44.7	MG/KG	
	Lead	11.9	MG/KG	J - S(+)
	Selenium	0.81	MG/KG	
	Thallium	.23	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	15.0	UG/KG	UJ - K
	4,4'-DDE	4.4	UG/KG	JN - K,P
	4,4'-DDT	7.9	UG/KG	JN - K,P,C

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	7.6	UG/KG	UJ - K
	alpha-BHC	7.6	UG/KG	UJ - K
	alpha-Chlordane	42	UG/KG	JN - K,P
	Aroclor-1016	150-	UG/KG	UJ - K
	Aroclor-1221	300.00	UG/KG	UJ - K
	Aroclor-1232	150.00	UG/KG	UJ - K
	Aroclor-1242	150.00	UG/KG	UJ - K
	Aroclor-1248	150.00	UG/KG	UJ - K
	Aroclor-1254	150.00	UG/KG	UJ - K
	Aroclor-1260	150.00	UG/KG	UJ - K
	beta-BHC	7.6	UG/KG	UJ - K
	delta-BHC	7.6	UG/KG	UJ - K
	Dieldrin	15.0	UG/KG	UJ - K
	Endosulfan I	7.6	UG/KG	UJ - K
	Endosulfan II	15.0	UG/KG	UJ - K
	Endosulfan sulfate	15.0	UG/KG	UJ - K
	Endrin	15.0	UG/KG	UJ - K
	Endrin Aldehyde	15.0	UG/KG	UJ - K
	Endrin Ketone	15.0	UG/KG	JN - K,C
	gamma-BHC (Lindane)	7.6	UG/KG	UJ - K
	gamma-Chlordane	50	UG/KG	J - K
	Heptachlor	7.6	UG/KG	UJ - K
	Heptachlor epoxide	7.6	UG/KG	UJ - K
	Methoxychlor	76.0	UG/KG	JN - K,C
	Toxaphene	760	UG/KG	UJ - K
RADIOLOGIC	Am-241	-0.12	PCI/G	UJ
	H-3	0.10	PCI/G	J
	Ra-226	0.98	PCI/G	
	Bi-207	0.086	PCI/G	
	Bi-210	0.10	PCI/G	
	Co-60	0.030	PCI/G	J
	Cs-137	-0.010	PCI/G	UJ
	Pu-238	4.10	PCI/G	
	Pu-239/240	0.089	PCI/G	
	Th-227	0.050	PCI/G	J

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.39	PCI/G	
	Th-230	0.72	PCI/G	
	Th-232	0.39	PCI/G	
	U-234	0.57	PCI/G	
	U-235	0.027	PCI/G	J
	U-238	0.68	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	370.00	UG/KG	U
	1,2-Dichlorobenzene	370.00	UG/KG	U
	1,3-Dichlorobenzene	370.00	UG/KG	U
	1,4-Dichlorobenzene	370.00	UG/KG	U
	2,2'-oxybis(1-Chlorop	370.00	UG/KG	U
	2,4,5-Trichlorophenol	890.00	UG/KG	U
	2,4,6-Trichlorophenol	370.00	UG/KG	U
	2,4-Dichlorophenol	370.00	UG/KG	U
	2,4-Dimethylphenol	370.00	UG/KG	U
	2,4-Dinitrophenol	890.00	UG/KG	UJ - C
	2,4-Dinitrotoluene	370.00	UG/KG	U
	2,6-Dinitrotoluene	370.00	UG/KG	U
	2-Chloronaphthalene	370.00	UG/KG	U
	2-Chlorophenol	370.00	UG/KG	U
	2-Methylnaphthalene	370.00	UG/KG	U
	2-Methylphenol	370.00	UG/KG	U
	2-Nitroaniline	890.00	UG/KG	U
	2-Nitrophenol	370.00	UG/KG	U
	2-Pentanone, 4-Hydrox	860.00	UG/KG	R - B
	3,3'-Dichlorobenzidin	370.00	UG/KG	U
	3-Nitroaniline	890.00	UG/KG	U
	4,6-Dinitro-2-methylp	890.00	UG/KG	U
	4-Bromophenyl-phenyle	370.00	UG/KG	U
	4-Chloro-3-methylphen	370.00	UG/KG	U
	4-Chloroaniline	370.00	UG/KG	U
	4-Chlorophenyl-phenyl	370.00	UG/KG	U
	4-Methylphenol	370.00	UG/KG	U
	4-Nitroaniline	890.00	UG/KG	U
	4-Nitrophenol	890.00	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	370.00	UG/KG	U
	Acenaphthylene	370.00	UG/KG	U
	Anthracene	370.00	UG/KG	U
	Benzene, methyl-	110.00	UG/KG	R - B
	Benzo(a)anthracene	140.00	UG/KG	J - 1 (+)
	Benzo(a)pyrene	140.00	UG/KG	J - 1 (+)
	Benzo(b)fluoranthene	160.00	UG/KG	J - 1 (+)
	Benzo(g,h,i)perylene	370.00	UG/KG	U
	Benzo(k)fluoranthene	110.00	UG/KG	J - 1 (+)
	bis(2-Chloroethoxy)me	370.00	UG/KG	U
	bis(2-Chloroethyl)eth	370.00	UG/KG	U
	bis(2-Ethylhexyl)phth	290.00	UG/KG	J - 1 (+)
	Butylbenzylphthalate	370.00	UG/KG	U
	Carbazole	370.00	UG/KG	U
	Chrysene	130.00	UG/KG	J - 1 (+)
	Di-n-butylphthalate	370.00	UG/KG	U
	Di-n-octylphthalate	370.00	UG/KG	U
	Dibenzo(a,h)anthracen	370.00	UG/KG	U
	Dibenzofuran	370.00	UG/KG	U
	Diethylphthalate	370.00	UG/KG	U
	Dimethylphthalate	370.00	UG/KG	U
	Ethanone, 1-PHENYL-	110.00	UG/KG	R - B
	Fluoranthene	230.00	UG/KG	J
	Fluorene	370.00	UG/KG	U
	Hexachlorobenzene	370.00	UG/KG	U
	Hexachlorobutadiene	370.00	UG/KG	U
	Hexachlorocyclopentad	370.00	UG/KG	U
	Hexachloroethane	370.00	UG/KG	U
	Indeno(1,2,3-c,d)pyre	370.00	UG/KG	U
	Isophorone	370.00	UG/KG	U
	N-Nitroso-di-n-propyl	370.00	UG/KG	U
	N-Nitrosodiphenylamin	370.00	UG/KG	U
	Naphthalene	370.00	UG/KG	U
	Nitrobenzene	370.00	UG/KG	U
	Pentachlorophenol	890.00	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Phenanthrene	170.00	UG/KG	J
	Phenol	370.00	UG/KG	U
	Pyrene	450.00	UG/KG	J - 1 (+)
	Unknown Carboxylic Acid	190.00	UG/KG	R - B
	Unknown Ester Cabroxylic	110.00	UG/KG	R - B
	Unknown Ester Cabroxylic	74.00	UG/KG	R - B
	Unknown Ester Hexanedioic	110.00	UG/KG	R - B
	Unknown Phthalate Est	480.00	UG/KG	R - B
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	R - C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	18	UG/KG	
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	UJ - C
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	71	UG/KG	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0301	597563.00900	1497115.92270	876.17000
Depth: 5.0 TO 7.0 FT	MND15-1103-0005			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0301

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0302	597563.00900	1497115.92270	876.17000
Depth: 7.0 TO 10.0 FT	MND15-1103-0010			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	0.02	PCI/G	J
	H-3	0.13	PCI/G	J
	Ra-226	1.7	PCI/G	
	Bi-207	-0.040	PCI/G	UJ
	Bi-210	-0.040	PCI/G	UJ
	Co-60	0.080	PCI/G	
	Cs-137	-0.050	PCI/G	UJ
	Pu-238	0.54	PCI/G	
	Pu-239/240	-0.009	PCI/G	UJ
	Th-227	0.140	PCI/G	
	Th-228	0.90	PCI/G	
	Th-230	1.10	PCI/G	
	Th-232	0.91	PCI/G	
	U-234	0.77	PCI/G	
	U-235	0.026	PCI/G	J
	U-238	0.96	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0302

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0401	597558.31890	1497206.98710	879.53000
Depth: 3.0 TO 3.9 FT	MND15-0104-0003			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	0.10	PCI/G	
	H-3	0.24	PCI/G	J
	Ra-226	1.3	PCI/G	
	Bi-207	0.040	PCI/G	
	Bi-210	0.060	PCI/G	
	Co-60	-0.010	PCI/G	UJ
	Cs-137	0.010	PCI/G	J
	Pu-238	5.50	PCI/G	
	Pu-239/240	0.045	PCI/G	
	Th-227	0.150	PCI/G	
	Th-228	4.40	PCI/G	
	Th-230	1.20	PCI/G	
	Th-232	5.40	PCI/G	
	U-234	1.70	PCI/G	
	U-235	0.077	PCI/G	
	U-238	1.70	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0401

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	60	UG/G	J - C
	Sulfate	50	UG/G	UJ - C
	Nitrate/Nitrite (NO3/	2.1	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	2.2	MG/KG	U - B
	Cyanide	2.7	MG/KG	UJ - HC(-)
	Mercury	0.09	MG/KG	U
	Aluminum	659	MG/KG	
	Antimony	16.5	MG/KG	R - S
	Barium	8.0	MG/KG	J - I(+)
	Beryllium	0.53	MG/KG	U
	Bismuth	37.40	MG/KG	U
	Cadmium	2.1	MG/KG	U
	Calcium	309000	MG/KG	
	Chromium	3.2	MG/KG	UJ - S(-)
	Cobalt	3.7	MG/KG	U
	Copper	15.6	MG/KG	J - SI(+)
	Iron	7000	MG/KG	J - I(+)
	Lithium	1.60	MG/KG	U
	Magnesium	77600	MG/KG	
	Manganese	335	MG/KG	
	Molybdenu	3.70	MG/KG	U
	Nickel	10.1	MG/KG	UJ - SI(+)
	Potassium	318	MG/KG	
	Silver	2.1	MG/KG	R - S
	Sodium	194	MG/KG	
	Tin	19.20	MG/KG	U
	Vanadium	4.0	MG/KG	
	Zinc	7.6	MG/KG	
	Lead	3.6	MG/KG	J - S(+)
	Selenium	0.58	MG/KG	
	Thallium	.21	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.4	UG/KG	UJ
	4,4'-DDE	3.4	UG/KG	UJ
	4,4'-DDT	3.4	UG/KG	UJ

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.8	UG/KG	UJ
	alpha-BHC	1.8	UG/KG	UJ
	alpha-Chlordane	1.8	UG/KG	UJ
	Aroclor-1016	34	UG/KG	UJ
	Aroclor-1221	70	UG/KG	UJ
	Aroclor-1232	34	UG/KG	UJ
	Aroclor-1242	34	UG/KG	UJ
	Aroclor-1248	34	UG/KG	UJ
	Aroclor-1254	34	UG/KG	UJ
	Aroclor-1260	34	UG/KG	UJ
	beta-BHC	1.8	UG/KG	UJ
	delta-BHC	1.8	UG/KG	UJ
	Dieldrin	3.4	UG/KG	UJ
	Endosulfan I	1.8	UG/KG	UJ
	Endosulfan II	3.4	UG/KG	UJ
	Endosulfan sulfate	3.4	UG/KG	UJ
	Endrin	3.4	UG/KG	UJ
	Endrin Aldehyde	3.4	UG/KG	UJ
	Endrin Ketone	3.4	UG/KG	UJ
	gamma-BHC (Lindane)	1.8	UG/KG	UJ
	gamma-Chlordane	1.8	UG/KG	UJ
	Heptachlor	1.8	UG/KG	UJ
	Heptachlor epoxide	1.8	UG/KG	UJ
	Methoxychlor	18	UG/KG	UJ
	Toxaphene	180	UG/KG	UJ
RADIOLOGIC	Am-241	0.10	PCI/G	
	H-3	1.6	PCI/G	J
	Ra-226	0.40	PCI/G	J
	Bi-207	0.030	PCI/G	
	Bi-210	-0.090	PCI/G	UJ
	Co-60	-0.040	PCI/G	UJ
	Cs-137	0.020	PCI/G	J
	Pu-238	17.00	PCI/G	
	Pu-239/240	0.280	PCI/G	
	Th-227	0.045	PCI/G	J

