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Argonne National Laboratory

Sampling and Analysis Data Document

This document contains uninterpreted sampling and analytical data. The data will be interpreted by the DOE Environmental Survey Team and used to modify, as appropriate, the tentative Survey findings contained in the Environmental Survey Preliminary Report. Final Survey findings will be presented in the Environmental Survey Summary Report.

DRAFT

Volume I

June 1989

DEPARTMENT OF ENERGY

ENVIRONMENTAL SURVEY

ORNL/TM-11203

ARGONNE NATIONAL LABORATORY SAMPLING AND ANALYSIS DATA DOCUMENT

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Approved

ORNL Data Management ______ K.L. Daniels

ORNL Analytical Team Leader ______ W.R. Laing

ORNL Field Team Leader ______ J.B. Murphy

ORNL QA Coordinators ______ R.K. Owenby

______ P.L. Howell

ORNL Program Manager ______ R.B. Fitts

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LIST OF ABBREVIATIONS

AA	Atomic absorption
ACD	Analytical Chemistry Division - ORNL
ACK	Analytical Chemistry Division - K-25
AE	Atomic emission; flame atomic emission photometry
AES	Atomic emission spectrometry
AFAN	Ammonium fluoride - ammonium nitrate solution
Ag	Silver
A_i	Percent relative atom abundance
ANL	Argonne National Laboratory
APG	Analytical Products Group
ARRF	Average relative retention factor
ASTM	American Society for Testing Materials
A-WMG	Wide-mouth glass (I-Chem cleaning protocol A)
BCD	Battelle Columbus Division
Be	Beryllium
BFB	Bromofluorobenzene
Br^-	Bromide
BOD	Biochemical oxygen demand
B-WMG	Wide-mouth glass (I-Chem cleaning protocol B)
C	Centigrade
Ca	Calcium
Ca^{+2}	Calcium ions
CAPA	Chemical and Physical Analysis Group
CAS	Chemical Abstract System
CCC	Calibration check compounds
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
Cl^-	Chloride
Cl_2	Chlorine
CLP	Contract Laboratory Program
cm	Centimeters
CN	Cyanide
CNCl	Cyanogen chloride
COC	Chain of custody
COLIWASA	Composite liquid waste sampler
Cont (Extraction)	Continuous liquid - liquid extraction
cpm	Counts per minute
Cr	Chromium
CRDL	Contract Required Detection Limits
CRQL	Contract Required Quantitation Limits
CRREL	U.S. Army Cold Regions Research and Engineering Laboratory
Cu	Copper
CV	Calibration verification

CVFAA	Cold vapor flameless atomic absorption
C-WMHDPE	Wide-mouth high density polyethylene (I-Chem cleaning protocol C)
D&D	Decontamination and decommissioning
DBBP	Dibutyl butyl phosphonate
DBC	Dibutylchlorendate
DDD	Dichloro diphenyl dichloroethane
DDE	Dichloro diphenyl chloroethane
DDT	Dichloro diphenyl trichloroethane
DEL	Deleted
DFTPP	Decafluorotriphenylphosphine
DMF	Dimethyl formamide
DMS	Data Management System
DOD	Department of Defense
DOE	Department of Energy
DOE-ES	Department of Energy Environmental Survey
DOE-HQ	Department of Energy Headquarters
dpm	Disintegrations per minute
DW	Drinking water
ECH	Environmental Compliance and Health Protection Division
EHP	Environmental and Health Protection Division
EICP	Extracted ion current profile
EML	Environmental Measurement Laboratory
EMSL-LV	Environmental Monitoring and Systems Laboratory, Las Vegas
EPA	Environmental Protection Agency
EPTC	Extraction Procedure Toxicity Characteristic
EPTOX	Extraction procedure toxicity
ESD	Environmental Sciences Division
ESM	Environmental Survey Manual
EVAL	Pesticide evaluation standard mixture
F^-	Fluoride
FAA	Flame atomic absorption
fCi/g	FemtoCuries per gram
FES	Flame emission photometry
FID	Flame ionization detector
FQC	Field quality control
FSCC	Fused silica capillary column
ft	Feet
FW	Formula weight
FY	Fiscal year
g	Grams
GA	Gross alpha
gal.	Gallon
GB	Gross beta
GC	Gas chromatograph
GC/ECD	Gas chromatograph - electron capture detector
GC-FID	Gas chromatograph - flame ionization detection

GC/MS	Gas chromatograph - mass spectrometer
GFAA	Graphite furnace atomic absorption
GPC	Gel permeation chromatography
GW	Groundwater
H	Hydrogen
HCl	Hydrochloric acid
HCN	Hydrocyanic acid
HD	High dispersion
HDPE(B)	High density polyethylene bottles (I-Chem cleaning protocol B)
HDPE(C)	High density polyethylene bottles (I-Chem cleaning protocol C)
He	Helium
HE	High explosive
Hg	Mercury
HMX	Cyclotetramethylene tetranitramine (i.e., octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine)
HNS	Dipicrylethane
HNO_3	Nitric acid
HKPCDD	Heptachlorodibenzo-p-dioxin
HPCDF	Heptachlorodibenzo-furan
HPLC	High performance liquid chromatography
HRGC	High resolution gas chromatography
HRMS	High resolution mass spectrometry
HXCDD	Hexachlorodibenzo-p-dioxin
HXCDF	Hexachlorodibenzo-furan
H&SO	Health and Safety Officer
H_2SO_4	Sulfuric acid
H_3	Tritium
IBM	International Business Machines, Inc.
IC	Ion chromatography
ICP	Inductively coupled plasma
ID	Identification
I.D.	Inside diameter
IDL	Instrument detection limits
in.	Inches
IND	Pesticide individual standard
INEL	The Idaho National Engineering Laboratory
IS	Internal standard compound
IS1 (BCM)	Volatile organic internal standard compound (Bromochloromethane)
IS1 (DCB)	Semivolatile internal standard compound (1,4-Dichlorobenzene-d4)
IS2 (DFB)	Volatile organic internal standard compound (1,4-Difluorobenzene)
IS2 (NPT)	Semivolatile internal standard compound (Naphthalene-d8)
IS3 (ANT)	Semivolatile internal standard compound (Acenaphthene-d8)
IS3 (CBZ)	Volatile organic internal standard compound (Chlorobenzene)
IS4 (PHN)	Semivolatile internal standard compound (Phenanthrene-d10)
IS5 (CRY)	Semivolatile internal standard compound (Chrysene-d12)
IS6 (PRY)	Semivolatile internal standard compound (Perylene-d12)

JMC	Soil hand-core sampling device
K	Potassium
K^+	Potassium ion
KCl	Potassium chloride
Kev	Kilovolt
Kg	Kilogram
km^2	Square kilometers
L	Liters
LCS	Laboratory control samples
LLRAG	Low-Level Radiochemical Analysis Group
LLW	Low-level waste
M	Molar
MCLG	Maximum contaminant level goal
MDL	Method detection limit
MeCl	Methylene chloride
MEK	Methyl ethyl ketone
MEPAS	Multimedia Environmental Pollutant Assessment System
MES	Method of External Standards
mg	microgram
Mg	Magnesium
Mg^{+2}	Magnesium ion
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
Mg_2SO_4	Magnesium sulfate
MIBK	Methyl isobutyl ketone (4-methyl-2-pentanone)
min	Minute
MIS	Method of Internal Standards
mL	milliliters
mm	Millimeter
Mm	Micrometer
MMES	Martin Marietta Energy Systems, Inc.
mR/hr	MilliRad per hour
mS/cm	milliSiemens per centimeter
MSA	Method of Standard Additions
MS%Rec	Matrix spike percent recovery
MSD%Rec	Matrix spike duplicate percent recovery
MSL	Mean sea level
MW	Monitoring well
N	Normal
Na	Sodium
Na^+	Sodium ion
NA	Not applicable, not available, not analyzed
NaOH	Sodium hydroxide
Na_2SO_3	Sodium sulfate
NBC	National Bureau of Calibrations
NBS	National Bureau of Standards

n_d	Refractive index
NEIC	National Enforcement Investigation Center
ng	Nanograms
Ni	Nickel
NI	No Information
NIOSH	National Institute for Occupational Safety and Health
nm	Nanometer
NO_3	Nitrate
NPDES	National Pollution Discharge Elimination System
NR	Not required
NS	No Samples
OCDD	Octachlorodibenzo-p-dioxin
OCDF	Octachlorodibenzo-furan
ODS	Octadecylsilane
O&G	Oil and grease
Org	Organics
ORGDP	Oak Ridge Gaseous Diffusion Plant
ORNL	Oak Ridge National Laboratory
OSHA	Occupational Safety and Health Administration
OTEC	Ocean thermal energy conversion
OVA	Organic vapor analysis
P/P	Pesticide/PCB
Pb	Lead
PBLK	Pesticide method blank
PC	Personal computer
PCB	Polychlorinated biphenyl
PCDD	Pentachlorodibenzo-p-dioxin
PCDF	Pentachlorodibenzo-furan
pCi	PicoCuries
pCi/L	PicoCuries per liter
P.E.	Performance evaluation
PETN	Pentaerythritol tetranitrate
PID	Photoionization detector
POTW	Publically owned treatment works
ppb	Parts per billion
ppm	Parts per million
ppt	Parts per trillion
Pu	Plutonium
PVC	Polyvinyl chloride
QA	Quality assurance
QA/QC	Quality Assurance/Quality Control
QB	Quarterly blind
QC	Quality control
QD	Quality Department
r	Correlation coefficient
Rad. or RAD	Radionuclides, or radioactivity, or radiological

RCRA	Resource Conservation and Recovery Act
RDX	Trimethylene trinitramine (i.e., hexahydro-1,3,5-trinitro-1,3,5-triazine)
RE	Reanalysis
RMCL	Recomended maximum contaminant level
RN	Rinsate
RPD	Relative percent difference
RRF	Relative response factor
RSD	Relative standard difference
RT	Retention time
S&A	Sampling and analysis
S1(DCB)	Pesticide surrogate compound (Dibutylchlorendate)
S1(NBZ)	Semivolatile surrogate compound (Nitrobenzene-d5)
S1(TOL)	Volatile organic surrogate compound (Toluene-d8)
S2(BFB)	Volatile organic surrogate compound (Bromofluorobenzene)
S2(FBP)	Semivolatile surrogate compound (2-Fluorobiphenyl)
S3(DCE)	Volatile organic surrogate compound (1,2 Dichloroethane-d4)
S3(TPH)	Semivolatile surrogate compound (Terphenyl-d14)
S4(PHL)	Semivolatile surrogate compound (Phenol-d5)
S5(ZFP)	Semivolatile surrogate compound (2-Fluorophenol)
S6(TBP)	Semivolatile surrogate compound (2,4,6-Tribromophenol)
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act of 1986
SAS	Statistical Analysis System
SBLK	Semivolatile method blank
SC	Surrogate compound
SD	Standard deviation
SDG	Sample delivery group
SIUs	International System of Units
SO_4	Sulfate
SOP	Standard operating procedures
SOW	Statement of work
SPCC	System performance check compounds
SS	Suspended soils
SSTD	Semivolatile standard
STD	Standard
STD DEV	Standard Deviation
SV	Semivolatile organic
SW	Surface water
SepF (Extraction)	Separatory funnel extraction
Sonc (Extraction)	Sonication extraction
TATB	Triamino-trinitro-benzene
TBP	Semivolatiles organics protocol
TC	Target compound
TCB	Trichlorobenzene
TCDD-TOT	Tetrachlorodibenzo-p-dioxin, total