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.14	PCI/G	
	Th-230	0.32	PCI/G	
	Th-232	0.12	PCI/G	
	U-234	0.22	PCI/G	
	U-235	-0.004	PCI/G	UJ
	U-238	0.09	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	340	UG/KG	U
	1,2-Dichlorobenzene	340	UG/KG	U
	1,3-Dichlorobenzene	340	UG/KG	U
	1,4-Dichlorobenzene	340	UG/KG	U
	2,2'-oxybis(1-Chlorop	340	UG/KG	U
	2,4,5-Trichlorophenol	840	UG/KG	U
	2,4,6-Trichlorophenol	340	UG/KG	U
	2,4-Dichlorophenol	340	UG/KG	U
	2,4-Dimethylphenol	340	UG/KG	U
	2,4-Dinitrophenol	840	UG/KG	U
	2,4-Dinitrotoluene	340	UG/KG	U
	2,6-Dinitrotoluene	340	UG/KG	U
	2-Chloronaphthalene	340	UG/KG	U
	2-Chlorophenol	340	UG/KG	U
	2-Methylnaphthalene	340	UG/KG	U
	2-Methylphenol	340	UG/KG	U
	2-Nitroaniline	840	UG/KG	U
	2-Nitrophenol	340	UG/KG	U
	2-Pentanone, 4-Hydrox	1100	UG/KG	R
	3,3'-Dichlorobenzidin	340	UG/KG	U
	3-Nitroaniline	840	UG/KG	U
	4,6-Dinitro-2-methylp	840	UG/KG	U
	4-Bromophenyl-phenyle	340	UG/KG	U
	4-Chloro-3-methylphen	340	UG/KG	U
	4-Chloroaniline	340	UG/KG	U
	4-Chlorophenyl-phenyl	340	UG/KG	U
	4-Methylphenol	340	UG/KG	U
	4-Nitroaniline	840	UG/KG	U
	4-Nitrophenol	840	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	340	UG/KG	U
	Acenaphthylene	340	UG/KG	U
	Anthracene	340	UG/KG	U
	Benzene, methyl-	100	UG/KG	R
	Benzo(a)anthracene	85	UG/KG	J
	Benzo(a)pyrene	76	UG/KG	J
	Benzo(b)fluoranthene	90	UG/KG	J
	Benzo(g,h,i)perylene	58	UG/KG	J
	Benzo(k)fluoranthene	96	UG/KG	J
	bis(2-Chloroethoxy)me	340	UG/KG	U
	bis(2-Chloroethyl)eth	340	UG/KG	U
	bis(2-Ethylhexyl)phth	45	UG/KG	J
	Butylbenzylphthalate	340	UG/KG	U
	Chrysene	93	UG/KG	J
	Di-n-butylphthalate	110	UG/KG	U
	Di-n-octylphthalate	340	UG/KG	U
	Dibenzo(a,h)anthracen	340	UG/KG	U
	Dibenzofuran	340	UG/KG	U
	Diethylphthalate	340	UG/KG	U
	Dimethylphthalate	340	UG/KG	U
	Ethanone, 1-PHENYL-	70	UG/KG	R
	Fluoranthene	170	UG/KG	J
	Fluorene	340	UG/KG	U
	Hexachlorobenzene	340	UG/KG	U
	Hexachlorobutadiene	340	UG/KG	UJ
	Hexachlorocyclopentad	340	UG/KG	U
	Hexachloroethane	340	UG/KG	U
	Indeno(1,2,3-c,d)pyre	52	UG/KG	J
	Isophorone	340	UG/KG	U
	N-Nitroso-di-n-propyl	340	UG/KG	U
	N-Nitrosodiphenylamin	340	UG/KG	U
	Naphthalene	340	UG/KG	U
	Nitrobenzene	340	UG/KG	U
	Pentachlorophenol	840	UG/KG	U
	Phenanthrene	130	UG/KG	J

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Phenol	340	UG/KG	U
	Pyrene	260	UG/KG	J
	Unknown	70	UG/KG	JN
	Unknown	100	UG/KG	JN
	Unknown Carboxylic Acid	210	UG/KG	R
	Unknown Ester Cabroxylic	100	UG/KG	R
	Unknown Ester Hexanedioic	100	UG/KG	R
	Unknown Ester Cabroxylic	490	UG/KG	R
	Carbazole	340	UG/KG	U
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	11	UG/KG	U
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0501	597556.15590	1497204.90920	879.39000
Depth: 0.5 TO 2.0 FT	MND15-0105-0001			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Methylene Chloride	11	UG/KG	U B
	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0501

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	120	UG/G	J - C
	Sulfate	50	UG/G	UJ - C
	Nitrate/Nitrite (NO3/	4.2	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	2.7	MG/KG	UJ - BI(+)
	Cyanide	2.9	MG/KG	UJ - HC(-)
	Mercury	0.11	MG/KG	U
	Aluminum	1990	MG/KG	
	Antimony	17.8	MG/KG	R - S
	Barium	16.6	MG/KG	
	Beryllium	0.57	MG/KG	U
	Bismuth	40.10	MG/KG	U
	Cadmium	2.3	MG/KG	U
	Calcium	267000	MG/KG	
	Chromium	3.9	MG/KG	UJ - BS(-)
	Cobalt	4.0	MG/KG	U
	Copper	5.2	MG/KG	J - S(+)
	Iron	7860	MG/KG	J - I(+)
	Lithium	3.10	MG/KG	
	Magnesium	51900	MG/KG	
	Manganese	275	MG/KG	
	Molybdenu	4.00	MG/KG	U
	Nickel	10.9	MG/KG	UJ - S(-)
	Potassium	432	MG/KG	
	Silver	2.3	MG/KG	R - S
	Sodium	157	MG/KG	
	Tin	20.60	MG/KG	U
	Vanadium	5.9	MG/KG	
	Zinc	20.7	MG/KG	
	Lead	39.5	MG/KG	J - S(+)
	Selenium	0.95	MG/KG	J - I(+)
	Thallium	0.23	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.6	UG/KG	UJ
	4,4'-DDE	3.6	UG/KG	UJ
	4,4'-DDT	3.6	UG/KG	UJ

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.9	UG/KG	UJ
	alpha-BHC	1.9	UG/KG	UJ
	alpha-Chlordane	1.9	UG/KG	UJ
	Aroclor-1016	36	UG/KG	UJ
	Aroclor-1221	73	UG/KG	UJ
	Aroclor-1232	36	UG/KG	UJ
	Aroclor-1242	36	UG/KG	UJ
	Aroclor-1248	36	UG/KG	UJ
	Aroclor-1254	36	UG/KG	UJ
	Aroclor-1260	36	UG/KG	UJ
	beta-BHC	1.9	UG/KG	UJ
	delta-BHC	1.9	UG/KG	UJ
	Dieldrin	3.6	UG/KG	UJ
	Endosulfan I	1.9	UG/KG	UJ
	Endosulfan II	3.6	UG/KG	UJ
	Endosulfan sulfate	3.6	UG/KG	UJ
	Endrin	3.6	UG/KG	UJ
	Endrin Aldehyde	3.6	UG/KG	UJ
	Endrin Ketone	3.6	UG/KG	UJ
	gamma-BHC (Lindane)	1.9	UG/KG	UJ
	gamma-Chlordane	1.9	UG/KG	UJ
	Heptachlor	1.8	UG/KG	UJ
	Heptachlor epoxide	1.8	UG/KG	UJ
	Methoxychlor	19	UG/KG	UJ
	Toxaphene	190	UG/KG	UJ
RADIOLOGIC	Am-241	0.10	PCI/G	
	H-3	2.2	PCI/G	J
	Ra-226	0.86	PCI/G	
	Bi-207	0.020	PCI/G	
	Bi-210	-0.090	PCI/G	UJ
	Co-60	0.010	PCI/G	J
	Cs-137	0.00	PCI/G	J
	Pu-238	17.00	PCI/G	
	Pu-239/240	0.200	PCI/G	
	Th-227	0.044	PCI/G	J

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	1.40	PCI/G	
	Th-230	0.80	PCI/G	
	Th-232	1.60	PCI/G	
	U-234	0.54	PCI/G	
	U-235	0.033	PCI/G	J
	U-238	0.58	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	360	UG/KG	U
	1,2-Dichlorobenzene	360	UG/KG	U
	1,3-Dichlorobenzene	360	UG/KG	U
	1,4-Dichlorobenzene	360	UG/KG	U
	2,2'-oxybis(1-Chlorop	360	UG/KG	U
	2,4,5-Trichlorophenol	870	UG/KG	U
	2,4,6-Trichlorophenol	360	UG/KG	U
	2,4-Dichlorophenol	360	UG/KG	U
	2,4-Dimethylphenol	360	UG/KG	U
	2,4-Dinitrophenol	870	UG/KG	U
	2,4-Dinitrotoluene	360	UG/KG	U
	2,6-Dinitrotoluene	360	UG/KG	U
	2-Chloronaphthalene	360	UG/KG	U
	2-Chlorophenol	360	UG/KG	U
	2-Methylnaphthalene	360	UG/KG	U
	2-Methylphenol	360	UG/KG	U
	2-Nitroaniline	870	UG/KG	U
	2-Nitrophenol	360	UG/KG	U
	2-Pentanone, 4-Hydrox	1200	UG/KG	R
	3,3'-Dichlorobenzidin	360	UG/KG	J I
	3-Nitroaniline	870	UG/KG	U
	4,6-Dinitro-2-methylp	870	UG/KG	U
	4-Bromophenyl-phenyle	360	UG/KG	U
	4-Chloro-3-methylphen	360	UG/KG	U
	4-Chloroaniline	360	UG/KG	U
	4-Chlorophenyl-phenyl	360	UG/KG	U
	4-Methylphenol	360	UG/KG	U
	4-Nitroaniline	870	UG/KG	U
	4-Nitrophenol	870	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	360	UG/KG	U
	Acenaphthylene	96	UG/KG	J
	Anthracene	360	UG/KG	U
	Benzo(a)anthracene	290	UG/KG	J I
	Benzo(a)pyrene	430	UG/KG	J I
	Benzo(b)fluoranthene	400	UG/KG	J I
	Benzo(g,h,i)perylene	300	UG/KG	J I
	Benzo(k)fluoranthene	430	UG/KG	J I
	bis(2-Chloroethoxy)me	360	UG/KG	U
	bis(2-Chloroethyl)eth	360	UG/KG	U
	bis(2-Ethylhexyl)phth	360	UG/KG	UJ I
	Butylbenzylphthalate	360	UG/KG	UJ I
	Carbazole	360	UG/KG	U B
	Chrysene	280	UG/KG	J I
	Di-n-butylphthalate	360	UG/KG	J
	Di-n-octylphthalate	360	UG/KG	UJ I
	Dibenzo(a,h)anthracen	360	UG/KG	UJ I
	Dibenzofuran	360	UG/KG	U
	Diethylphthalate	360	UG/KG	U
	Dimethylphthalate	360	UG/KG	U
	Ethanone, 1-PHENYL-	110	UG/KG	R
	Fluoranthene	220	UG/KG	J I
	Fluorene	360	UG/KG	U
	Hexachlorobenzene	360	UG/KG	U
	Hexachlorobutadiene	360	UG/KG	U
	Hexachlorocyclopentad	360	UG/KG	U
	Hexachloroethane	360	UG/KG	U
	Indeno(1,2,3-c,d)pyre	260	UG/KG	R +
	Isophorone	360	UG/KG	U
	N-Nitroso-di-n-propyl	360	UG/KG	U
	N-Nitrosodiphenylamin	360	UG/KG	U
	Naphthalene	360	UG/KG	U
	Nitrobenzene	360	UG/KG	U
	Pentachlorophenol	870	UG/KG	U
	Phenanthrene	360	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Phenol	360	UG/KG	U
	Pyrene	570	UG/KG	UJ I
	Unknown	73	UG/KG	JN
	Unknown Alkane	150	UG/KG	JN
	Unknown Alkane	150	UG/KG	JN
	Unknown Carboxylic Acid	180	UG/KG	R
	Unknown Ester Cabroxylic	73	UG/KG	R
	Unknown Ester Cabroxylic	73	UG/KG	R
	Unknown Phthalate Est	580	UG/KG	R
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	26	UG/KG	
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0502	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-0003			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Methylene Chloride	24	UG/KG	U B
	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0502