TCDF-TOT	Tetrachlorodibenzo-furan, total
TCE	Trichloroethylene
TCL	Target compound list
TCLP	Toxicity characteristic leaching procedure
TCTNB	Trichloro-trinitro-benzene
TDS	Total dissolved solids
TIC	Tentatively identified compounds
TICH	Total identifiable chlorinated hydrocarbons
TICP	Total ion current profile
TIP	PhotoVac OVA instrument
TLD	Thermoluminescent dosimeter
TNT	2,4,6-trinitrotoluene
TOC	Total organic carbon
TOPO	Trioctylphosphine oxide
TRU	Transuranic
TSCA	Toxic Substance Control Act
2,3,7,8-TCDD	2,3,7,8-Tetrachlorodibenzo-p-dioxin
2,3,7,8-TCDF	2,3,7,8-Tetrachlorodibenzo-furan
2,4D	2,4-Dichlorophenoxy acetic acid
2,4-DNT	2,4-dinitrotoluene
2,6-DNT	2,6-dinitrotoluene
2,4,5-T	2,4,5-Trichlorophenoxy
2,4,5-TP	Propionic acid (Silvex)
2NZN	2 N (Normal) Zinc acetate
U	Uranium
ug	Micrograms
ug/kg	Micrograms per kilogram
ug/L	Micrograms per liter
UST	Underground storage tank
V&V	Verification and validation
VBLK	Volatile organic method blank
VISR	Validated time of sample receipt
VOA	Volatile organic
VOC	Volatile organic compound
vol	Volume
VSTD	Volatile organic standard
W	Tungsten
W_i	Percent relative weight abundance
Y	Yttrium
Zn	Zinc
%D	Percent difference

INORGANIC ANALYSIS DATA FLAGS

Concentration Qualifiers

B	Value less than the CRDL but greater than IDL
U	Analyte analyzed for but not detected

QA/QC Qualifiers

E	Value estimated or not reported because of the presence of interference
M	Duplicate injection results exceed control limits
N	Spiked sample recovery not within control limits
S	Value determined by the Method of Standard Additions (MSA)
*	Duplicate analysis not within control limits
+	Correlation coefficient for the MSA is less than 0.995

Method Qualifiers

A	Flame AA
AE	Atomic emission - ICP
AS	Semiautomated spectrophotometric
AV	Automated cold vapor AA
C	Manual spectrophotometric
CV	Manual cold vapor AA
F	Furnace AA
NR	Analyte is not required to be analyzed
P	ICP
T	Titrimetric

ORGANIC ANALYSIS DATA FLAGS

B	Analyte found in associated blank as well as in the sample
E	Concentration exceeds the calibration range of the instrument
J	Estimated value
U	Compound analyzed for but not detected

1.0 INTRODUCTION

This document presents the Department of Energy's (DOE's) Environmental Survey with the majority of the field and analytical data collected by the Oak Ridge National Laboratory (ORNL) Sampling and Analysis Team at the Argonne National Laboratory (ANL) Site. Sampling activities at the ANL site were initiated during the week of October 18, 1987. Analyses of these samples were essentially completed by August 1988. Four additional samples were analyzed in February 1989. Battelle Columbus Division (BCD) planned, supervised the installation of, sampled, and analyzed samples for the new wells at ANL.

NOTE

It should be noted that this document contains uninterpreted sampling and analysis data. The data will be interpreted by the DOE Environmental Survey Team and used with the tentative Survey findings contained in the Environmental Survey Preliminary Report. Final Survey findings will be contained in the Environmental Survey Summary Report.

This ANL Sampling and Analysis Data Document includes information from the DOE Environmental Survey Sampling and Analysis Plan for the ANL Site (Ref. 1-1) and field and analytical data. Please refer to the August 1987 version of the DOE Environmental Survey Manual (Ref. 1-2) for additional detailed descriptions of field and analytical procedures. For an overview of the DOE Environmental Survey Sampling and Analysis Program and for background information on the ANL environmental setting, please refer to the Preliminary Report for the DOE Environmental Survey for the ANL Site (Ref. 1-3) and the DOE Environmental Survey Sampling and Analysis Plan for the ANL Site (Ref. 1-1).

Volume I of this document contains six sections. Section 1.0 provides background information on site sampling and analysis efforts. Section 2.0 represents the former location of the Executive Summary. Section 3.0 provides a brief description of field and analytical procedures. Section 4.0 describes how to evaluate the sampling and analysis data and presents the main data on each environmental problem. Quality assurance (QA) data are presented and discussed in Sect. 5.0. References and bibliographic information are included in Sect. 6.0.

Volume II contains Appendices A through E. Appendix A contains a listing of ANL sampling and analytical requests. Appendix B presents a discussion and listing of background concentrations of analytes. Appendix C includes audit findings. Appendix D contains a summary of analytical quality assurance/quality control (QA/QC) information. Appendix E includes radiological QA/QC data.

1.1 Site Sampling and Analysis

Oak Ridge National Laboratory was designated by DOE to provide a sampling team for the ANL Site and to perform the required laboratory analytical services. During the on-site portion of the ANL Survey (June 15 to June 26, 1987), meetings were held between members of the Survey Team and the leader of the ANL Sampling and Analysis Team to discuss required sampling and analytical needs. A draft list of sample requests was provided to ORNL's ANL Sampling and Analysis Team Leader in June 1987. The Survey Team revised this list during a joint meeting with Sampling Team members in July 1987. The ANL Sampling and Analysis Plan (issued October 28, 1987) was based on the revised sample requests that resulted from the July 1987 meeting and continuing dialogue between DOE, ORNL, and the Survey Team technical specialists.

The purpose of the sampling and analysis plan was to outline a plan for environmental field sampling and laboratory analysis in support of the DOE Environmental Survey at the ANL Site (see Fig. 1.1) located near Chicago, Illinois. The sampling and analysis plan was intended to be a guide that incorporated the standard procedures, analytical protocols, field sampling protocols, and other laboratory guidance from the DOE Environmental Survey Manual (Ref. 1-2) in effect at the time of sampling.

The ANL Sampling and Analysis Team involved personnel from many organizations. ORNL managed the project and was responsible for all sampling, laboratory analyses,

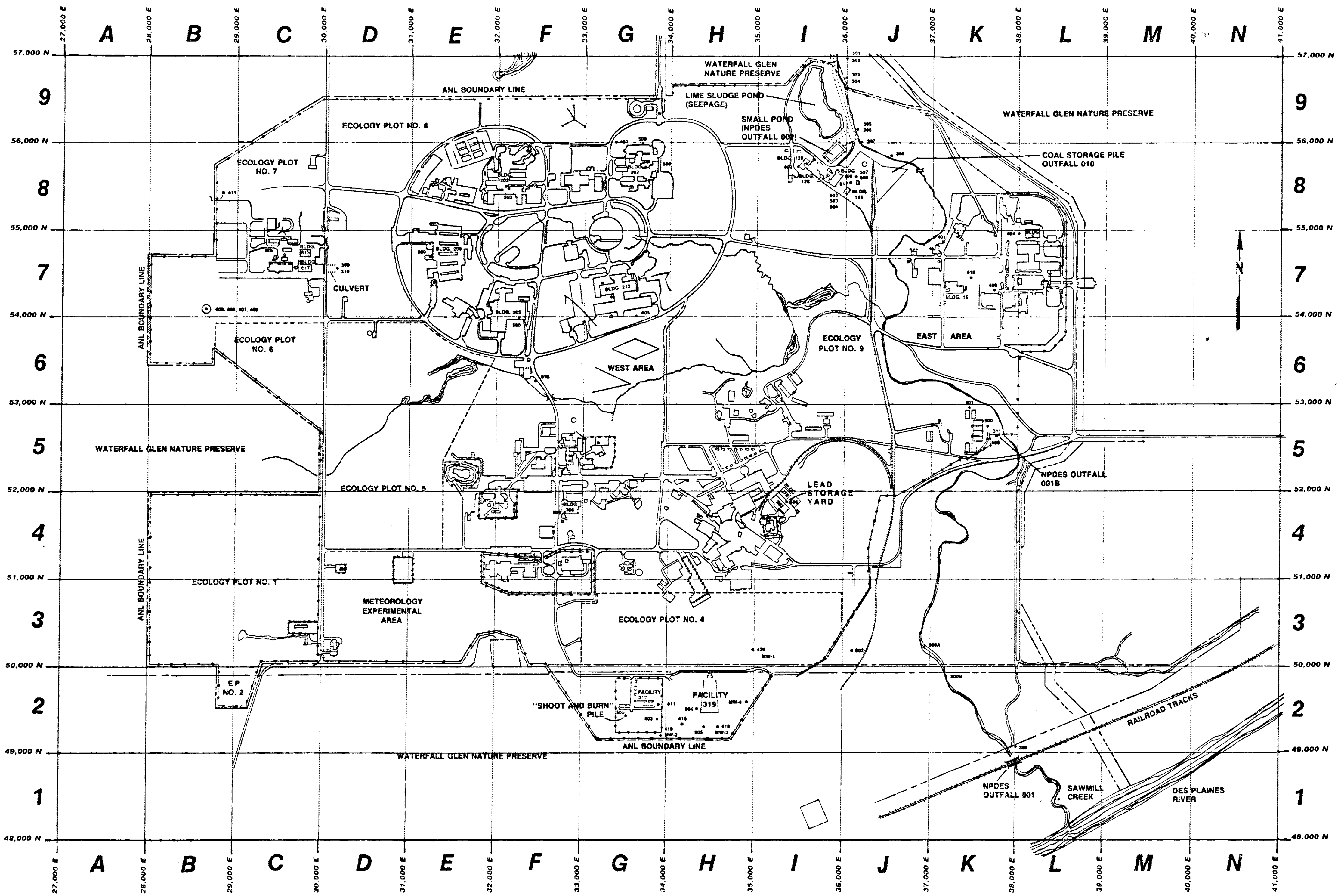

Figure 1.1

BLDG. #	DESCRIPTION	COORD.
6	Stores Storage	L7
16	Quality Assurance and Storage	K7
17		
19	No Longer Standing	K7
31	Shallow Well #1, Pump House	
32	Shallow Well #2, Pump House	
34	No Longer Standing	K7
108	Central Boiler House	I8
128	Chemical Storage	I8
129	Water Treatment Plant	I8
145	AMPEL Facility	J8
163	Shallow Well #3, Pump House	
200	Chemistry	E7
202	Biological & Medical Research	G8
203	Physics & Environmental Research	F8
205	Chemical Technology Division	F7
212	Materials Science & Technology	G7
264	Shallow Well #4, Pump House	
306	Reclamation	F4
317	Waste Storage	G2
378	Storage	I4
382	Cryogenic Laboratory & EES Storage	I4
519	Water Sample Station-Sawmill Creek	L2
575	Chemical Feed Building	K5
579	Ion Exchange Building	K5
815	Transportation Services-Garage	C7
817	Vacant	C7
	Wastewater Treatment Plant	K5

field analyses, data management, and report preparation. Figure 1.2 shows the organizational structure for sampling and analysis personnel for the ANL Site.

This ANL Sampling and Analysis Data Document has been prepared by ORNL and subsequently reviewed by the Environmental Protection Agency's (EPA's) Environmental Monitoring Systems Laboratory in Las Vegas (EMSL-LV) and the DOE Survey Team. All comments have been addressed or considered before issuing this final draft.

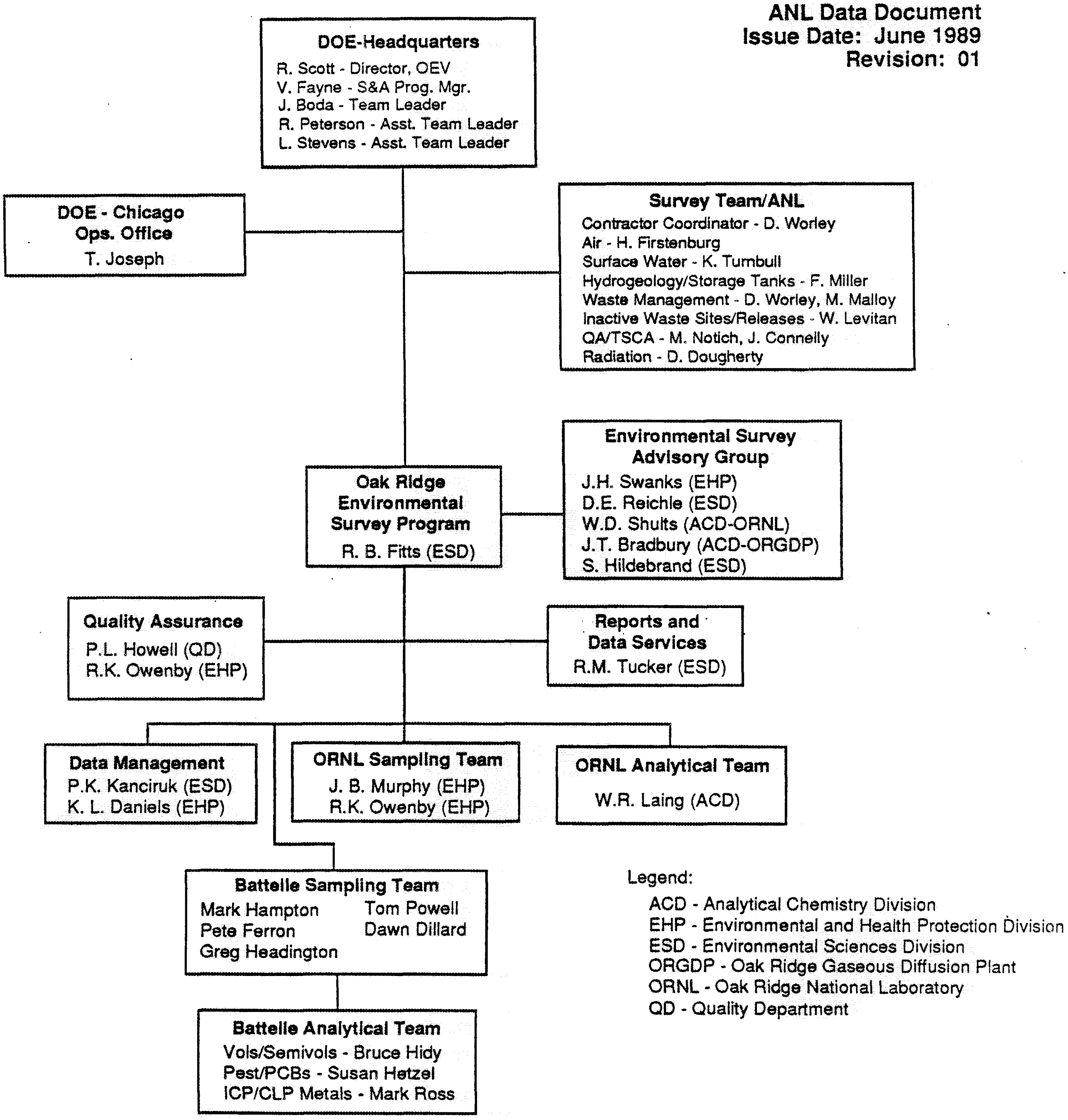

Figure 1.2. DOE Leaders, Team Leaders and Sampling and Analysis Teams for ANL

2.0 SUMMARY OF SAMPLING AND ANALYSIS

Section 2.0 was originally reserved for a summary of the scope and data resulting from the sampling and analysis effort. After further consideration, it was decided that the Survey teams could just as effectively accomplish their objective of modifying the findings by reviewing the data as it appears in Sect. 4.0, Data Presentation. Consequently, Sect. 2.0 was deemed to be redundant and unnecessary; it is retained only in title so as to avoid inconsistencies with references in the DOE Environmental Survey Manual and other sections within the data document.

3.0 METHODS

Standard methods and procedures for sampling and analysis provide results which are representative of the site, of known analytical quality, and comparable with other Survey data. Field sampling protocols and analytical methods have been developed and documented in the DOE Environmental Survey Manual (Refs. 1-2). Appendices D and E of the DOE Environmental Survey Manual provide detailed technical descriptions of the sampling and analytical methods described in the following sections.

Sampling and analytical teams used sampling protocols developed by the American Society for Testing Materials (ASTM), The National Bureau of Standards (NBS), and the U.S. Environmental Protection Agency (EPA); EPA inorganic and organic laboratory analysis methods; and DOE radiological assessment procedures.

Standard practices to ensure sample integrity were in place for each field sampling method. Samples were handled with latex gloves, surface contamination was wiped or rinsed off, and samples were then labeled. Each sample was bagged in a zip-top bag and placed in an insulated ice chest. The samples were then logged in field books and chain-of-custody documents. Chain-of-custody documents were initiated at the time of sample collection and accompanied the samples until they arrived at the analytical laboratories.

For additional details on methods, please refer to the DOE Environmental Survey Manual (i.e., E4.2.1 refers to Sect. E4.2.1, "Sample Container Immersion," of Appendix E of the DOE Environmental Survey Manual). Section 6.0 of this data document contains a bibliography of sources and references used to develop and perform analyses.

3.1 Field Sampling Methods

3.1.1 Surface Water Sampling Methods

3.1.1.1 Immersion Method

The immersion method was the preferred method for collection of grab samples from shallow streams, ponds, and effluent streams. The sample bottle was submerged below the water surface with the opening oriented upstream. The sample was collected, preserved, capped, and rinsed with deionized water (Sampling Method: Reference E4.2.1, "Sample Container Immersion").

3.1.1.2 Time Composite Sampling

An automated sampler was used to determine mass per unit time concentrations and identify sporadically discharged contaminants from outfalls or streams. Composite samplers were located near the sample point and set to collect a selected volume at the desired frequency, e.g., 320 milliliter (mL) collected at the same time each hour. The sample was pumped through a tube to a 2-1/2 gallon (gal.) refrigerated collection jar. Samples were then dispersed from the collection jar to appropriate sample containers (Sampling Method: Reference E4.2.2, "Automated Composite Sampler").

3.1.1.3 Volatile Organic Compounds by Vial

Grab samples for volatile organics were collected by submerging a 40-mL vial with a Teflon-coated septum in water. The vial was slowly submerged, upside down, in the water. The sample was then collected by righting the vial. The vial was removed from the water, capped, and inverted to check for air bubbles. A lack of bubbles verified an intact sample. It was then rinsed, wiped, labeled, and packed (Sampling Method: Reference E4.2.3A, "Volatile Organic Compounds by Vial").

3.1.1.4 Volatile Organic Compounds by Dipper

A grab sample for volatile organics was obtained by slowly submerging a stainless steel dipper in water. The dipper was retrieved and a sample decanted into a 40-mL sample vial that was slightly tipped against the dipper. The vial was filled, capped, checked for air bubbles, and packaged (Sampling Method: Reference E4.2.3B, "Volatile Organic Compounds by Dipper").

3.1.2 Groundwater Sampling Methods

3.1.2.1 Purging Wells

Grab samples from developed wells were taken after using an electronic sounder to indicate the depth to water level and calculating the well volume. Typically, a submersible pump was used to purge the well of 3 to 5 well volumes. Well purging ensured that a sample representative of the groundwater was secured. As the well was being purged, the purged water was monitored for temperature, conductivity, and pH. When these parameters stabilized, they indicated that the water being pumped was most likely from the aquifer and not the well casing. Types of pumps used for purging wells included peristaltic pumps (shallow wells) and bladder pumps (Sampling Method: Reference E4.4.4.1, "Purging and Sampling with a Submersible Pump").

3.1.2.2 Groundwater Sample Collection

Samples were collected from wells after adequate purging and stabilization of field parameters. Samples were then collected from the pump discharge or bailer (narrow bucket with check valve).

Grab samples collected using bailers were preferred for volatile organics, dissolved gases, or other samples that could be degraded by aeration.

Samples collected using submersible centrifugal pumps were not suitable for volatile organic analysis. The turbulence caused by the submersible pump may have released volatiles to vapor phase, excluding them from the sample. Logbook entries indicative of volatile organic samples collected in this manner were made by the Sampling Team Leader.

Other types of pumps used to collect samples were considered suitable for maintaining volatile sample integrity. Filtered samples were taken by connecting the pump outlet to the filter unit. Pump pressure was regulated to prevent filter breakthrough (Sampling Method: Reference E4.4, "Groundwater").

3.1.2.3 Field Measurements

Horiba or Yellow Springs instruments were used to monitor water samples for pH, temperature, conductivity, and, in most cases, turbidity and dissolved oxygen. The presence of volatile organic compounds (VOCs) was determined with either a photoionization detector (PID) or a flame ionization detector (FID). A Sybron/Barnstead conductivity bridge was used to determine resistivity. The reduction-oxidation potential of samples was determined with a standard millivolt meter using either a silver-silver chloride (Ag-AgCl)-platinum or calomel-platinum electrode system (Sampling Method: Reference E4.5, "Field Measurements").

3.1.3 Solids

The methods used for solids sampling (soils, sludge, and sediments) were designed to account for the heterogeneous composition of such solids. Several grab samples from selected locations were collected, pooled, homogenized in an aluminum pan using a stainless steel spoon, and bottled. A minimum of three pooled samples were collected from each sample location (Sampling Method: Reference E5.0, "Solids"). In instances where the media to be collected were limited in quantity (e.g., sediment), grab samples were collected until a suitable volume was obtained.

3.1.4 Surface Soils

The top 3 inches (in.) of soil (with stones and vegetation removed) were collected using stainless steel spoons, spatulas, etc.; pooled; and placed in sample bottles. Volatile samples were collected without homogenization or pooling. Nonvolatile samples were collected in an aluminum pan, mixed, and placed in sample bottles.

For trenches and ditches, subsamples were systematically collected at random along the centerline of the trench. For spill areas, the subsamples were obtained from heavily stained areas; for large surface areas, a simple random grid was used to ensure a representative sample (Sampling Method: Reference E5.1, "Surface Soils").

3.1.5 Subsurface Soils

Subsurface soil samples [less than 50 feet (ft) in depth] were collected using a variety of techniques. Augers, core samplers, and drive tubes with split-spoon samplers were used as soil conditions dictated. Soil cores were preferable to augered samples, but a core sampler was useful only in areas where gravel/cobble was not abundant and where there were no highly hazardous wastes (Sampling Method: Reference E5.2, "Subsurface Soils").

3.1.6 Auger and Thin-Wall Tube Sampling

Following augering to a desired sample depth, samples were collected by removing the auger and replacing it with a tube corer. The corer was lowered into position at the sample depth, forced into the soil, and the sample collected. When the soil contained cobble which precluded use of the corer, the samples had to be collected directly from the auger. Continuous flight augers were used in some cases. Although samples from specific depths were difficult to collect directly off the auger, satisfactory composite samples were collected (Sampling Method: Reference E5.2.1, "Subsurface Solid Sampling with Auger and Thin-Wall Tube Sampler").