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	160	UG/G	J - C
	Sulfate	50	UG/G	UJ - C
	Nitrate/Nitrite (NO3/	4.1	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	3.6	MG/KG	
	Cyanide	2.9	MG/KG	UJ - HC(-)
	Mercury	0.10	MG/KG	U
	Aluminum	2730	MG/KG	
	Antimony	17.7	MG/KG	R - S
	Barium	23.8	MG/KG	
	Beryllium	0.57	MG/KG	U
	Bismuth	40.00	MG/KG	U
	Cadmium	2.3	MG/KG	U
	Calcium	225000	MG/KG	
	Chromium	5.1	MG/KG	UJ - BS(-)
	Cobalt	4.0	MG/KG	U
	Copper	4.4	MG/KG	J - S(+)
	Iron	7840	MG/KG	J - S(+)
	Lithium	4.10	MG/KG	
	Magnesium	48700	MG/KG	
	Manganese	281	MG/KG	
	Molybdenu	4.00	MG/KG	U
	Nickel	10.9	MG/KG	UJ - S(-)
	Potassium	634	MG/KG	
	Silver	2.3	MG/KG	R - S
	Sodium	149	MG/KG	
	Tin	20.60	MG/KG	U
	Vanadium	5.0	MG/KG	
	Zinc	29.0	MG/KG	
	Lead	53.7	MG/KG	J - S(+)
	Selenium	0.89	MG/KG	
	Thallium	0.23	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.6	UG/KG	UJ
	4,4'-DDE	3.6	UG/KG	UJ
	4,4'-DDT	3.6	UG/KG	UJ

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.9	UG/KG	UJ
	alpha-BHC	1.9	UG/KG	UJ
	alpha-Chlordane	1.9	UG/KG	UJ
	Aroclor-1016	36	UG/KG	UJ
	Aroclor-1221	74	UG/KG	UJ
	Aroclor-1232	36	UG/KG	UJ
	Aroclor-1242	36	UG/KG	UJ
	Aroclor-1248	36	UG/KG	UJ
	Aroclor-1254	36	UG/KG	UJ
	Aroclor-1260	36	UG/KG	UJ
	beta-BHC	1.9	UG/KG	UJ
	delta-BHC	1.9	UG/KG	UJ
	Dieldrin	3.6	UG/KG	UJ
	Endosulfan I	1.9	UG/KG	UJ
	Endosulfan II	3.6	UG/KG	UJ
	Endosulfan sulfate	3.6	UG/KG	UJ
	Endrin	3.6	UG/KG	UJ
	Endrin Aldehyde	3.6	UG/KG	UJ
	Endrin Ketone	3.6	UG/KG	UJ
	gamma-BHC (Lindane)	1.9	UG/KG	UJ
	gamma-Chlordane	1.9	UG/KG	UJ
	Heptachlor	1.9	UG/KG	UJ
	Heptachlor epoxide	1.9	UG/KG	UJ
	Methoxychlor	19	UG/KG	UJ
	Toxaphene	190	UG/KG	UJ
RADIOLOGIC	Am-241	0.14	PCI/G	
	H-3	2.8	PCI/G	J
	Ra-226	0.92	PCI/G	
	Bi-207	0.050	PCI/G	
	Bi-210	-0.080	PCI/G	UJ
	Co-60	-0.10	PCI/G	UJ
	Cs-137	-0.030	PCI/G	UJ
	Pu-238	21.00	PCI/G	
	Pu-239/240	0.180	PCI/G	
	Th-227	0.077	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	1.40	PCI/G	
	Th-230	0.82	PCI/G	
	Th-232	1.30	PCI/G	
	U-234	0.60	PCI/G	
	U-235	0.022	PCI/G	J
	U-238	0.45	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	360	UG/KG	U
	1,2-Dichlorobenzene	360	UG/KG	U
	1,3-Dichlorobenzene	360	UG/KG	U
	1,4-Dichlorobenzene	360	UG/KG	U
	2,2'-oxybis(1-Chlorop	360	UG/KG	U
	2,4,5-Trichlorophenol	870	UG/KG	U
	2,4,6-Trichlorophenol	360	UG/KG	U
	2,4-Dichlorophenol	360	UG/KG	U
	2,4-Dimethylphenol	360	UG/KG	U
	2,4-Dinitrophenol	870	UG/KG	U
	2,4-Dinitrotoluene	360	UG/KG	U
	2,6-Dinitrotoluene	360	UG/KG	U
	2-Chloronaphthalene	360	UG/KG	U
	2-Chlorophenol	360	UG/KG	U
	2-Methylnaphthalene	360	UG/KG	U
	2-Methylphenol	360	UG/KG	U
	2-Nitroaniline	870	UG/KG	U
	2-Nitrophenol	360	UG/KG	U
	2-Pentanone, 4-Hydrox	470	UG/KG	R
	3,3'-Dichlorobenzidin	360	UG/KG	U
	3-Nitroaniline	870	UG/KG	U
	4,6-Dinitro-2-methylp	870	UG/KG	U
	4-Bromophenyl-phenyle	360	UG/KG	U
	4-Chloro-3-methylphen	360	UG/KG	U
	4-Chloroaniline	360	UG/KG	U
	4-Chlorophenyl-phenyl	360	UG/KG	U
	4-Methylphenol	360	UG/KG	U
	4-Nitroaniline	870	UG/KG	U
	4-Nitrophenol	870	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	360	UG/KG	U
	Acenaphthylene	87	UG/KG	J
	Anthracene	360	UG/KG	U
	Benzo(a)anthracene	290	UG/KG	J
	Benzo(a)pyrene	400	UG/KG	J I
	Benzo(b)fluoranthene	410	UG/KG	J I
	Benzo(g,h,i)perylene	280	UG/KG	J I
	Benzo(k)fluoranthene	350	UG/KG	UJ I
	bis(2-Chloroethoxy)me	360	UG/KG	U
	bis(2-Chloroethyl)eth	360	UG/KG	U
	bis(2-Ethylhexyl)phth	360	UG/KG	U
	Butylbenzylphthalate	360	UG/KG	U
	Carbazole	360	UG/KG	U
	Chrysene	260	UG/KG	J
	Di-n-butylphthalate	360	UG/KG	U B
	Di-n-octylphthalate	360	UG/KG	UJ I
	Dibenzo(a,h)anthracen	360	UG/KG	UJ I
	Dibenzofuran	360	UG/KG	U
	Diethylphthalate	360	UG/KG	U
	Dimethylphthalate	360	UG/KG	U
	Ethanone, 1-PHENYL-	110	UG/KG	R
	Fluoranthene	230	UG/KG	J
	Fluorene	360	UG/KG	U
	Hexachlorobenzene	360	UG/KG	U
	Hexachlorobutadiene	360	UG/KG	U
	Hexachlorocyclopentad	360	UG/KG	U
	Hexachloroethane	360	UG/KG	U
	Indeno(1,2,3-c,d)pyre	260	UG/KG	R +
	Isophorone	360	UG/KG	U
	N-Nitroso-di-n-propyl	360	UG/KG	U
	N-Nitrosodiphenylamin	360	UG/KG	U
	Naphthalene	360	UG/KG	U
	Nitrobenzene	360	UG/KG	U
	Pentachlorophenol	870	UG/KG	U
	Phenanthrene	48	UG/KG	J

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Phenol	360	UG/KG	U
	Pyrene	540	UG/KG	
	Unknown Carboxylic Acid	140	UG/KG	JN
	Unknown Ester Cabroxylic	72	UG/KG	R
	Unknown Ester Hexanedioic	72	UG/KG	R
	Unknown Hydrocarbon	110	UG/KG	JN
	Unknown Hydrocarbon	110	UG/KG	JN
	Unknown Phthalate Est	470	UG/KG	R
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	26	UG/KG	
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	24	UG/KG	U B

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0503	597556.15590	1497204.90920	879.39000
Depth: 2.2 TO 3.8 FT	MND15-0105-1003			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0503

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0601	597558.08940	1497200.73640	879.04000
Depth: 3.0 TO 3.9 FT	MND15-0106-0003			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	0.06	PCI/G	
	H-3	2.4	PCI/G	J
	Ra-226	0.48	PCI/G	J
	Bi-207	0.050	PCI/G	
	Bi-210	-0.020	PCI/G	UJ
	Co-60	-0.020	PCI/G	UJ
	Cs-137	0.060	PCI/G	
	Pu-238	5.70	PCI/G	
	Pu-239/240	0.460	PCI/G	
	Th-227	0.120	PCI/G	
	Th-228	0.63	PCI/G	
	Th-230	0.94	PCI/G	
	Th-232	0.57	PCI/G	
	U-234	0.55	PCI/G	
	U-235	0.013	PCI/G	J
	U-238	0.59	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0601

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	140	UG/G	J - C
	Sulfate	100	UG/G	J - C
	Nitrate/Nitrite (NO3/	1.9	UG/G	
	Fluoride	3.0	UG/G	
INORGANIC	Arsenic	4.9	MG/KG	
	Cyanide	2.7	MG/KG	UJ - HC(-)
	Mercury	0.10	MG/KG	U
	Aluminum	827	MG/KG	
	Antimony	16.5	MG/KG	R - S
	Barium	6.9	MG/KG	
	Beryllium	0.53	MG/KG	U
	Bismuth	37.30	MG/KG	U
	Cadmium	2.0	MG/KG	U
	Calcium	235000	MG/KG	
	Chromium	8.4	MG/KG	UJ - BS(-)
	Cobalt	3.7	MG/KG	U
	Copper	1.3	MG/KG	J - S(+)
	Iron	6220	MG/KG	J - I(+)
	Lithium	1.60	MG/KG	U
	Magnesium	127000	MG/KG	
	Manganese	310	MG/KG	
	Molybdenu	3.70	MG/KG	U
	Nickel	10.1	MG/KG	UJ - S(-)
	Potassium	383	MG/KG	
	Silver	2.1	MG/KG	R - S
	Sodium	316	MG/KG	
	Tin	19.20	MG/KG	U
	Vanadium	6.0	MG/KG	
	Zinc	4.9	MG/KG	
	Lead	6.3	MG/KG	J - S(+)
	Selenium	0.51	MG/KG	
	Thallium	0.21	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.5	UG/KG	UJ - K
	4,4'-DDE	3.5	UG/KG	UJ - K
	4,4'-DDT	3.5	UG/KG	UJ - C,K