3.1.7 Core Sampling

The core tube was driven into the ground to a desired depth, withdrawn, and the sample placed in an aluminum tray. The core was then examined with field survey instruments for radioactivity and organic vapor concentrations. The sample site having the highest concentrations was resampled, and an undisturbed sample collected for volatile organic analysis. Three additional cores from the same sample location were collected, pooled, mixed, and placed in sample bottles. This procedure was completed three additional times to collect a total of three composite samples (Sampling Method: Reference E5.2.2, "Core Sample"). When sampling boreholes that penetrated the soil 10 ft or more, split-spoon samples were taken. The contents of the split-spoon were screened for VOCs and radioactivity. Immediately following screening, the VOC samples were taken. Following collection of the VOC samples, the split-spoon sample was emptied into a stainless steel pan and homogenized. The remaining samples were then taken from this composite.

3.1.8 Sludge and Sediments

Sludge is a semidry material ranging from dewatered solids to high viscosity liquids. Sediments are the deposited materials underlying a body of water. When sediments are exposed by evaporation, stream rerouting, or other means, they are collected by soil or sludge collection methods.

Sludge and sediment were usually sampled using a scoop if the liquid layer over the material was shallow (Sampling Method: Reference E5.3, "Sludges and Sediments").

3.1.9 Scoop Sampling

Although sample collection with a scoop may disturb the liquid-solid interface and alter the sample integrity, sample integrity can be maintained by using extreme care.

The scoop method was used to collect a composite sample by inserting the scoop and removing a sample. For sludge exposed to air, the first 1 to 2 centimeters (cm) of material were removed prior to collecting the sample. The sample was placed in an aluminum tray, mixed, and transferred to an appropriate bottle (Sampling Method: Reference E5.3.1, "Scoop").

3.1.10 Photoionization Detector and Flame Ionization Detector

When used, the PID was calibrated with benzene using the headspace method. A specified volume of vapor was removed from the headspace in a benzene reagent bottle and injected into a known volume Tedlar air bag containing zero air. The benzene atmosphere in the bag was calculated from the atmospheric pressure and the vapor pressure of the benzene at the ambient temperature. The PID was calibrated to the resultant concentration and periodically checked throughout the sampling procedure. In sampling, the soil core was removed from the bore hole and a portion placed into a container to prevent loss of volatiles. The remaining portion was placed into a container fitted with a gas-tight sampling port. After 10 to 20 minutes (min), the PID sampling tube was inserted into the container through the port and the vapor concentrations measured. The results were recorded as "ppm benzene equivalent." The depth with the highest PID measurement was selected for sample submission and the portion previously placed in the container to prevent loss of volatiles constituted the sample.

When used, a FID was calibrated using a methane/air mixture. A gas chromatograph-mass spectrometer (GC/MS) was used to determine the methane concentration (usually 93 parts per million [ppm]) in the cylinder containing the compressed methane/air mixture. Daily calibrations of the FID were performed by filling a Tedlar air bag with the calibration gas, making the necessary adjustments to the FID, and then "locking" the instrument dials. This ensured that the readings on the FID were correct.

3.1.11 Soil Gas Collection

Soil gas samples for the determination of volatile organic compounds were collected by the active method. The active method utilizes a pump for the continuous withdrawal of subsurface gases with syringe sampling and in situ gas chromatograph (GC) analysis, or the subsurface gases are pumped through adsorbent tubes and analyzed in the laboratory by GC. The active sampling method is preferred because the zone of sampling is effectively enlarged by the moving air stream, thereby providing a more representative sample from the interstitial spaces. Soil gas sampling at ANL was accomplished by the active method, with the sample tubes returned to ORNL for analysis by GC.

Samples for soil gas analysis were collected using solid sorbent tubes (Carbotrap 300). The Carbotrap 300 tube was designed to trap hydrocarbons, whether present individually or in complex mixtures. The tube contained three distinct adsorbent beds. The back bed trapped vinyl chloride and other light compounds, while the middle bed trapped the C5-C8 compounds, and the front bed (gas inlet) trapped the heaviest compounds. The tube was constructed to allow sampling volumes of up to 10 liters (L) without breakthrough. The soil gas stream was pulled through the tube with a personal air monitor pump which had an adjustable sample rate of 0.2 to 4 L per minute.

3.1.12 Field Radioactivity Measurements

Field radioactivity measurements were made using a portable beta/gamma meter. The instrument was calibrated at the Sampling Team's laboratory prior to the team's departure to the site.

3.2 Analytical Methods

3.2.1 Organic Analysis Methods

3.2.1.1 Volatile Organics

Volatile organic contaminants in low- and medium-level concentration samples of water, soil, or sediment were determined using the 7/87 Contract Laboratory Program (CLP) Statement of Work (SOW) and Appendix D of the DOE Environmental Survey Manual. The method cited in these two sources is appropriate for the determination of volatile organics in typical environmental matrices, using purge and trap sample introduction into a GC-MS. Thirty-four volatile target compounds can be identified and quantitated with the technique. Table 3.1 summarizes these analytes and their respective quantitation limits, as specified in the DOE Environmental Survey Manual and the 7/87 CLP SOW.

Volatile organics are purged from an aqueous sample or a mixture of soil and distilled water at ambient temperature using an inert gas. The vapor is swept through a sorbent column where the volatiles are trapped. After purging is completed, the sorbent column is heated and backflushed with the inert gas to desorb the volatiles onto a gas chromatographic (GC) column. The GC is temperature programmed to separate the volatiles, which are then detected with a mass spectrometer. Target compounds are identified by: (1) elution of the sample component at the same GC relative retention time as the standard component, and (2) correspondence of the sample component and

Table 3.1. Analytes Determined by CLP Volatiles Analysis Method

			Contract Required Quantitation Limits[a]	
	Analyte	CAS Number	Water (µg/L)	Low Soil/Sediment[b,c] (µg/kg)
1.	Chloromethane	74-87-3	10	10
2.	Bromomethane	74-83-9	10	10
3.	Vinyl Chloride	75-00-4	10	10
4.	Chloroethane	75-00-3	10	10
5.	Methylene Chloride	75-09-2	5	5
6.	Acetone	67-64-1	10	10
7.	Carbon disulfide	75-15-0	5	5
8.	1,1-Dichloroethene	75-35-4	5	5
9.	1,1-Dichloroethane	75-35-3	5	5
10.	1,2-Dichloroethene (total)	540-59-0	5	5
11.	Chloroform	67-66-3	5	5
12.	1,2-Dichloroethane	107-06-2	5	5
13.	2-Butanone	78-93-3	10	10
14.	1,1,1-Trichloroethane	71-55-6	5	5
15.	Carbon Tetrachloride	56-23-5	5	5
16.	Vinyl acetate	108-05-4	10	10
17.	Bromodichloromethane	75-27-4	5	5
18.	1,1,2,2-Tetrachloroethane	79-34-5	5	5
19.	1,2-Dichloropropane	78-87-5	5	5
20.	cis-1,3-Dichloropropene	10061-01-5	5	5
21.	Trichloroethene	79-01-6	5	5
22.	Dibromochloromethane	124-48-1	5	5
23.	1,1,2-Trichloroethane	79-00-5	5	5
24.	Benzene	71-43-2	5	5
25.	trans-1,3-Dichloropropene	10061-02-6	5	5
26.	Bromoform	75-25-2	5	5
27.	2-Hexanone	591-78-6	10	10
28.	4-Methyl-2-pentanone	108-10-1	10	10
29.	Tetrachloroethene	127-18-4	5	5
30.	Toluene	108-88-3	5	5
31.	Chlorobenzene	108-90-7	5	5
32.	Ethyl benzene	100-41-4	5	5
33.	Styrene	100-42-5	5	5
34.	Xylenes (total)	133-02-7	5	5

Table 3.1. Analytes Determined by CLP Volatiles Analysis Method (Continued)

a. Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

b. Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

c. Contract required quantitation limits (CRQL) for volatiles at medium levels in soil/sediment are 100 times the listed CRQL for volatiles at low levels in soil/sediment.

standard component mass spectra. A combined search of the 1985 NBS and Wiley Mass Spectral Libraries is used to tentatively identify up to ten nontarget analytes of greatest concentration in the chromatogram.

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that could lead to artifacts and/or elevated baselines in the total ion profile. Laboratory reagent blanks are used to monitor the presence of such interferences. Interferences introduced by the sample matrix are monitored by the use of internal standards and matrix and surrogate spike recoveries.

Interpretation of volatiles data requires an assessment of the impact of holding times on data quality. The Survey protocol requires that the analysis be conducted within 14 days of sample collection. Samples which exceed this holding time can still provide useful information, as long as the data are interpreted with caution.

3.2.1.2 Semivolatile Organics

Semivolatile organic contaminants in low- and medium-level concentration samples of water, soil, or sediment were determined using the 7/87 CLP SOW and Appendix D of the DOE Environmental Survey Manual. The protocol described in these two sources is appropriate for the determination of a number of organic compounds that are partitioned into an organic solvent and are amenable to gas chromatography. The target compound list (TCL) and required quantitation limits specified in the DOE Environmental Survey Manual are listed in Table 3.2.

Semivolatile organics are serially extracted from aqueous samples with methylene chloride at a pH greater than 11, and again at a pH less than 2. The methylene chloride extracts are dried and concentrated separately. Low level soil samples are mixed with anhydrous powdered sodium sulfate and serially extracted with 1:1 methylene chloride/acetone using an ultrasonic probe. The methylene chloride and

Table 3.2. Analytes Determined by CLP Semivolatiles Analysis Method

	Analyte	CAS Number	Contract Required Quantitation Limits[a] Water (µg/L)	Low Soil/Sediment[b,c] (µg/kg)
35.	Phenol	108-95-2	10	330
36.	bis(2-Chloroethyl) ether	111-44-4	10	330
37.	2-Chlorophenol	95-57-8	10	330
38.	1,3-Dichlorobenzene	541-73-1	10	330
39.	1,4-Dichlorobenzene	106-46-7	10	330
40.	Benzyl alcohol	100-51-6	10	330
41.	1,2-Dichlorobenzene	95-50-1	10	330
42.	2-Methylphenol	95-48-7	10	330
43.	bis(2-Chloroisopropyl) ether	39638-32-9	10	330
44.	4-Methylphenol	106-44-5	10	330
45.	N-Nitroso-di-n-propylamine	621-64-7	10	330
46.	Hexachloroethane	67-72-1	10	330
47.	Nitrobenzene	98-95-3	10	330
48.	Isophorone	78-59-1	10	330
49.	2-Nitrophenol	88-75-5	10	330
50.	2,4-Dimethylphenol	105-67-9	10	330
51.	Benzoic acid	65-85-0	50	1600
52.	bis(2-Chloroethoxy) methane	111-91-1	10	330
53.	2,4-Dichlorophenol	120-83-2	10	330
54.	1,2,4-Trichlorobenzene	120-82-1	10	330
55.	Naphthalene	91-20-3	10	330
56.	4-Chloroaniline	106-47-8	10	330
57.	Hexachlorobutadiene	87-68-3	10	330
58.	4-Chloro-3-methylphenol (para-chloro-meta-cresol)	59-50-7	10	330
59.	2-Methylnaphthalene	91-57-6	10	330
60.	Hexachlorocyclopentadiene	77-47-4	10	330
61.	2,4,6-Trichlorophenol	88-06-2	10	330
62.	2,4,5-Trichlorophenol	95-95-4	50	1600
63.	2-Chloronaphthalene	91-58-7	10	330
64.	2-Nitroaniline	88-74-4	50	1600