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.8	UG/KG	UJ - K
	alpha-BHC	1.8	UG/KG	UJ - K
	alpha-Chlordane	1.8	UG/KG	UJ - K
	Aroclor-1016	35	UG/KG	UJ - K
	Aroclor-1221	70	UG/KG	UJ - K
	Aroclor-1232	35	UG/KG	UJ - K
	Aroclor-1242	35	UG/KG	UJ - K
	Aroclor-1248	35	UG/KG	UJ - K
	Aroclor-1254	35	UG/KG	UJ - K
	Aroclor-1260	35	UG/KG	UJ - K
	beta-BHC	1.8	UG/KG	UJ - K
	delta-BHC	1.8	UG/KG	UJ - K
	Dieldrin	3.5	UG/KG	UJ - K
	Endosulfan I	1.8	UG/KG	UJ - K
	Endosulfan II	3.5	UG/KG	UJ - K
	Endosulfan sulfate	3.5	UG/KG	UJ - K
	Endrin	3.5	UG/KG	UJ - K
	Endrin Aldehyde	3.5	UG/KG	UJ - K
	Endrin Ketone	3.5	UG/KG	UJ - C,K
	gamma-BHC (Lindane)	1.8	UG/KG	UJ - K
	gamma-Chlordane	1.8	UG/KG	UJ - K
	Heptachlor	1.8	UG/KG	UJ - K
	Heptachlor epoxide	1.8	UG/KG	UJ - K
	Methoxychlor	18	UG/KG	UJ - C,K
	Toxaphene	180	UG/KG	UJ - K
RADIOLOGIC	Am-241	-0.17	PCI/G	UJ
	H-3	3.0	PCI/G	J
	Ra-226	0.60	PCI/G	
	Bi-207	0.015	PCI/G	
	Bi-210	-0.020	PCI/G	UJ
	Co-60	0.030	PCI/G	J
	Cs-137	0.020	PCI/G	J
	Pu-238	0.54	PCI/G	
	Pu-239/240	0.004	PCI/G	J
	Th-227	0.160	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.29	PCI/G	
	Th-230	0.60	PCI/G	
	Th-232	0.23	PCI/G	
	U-234	0.36	PCI/G	
	U-235	0.004	PCI/G	J
	U-238	0.36	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	350	UG/KG	UJ C
	1,2-Dichlorobenzene	350	UG/KG	UJ - K
	1,3-Dichlorobenzene	350	UG/KG	UJ - K
	1,4-Dichlorobenzene	350	UG/KG	UJ - K
	2,2'-oxybis(1-Chlorop	350	UG/KG	UJ - K
	2,4,5-Trichlorophenol	850	UG/KG	U
	2,4,6-Trichlorophenol	350	UG/KG	UJ C
	2,4-Dichlorophenol	350	UG/KG	U
	2,4-Dimethylphenol	350	UG/KG	U
	2,4-Dinitrophenol	850	UG/KG	U
	2,4-Dinitrotoluene	350	UG/KG	U
	2,6-Dinitrotoluene	350	UG/KG	U
	2-Chloronaphthalene	350	UG/KG	U
	2-Chlorophenol	350	UG/KG	UJ - K
	2-Methylnaphthalene	350	UG/KG	U
	2-Methylphenol	350	UG/KG	UJ - K
	2-Nitroaniline	850	UG/KG	U
	2-Nitrophenol	350	UG/KG	U
	2-Pentanone, 4-Hydrox	250	UG/KG	U - B
	3,3'-Dichlorobenzidin	350	UG/KG	UJ - I
	3-Nitroaniline	850	UG/KG	U
	4,6-Dinitro-2-methylp	850	UG/KG	U
	4-Bromophenyl-phenyle	350	UG/KG	U
	4-Chloro-3-methylphen	350	UG/KG	U
	4-Chloroaniline	350	UG/KG	U
	4-Chlorophenyl-phenyl	350	UG/KG	U
	4-Methylphenol	350	UG/KG	UJ - K
	4-Nitroaniline	850	UG/KG	U
	4-Nitrophenol	850	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	350	UG/KG	U
	Acenaphthylene	350	UG/KG	U
	Anthracene	350	UG/KG	U
	Benzo(a)anthracene	350	UG/KG	UJ - I
	Benzo(a)pyrene	350	UG/KG	UJ - I
	Benzo(b)fluoranthene	350	UG/KG	UJ - I
	Benzo(g,h,i)perylene	350	UG/KG	UJ - I
	Benzo(k)fluoranthene	350	UG/KG	UJ - I
	bis(2-Chloroethoxy)me	350	UG/KG	U
	bis(2-Chloroethyl)eth	350	UG/KG	UJ - K
	bis(2-Ethylhexyl)phth	350	UG/KG	UJ - I
	Butylbenzylphthalate	350	UG/KG	UJ - I
	Chrysene	350	UG/KG	UJ - I
	Di-n-butylphthalate	350	UG/KG	U B
	Di-n-octylphthalate	350	UG/KG	UJ - I
	Dibenzo(a,h)anthracen	350	UG/KG	UJ - I
	Dibenzofuran	350	UG/KG	U
	Diethylphthalate	350	UG/KG	U
	Dimethylphthalate	350	UG/KG	U
	Fluoranthene	350	UG/KG	
	Fluorene	350	UG/KG	U
	Hexachlorobenzene	350	UG/KG	U
	Hexachlorobutadiene	350	UG/KG	UJ C
	Hexachlorocyclopentad	350	UG/KG	U
	Hexachloroethane	350	UG/KG	UJ - K
	Indeno(1,2,3-c,d)pyre	350	UG/KG	UJ - I
	Isophorone	350	UG/KG	U
	N-Nitroso-di-n-propyl	350	UG/KG	UJ - K
	N-Nitrosodiphenylamin	350	UG/KG	U
	Naphthalene	350	UG/KG	U
	Nitrobenzene	350	UG/KG	U
	Pentachlorophenol	850	UG/KG	U
	Phenanthrene	350	UG/KG	U
	Phenol	350	UG/KG	UJ - K
	Pyrene	38	UG/KG	R - +

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Unknown	110	UG/KG	U - B
	Unknown Carboxylic Acid	180	UG/KG	U - B
	Unknown Ester Cabroxylic	71	UG/KG	U - B
	Unknown Ester Hexanedioic	210	UG/KG	U - B
	Unknown Phthalate Est	490	UG/KG	U - B
	Carbazole	350	UG/KG	U
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	11	UG/KG	U
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	12	UG/KG	U B
	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0701	597558.17290	1497186.59210	878.74000
Depth: 1.0 TO 3.0 FT	MND15-0307-0001			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0701

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0702	597558.17290	1497186.59210	878.74000
Depth: 3.0 TO 4.0 FT	MND15-0307-0003			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	-0.24	PCI/G	UJ
	H-3	2.8	PCI/G	J
	Ra-226	0.90	PCI/G	
	Bi-207	0.015	PCI/G	
	Bi-210	-0.010	PCI/G	UJ
	Co-60	0.040	PCI/G	J
	Cs-137	-0.030	PCI/G	UJ
	Pu-238	0.28	PCI/G	
	Pu-239/240	0.018	PCI/G	J
	Th-227	0.120	PCI/G	
	Th-228	0.30	PCI/G	
	Th-230	0.94	PCI/G	
	Th-232	0.28	PCI/G	
	U-234	0.65	PCI/G	
	U-235	0.022	PCI/G	J
	U-238	0.79	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0702

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	160	UG/G	J - C
	Sulfate	60	UG/G	UJ - C
	Nitrate/Nitrite (NO3/	3.9	UG/G	
	Fluoride	6.2	UG/G	
INORGANIC	Arsenic	2.4	MG/KG	U - B
	Cyanide	2.9	MG/KG	UJ - HC(-)
	Mercury	0.11	MG/KG	U
	Aluminum	2170	MG/KG	
	Antimony	1708	MG/KG	R - S
	Barium	18.9	MG/KG	
	Beryllium	0.57	MG/KG	U
	Bismuth	40.10	MG/KG	U
	Cadmium	2.3	MG/KG	U
	Calcium	231000	MG/KG	
	Chromium	3.4	MG/KG	UJ - S(-)
	Cobalt	4.0	MG/KG	U
	Copper	3.6	MG/KG	J - S(+)
	Iron	5310	MG/KG	J - I(+)
	Lithium	4.90	MG/KG	
	Magnesium	88200	MG/KG	
	Manganese	192	MG/KG	
	Molybdenu	4.00	MG/KG	U
	Nickel	10.9	MG/KG	UJ - S(-)
	Potassium	702	MG/KG	
	Silver	2.3	MG/KG	R - S
	Sodium	486	MG/KG	
	Tin	20.60	MG/KG	U
	Vanadium	4.1	MG/KG	
	Zinc	14.8	MG/KG	
	Lead	6.5	MG/KG	U - B
	Selenium	0.66	MG/KG	
	Thallium	2.3	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.5	UG/KG	UJ - K
	4,4'-DDE	3.5	UG/KG	UJ - K
	4,4'-DDT	3.5	UG/KG	UJ - C,K

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.8	UG/KG	UJ - K
	alpha-BHC	1.8	UG/KG	UJ - K
	alpha-Chlordane	1.8	UG/KG	UJ - K
	Aroclor-1016	35	UG/KG	UJ - K
	Aroclor-1221	71	UG/KG	UJ - K
	Aroclor-1232	35	UG/KG	UJ - K
	Aroclor-1242	35	UG/KG	UJ - K
	Aroclor-1248	35	UG/KG	UJ - K
	Aroclor-1254	35	UG/KG	UJ - K
	Aroclor-1260	35	UG/KG	UJ - K
	beta-BHC	1.8	UG/KG	UJ - K
	delta-BHC	1.8	UG/KG	UJ - K
	Dieldrin	3.5	UG/KG	UJ - K
	Endosulfan I	1.8	UG/KG	UJ - K
	Endosulfan II	3.5	UG/KG	UJ - K
	Endosulfan sulfate	3.5	UG/KG	UJ - K
	Endrin	3.5	UG/KG	UJ - K
	Endrin Aldehyde	3.5	UG/KG	UJ - K
	Endrin Ketone	3.5	UG/KG	UJ - C,K
	gamma-BHC (Lindane)	1.8	UG/KG	UJ - K
	gamma-Chlordane	1.8	UG/KG	UJ - K
	Heptachlor	1.8	UG/KG	UJ - K
	Heptachlor epoxide	1.8	UG/KG	UJ - K
	Methoxychlor	18	UG/KG	UJ - C,K
	Toxaphene	180	UG/KG	UJ - K
RADIOLOGIC	Am-241	-0.19	PCI/G	UJ
	H-3	4.1	PCI/G	J
	Ra-226	1.0	PCI/G	
	Bi-207	-0.10	PCI/G	UJ
	Bi-210	-0.010	PCI/G	UJ
	Co-60	0.020	PCI/G	J
	Cs-137	-0.030	PCI/G	UJ
	Pu-238	0.14	PCI/G	J
	Pu-239/240	0.000	PCI/G	
	Th-227	0.077	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.65	PCI/G	
	Th-230	1.10	PCI/G	
	Th-232	0.54	PCI/G	
	U-234	0.72	PCI/G	
	U-235	0.031	PCI/G	J
	U-238	0.81	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	350	UG/KG	UJ C
	1,2-Dichlorobenzene	350	UG/KG	UJ K
	1,3-Dichlorobenzene	350	UG/KG	UJ K
	1,4-Dichlorobenzene	350	UG/KG	UJ K
	2,2'-oxybis(1-Chlorop	350	UG/KG	UJ K
	2,4,5-Trichlorophenol	850	UG/KG	U
	2,4,6-Trichlorophenol	350	UG/KG	UJ C
	2,4-Dichlorophenol	350	UG/KG	U
	2,4-Dimethylphenol	350	UG/KG	U
	2,4-Dinitrophenol	850	UG/KG	U
	2,4-Dinitrotoluene	350	UG/KG	U
	2,6-Dinitrotoluene	350	UG/KG	U
	2-Chloronaphthalene	350	UG/KG	U
	2-Chlorophenol	350	UG/KG	UJ K
	2-Methylnaphthalene	350	UG/KG	U
	2-Methylphenol	350	UG/KG	UJ K
	2-Nitroaniline	850	UG/KG	U
	2-Nitrophenol	350	UG/KG	U
	2-Pentanone, 4-Hydrox	4600	UG/KG	U - B
	3,3'-Dichlorobenzidin	350	UG/KG	UJ I
	3-Nitroaniline	850	UG/KG	U
	4,6-Dinitro-2-methylp	850	UG/KG	U
	4-Bromophenyl-phenyle	350	UG/KG	U
	4-Chloro-3-methylphen	350	UG/KG	U
	4-Chloroaniline	350	UG/KG	U
	4-Chlorophenyl-phenyl	350	UG/KG	U
	4-Methylphenol	350	UG/KG	UJ K
	4-Nitroaniline	850	UG/KG	U
	4-Nitrophenol	850	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	350	UG/KG	U
	Acenaphthylene	350	UG/KG	U
	Anthracene	350	UG/KG	U
	Benzo(a)anthracene	350	UG/KG	UJ I
	Benzo(a)pyrene	350	UG/KG	UJ I
	Benzo(b)fluoranthene	350	UG/KG	UJ I
	Benzo(g,h,i)perylene	350	UG/KG	UJ I
	Benzo(k)fluoranthene	350	UG/KG	UJ I
	bis(2-Chloroethoxy)me	350	UG/KG	U
	bis(2-Chloroethyl)eth	350	UG/KG	UJ K
	bis(2-Ethylhexyl)phth	73	UG/KG	UJ I
	Butylbenzylphthalate	350	UG/KG	UJ I
	Carbazole	350	UG/KG	U
	Chrysene	350	UG/KG	UJ I
	Di-n-butylphthalate	350	UG/KG	U B
	Di-n-octylphthalate	350	UG/KG	UJ I
	Dibenzo(a,h)anthracen	350	UG/KG	UJ I
	Dibenzofuran	350	UG/KG	U
	Diethylphthalate	350	UG/KG	U
	Dimethylphthalate	350	UG/KG	U
	Fluoranthene	350	UG/KG	U
	Fluorene	350	UG/KG	U
	Hexachlorobenzene	350	UG/KG	U
	Hexachlorobutadiene	350	UG/KG	UJ C
	Hexachlorocyclopentad	350	UG/KG	U
	Hexachloroethane	350	UG/KG	U
	Indeno(1,2,3-c,d)pyre	350	UG/KG	UJ I
	Isophorone	350	UG/KG	U
	N-Nitroso-di-n-propyl	350	UG/KG	UJ K
	N-Nitrosodiphenylamin	350	UG/KG	U
	Naphthalene	350	UG/KG	U
	Nitrobenzene	350	UG/KG	U
	Pentachlorophenol	850	UG/KG	U
	Phenanthrene	350	UG/KG	U
	Phenol	350	UG/KG	UJ K

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Pyrene	350	UG/KG	U B
	Unknown Carboxylic Acid	460	UG/KG	U - B
	Unknown Carboxylic Acid	71	UG/KG	U - B
	Unknown Ester Cabroxylic	110	UG/KG	U - B
	Unknown Ester Cabroxylic	110	UG/KG	U - B
	Unknown Ester Hexanedioic	1200	UG/KG	U - B
	Unknown Phthalate Est	670	UG/KG	U - B
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	17	UG/KG	
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	11	UG/KG	U B
	Styrene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0703	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-0004			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0703

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0704	597558.17290	1497186.59210	878.74000
Depth: 4.0 TO 4.5 FT	MND15-0307-1004			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	-0.10	PCI/G	UJ
	H-3	3.1	PCI/G	J
	Ra-226	1.4	PCI/G	
	Bi-207	0.20	PCI/G	
	Bi-210	0.020	PCI/G	
	Co-60	0.040	PCI/G	J
	Cs-137	0.050	PCI/G	
	Pu-238	0.18	PCI/G	
	Pu-239/240	0.004	PCI/G	J
	Th-227	0.100	PCI/G	
	Th-228	0.43	PCI/G	
	Th-230	0.97	PCI/G	
	Th-232	0.46	PCI/G	
	U-234	0.73	PCI/G	
	U-235	0.048	PCI/G	
	U-238	0.76	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0704

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	1	UG/G	J - C
	Sulfate	5	UG/G	UJ - C
	Nitrate/Nitrite (NO3/	0.05	UG/G	U
	Fluoride	4.0	UG/G	
INORGANIC	Arsenic	2.3	MG/KG	U - B
	Cyanide	2.6	MG/KG	UJ - HC(-)
	Mercury	0.10	MG/KG	
	Aluminum	157020.	MG/KG	
	Antimony	16.3	MG/KG	R - S
	Barium	62.5	MG/KG	J - I(+)
	Beryllium	0.53	MG/KG	
	Bismuth	36.80	MG/KG	
	Cadmium	2.1	MG/KG	
	Calcium	263000	MG/KG	
	Chromium	5.9	MG/KG	UJ - BS(-)
	Cobalt	3.7	MG/KG	
	Copper	4.2	MG/KG	J - SI(+)
	Iron	5060	MG/KG	J - I(+)
	Lithium	5.40	MG/KG	
	Magnesium	83800	MG/KG	
	Manganese	292	MG/KG	
	Molybdenu	3.70	MG/KG	
	Nickel	10	MG/KG	UJ - I(+)
	Potassium	574	MG/KG	
	Silver	2.1	MG/KG	R - S
	Sodium	215	MG/KG	
	Tin	18.90	MG/KG	
	Vanadium	4.9	MG/KG	
	Zinc	13.9	MG/KG	J - I (+)
	Lead	19.5	MG/KG	U - B
	Selenium	0.66	MG/KG	
	Thallium	2.1	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.4	UG/KG	UJ
	4,4'-DDE	3.4	UG/KG	UJ
	4,4'-DDT	3.4	UG/KG	UJ

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.8	UG/KG	UJ
	alpha-Chlordane	1.8	UG/KG	UJ
	Aroclor-1016	34	UG/KG	UJ
	Aroclor-1221	70	UG/KG	UJ
	Aroclor-1232	34	UG/KG	UJ
	Aroclor-1242	34	UG/KG	UJ
	Aroclor-1248	34	UG/KG	UJ
	Aroclor-1254	34	UG/KG	UJ
	Aroclor-1260	34	UG/KG	UJ
	delta-BHC	1.8	UG/KG	UJ
	Dieldrin	3.4	UG/KG	UJ
	Endosulfan I	1.8	UG/KG	UJ
	Endosulfan II	3.4	UG/KG	UJ
	Endosulfan sulfate	3.4	UG/KG	UJ
	Endrin	3.4	UG/KG	UJ
	Endrin Aldehyde	3.4	UG/KG	UJ
	Endrin Ketone	3.4	UG/KG	UJ
	gamma-BHC (Lindane)	1.8	UG/KG	UJ
	gamma-Chlordane	1.8	UG/KG	UJ
	Heptachlor	1.8	UG/KG	UJ
	Heptachlor epoxide	1.8	UG/KG	UJ
	Methoxychlor	18	UG/KG	UJ
	Toxaphene	180	UG/KG	UJ
	alpha-BHC	0.048	UG/L	U
	beta-BHC	1.8	UG/KG	UJ
RADIOLOGIC	Am-241	-0.05	PCI/G	UJ
	H-3	2.8	PCI/G	J
	Ra-226	0.90	PCI/G	
	Bi-207	0.034	PCI/G	
	Bi-210	0.010	PCI/G	
	Co-60	-0.020	PCI/G	UJ
	Cs-137	0.010	PCI/G	J
	Pu-238	0.15	PCI/G	
	Pu-239/240	-0.004	PCI/G	UJ
	Th-227	0.100	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	0.15	PCI/G	
	Th-230	0.52	PCI/G	
	Th-232	0.20	PCI/G	
	U-234	0.42	PCI/G	
	U-235	0.000	PCI/G	
	U-238	0.58	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	350	UG/KG	U
	1,2-Dichlorobenzene	350	UG/KG	U
	1,3-Dichlorobenzene	350	UG/KG	U
	1,4-Dichlorobenzene	350	UG/KG	U
	2,2'-oxybis(1-Chlorop	350	UG/KG	U
	2,4,5-Trichlorophenol	840	UG/KG	U
	2,4,6-Trichlorophenol	350	UG/KG	UJ C
	2,4-Dichlorophenol	350	UG/KG	U
	2,4-Dimethylphenol	350	UG/KG	U
	2,4-Dinitrophenol	840	UG/KG	U
	2,4-Dinitrotoluene	350	UG/KG	U
	2,6-Dinitrotoluene	350	UG/KG	U
	2-Chloronaphthalene	350	UG/KG	U
	2-Chlorophenol	350	UG/KG	U
	2-Methylnaphthalene	350	UG/KG	U
	2-Methylphenol	350	UG/KG	U
	2-Nitroaniline	840	UG/KG	U
	2-Nitrophenol	350	UG/KG	U
	2-Pentanone, 4-Hydrox	1500	UG/KG	R
	3,3'-Dichlorobenzidin	350	UG/KG	UJ I
	3-Nitroaniline	840	UG/KG	U
	4,6-Dinitro-2-methylp	840	UG/KG	U
	4-Bromophenyl-phenyle	350	UG/KG	U
	4-Chloro-3-methylphen	350	UG/KG	U
	4-Chloroaniline	350	UG/KG	U
	4-Chlorophenyl-phenyl	350	UG/KG	U
	4-Methylphenol	350	UG/KG	U
	4-Nitroaniline	840	UG/KG	U
	4-Nitrophenol	840	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	350	UG/KG	U
	Acenaphthylene	350	UG/KG	U
	Anthracene	350	UG/KG	U
	Benzo(a)anthracene	350	UG/KG	UJ I
	Benzo(a)pyrene	350	UG/KG	UJ I
	Benzo(b)fluoranthene	350	UG/KG	UJ I
	Benzo(g,h,i)perylene	350	UG/KG	UJ I
	Benzo(k)fluoranthene	350	UG/KG	UJ I
	bis(2-Chloroethoxy)me	350	UG/KG	U
	bis(2-Chloroethyl)eth	350	UG/KG	U
	bis(2-Ethylhexyl)phth	350	UG/KG	UJ I
	Butylbenzylphthalate	350	UG/KG	UJ I
	Carbazole	350	UG/KG	U
	Chrysene	350	UG/KG	UJ I
	Di-n-butylphthalate	130	UG/KG	U B
	Di-n-octylphthalate	350	UG/KG	UJ I
	Dibenzo(a,h)anthracen	350	UG/KG	UJ I
	Dibenzofuran	350	UG/KG	U
	Diethylphthalate	350	UG/KG	U
	Dimethylphthalate	350	UG/KG	U
	Fluoranthene	350	UG/KG	U
	Fluorene	350	UG/KG	U
	Hexachlorobenzene	350	UG/KG	U
	Hexachlorobutadiene	350	UG/KG	UJ C
	Hexachlorocyclopentad	350	UG/KG	U
	Hexachloroethane	350	UG/KG	U
	Indeno(1,2,3-c,d)pyre	350	UG/KG	UJ I
	Isophorone	350	UG/KG	U
	N-Nitroso-di-n-propyl	350	UG/KG	U
	N-Nitrosodiphenylamin	350	UG/KG	U
	Naphthalene	350	UG/KG	U
	Nitrobenzene	350	UG/KG	U
	Pentachlorophenol	840	UG/KG	U
	Phenanthrene	350	UG/KG	U
	Phenol	350	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Pyrene	350	UG/KG	UJ I
	Unknown Carboxylic Acid	170	UG/KG	R
	Unknown Ester Cabroxylic	70	UG/KG	JN
	Unknown Ester Hexanedioic	6600	UG/KG	R
	Unknown Phthalate Est	380	UG/KG	R
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	11	UG/KG	U
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	11	UG/KG	U B
	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U
	Toluene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0801	597558.85490	1497193.12870	878.58000
Depth: 1.0 TO 2.0 FT	MND15-0208-0001			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0801

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0802	597558.85490	1497193.12870	878.58000
Depth: 2.0 TO 4.0 FT	MND15-0208-0002			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	-0.13	PCI/G	UJ
	H-3	2.9	PCI/G	J
	Ra-226	1.2	PCI/G	
	Bi-207	0.020	PCI/G	
	Bi-210	0.010	PCI/G	
	Co-60	0.030	PCI/G	J
	Cs-137	0.030	PCI/G	
	Pu-238	0.066	PCI/G	J
	Pu-239/240	-0.008	PCI/G	UJ
	Th-227	0.064	PCI/G	J
	Th-228	0.31	PCI/G	
	Th-230	0.76	PCI/G	
	Th-232	0.25	PCI/G	
	U-234	0.42	PCI/G	
	U-235	0.017	PCI/G	J
	U-238	0.44	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0802

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
ANIONS	Chloride	270	UG/G	J - C
	Sulfate	60	UG/G	J - C
	Nitrate/Nitrite (NO3/	5.5	UG/G	
	Fluoride	5.3	UG/G	
INORGANIC	Arsenic	3.1	MG/KG	
	Cyanide	2.6	MG/KG	UJ - HC(-)
	Mercury	0.11	MG/KG	
	Aluminum	2460	MG/KG	
	Antimony	16.3	MG/KG	
	Barium	24.5	MG/KG	
	Beryllium	0.53	MG/KG	
	Bismuth	36.80	MG/KG	
	Cadmium	2.1	MG/KG	
	Calcium	183000	MG/KG	UJ - BS(-)
	Chromium	6.9	MG/KG	
	Cobalt	4.0	MG/KG	
	Copper	6.8	MG/KG	J - S(+)
	Iron	6630	MG/KG	J - S(+)
	Lithium	4.50	MG/KG	
	Magnesium	57200	MG/KG	
	Manganese	252	MG/KG	
	Molybdenu	3.70	MG/KG	
	Nickel	14.3	MG/KG	J - S(-)
	Potassium	539	MG/KG	
	Silver	2.1	MG/KG	R - S
	Sodium	194	MG/KG	
	Tin	18.90	MG/KG	
	Vanadium	6.2	MG/KG	
	Zinc	24.0	MG/KG	
	Lead	5.3	MG/KG	J - S(+)
	Selenium	0.76	MG/KG	
	Thallium	2.1	MG/KG	UJ - SI(-)
PESTICIDES /PCB's	4,4'-DDD	3.6	UG/KG	UJ
	4,4'-DDE	3.6	UG/KG	UJ
	4,4'-DDT	3.6	UG/KG	UJ