Table 3.2. Analytes Determined by CLP Semivolatiles Analysis Method (Continued)

	Analyte	CAS Number	Contract Required Quantitation Limits[a] Water (µg/L)	Low Soil/Sediment[b,c] (µg/kg)
65.	Dimethylphthalate	131-11-3	10	330
66.	Acenaphthylene	208-96-8	10	330
67.	2,6-Dinitrotoluene	606-20-2	10	330
68.	3-Nitroaniline	99-09-2	50	1600
69.	Acenaphthene	83-32-9	10	330
70.	2,4-Dinitrophenol	51-28-5	50	1600
71.	4-Nitrophenol	100-02-7	50	1600
72.	Dibenzofuran	132-64-9	10	330
73.	2,1-Dinitrotoluene	121-14-2	10	330
74.	Diethylphthalate	84-66-2	10	330
75.	4-Chlorophenyl phenyl ether	7005-72-3	10	330
76.	Fluorene	86-73-7	10	330
77.	4-Nitroaniline	100-01-6	50	1600
78.	4,6-Dinitro-2-methylphenol	534-52-1	50	1600
79.	N-Nitrosodiphenylamine	86-30-6	10	330
80.	4-Bromophenyl phenyl ether	101-55-3	10	330
81.	Hexachlorobenzene	118-74-1	10	330
82.	Pentachlorophenol	87-86-5	50	1600
83.	Phenanthrene	85-01-8	10	330
84.	Anthracene	120-12-7	10	330
85.	Di-n-butylphthalate	84-74-2	10	330
86.	Fluoranthene	206-44-0	10	330
87.	Pyrene	129-00-0	10	330
88.	Butylbenzylphthalate	85-68-7	10	330
89.	3,3'-Dichlorobenzidine	91-94-1	20	660
90.	Benzo(a)anthracene	56-55-3	10	330
91.	Chrysene	218-01-9	10	330
92.	bis(2-Ethylhexyl)phthalate	117-81-7	10	330
93.	Di-n-octylphthalate	117-84-0	10	330
94.	Benzo(b)fluoranthene	205-99-2	10	330

Table 3.2. Analytes Determined by CLP Semivolatiles Analysis Method (Continued)

	Analyte	CAS Number	Contract Required Quantitation Limits[a] Water (μg/L)	Low Soil/Sediment[b,c] (μg/kg)
95.	Benzo(k)fluoranthene	207-08-9	10	330
96.	Benzo(a)pyrene	50-32-8	10	330
97.	Indeno(1,2,3-cd) pyrene (l.c.)	193-39-5	10	330
98.	Dibenz(a,h)anthracene	53-70-3	10	330
99.	Benzo(g,h,i)perylene	191-24-2	10	330

a. Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

b. Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

c. Contract required quantitation limits (CRQL) for semivolatiles at medium levels in soil/sediment are 60 times the listed CRQL for semivolatiles at low levels in soil/sediment.

extracted semivolatile organics are then collected by decanting and concentrated. All extracts are stored at 4°C in the dark until they are analyzed using GC-MS. If extracts are to be held for greater than 40 days, they are stored at -20°C. Target compounds are identified on a cross-correlation basis of: (1) relative retention times (compound elution times) compared to internal standard retention times, and (2) correspondence of the sample component and standard component mass spectra. A combined search of the 1985 NBS and Wiley Mass Spectral Libraries and interpretation by a mass spectrometer specialist are used to provide tentative identification for up to 20 non-targeted compounds meeting EPA concentration criteria.

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to artifacts or elevated baselines in the total ion profiles. Laboratory reagent blanks are used to monitor the presence of such interferences. Matrix interferences may be caused by soil acting as a sorbent for semivolatile organics, or by contaminants that are co-extracted with the sample. Sample matrix effects are monitored by internal standards, as well as surrogate and matrix spike recoveries.

Interpretation of semivolatile organics data requires an assessment of the impact of holding times on data quality. The Survey protocol requires that aqueous samples must be extracted within 7 days of sample collection; soil samples must be extracted within 14 days. Samples that have exceeded this holding time can still provide useful information as long as the data are interpreted with caution.

3.2.1.3 Pesticides/Polychlorinated Biphenyls

Pesticides and polychlorinated biphenyls (PCBs) in low- and medium-level concentration water, soil, or sediment samples were determined using the 7/87 CLP SOW and the DOE Environmental Survey Manual. The analytical method described in these two sources involves extraction of the chlorinated hydrocarbon contaminants from the environmental matrices with methylene chloride, concentration of the extracts, and the analysis of the extracts on a gas chromatograph/electron capture detector (GC/ECD). If pesticides or PCBs are tentatively identified, a second GC/ECD analysis is performed using an alternate chromatographic column for positive identification. Confirmation by GC/MS is seldom done due to insufficient concentration of the pesticides and PCBs in the samples.

Survey protocol requires the identification of 27 target compounds at the Contract Required Quantitation Limit (CRQL) listed in Table 3.3.

Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware. The presence of these artifacts is determined by running a laboratory method blank under the same conditions as the samples. Poor extraction efficiency due to sample matrix effects is monitored by the use of surrogate and matrix spike recoveries.

Interpretation of pesticide/PCB data requires an assessment of the impact of holding times on data quality. The Survey protocol requires that aqueous samples be extracted within 7 days of sample collection and soil samples completed within 14 days. Samples that have exceeded these holding times can still provide useful information as long as the data are interpreted with caution. Extracts are stored at less than $0^{o}C$ between the time of extraction and analysis to ensure that the sample quality is not compromised.

3.2.1.4 Petroleum Hydrocarbons

The method for petroleum hydrocarbons determines the presence and amounts of fuels, as well as individual petroleum-derived hydrocarbons, in soil samples. The fuels include gasoline, jet fuels (e.g., JP-4), kerosene, and diesel fuels (e.g., DF-2). Individual hydrocarbons and other gas chromatographable compounds having volatiles similar to compounds in the range of n-C_6H_{14} to approximately n-$C_{20}H_{42}$ (boiling points from approximately 69 to $344^{o}C$) are also measured. The limit of detection depends upon the

Table 3.3. Analytes Determined by CLP Pesticide/PCB Analysis Method

Analyte	CAS Number	Contract Required Quantitation Limits[a] Water (µg/L)	Low Soil/Sediment[b,c] (µg/kg)
100. alpha-BHC	319-84-6	0.05	8.0
101. beta-BHC	319-85-7	0.05	8.0
102. delta-BHC	319-86-8	0.05	8.0
103. gamma-BHC (Lindane)	58-89-9	0.05	8.0
104. Heptachlor	76-44-8	0.05	8.0
105. Aldrin	309-00-2	0.05	8.0
106. Heptachlor epoxide	1024-57-3	0.05	8.0
107. Endosulfan I	959-98-8	0.05	8.0
108. Dieldrin	60-57-1	0.10	16.0
109. 4,4'-DDE	72-55-9	0.10	16.0
110. Endrin	72-20-8	0.10	16.0
111. Endosulfan II	33213-65-9	0.10	16.0
112. 4,4'-DDD	72-54-8	0.10	16.0
113. Endosulfan sulfate	1031-07-8	0.10	16.0
114. 4,4'-DDT	50-29-3	0.10	16.0
115. Endrin ketone	53494-70-5	0.10	16.0
116. Methoxychlor	72-43-5	0.5	80.0
117. alpha-chlordane	5103-71-9	0.5	80.0
118. Gamma-chlordane	5103-74-2	0.5	80.0
119. Toxaphene	8001-35-2	1.0	160.0
120. Aroclor-1016	12674-11-2	0.5	80.0
121. Aroclor-1221	11104-28-2	0.5	80.0
122. Aroclor-1232	11141-16-5	0.5	80.0
123. Aroclor-1242	53469-21-9	0.5	80.0
124. Aroclor-1248	12672-29-6	0.5	80.0
125. Aroclor-1254	11097-69-1	1.0	160.0
126. Aroclor-1260	11096-82-5	1.0	160.0

a. Specific quantitation limits are highly matrix dependent. The quantitation limits listed herein are provided for guidance and may not always be achievable.

b. Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on dry weight basis as required by the contract, will be higher.

c. Contract Required Quantitation Limits (CRQL) for pesticides/PCBs at medium levels in soil/sediment are 15 times the listed CRQL for pesticides/PCBs at low levels in soil/sediment.

amount of sample taken, but is typically about 100 micrograms (μg) of total fuel per gram (g) of soil. The limit of detection for individual compounds is approximately 2 μg/g soil.

The EPA CLP has no standard method for the determination of petroleum hydrocarbons in soils. The following procedure was developed at ORNL based on a method that has been used extensively for the measurement of JP-4 contamination in soils and water. A 5-g sample of soil is weighed into a vial, an internal standard is added (200 μg of pristane when JP-4 is calibrated, and n-$C_{23}H_{48}$ when DF-2 is calibrated), and the vial shaken with 5-mL of methanol to disperse the soil. Five mL of methylene chloride are added to improve the solubility characteristics of the solvent, and the vial is sonicated for 30 min in an ultrasonic bath. The solids are allowed to settle out or are centrifuged out, and an aliquot of the extract is analyzed by the method of internal standards (MIS) using a capillary column gas chromatograph with flame ionization detection. The response factor for JP-4 is calculated from a calibration at a single concentration level, while the response factor for DF-2 is calculated from a least squares plot of the fuel concentration versus total integrated peak area of the fuel divided by that of the internal standard. Four calibration points cover one order of magnitude of DF-2 concentrations. Fuel concentrations in the samples are calculated from the standards curve using the ratio of the total integrated peak area divided by the internal standard peak area. Blanks and samples spiked with known quantities of authentic fuels are analyzed for quality control (QC) purposes. JP-4 is routinely used for calibration purposes because its carbon number range overlaps those of gasoline and diesel fuel. If other fuels are detected, then a recalibration with these other fuels is conducted, and the samples are reanalyzed. Because the relative response factor (RRF) of JP-4 is very similar to those of individual hydrocarbons, the RRF of JP-4 can be used to estimate the concentrations of any individual components detected in the samples.

3.2.1.5 Soil Gases

Currently, there is no EPA CLP method for soil gas analysis. The method used for the determination of soil gases collected in solid sorbent tubes is thermal desorption, capillary column gas chromatography with flame ionization detection. The soil gas components are desorbed from the solid sorbent tubes using a conventional tube furnace with flow control from an injector control unit. The solid sorbent tube is desorbed at 220°C for 10 min with a helium flow rate of 10 mL/min, and the liberated compounds are trapped downstream of the desorber in a cryotrap immersed in liquid nitrogen (about -185°C). After completion of the transfer of the components from the sample tube to the cryotrap, the components are swept into the gas chromatographic column with helium carrier gas.

The components separated by the capillary column are detected and measured by a flame ionization detector (FID). Qualitative identification is made on the basis of chromatographic retention time comparison with authentic standards, as in the EPA SW-846 series 8000 methods. The identifications are not absolute because a confirmatory mass spectrum is not generated. Quantitative determination is by the method of external standards. Response factors are calculated manually using peak areas. Standardization of the retention times and detector response on the analytical instrument is achieved by analyzing a blank solid sorbent tube which has been spiked with known masses of the standard compounds. The tube is spiked by applying a known volume of standard solution to a blank solid sorbent tube and drawing the compounds into the sorbent in a stream of air by connecting the tube to a vacuum line. In Table 3.4, detection limits range from 7 to 58 ng, depending on the compound being measured.

Table 3.4. Detection Limits for Soil Gases

Component	Detection Limit (ng)
Acetone	22
Methylene chloride	54
Methyl ethyl ketone	13
Ethyl acetate	16
Chloroform	47
Tetrahydrofuran	8
Benzene	7
Carbon tetrachloride	58
Trichloroethylene	23
Methyl isobutyl ketone	14
N,N-dimethylformamide	47

3.2.1.6 Pyridine

There is no CLP method for the specific determination of pyridine. Two approaches were taken for the estimation of pyridine in the ANL samples. The main approach used the analytical data obtained from the CLP procedures for the determination of semivolatile and volatile organic compounds. Although pyridine is not a TCL constituent, it would be detected as a tentatively identified compound (TIC) in the semivolatile and volatile procedures (per the 7/87 CLP SOW) if it was present at high enough concentrations to be among the 20 most concentrated uncalibrated constituents. These data would be estimations according to CLP protocol and do not represent rigorous quantitative measurements.

In the second approach, pyridine measurements were conducted by solvent extraction and gas chromatography upon one set of soil samples. In this procedure, 5 g of soil were shaken with 5 mL of methanol (purge and trap grade), and the slurry was placed in an ultrasonic bath for 30 min. The bottle was centrifuged for 5 min using a benchtop centrifuge; a 1 µL aliquot of the supernatant liquid then was analyzed with capillary column gas chromatography-flame ionization detection. The method of external standards (MES) was used for quantitation. A blank and spiked samples were also prepared and analyzed. Although this was a direct measurement of pyridine, the results must be considered supplementary to the CLP volatile and semivolatile data because of the extended time elapsed between sample collection and analysis.

3.2.2 Inorganic Analysis Methods

3.2.2.1 CLP Metals Determination by Atomic Emission or Absorption Techniques

The determination of low levels of metal contaminants was accomplished using a protocol based on the EPA 7/87 CLP SOW for Inorganic Analysis Multi-media, Multi-concentration and Appendix D of the DOE Environmental Survey Manual. Table

3.5 summarizes the analytical method and the required quantitation limits for a total of 23 specific metal contaminants. The metals determined by the inductively coupled plasma (ICP) technique according to the full CLP technical criteria include most of the elements specified by the DOE protocol. Exceptions to the CLP protocol include potassium analysis by flame emission photometry in ORNL analyses and sodium analysis by flame atomic absorption (AA) in Battelle analyses. In addition, three elements (arsenic, selenium, and lead) were also determined by ICP and were reported to detection levels which exceeded the CLP requisite limits, but were significantly below the ICP method detection limits listed in the DOE protocol. Graphite furnace atomic absorption (GFAA) was used to determine and report the concentrations of seven elements (silver, arsenic, antimony, cadmium, lead, selenium, and thallium) in ANL Site samples.

Mercury was determined by cold vapor flameless atomic absorption (CVFAA) and cesium and lithium were analyzed using the flame atomic absorption technique.

CLP protocol was used to monitor the precision and accuracy of the individual elemental results. Calibration data were verified during the course of an analytical run. Interference check samples were used to determine the effectiveness of interelement corrections for the ICP metals. The precision of the measurements wasestimated using sample duplicates. Sample digestion efficiency was assessed by including laboratory control samples with each preparation batch. Matrix spikes, analytical spikes (for GFAA only), and serial dilutions of samples (for ICP only) were made to assess the accuracy and to determine the presence of analytical interferences attributable to the sample matrix or to preparation procedures.

3.2.2.1.1 ICP Metals-Atomic Emission Spectrometry

The basis of this method is the simultaneous multi-element measurement of atomic emission by an optical spectroscopic technique. Samples are nebulized and the aerosol

Table 3.5. Elements Determined by Atomic Emission or Absorption Techniques

Element	Contract Required Detection Limit (µg/L)	ICP Method Detection Limit	Analytical Method
Aluminum	200	200	ICP
Antimony	60	150	ICP, GFAA
Arsenic	10	250	ICP, GFAA
Barium	200	200	ICP
Beryllium	5	5	ICP
Cadmium	5	20	ICP, GFAA
Calcium	5000	5000	ICP
Chromium	10	10	ICP
Cobalt	50	50	ICP
Copper	25	25	ICP
Iron	100	100	ICP
Lead	5	200	ICP, GFAA
Magnesium	5000	5000	ICP
Manganese	15	15	ICP
Mercury	0.2	---	CVFAA
Nickel	40	40	ICP
Potassium	5000	5000	ICP, FES
Selenium	5	400A	ICP, GFAA
Silver	10	30	ICP, GFAA
Sodium	5000	5000	ICP FAA
Thallium	10	500	GFAA
Vanadium	50	50	ICP
Zinc	20	20	ICP

ICP = Inductively coupled plasma emission spectrometry
GFAA = Graphite furnace atomic absorption spectrometry
FES = Flame emission photometry
CVFAA = Cold vapor flameless atomic absorption spectrometry
FAA = Flame atomic absorption spectrometry

that is produced is transported to a high temperature plasma where excitation occurs. Characteristic atomic-line emission spectra are produced by the radio-frequency inductively coupled plasma and are dispersed by a grating spectrometer. The line intensities, which are a measurement of elemental concentrations, are monitored by photomultiplier tubes. The photocurrents from the photomultiplier tubes are processed and controlled by a computer system.

A background correction technique is required to compensate for variable background contributions to the determination of trace elements. Background is measured adjacent to analyte lines on samples during analysis. The position selected for the background intensity measurement, on either or both sides of the analytical line, is determined by the complexity of the spectrum adjacent to the analyte line. The position used should be free of spectral interference and reflect the same change in background intensity that occurs as the analyte wavelength is measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. Additional interferences, i.e., spectral, physical, and/or chemical, are also possible. Appropriate corrections are made, when required, and are documented in the ICP case narrative.

Acid digestion of water, soil, sediment, and sludge samples is performed according to the 7/87 CLP SOW protocol prior to trace metal analysis by ICP. A 100-mL aliquot of an aqueous sample is digested with a mixture of nitric and hydrochloric acids. The acidified sample is heated below boiling for approximately 2 hrs or until the sample volume is reduced to half of its initial volume. The sample is then cooled, filtered, and diluted volumetrically. For solid samples, a representative 1-g (wet weight) sample is digested with nitric acid and hydrogen peroxide. The digestate is refluxed with nitric and hydrochloric acid, then allowed to cool prior to filtration and dilution. Elemental sample concentrations are reported on a dry weight basis.

3.2.2.1.2 Potassium

A direct-reading flame photometer is used for the quantitative analysis of potassium in aqueous and solid samples analyzed at ORNL. In this technique, an aspirating atomizer capillary tube is used to transfer a portion of a digested sample into a high velocity, propane-oxygen burner assembly. Ground state potassium atoms are thermally excited in the high temperature flame. Light emitted from the excited atoms as they return to ground state passes through a sodium light attenuator, and then through an optical transmission filter specific for potassium emission. The light emission is detected by a phototube and is directly proportional to potassium concentration in the digested sample. The operating range for the flame photometer is 0.1-8 mg/L.

The same digestates prepared for ICP analyses are also used for the analysis of potassium by flame photometry.

3.2.2.1.3 Atomic Absorption, Furnace Technique

Graphite furnace atomic absorption is used to determine the concentration of arsenic, antimony, cadmium, lead, selenium, silver, and thallium in ANL Site samples. When using the furnace technique in conjunction with an atomic absorption spectrophotometer, a representative aliquot of a sample is placed in the graphite tube of the furnace, evaporated to dryness, charred, and atomized. Analyte atoms are vaporized and dissociated for light absorption in the tube. Radiation from a light source, hollow cathode, or electrodeless discharge lamp of the element being determined is passed through the vapor containing ground-state atoms of that element. The intensity of the transmitted radiation decreases in proportion to the amount of the ground state element in the vapor. A grating monochromator isolates the characteristic radiation from the hollow cathode lamp and a photosensitive device measures the attenuated transmitted radiation.

Aqueous samples are prepared by digesting 100-mL aliquots with a mixture of nitric acid and hydrogen peroxide. The acidified sample is then heated below boiling for approximately 2 hrs, or until the sample volume is reduced to half of its initial volume. The sample is then cooled, diluted volumetrically, and allowed to settle overnight to remove insoluble material. Representative 1-g solid samples are prepared by digesting them in nitric acid and hydrogen peroxide. The digestate is refluxed with nitric acid, cooled, diluted volumetrically, and allowed to settle overnight.

3.2.2.1.4 Atomic Absorption, Flame Technique

BCD used the flame atomic absorption (FAA) technique to determine the sodium concentration in ANL Site samples. A sample is aspirated into the base of a hot flame using a nebulizer-burner assembly. The sample is vaporized and a substantial fraction of the metallic constituent is reduced to the elemental state. Radiation from an external light source, such as a hollow cathode tube or vapor discharge lamp, is passed through the flame. As in the GFAA technique, the measurement of light absorbed at the wavelength of the resonance line by the unexcited atoms provides the basis for the flame atomic absorbtion method. The number of atoms capable of absorbing the transmitted light is proportional to the product of the concentration of these atoms in the flame and the length of the light path through the flame.

Sample preparation is similar to that described for the GFAA technique.

3.2.2.1.5 Mercury

Mercury is determined by CVFAA. The flameless AA procedure is a physical method based on the absorption of radiation at 253.7 nanometers (nm) by mercury vapor. Organic mercury compounds are converted to inorganic forms by the oxidative digestion of the sample. An aliquot of the diluted digestate is transferred to a 50-mL closed reaction chamber where stannous chloride is used to reduce the mercury to the elemental form. The mercury vapor is then purged from the solution into a 90-cm absorption cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance (peak height) is measured as a function of mercury concentration.

Samples are prepared using a method developed at ORNL. The method is capable of determining two nanograms (ng) of mercury. A perchloric acid/nitric acid wet-ashing procedure is used to convert the organic mercury to an inorganic form. Reagent blanks are very low (<2 ng) for this procedure. To obtain these low blanks, acids are preselected by analytical testing and washed glassware is baked overnight at 450°C. Samples are digested in a 250-mL borosilicate volumetric flask equipped with supplemental air condensers to prevent the loss of mercury. After digestion the sample volume is adjusted to 50 mL. An aliquot of this solution is introduced into the instrument reaction chamber for the subsequent determination of mercury.

3.2.2.2 Non-Target List Parameters

3.2.2.2.1 Cyanide in Water and Soils

Cyanide is determined spectrophotometrically in drinking, surface, and saline waters; domestic and industrial wastes; and in sediments and other solids. For aqueous samples analyzed at ORNL and all samples analyzed by BCD, cyanide as hydrocyanic acid (HCN) is released from cyanide complexes by performing a reflux-distillation of the sample in the presence of a mineral acid and magnesium ion. (Magnesium prevents the co-distillation of thiocyanate.) The evolved HCN is absorbed in a scrubber solution containing sodium hydroxide. Cyanide is then determined spectrophotometrically by first converting HCN to cyanogen chloride (CNCl) by reaction with chloramine-T under controlled pH conditions. Upon completion of the chemical reaction, pyridinebarbituric acid reagent is added to form a chromophore which absorbs at 578 nm. Concentration is read from a standard curve of absorbance versus cyanide concentration. The holding time for cyanide analysis is limited to 14 days from sample collection.