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
PESTICIDES /PCB's	Aldrin	1.8	UG/KG	UJ
	alpha-BHC	1.8	UG/KG	UJ
	alpha-Chlordane	1.8	UG/KG	UJ
	Aroclor-1016	36	UG/KG	UJ
	Aroclor-1221	72	UG/KG	UJ
	Aroclor-1232	36	UG/KG	UJ
	Aroclor-1242	36	UG/KG	UJ
	Aroclor-1248	36	UG/KG	UJ
	Aroclor-1254	36	UG/KG	UJ
	Aroclor-1260	36	UG/KG	UJ
	beta-BHC	1.8	UG/KG	UJ
	delta-BHC	1.8	UG/KG	UJ
	Dieldrin	3.6	UG/KG	UJ
	Endosulfan I	1.8	UG/KG	UJ
	Endosulfan II	3.6	UG/KG	UJ
	Endosulfan sulfate	3.6	UG/KG	UJ
	Endrin	3.6	UG/KG	UJ
	Endrin Aldehyde	3.6	UG/KG	UJ
	Endrin Ketone	3.6	UG/KG	UJ
	gamma-BHC (Lindane)	1.8	UG/KG	UJ
	gamma-Chlordane	1.8	UG/KG	UJ
	Heptachlor	1.8	UG/KG	UJ
	Heptachlor epoxide	1.8	UG/KG	UJ
	Methoxychlor	18	UG/KG	UJ
	Toxaphene	180	UG/KG	UJ
RADIOLOGIC	Am-241	0.03	PCI/G	
	H-3	3.1	PCI/G	J
	Ra-226	1.2	PCI/G	
	Bi-207	-0.020	PCI/G	UJ
	Bi-210	0.00	PCI/G	J
	Co-60	0.010	PCI/G	J
	Cs-137	0.030	PCI/G	
	Pu-238	0.15	PCI/G	
	Pu-239/240	-0.009	PCI/G	UJ
	Th-227	0.130	PCI/G	

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Th-228	1.10	PCI/G	
	Th-230	0.88	PCI/G	
	Th-232	1.00	PCI/G	
	U-234	0.76	PCI/G	
	U-235	0.009	PCI/G	J
	U-238	0.75	PCI/G	
SEMIVOLATILE	1,2,4-Trichlorobenzen	360	UG/KG	U
	1,2-Dichlorobenzene	360	UG/KG	U
	1,3-Dichlorobenzene	360	UG/KG	U
	1,4-Dichlorobenzene	360	UG/KG	U
	2,2'-oxybis(1-Chlorop	360	UG/KG	U
	2,4,5-Trichlorophenol	860	UG/KG	U
	2,4,6-Trichlorophenol	360	UG/KG	U
	2,4-Dichlorophenol	360	UG/KG	U
	2,4-Dimethylphenol	360	UG/KG	U
	2,4-Dinitrophenol	860	UG/KG	UJ C
	2,4-Dinitrotoluene	360	UG/KG	U
	2,6-Dinitrotoluene	360	UG/KG	U
	2-Chloronaphthalene	360	UG/KG	U
	2-Chlorophenol	360	UG/KG	U
	2-Methylnaphthalene	360	UG/KG	U
	2-Methylphenol	360	UG/KG	U
	2-Nitroaniline	860	UG/KG	U
	2-Nitrophenol	360	UG/KG	U
	2-Pentanone, 4-Hydrox	1000	UG/KG	R +
	3,3'-Dichlorobenzidin	360	UG/KG	UJ I
	3-Nitroaniline	860	UG/KG	U
	4,6-Dinitro-2-methylp	860	UG/KG	U
	4-Bromophenyl-phenyle	360	UG/KG	U
	4-Chloro-3-methylphen	360	UG/KG	U
	4-Chloroaniline	360	UG/KG	U
	4-Chlorophenyl-phenyl	360	UG/KG	U
	4-Methylphenol	360	UG/KG	U
	4-Nitroaniline	860	UG/KG	U
	4-Nitrophenol	860	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Acenaphthene	360	UG/KG	U
	Acenaphthylene	360	UG/KG	U
	Anthracene	360	UG/KG	U
	Benzo(a)anthracene	360	UG/KG	UJ I
	Benzo(a)pyrene	360	UG/KG	UJ I
	Benzo(b)fluoranthene	360	UG/KG	UJ I
	Benzo(g,h,i)perylene	360	UG/KG	UJ I
	Benzo(k)fluoranthene	360	UG/KG	UJ I
	bis(2-Chloroethoxy)me	360	UG/KG	U
	bis(2-Chloroethyl)eth	360	UG/KG	U
	bis(2-Ethylhexyl)phth	360	UG/KG	UJ I
	Butylbenzylphthalate	360	UG/KG	UJ I
	Carbazole	360	UG/KG	U
	Chrysene	360	UG/KG	UJ I
	Di-n-butylphthalate	360	UG/KG	U B
	Di-n-octylphthalate	360	UG/KG	UJ I
	Dibenzo(a,h)anthracen	360	UG/KG	UJ I
	Dibenzofuran	360	UG/KG	U
	Diethylphthalate	360	UG/KG	U
	Dimethylphthalate	360	UG/KG	U
	Fluoranthene	360	UG/KG	U
	Fluorene	360	UG/KG	U
	Hexachlorobenzene	360	UG/KG	U
	Hexachlorobutadiene	360	UG/KG	U
	Hexachlorocyclopentad	360	UG/KG	U
	Hexachloroethane	360	UG/KG	U
	Indeno(1,2,3-c,d)pyre	360	UG/KG	UJ I
	Isophorone	360	UG/KG	U
	N-Nitroso-di-n-propyl	360	UG/KG	U
	N-Nitrosodiphenylamin	360	UG/KG	U
	Naphthalene	360	UG/KG	U
	Nitrobenzene	360	UG/KG	U
	Pentachlorophenol	860	UG/KG	U
	Phenanthrene	360	UG/KG	U
	Phenol	360	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
SEMIVOLATILE	Pyrene	360	UG/KG	UJ I
	Unknown	72	UG/KG	JN
	Unknown Carboxylic Acid	180	UG/KG	R +
	Unknown Ester Hexanedioic	140	UG/KG	JN
	Unknown Ester Hexanedioic	6800	UG/KG	R +
	Unknown Hydrocarbon	72	UG/KG	JN
VOLATILE	1,1,1-Trichloroethane	11	UG/KG	U
	1,1,2,2-Tetrachloroet	11	UG/KG	U
	1,1,2-Trichloroethane	11	UG/KG	U
	1,1-Dichloroethane	11	UG/KG	U
	1,1-Dichloroethene	11	UG/KG	U
	1,2-Dichloroethane	11	UG/KG	U
	1,2-Dichloroethene	11	UG/KG	U
	1,2-Dichloropropane	11	UG/KG	U
	2-Butanone	11	UG/KG	UJ C
	2-Hexanone	11	UG/KG	U
	4-Methyl-2-pentanone	11	UG/KG	U
	Acetone	11	UG/KG	U
	Benzene	11	UG/KG	U
	Bromodichloromethane	11	UG/KG	U
	Bromoform	11	UG/KG	U
	Bromomethane	11	UG/KG	U
	Carbon Disulfide	11	UG/KG	U
	Carbon Tetrachloride	11	UG/KG	U
	Chlorobenzene	11	UG/KG	U
	Chloroethane	11	UG/KG	U
	Chloroform	11	UG/KG	U
	Chloromethane	11	UG/KG	U
	cis-1,3-Dichloropropene	11	UG/KG	U
	Dibromochloromethane	11	UG/KG	U
	Diethylbenzene, Total	11	UG/KG	U
	Ethylbenzene	11	UG/KG	U
	Methylene Chloride	11	UG/KG	U B
	Styrene	11	UG/KG	U
	Tetrachloroethene	11	UG/KG	U

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0803	597558.85490	1497193.12870	878.58000
Depth: 4.0 TO 4.5 FT	MND15-0208-0004			

	Parameter	Results	Units	Validation Qualifier
VOLATILE	Toluene	11	UG/KG	U
	trans-1,3-Dichloropro	11	UG/KG	U
	Trichloroethene	11	UG/KG	U
	Vinyl Chloride	11	UG/KG	U
	Xylene, Total	11	UG/KG	U

* LAST ANALYSIS FOR SAMPLE BS0803

Sampling Point	Sampling ID	Northing	Easting	Elevation
MOUND OU6 AREA D	BS0901	597561.80230	1497110.69620	875.93000
Depth: 8.0 TO 8.8 FT	MND15-1109-0008			

	Parameter	Results	Units	Validation Qualifier
RADIOLOGIC	Am-241	0.00	PCI/G	
	H-3	1.9	PCI/G	J
	Ra-226	2.2	PCI/G	
	Bi-207	0.20	PCI/G	
	Bi-210	0.010	PCI/G	
	Co-60	0.00	PCI/G	J
	Cs-137	0.060	PCI/G	
	Pu-238	0.16	PCI/G	
	Pu-239/240	0.009	PCI/G	
	Th-227	0.120	PCI/G	
	Th-228	1.00	PCI/G	
	Th-230	1.50	PCI/G	
	Th-232	0.57	PCI/G	
	U-234	0.90	PCI/G	
	U-235	0.066	PCI/G	
	U-238	1.07	PCI/G	

* LAST ANALYSIS FOR SAMPLE BS0901

APPENDIX D

DATA QUALIFIERS

DATA VALIDATION REPORT FORMAT

SUMMARIES OF DATA VALIDATION

D-1. OU6 AREA D DATA QUALIFIERS

Environmental data obtained from the laboratory analysis were validated and qualified using the following guidelines:

> **Data Validation Guidelines for Chemical and Radionuclide Analyses**, OU9 Site Wide Quality Assurance Project Plan, DOE, Revision 3, FINAL, June, 1993;
>
> **Laboratory Data Validation - Functional Guidelines for Evaluation of Organic Analyses** (February 1, 1988); and
>
> **Laboratory Data Validation - Functional Guidelines for Evaluation of Inorganic Analyses** (July 1, 1988).

The descriptive primary data validation qualifiers applied to the concentrations are listed below:

U The analyte was not detected. The reported concentration is the sample quantitation limit.

UJ The analyte was not detected. The reported concentration is an estimated value.

J The reported value is an estimated quantity.

R The data are unusable. The analyte may or may not be present.

N Presumptive evidence of presence of material.

NJ Presumptive evidence of the presence of the material at an estimated quantity.

Subqualifiers were used to assist in data assessment by indicating the source of the primary qualifier. The subqualifiers are attached to the primary qualifier by a hyphen. The allowable subqualifiers are:

SUBQUALIFIERS - ORGANICS

B - Qualified due to method blank or a field blank
C - Qualified due to calibration
H - Holding time exceeded
K - Qualified due to surrogate recovery
S - Qualified due to matrix spike
I - Qualified due to internal standard
P - Pesticide/PCB results have >25% difference on two different columns
(+) - Potential positive bias (added after subqualifier with a parentheses)
(-) - Potential negative bias (added after subqualifier with a parentheses)

SUBQUALIFIERS - INORGANICS

B - Qualified due to method blank or field blank
C - Qualified due to calibration
H - Holding time exceeded
S - Qualified due to matrix spike recovery
I - Interface
D - Duplicate (replicate) limits exceeded
L - Qualified due to LCS
(+) - Potential positive bias (added after subqualifier with a parentheses)
(-) - Potential negative bias (added after subqualifier with a parentheses)

Radiological data validation qualifiers were consistent with those qualifiers for organics and inorganics, where applicable.

Each data point was reviewed and assessed to determine whether the value was considered usable (no qualifiers), usable but estimated (qualifier J) or not usable (qualifier R). Laboratory and data validation qualifiers were applied to all data, detected and non-detected, as necessary. For the purpose of the verification sampling, VOC and SVOC TICs were used to indicate additional contaminants present that was not included on the TCL list.

Data validation reports were completed in the required EG&G data validation report format as presented in the following section.

D-2. DATA VALIDATION REPORT FORMAT

I. TITLE - "Report of Data Validation Results"

II. HEADER - Name of Project, Operable Unit, Description of Task (e.g. Groundwater monitoring), Work Order Number and date of report.

III. CASE SUMMARY

State the following:

- Case/Batch Number
- Number of samples and type of matrix
- Date of collection
- Chain of custody identifier, if any
- Type of analysis (Discuss impacts if incorrect method used)
- Condition of samples when received by the laboratory, any lost data
- List of client sample identifications applicable to the report.

IV. HOLDING TIMES

Discuss results of holding times and those outside the required holding time.

V. RESULTS OF LABORATORY QUALITY CONTROL CHECKS

For each laboratory quality control check required to be performed, discuss whether the frequency, acceptance criteria, and corrective actions were met. Summarize which samples were affected and how the data was impacted.

The laboratory quality control checks for each analysis are listed below:

<u>VOCs and SVOCs</u>

a. GC/MS Tuning
b. Calibration
c. Blanks
d. Surrogate Spike Recoveries
e. Matrix spike/Matrix spike Duplicate Recoveries
f. Internal Standards
g. Compound Identification
h. System Performance
i. Compound Quantitation and Contract Required Quantitation Limits (CRQLs)

j. Tentatively Identified Compounds
k. Laboratory Control Sample

Pesticides/PCBs

a. GC/ECD Performance Check
b. Performance Evaluation Mixture
   i) Resolution
   ii) Retention Time
   iii) Recovery
   iv) DDT/Endrin Breakdown
c. Calibration
d. Blanks
e. Surrogate Spike Recoveries
f. Matrix spike/Matrix Spike Duplicate Recoveries
g. Pesticide Cleanup Checks
   i) GPC Recoveries
   ii) Florosil Cartridge Cleanup
h. Compound Identification
i. System Performance
j. Compound Quantitation and Reported CRQLs
k. Laboratory Control Sample

Inorganic Metals and Cyanide

a. Calibration and CRDL
b. Blanks
   i) Preparation Blanks
   ii) Calibration Blanks
c. Interference Check Sample
d. Laboratory Control Sample
e. Duplicate Sample Analysis
f. Matrix spike sample analysis
   i) ICP Metals
   ii) GFAA Metals
   iii) Cyanide
g. Furnace Atomic Absorption QC
h. ICP Serial Dilution
i. Sample Result Verification

Anions

a. Calibration
b. Blanks
   i) Preparation Blanks
   ii) Calibration Blanks
c. Laboratory Control Sample
d. Matrix spike/Matrix Spike Duplicate Sample Analysis
e. Sample Result Verification

VI. RESULTS OF ASSOCIATED FIELD QUALITY CONTROL CHECKS

A. Field Duplicates
B. Field Blanks (equipment blanks, etc.)

VII. OVERALL ASSESSMENT OF DATA

- Discuss overall assessment of data and categorize data in one or more of the following (use these as subsections to this section):

  - Data had no problem/or qualified due to minor problems.
  - Data qualified due to major problems.
  - Data unacceptable.
  - Problems, but does not affect data.

Discuss how all findings in the review could impact the data usability.

ATTACHMENT I - Data Outlier Summary Forms

ATTACHMENT II - Qualified Data Summary Reports*

ATTACHMENT III - Data Completeness Checklist

ATTACHMENT IV - Laboratory Case Narrative

ATTACHMENT V - Chain-of-Custody

* Form is for CLP analyses, data summary reports from laboratory for non-CLP analyses.

D-3. SUMMARY OF DATA VALIDATION RESULTS

D-3.1. INORGANIC ANALYSIS

D-3.1.1. Trace Metals and Cyanide Results

Nine soil samples and one equipment rinsate (water) were collected and analyzed for TAL metals and cyanide by PACE, Inc. laboratory using the March 1990 EPA CLP SOW. Data quality was evaluated using the guidelines and control limits specified for holding times, initial and continuing calibration verification, method field QC blanks, interference check sample analysis, spiked sample analysis, laboratory and field duplicate sample analysis, laboratory control sample analysis, serial dilution analysis, and furnace atomic absorption results.

Holding Times - Based on the evaluation of all environmental samples and the quality control blank analyzed, all holding times were met except for cyanide in R00001 (3 days), BS0201 (3 days), BS0301 (3 days), BS0501 (2 days), BS0502 (2 days), BS0503 (2 days, BS0701 (1 day) and BS0703 (1 day). As a result, all undetected cyanide results were considered estimated ("UJ") due to the possibility that the detection limit reported for cyanide in all samples may be bias low.

Initial Calibration Verification (ICV) - Based on an evaluation of the initial calibrations conducted, all percent recovery values were within the appropriate control limits, except for cyanide (i.e. %R = 66.3) in the initial calibration verification analyzed on June 4, 1993. The cyanide undetected results in all samples were qualified ("UJ") to indicate the exceeded percent recovery for the initial calibration. The detection limits reported for cyanide may be bias low.

Continuing Calibration Verification (CCAL) - Based on an evaluation of the continuing calibration conducted, all percent recovery values were within control limits.

Method Blanks - Based on an evaluation of all method blanks, numerous interferents (aluminum, arsenic, calcium, iron, lead, sodium, thallium, and zinc) were detected at concentrations greater than the IDL and less than the CRDL in many laboratory blanks. Data validation qualifiers ("U") were applied to antimony, iron, sodium, and zinc detected in R00001, arsenic detected in BS0501, BS0703, and BS0801, and lead detected in BS0703 and BS0801 in concentrations less than five times that detected in an associated method blank.

Equipment Rinsate Blanks - Calcium and chromium were detected in R00001 (equipment blank) at concentrations of 188 ug/L and 1.6 ug/L, respectively. As a result, the data validation qualifier ("U") was applied to chromium results in BS0502, BS0503, BS0701, BS0801, and BS0803 to indicate that the chromium did not exceed five times that detected in the equipment blank.

Interference Check Sample (ICS) Analysis - Based on an evaluation of the ICS analysis conducted for all metals analyzed, all recovery criteria were within control limits. Each analytical result was also evaluated for interferences caused by aluminum, calcium, iron, and magnesium. These interferences, depending on the affected element and the interferant concentration, may potentially produce false positive values. Therefore, barium, copper, nickel, and zinc detected in BS0501 and BS0801 were considered estimated ("J") due to calcium interference and in BS0201 the analytes were considered estimated ("J") due to iron interferences.

Spiked Sample Analysis - One spiked sample analyses (BS0803) was conducted using soil samples. All percent recoveries were within control limits, except antimony (0 percent), chromium (67.5 percent), copper (135.6 percent), lead (162.2 percent), nickel (52 percent), silver (0 percent), and thallium (74.2 percent). As a result, antimony and silver undetected results in all soil samples were rejected ("R") to indicate that percent recovery in the associated spike sample analysis was less than 30 percent. Chromium, nickel, and thallium results in soil samples were estimated (all undetected results "UJ" and detected values "J") to indicate that percent recovery in the associated matrix spike analysis was less than 75 percent, but greater than 30 percent. Copper and lead detected in soil sample were considered estimated ("J") due to the possibility of false positives.

Duplicate Sample Analysis - Duplicate samples were evaluated to verify that one duplicate sample analysis was conducted for every 20 environmental samples received by the laboratory, that these analyses were conducted on environmental samples only, and that the difference in results did not indicate systematic laboratory control problems. Precision was expressed as the relative percent difference (RPD) of the concentrations of the elements detected in the duplicate sample. All results were acceptable.

Field Duplicate Results - One field duplicate sample analyses (BS0503) was conducted using a soil sample collected during the sampling event. All RPD values were within control limits for

sample and duplicate results greater than five times the CRDL. The +/- two times CRDL criteria were met for sample and duplicate results less than five times the CRDL.

Laboratory Control Sample (LCS) Analysis - Based on an evaluation of all LCS analyses, the percent recoveries of all spike compounds were within acceptable limits.

GFAA Results - Arsenic, lead, selenium, and thallium were analyzed using GFAA techniques. Data quality was evaluated using the guidelines and control limits specified for the analytical spike and standard addition analyses. Based on an evaluation of the analytical spike results, all percent recovery values were within the control limits, except for selenium and thallium in R00001 and selected soil samples; therefore, all results have been estimated ("J" or "UJ") to indicate that the analytical spike results were outside the control limits.

Serial Dilution Results - One serial dilution analyses was conducted using soil samples. All difference values were within control limits, except iron (12.1 percent). Data validation qualifiers were applied ("J") to all detected iron concentrations in soil samples.

Overall Assessment of Metals and Cyanide Data - The quality of the submitted data was acceptable; however, undetected antimony and silver values were rejected due to matrix spike recoveries. Aluminum, iron, sodium, and zinc in R00001, and arsenic, lead, and chromium in selected soil samples were considered undetected with the detection limits raised to each quantitated value due to blank interferences. Barium, copper, iron, selenium, nickel, thallium, zinc, and cyanide results in selected soil samples were estimated due to poor QC results.

D-3.1.2. Anions Analysis Results

Ten soil samples and one water sample were analyzed for chloride, sulfate, and nitrate-nitrite. Nine soil samples and one water sample were analyzed for fluoride. Data quality was evaluated using the guidelines and control limits specified for holding times, initial and continuing calibration, method and field QC blanks, laboratory control sample, matrix spike/matrix spike duplicate analysis, and field duplicate analysis.

Holding Times - All holding times criteria were met.

ICV - Ten standards were analyzed for chloride, five for sulfate, six for nitrate-nitrite and fluoride to establish standard curves. The calibration curve correlation coefficients for chloride and sulfate were less than 0.995 and as a result, chloride and sulfate detected results in all soil samples were considered estimated (undetected values "UJ" and detected values "J") due to low correlation coefficients for the calibration curves. The calibration curve correlation coefficients for fluoride analysis were not calculated. No action was taken since the initial calibration verification and continuing calibration verification percent recoveries were within the control limits of 85 to 115 percent.

CCAL Verification - Based on an evaluation of the continuing calibration conducted, all percent recovery values were within control limits of 90 to 100 percent.

Method Blanks - One method blank analysis was conducted for chloride, sulfate, nitrate-nitrite, and fluoride. Each method blank was evaluated for interferents that might potentially interfere with accurate quantitation of a target element. Based on an evaluation of all method blanks, no interferents were detected.

Equipment Blank Results - No interferences were detected in R00001.

LCS Analysis - One solid LCS was conducted for chloride, sulfate, nitrate-nitrite and chloride using the same sample preparation and analytical methods employed for the environmental sample. Based on an evaluation of all LCS analyses, the percent recoveries were within acceptable control limits. No LCS was required for fluoride analysis.

MS/MSD Revisions - One MS/MSD analysis (BS0803) was conducted using soil sample. All percent recoveries were within the control limits, except for sulfate (137 percent). No action was taken, since the sample result is less than 4 times the amount of spike added.

Field Duplicate Results - One soil sample was collected in duplicate. The RPD value was not calculated for sulfate that was not detected in both the sample and duplicate sample. RPD values were within the control limit for chloride, nitrate-nitrite, and fluoride field duplicate samples.

Overall Assessment of Anion Data - The quality of the submitted data was acceptable; however, chloride and sulfate results were considered estimated due to low calibration curve correlation coefficients.

D-3.2. ORGANIC ANALYSIS

Eight soil samples, one duplicate soil sample, one water sample was collected for volatile organics, semivolatile organics, and pesticides/PCBs analysis. Analysis was performed by TMA/Skinner & Sherman using the March 1990 CLP SOW. Data quality was evaluated using the guidelines and control limits specified in the CLP SOW and the referenced guidelines for organic analysis for holding times, tuning, initial and continuing calibration, method blanks, surrogate recoveries, internal standards, and MS/MSD results.

D-3.2.1. VOC Analysis Results

Holding Times - All holding times were within the prescribed QC limits.

GC/MS Tuning - All tuning criteria were within the specified QC limits.

ICV - All calibration parameters were within the prescribed QC limits except for chloroethane and 2-butanone, flagged "J" or "UJ". Flags for chloroethane were attributed to RSD criteria and flags for 2-butanone to Relative Response Factors (RRF). No samples were affected by this initial calibration.

CCAL Verification - All continuing calibration parameters were within the prescribed QC limits except for chloromethane, vinyl chloride, and 2-butanone (flagged "J" or "UJ"). Flags for 2-butanone were attributed to RRF and flags for chloroethane and vinyl chloride to RSD criteria. It should be noted that these compounds are "poor performers" and it is not unusual for these to be out.

Method Blanks - Method blank VBLK0526 was free of TCL compounds and TICS and method blank VBLK0528 contained methylene chloride at 7 ppb, with an action level of 70 ppb. There were no TICS detected. All samples were qualified as "U-B" due to the methylene chloride contamination.

Surrogate Recoveries - All surrogate recoveries were within the specified QC limits.

MS/MSD Recoveries - Based on the laboratory data reviewed, all MS/MSD results met required QC criteria, except for the outliers noted below: 1,1-dichloroethene, trichloroethene, benzene, toluene, and chlorobenzene. The flag "J" or "UJ" was applied only to the MS/MSD sample (BS0301). There appeared to be a slight matrix effect.

Internal Standards (IS) - Based on an evaluation of the laboratory data, all IS results, peak areas and retention times, were within the appropriate QC limits.

Target Compound Identification - For SDGs BS0201, BS0801, and TB0003, all detected TCL compounds met the minimum QC spectral criteria. For SDG TB0002, all detected TCL compounds spectra were reviewed for correctness. The following are compounds that the spectra did not meet the minimum criteria: A00002 - methylene chloride, SBB002 - methylene chloride, and TB0002 - methylene chloride. The methylene chloride detections in the above samples were flagged as unusable ("R"), and may or may not be present.