At ORNL, hydrogen cyanide reactivity is determined for sediment, soil, and sludge samples. Hydrogen cyanide reactivity is a measurement of the tendency of a sample to release toxic levels of hydrogen cyanide upon contact with acidic medium. This procedure is designed to measure only the hydrogen cyanide gas evolved under the test conditions and not reflect the total concentration of this gas or its precursors in the sample. About 10 g of sample is acidified to pH 2 in a closed system. It is then slowly heated such that it is almost boiling after a 30 min reaction period. The evolved HCN is collected and analyzed spectrophotometrically as described in the first paragraph of this section. The current EPA action level for total releasable cyanide is 250 mg HCN/kg waste.

The spectrophotometric procedure has a detection limit of 0.002 mg/L and can be used for solutions containing up to 1 mg/L cyanide. A silver nitrate titration procedure using a p-dimethylaminobenzalrhodanine indicator can be used for samples containing higher amounts of cyanide.

3.2.2.2.2 Recoverable Oil and Grease

Extractable matter from surface and saline waters and industrial and organic wastes is determined gravimetrically after sample extraction with Freon. The oil and grease present in a sample are extracted from an acidified, 1-L aliquot with Freon-113 using a 2-L separatory funnel. The entire specimen container must be extracted to avoid sidewall loss of oils. The Freon extract is evaporated from a constant weight-tared crucible and the oil/grease residue weighed. A concentration range of 5 to 1000 mg/L of extractable oil/grease may be directly determined from 1-L specimens.

The nature of the oil or grease and the presence of extractable non-oily matter will influence the material measured and the interpretation of the results. Vegetable oils, waxes, soaps, greases, animal fats, and relatively nonvolatile hydrocarbons can be measured with this procedure. The method is not applicable to light hydrocarbons that volatilize below 70°C, gasoline, and petroleum fuels through No. 2 fuel oil.

3.2.2.3. Anions

Ion chromatography is a rapid analytical technique for multi-ion analysis in a single solution scan. The method depends on the separation of a group of anions flowing through an anion exchange column, suppression of the eluant conductivity on an acid-form cation exchange column, and final conductimetric detection of the separated anions as they pass through the measurement cell. Identification of the ions present is made by characteristic retention times and is supported by sample spikes. The increase in conductivity caused by each electronegative anion is recorded using a peak integrator or strip chart recorder. Results are compared with those of standard solutions to determine anion concentration. Results are reported for sulfate (SO_4^{-2}). Aqueous samples are allowed to come to ambient temperature before analysis. The holding time for sample analysis of sulfate (SO_4^{-2}) is limited to 28 days.

3.2.2.4 Percent Solids

To determine the percent solids in a sample, a portion of the material is placed on a weighed dish; the difference in weight represents the wet sample weight. The sample is then dried at 103-105°C overnight, cooled, and reweighed. The difference between the dried sample and the dish represents the dry weight. The ratio of dry weight to wet weight is multiplied by 100 to obtain the percent solids contained in a solid sample. A single determination of percent solids was performed for a sample at ORNL; duplicate determinations for each sample were performed at Battelle.

3.2.2.5 Toxicity Characteristic Leaching Procedure

The EPA has proposed to amend the Extraction Procedure Toxicity Characteristic (EPTC) to include 38 additional compounds and a modified leaching procedure known as the Toxicity Characteristic Leaching Procedure (TCLP). A description of and background information on TCLP is found in "Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Notification Requirements; Reportable Quantity Adjustments: Proposed Rule" (40 CFR Parts 261, 271, and 302) in Volume 51 of the Federal Register. Under the proposed rule, a leaching test is used to determine whether an unacceptably high level of groundwater contamination might result from improper waste management of wastes containing any one of the 52 listed toxicants. Regulatory level concentrations for the individual toxicants are based on chronic toxicity reference levels, combined with a compound-specific dilution/attenuation factor (derived from application of a groundwater transport equation).

The TCLP is intended to be a first-order approximation of the leaching of low molecular weight carboxylic acids generated in actively decomposing sanitary landfills. Acetic acid is one of the more dominant carboxylic acids present in municipal waste leachate. As such, approximately 100 g of a soil sample is extracted with 20 times the weight of the solid phase with a buffered acidic acid extraction fluid. The liquid extract is separated from the solid phase prior to chemical analysis. Waste samples containing less then 0.5% solids are defined as the TCLP extract. Two-phase waste samples are filtered with 0.6-0.8 µm glass fiber filters; the solid phase then is extracted with the acetic acid extraction fluid. The leachate, if compatible, is then recombined with the liquid phase prior to analysis. If incompatible, the liquids are analyzed separately and the results are mathematically combined to yield a volume weighted average concentration. Analytical results above the proposed regulatory limits for the individual compounds will define the sample as a hazardous waste. TCLP need not be run on samples if a total analysis of the original sample demonstrates that individual contaminants are not present in the waste, or that they are present, but at such low concentrations that the appropriate regulatory thresholds could not possibly be exceeded. Tables 3.6, 3.7, and 3.8 list the regulatory levels for semivolatile, pesticide, and metal analytes determined using CLP analysis protocol.

3.2.2.6 Radiological

Radiochemical contamination in soil and water is determined by either direct counting or by radiochemical separations and specific counting to ascertain radionuclide activity. Water samples (other than those for tritium analysis) are acidified to pH 2 at collection time. Samples that are not acidified in the field are acidified when they are received and allowed to equilibrate overnight before sample aliquots are removed. Soil samples are dried at 105°C to a constant weight, then pulverized and blended well before sample aliquots are removed. All soil samples are analyzed on a dry weight basis.

3.2.2.6.1 Determination of Gross Alpha and Beta Activity in Water

An aliquot of a preserved water sample is evaporated to a small volume and transferred quantitatively to a tared 2-in. stainless steel counting planchet. The sample residue is dried to constant weight, then reweighed to determine dry residue weight. The sample is then counted for gross alpha and gross beta activity.

Counting is performed on a Tennelec LB-4000 system that is comprised of 12 gas-flow proportional counters and an International Business Machines, Inc., (IBM) personal computer (PC) controller. Counting efficiencies for both alpha and beta particle activities are determined according to the amount of sample solids from a standard curve of counting efficiency versus sample solids.

Table 3.6. TCLP Limits for Semivolatile Compounds

Semivolatile	CAS Number	Regulatory Level (mg/L)
Bis (2-Chloroethyl)ether	111-44-4	0.05
o-Cresol	95-48-7	10.0
m-Cresol	108-39-4	10.0
p-Cresol	106-44-5	10.0
1,2-Dichlorobenzene	95-50-1	4.3
1,4-Dichlorobenzene	106-46-7	10.8
2,4-Dinitrotoluene	121-14-2	0.13
Hexachlorobenzene	118-74-1	0.13
Hexachlorobutadiene	87-68-3	0.72
Hexachloroethane	67-72-1	4.3
Nitrobenzene	98-95-3	0.13
Pentachlorophenol	87-86-5	3.6
Phenol	108-95-2	14.4
2,4,5-Trichlorophenol	95-95-4	5.8
2,4,6-Trichlorophenol	88-06-2	0.30
2,3,4,6-Tetrachlorophenol	108-88-3	14.4
Pyridine	110-86-1	5.0

Table 3.7. TCLP Limits for Pesticide Compounds

Pesticides	CAS Number	Regulatory Level (mg/L)
Chlorodome	57-74-9	0.03
Endrin	72-20-8	0.003
Heptachlor(& hydroxide)	76-44-2	0.001
gamma-BHC (Lindane)	58-89-9	0.06
Methoxychlor	72-43-5	1.4
Toxaphene	8001-35-2	0.07

Table 3.8. TCLP Limits for Metals

Metals	CAS Number	Regulatory Level (mg/L)
Arsenic	7440-38-2	5.0
Barium	7440-39-3	100
Cadmium	7440-43-9	1.0
Chromium	1330-82-0	5.0
Lead	7439-91-1	5.0
Mercury	7439-97-6	0.2
Selenium	7782-49-2	1.0
Silver	7440-22-4	5.0

3.2.2.6.2 Isotopic Uranium in Water

The sample is equilibrated with uranium-232, which is an internal standard. The uranium is then chemically purified by the use of anion exchange resin chromatography and repeated methyl isobutyl ketone (hexone) extractions. The extracted uranium is deposited on a stainless steel disc which is counted on a Nuclear Data MicroVAX-based analyzer system using a silicon surface-barrier detector to determine uranium concentration.

Concentrations as low as 4×10^{-5} picoCuries per mL (pCi/mL) have been reported when 1-L samples were spiked with 10 disintegrations per minute (dpm) of uranium-232 and counted for 1000 min on an alpha pulse height analyzer. The detectors had a 20% efficiency and a 0.005-counts per minute (cpm) background over each energy region of interest. A 60% chemical recovery of the uranium was obtained.

3.2.2.6.3 Isotopic Uranium in Soil

A known quantity of uranium-232 tracer, used as an internal standard, is added to a 10-g sample which is then leached with hot nitric acid followed by hot nitric acid-hydrogen peroxide treatment. The leachate is passed through an anion exchange resin to adsorb plutonium and thorium, leaving purified uranium in the effluent solution. The uranium is further purified by repeated extractions with methyl isobutyl ketone (hexone). The final hexone extract is dried on a stainless steel disc which is counted on a Nuclear Data MicroVAX-based analyzer system using a silicon surface-barrier detector to determine the uranium concentration.

Concentrations as low as 0.004 pCi/g have been reported for 10-g soil samples using the counting conditions described for the determination of isotopic uranium in aqueous samples (Sect. 3.2.2.6.2).

3.2.2.6.4 Total Uranium in Water

The total uranium content in drinking water, surface water, groundwaters, and domestic industrial wastes is determined by fluorometric analysis. Uranium is quantitatively extracted from acidified nitrate solutions using trioctylphosphine oxide (TOPO) dissolved in an organic solvent, such as dodecane. Aliquots of the resulting organic extract are pipetted onto pellets of sodium fluoride in small (22 mm) platinum dishes. The pellets are dried at 585^{o}C, fused at 990^{o}C, and annealed at 765^{o}C. The prepared pellets are then placed in a fluorophotometer for measurement of the uranium concentration.

The fluorophotometer was designed and fabricated at ORNL (Model 5198), but is typical of commercial units later available. The analyzer has two ultraviolet light sources for greater sensitivity, optical filters, a multisampler turntable, and a photomultiplier tube for measuring the intensity of the uranium fluorescence light. In routine practice, a set of known uranium standards is prepared on pellets and exposed to the primary excitation radiation. The characteristic emitted uranium fluorescence is used to adjust the instrument to read directly in nanograms (ng) of uranium. The samples are similarly measured; the fluorescence of each is determined and the actual uranium concentration is read in nanograms of uranium. The method has a detection limit of 1 ng.

3.2.2.6.5 Plutonium Isotopes in Water

Plutonium (Pu) concentration in natural and industrial waters is analyzed according to protocol defined in Appendix D of the DOE Environmental Survey Manual. Plutonium in the sample is equilibrated with plutonium-242 tracer, coprecipitated with bismuth phosphate, adsorbed on an anion exchange resin, selectively eluted from the resin, coprecipitated with praseodymium hydroxide, and extracted with thenoyltrifluoroacetone-xylene. The plutonium extract is dried on a stainless steel disc which is analyzed by alpha pulse-height analysis to determine the plutonium concentration.