For all four SDGs, the additional volatile compounds below that were to be incorporated in the TCL were not included by direction of SAIC, with the exception of diethylbenzene. However, these compounds were not detected as target compounds or as TIC's; vinyl acetate, acrylonitrile, acetonitrile, 1,1,2-trichloro-1,2,2-trifluoroethane, hexane, and iodomethane.

Compound Quantitation and CRQLs - Compound concentrations in the samples were verified by recalculation using raw data. All instrument detection limits and required detection/quantitation limits reported comply with the method SOW requirements.

TICS - For SDGs BS0201, BS0801, and TB0003, no TICs were found in the samples. In SDG TB0002, all reported TICS met the spectral criteria. An unknown TIC concentration in sample SBB002, was recalculated and the reported concentration was verified.

System Performance - Instrument performance parameters available indicate that the quality of data remained consistent and generally good for the time period during which the analysis was completed. For SDG BS0801, the compound 2-butanone for calibration was consistently out of the QC limits for RRF. The chromatograms were normal for this type of analysis.

Field QC Samples - The field duplicates, which were collected with SDG TB0002 on May 19, 1993, cover each individual SDG. Each individual SDG did not have its own duplicate. The volatile duplicates BS0502 and BS0503 were free of any volatile target compounds, and thus the RPD's were zero. The volatile rinsate R00001 had methylene chloride at 6 ppb as the only hit. The following compounds were qualified as UJ-C; chloromethane, vinyl chloride, and chloroethane.

Overall Assessment of VOC Data - Overall the data is usable. The majority of the data was not qualified. The general quality of the data is very good as the qualifications needed were typical in nature. Some of the data was qualified due to blank contamination and field QC contamination. Methylene chloride was qualified as unusable "R" because it did not meet the mass spectra criteria.

D-3.2.2. SVOC Analysis Results

Holding Times - All holding times were within the prescribed QC limits, except for three re-extractions. BS0502RE and BS0503RE were extracted out of holding times by fourteen days and

will be flagged as "J" or "UJ" due to this deviation. One re-extraction, BS0201RE, was extracted one day out of holding times.

GC/MS Tuning - Based on an evaluation of all mass spectroscopy, all tuning criteria were met.

ICV - All ICAL parameters were within the prescribed QC limits except for 2,4-dinitrophenol. No samples were affected.

CCAL Verification - All four SDGs exhibited CCAL runs which included compounds that did not meet the QC criteria. These compounds were predominantly hexachlorobutadiene, 1,2,4-trichlorobenzene, 2,4,6-trichlorophenol, di-n-octylphthalate, 4,6-dinitro-2-methylphenol, 4-nitrophenol, hexachlorobenzene, 4-chlorophenyl phenyl ether, and 2,2-oxybis-(2-chloropropane). Since most of the compounds are noted "poor performers," the associated compounds were qualified "J" or "UJ" as necessary. The overall CCAL assessment was acceptable, with qualifications.

Method Blanks - All method blanks but one exhibited contamination. The compounds most

Method Blanks - All method blanks but one exhibited contamination. The compounds most associated with the contamination were bis(2-ethylhexyl) phthalate, di-n-butylphthalate (DNBP), and pyrene. All phthalates listed here and detected in samples were flagged with "U" or "UJ" because all detected phthalates were less than five times the blank contamination. Method blank performance other than the listed compounds was acceptable.

Surrogate Recoveries - All surrogate recoveries were within the specified QC limits except for the following: 2-fluorophenol, 1,2,-dichlorobenzene, and decachlorobiphenyl. In several samples, since 2-fluorophenol was outside the lower bounds of recovery on the blanks, all acidic compounds were flagged "J" or "R" on all samples. The acidic compounds are as follows: phenol, bis(2-chloroethyl)ether, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,2-dichlorobenzene, 2-methylphenol, 2,2-oxybis-(1-chloropropane), 4-methylphenol, n-nitroso-di-n-propylamine, and hexachloroethane.

MS/MSD Recoveries - All MS/MSD recoveries were within the prescribed QC criteria except 2-chlorophenol, 1,4-dichlorobenzene, and pyrene. Samples BS0301MS and BS0301MSD were flagged "J" for this reason. No qualifiers were assigned to other samples due to the MS/MSD deviations. Consistent low recoveries for 2-fluorophenol was probably the result of a matrix interference.

IS - The following internal standards are outside the QC limits: chrysene and perylene. The compounds associated with the above internal standards will be flagged as "J" or "UJ" due to the low area counts.

Target Compound Identification - All detected target compounds met the prescribed QC criteria for spectra identification except benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(g,h,i)perylene, and indeno(1,2,3-cd)pyrene.

Compound Quantitation and Reported CRDL's - All detected target compounds met the criteria for quantitation. The reported CRDL's are correct.

TICs - In SDG BS0201, two TICs were found in the samples which were not also identified as contaminants in the method blanks. Numerous TICs were also identified in SDGs BS0801,

TB0002, and TB0003. All detected TICs met the quantitation requirements and the spectral criteria.

System Performance - For SDGs TB0002 and TB0003, the semivolatile blank contamination pertaining to the TICs were consistent throughout the entire investigation. The internal standards that were out of QC limits is a bit atypical, but acceptable. There was no system performance problems for SDG BS0201 and BS0801.

Results of Field Quality Control Samples - The field duplicates, which were collected with SDG TB0002 on May 19, 1993, cover each individual SDG. The semivolatile duplicates, BS0502 and BS0503, had hits of the following target compounds: acenaphthylene, fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, and

benzo(g,h,i)perylene. The semivolatile rinsate R00001 had no target compounds detected. There were two TICs, methyl benzene and an unknown, that were qualified as unusable "R".

Overall Assessment of SVOC Data - Overall the data is acceptable. The surrogate 2-fluorphenol recoveries were consistently out of limits, and internal standard chrysene and perylene were low in area counts. Qualifiers were assigned to acidic compounds because of the 2-fluorophenol outliers. Compounds associated with the two internal standards, chrysene and perylene, were also qualified due to the low area counts.

D-3.2.3. Pesticides/PCBs Analysis Results

Holding Times - All holding times were within the prescribed QC limits.

Performance Evaluation Mixture

Resolution - The resolution of the adjacent peaks were above the minimum QC limit.

Retention - For BS0201 and TB0003, the retention time of the compounds were within eh prescribed QC limits. The retention time of decachlorobiphenyl in four samples were slightly outside QC limits. No qualifiers were assigned due to these deviations.

Recovery - All compound recoveries and RPD's were within the specified limits except for methoxychlor, endrin ketone, decachlorobiphenyl, and DDT. The above compounds, with the exception of decachlorobiphenyl will be flagged J or UJ on all samples.

Endrin/DDT Breakdown - The breakdown of endrin, DDT, and endrin/DDT combines were below the maximum percent breakdown allowed.

ICV and CCAL Verification - The percent RSD and retention times of the target compounds were within the prescribed QC limits on both columns for initial calibration. For SDG TB0003 and BS0201, three target compounds had percent differences above the QC limit. For SDG's

BS0801 and TB0002, the percent differences for the target compounds were below the maximum limit. Since no compounds were detected in all samples, no qualifiers were assigned.

Blanks - There were no compounds detected in the method blanks PBLK01 and PBLK02. The corresponding instrument blanks were also free of target compounds.

Surrogate Recoveries - In several samples, surrogate recoveries for tetrachloro-m-xylene (TCMX) and decachlorobiphenyl were outside required QC limits. All samples were flagged "UJ" for non-detects and "J" for detected target compounds.

MS/MSD Recoveries - All MS/MSD recoveries were within QC limits except aldrin. The parameter aldrin was flagged "UJ" in all samples due to the MS/MSD recovery being outside QC limits.

Pesticide Cleanup Checks

GPC Recoveries - The laboratory did not include GPC information with the data package. The matrix spike recoveries for GPC were not run.

Florisil Recoveries - The recoveries from the florisil cleanup were within the prescribed QC limits except for alpha-BHC, gamma-BHC, and heptachlor. The compounds were qualified as "J"/"UJ" in all samples due to the recovery outliers.

Compound Identification - No target compounds were detected in SDG TB0002, TB0003, and BS0801. In SDG BS0201, a few target compounds were detected with good confirmation. Alpha- and gamma-chlordane were quantified just above the linear range in the first analyses (BS0301), which was rerun as BS0301DL with a 4 to 1 dilution. Sample BS0301 is not recommended for use. BS0301DL was used for all compounds.

System Performance - Overall system performance was satisfactory, with no instrument problems. Baselines were free from obvious on-line contaminations.

Compound Quantitation - There were no target compound hits, except in SDG BS0201. Manual calculations verify correct quantitation for the target compounds detected. CRDL's are correct as reported.

LCS - No laboratory QC samples were analyzed.

Results of Field QC - The field duplicate were collected with SDG TB0002 on May 19, 1993. The pesticide duplicate, BS0502 and BS0503, were free of any pesticides. The equipment rinsate, R00001, had no target compounds detected. Three compounds were qualified ("UJ-C"); DDT, methoxychlor, and endrin ketone.

Overall Assessment of Pesticide/PCB Data

The overall quality of the data is good. The data has been qualified due only to minor QC problems. The GPC recovery sample was not analyzed and poses a question as to how the data is affected. Since no compounds were detected, and recoveries for the compounds used to monitor the GPC process (bis-(2-ethylhexyl)phthalate, methyloxychlor, perylene, corn oil) seemed to be in order, no qualifiers were issued. The surrogate decachlorobiphenyl (DCB) was repeatedly out of QC limits for retention on the continuing calibration verification samples. However, this did not pose a problem due to the fact that no additional peaks were close to the retention time window of DCB.

D-3.3. RADIOLOGICAL ANALYSIS

Seventeen soil samples and two water samples were analyzed by Pace, Inc. laboratory for isotopic plutonium, isotopic uranium, isotopic thorium (including thorium-227), cobalt-60, tritium, radium-226, cesium-137, americium-241, bismuth-207, and bismuth-210. Data quality was evaluated using the

guidelines and control limits specified in Appendix H of the OU9 QAPjP for holding times, calibration, check source, background, efficiency, yield, method blank, method spike, matrix spike, replicates, and duplicates. Additional criteria were developed to qualify low (or even negative) results as estimated ("J") or non-detects estimated ("UJ").

Holding Times - All holding times were met for tritium, alpha and gamma analysis.

Calibration - All prescribed calibration parameters were met for alpha and gamma analysis. Tritium analysis had no annual calibration information. For SDG D30519.501, all tritium results for R00001 and R00002 were qualified "J"/"UJ" due to insufficient calibration information.

Source Check - All source checks for alpha and gamma analysis were verified on the day of analysis except for tritium. All positive tritium results were flagged "J" because no source check information was included in the package.

Background - All background checks used for alpha and tritium were within three standard deviations of the respective means. The background for gamma analysis was counted at a rate of once per month.

Efficiencies - All efficiencies used for alpha and tritium analysis were accurate.

Yield - All yield (tracer) recoveries for alpha analysis were reported correctly. For SDG D30519.501, the mixed standard for gamma (LCS sample) was analyzed, however, no LCS concentrations were included in the package. All gamma results have been flagged as "J"/"UJ".

Method Blank - The method spike result for tritium was within +/- three standard deviations of the theoretical spike value. The method spike for all alpha spectrometry was within +/- three standard deviations of the true value, and was analyzed at a rate of one per twenty samples. The percent recovery for the gamma LCS was calculated correctly. The gamma QC criteria of +/- 5 percent was met for all isotopes in all samples except Co-60 when analyzed on Detector #2. Detector #2 was slightly out at 93.5 percent affecting samples BS0201, BS0301, BS0401, BS0501, BS0502, BS0601, BS0901, BS0701, BS0702, BS0704, BS0801, and BS0802, all of which were flagged "J" for Co-60 only.

Matrix Spike - The matrix spike results for tritium were within three standard deviations of the true value. The matrix spike results for alpha spectroscopy were within three standard deviations of the true value and were analyzed at the rate of one per twenty samples. The laboratory case narrative indicated that a matrix spike is not analyzed for gamma spectrometry.

Replicates/Duplicates - Replicate and duplicate results for tritium, alpha and gamma spectroscopy were within the required QC limits. Some RPD's were not calculated due to one or both results being less than the minimum detectable activity (MDA).

Results - Approximately ten percent of the results for tritium and alpha spectroscopy were recalculated and checked for accuracy in reporting. In general, there was a complete lack of gamma activity for the specified isotopes. Many results were not above the MDA.

Overall Assessment of Radiological Data - The overall quality of the data is good. The data has been qualified due to minor QC problems, negative results, and results less than uncertainty.