The lowest concentration reported is 4×10^{-5} pCi/mL when analyzing a 1-L sample using 10 disintegrations per minute (dpm) of plutonium-242 tracer, counting for 1000 min on an alpha pulse-height analyzer with a detector efficiency of 20% and a 0.005-cpm background over each energy region of interest, and realizing an 80% chemical recovery of plutonium.

Interferences from other alpha-emitting nuclides are generally eliminated by alpha pulse-height analysis, except for plutonium-240 which cannot be resolved from plutonium-239 by this means. Mass spectrometric analysis is required if independent measurements of both of these isotopes are desired.

3.2.2.6.6 Plutonium Isotopes in Sediment and Soil

A known quantity of plutonium-242 tracer, which is used as the internal standard, is added to the sample that is leached by hot nitric acid and hot nitric acid-hydrogen peroxide treatment. After leaching, plutonium is adjusted to Pu^{+4}, adsorbed on anion exchange resin, reduced to Pu^{+3}, and selectively eluted from the resin. Subsequently, plutonium is coprecipitated with praseodymium hydroxide, dissolved, and oxidized to Pu^{+4}, which is then extracted with thenoyltrifluoroacetone-xylene. The organic extract is deposited on a stainless steel disc and the plutonium is determined by alpha pulse-height analysis.

The lowest concentration reported is 0.004 pCi/g when analyzing a 10-g sample using 10 dpm of plutonium-242 tracer, counting for 1000 min on an alpha pulse-height analyzer with a detector having a 20% efficiency and a 0.005-cpm background over each energy region of interest, and realizing an 80% chemical recovery of plutonium.

Samples which are refractory, such as test-site materials, are not apt to release plutonium in the leaching process; therefore, more rigorous treatment is recommended for decomposition of these samples. Plutonium-240 cannot be distinguished from plutonium-239 by alpha pulse-height analysis. However, alpha spectrometry eliminates most other alpha interferences.

3.2.2.6.7 Total Radioactive Strontium in Water

Stable strontium carrier is added to an aliquot of water and the strontium precipitated from the sample as the carbonate. Interferences from calcium and some radionuclides are removed by one or more precipitations of the strontium carrier as strontium nitrate. Barium and radium are removed as the chromate; the yttrium-90 daughter of strontium-90 is removed by hydroxide precipitation. The separated strontium is counted immediately for beta particle activity. The counting result represents the total strontium activity (strontium-89 and strontium-90) plus an insignificant fraction of the yttrium-90 that has grown into the separated strontium-90. Counting is performed on a Tennelec Model LB 4000 computer-controlled system. The lowest reported concentration is 0.5 pCi/L for 250-mL samples.

3.2.2.6.8 Total Radioactive Strontium in Soil

Stable strontium carrier is added to a 10-g sample which then is leached by hot nitric acid, followed by a hot nitric acid-hydrogen peroxide treatment. The leachate is reduced in volume and the strontium is precipitated from the solution as the nitrate salt. Interferences from calcium and some radionuclides are removed by one or more precipitations of the strontium carrier as strontium nitrate. Barium and radium are removed as the chromate; the yttrium-90 daughter of strontium-90 is removed by hydroxide precipitation. The separated strontium is counted immediately for beta particle activity. The counting result represents the total strontium activity (strontium-89 and strontium-90) plus an insignificant fraction of yttrium-90 that has grown into the separated strontium-90. Counting is performed on a Tennelec Model LB 4000 computer-controlled system. The lowest reported concentration is 0.2 pCi/g for 10-g samples.

3.2.2.6.9 Gamma-Ray Emitting Nuclides in Water and Soil

Nine hundred mL of water sample are transferred to a polyethylene Marinelli beaker, placed on a high purity germanium detector, and counted for gamma activity. Soil samples are weighed into a 3-in. petri dish, placed on a high purity germanium detector, and counted for gamma activity. The efficiencies of the six detectors used in this determination are between 20 and 35%. The gamma spectra are reduced and reports generated by a Nuclear Data MicroVAX-based analyzer system. The lowest reported concentration for cesium-137 is 3 pCi/L for a 900-mL water sample and 50 pCi/kg for a 75-g soil sample.

3.2.2.6.10 Tritium in Water and Soil

Soil samples are prepared by leaching with equal or double portions of distilled water; water samples require no pretreatment. An aliquot of water or soil leachate is treated with a small amount of sodium hydroxide and potassium permanganate and distilled. The alkaline treatment prevents other radionuclides, such as radioiodine and radiocarbon, from co-distilling over with the tritium. Some water supplies will contain trace quantities of organic compounds (especially surface water sources that contain biota). The permanganate treatment oxidizes trace organics in the sample aliquot, which could distill over and cause quenching interferences. A middle fraction of the distillate is collected for tritium analysis because the early and late fractions are more apt to contain materials that might interfere with the liquid scintillation counting process. The collected distillate fraction is thoroughly mixed and a portion is mixed with a liquid scintillator solution. After dark adapting, the aliquot is counted in a Packard 460C liquid scintillation counter for tritium beta particle activity.

4.0 DATA PRESENTATION

4.1 Introduction

This section presents the data collected as part of the DOE Environmental Survey of the ANL site. Findings generated by the Survey team were divided into units called environmental problems. This section presents the environmental problem sampling and analysis data. Section 4.2 describes the format and content of data tables, data qualifiers, and the criteria for reporting values.

NOTE: The lists of acronyms and data flags at the end of the Table of Contents can be removed from their location and referenced as data for each environmental problem are examined.

Data are presented in order by environmental problem. Sample request numbers and the name of the Survey team member who requested the sample collection and analysis are presented for each problem. The reason for examination of a certain site or sites is given in the Finding and Basis section. The Sampling and Analysis Objectives section defines the Survey's goal for that environmental problem. The Sampling and Analysis Design section describes the sampling and design methods, the analytes of interest for each sample, and changes from the design and methods reported in the ANL Sampling and Analysis Plan (Ref. 1-1) or the Battelle addendum to the plan (see Appendix F). The field and analytical data are then presented in text and tabular form with statements of the level of data quality. Italicized text indicates summary information, including a summary of sampling and analytical data and related findings for the environmental problem.

The data tables present samples by analysis type. The analysis type is further divided into specific analytes. Analytes are presented only if a positive determination has been reported for the specific analyte in the specific set of samples.

A complete listing of non-radiological data is available in Appendix D in the form of a QC presentation. A discussion of the QA/QC results can be found in Sect. 5.0.

Other appendices include an updated listing of sampling and analytical requests (Appendix A); background information (Appendix B); results of field, analytical chemistry, documentation, and data management audits for ORNL and Battelle, as applicable (Appendix C); the radiological QC section (Appendix E); and a copy of Battelle's addendum to the ANL Sampling and Analysis Plan (Appendix F).

4.2 Data Tables, Data Flags, and Restrictions on Data Reporting

This section presents descriptions of the structure and contents of the three basic types of data tables which may accompany the discussion of each environmental problem. Explanations for the types of data flags that appear in the tables are given. The basis for inclusion/exclusion of entries to tables is discussed.

4.2.1 Sampling and Analytical Data Tables

Table 4.1 summarizes field and analytical completion data for sampling and analysis requests for the ANL site. The summary is organized by request number. For each request number, the status, date collected, location, type location, media, number of samples planned and actually collected, the type of sample, and the number of samples planned and actually collected for each parameter are given. In each section presenting an environmental problem, a table with a similar format is provided if samples were requested. Table 4.1 can be used as a guide to the environmental problem-specific Table 4.2 series of tables.

NOTE: When data are formatted into environmental problem-specific tables, the last digit in the three-digit table number refers to a specific environmental problem. For example, Table 4.3.6 is the analytical data summary by sample medium that applies specifically to Environmental Problem 6. Problem-specific tables are located in the appropriate environmental problem section of this chapter. The problem-specific data series tables are:

TABLE 4.1 ARGONNE SITE ENVIRONMENTAL SURVEY S&A REQUESTS
WITH FIELD AND ANALYTICAL COMPLETION DATA

REQUEST NUMBER	STAT	DATE COLL. DD/MM/YY	LOCATION	TYPE LOCATION	MEDIA	NUMB SAMP ACT COLL	NUMB SAMP PLAN COLL	TYPE	ANIONS ACT ANAL	ANIONS PLAN ANAL	METALS ACT ANAL	METALS PLAN ANAL	O&G ACT ANAL	O&G PLAN ANAL	PET HYDRO ACT ANAL	PET HYDRO PLAN ANAL	SOIL GAS ACT ANAL	SOIL GAS PLAN ANAL	PES/H/PCB ACT ANAL	PES/H/PCB PLAN ANAL	SEMIVOLS ACT ANAL	SEMIVOLS PLAN ANAL	VOLS ACT ANAL	VOLS PLAN ANAL	RADS ACT ANAL	RADS PLAN ANAL
AR300		07/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR300		07/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR300		10/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR300		10/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR300		12/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	2	2	QC FL	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR300		12/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR300		12/11/87	NPDESOUTF1	EFFLUENT	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR302		04/11/87	SAWMILL CR	BACKGROUND	SEDIMENT	3	3	GRAB	3	3	3	3	3	3	0	0	0	0	3	3	3	3	3	3	0	0
AR307		05/11/87	NPDESOUTF2	SEEP	SUR WATER	1	1	GRAB	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0
AR307		06/11/87	NPDESOUTF2	SEEP	SUR WATER	1	1	GRAB	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0
AR307		06/11/87	NPDESOUTF2	SEEP	SUR WATER	1	1	QC RN	1	1	1	1	0	1	0	0	0	0	1	1	1	1	1	1	0	0
AR307		10/11/87	NPDESOUTF2	SEEP	SUR WATER	1	1	GRAB	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0
AR308		04/11/87	COAL PILE	RUNOFF	SEDIMENT	3	3	GRAB	3	3	3	3	3	3	0	0	0	0	3	3	3	3	3	3	0	0
AR308		04/11/87	COAL PILE	RUNOFF	SUR WATER	1	1	QC RN	1	1	1	1	1	1	0	0	0	0	1	1	0	1	1	1	0	0
AR309		04/11/87	B815 SEWER	DRAINAGE	SUR WATER	1	1	GRAB	0	0	1	1	1	1	0	0	0	0	0	1	1	1	1	1	0	0
AR309		05/11/87	B815 SEWER	DRAINAGE	SUR WATER	1	1	QC FL	0	0	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0
AR309		05/11/87	B815 SEWER	DRAINAGE	SUR WATER	1	1	GRAB	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0
AR309		06/11/87	B815 SEWER	DRAINAGE	SUR WATER	1	1	GRAB	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	0	0
AR310		04/11/87	B815 SEWER	DRAINAGE	SEDIMENT	3	3	GRAB	0	0	3	3	3	3	0	0	0	0	3	3	3	3	3	3	0	0
AR311		07/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR311		07/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR311		07/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR311		10/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR311		10/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR311		12/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR311		12/11/87	NPDES10WTP	DISCHARGES	SUR WATER	1	1	T COM	0	0	1	1	0	0	0	0	0	0	1	1	1	1	0	0	0	0
AR400		10/11/87	B31 TAP WA	WELLS	GRN WATER	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR401		10/11/87	B32 TAP WA	WELLS	GRN WATER	1	1	QC FL	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
AR401		10/11/87	B32 TAP WA	WELLS	GRN WATER	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR402		10/11/87	B163 TAP W	WELLS	GRN WATER	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR403		10/11/87	B264 TAP W	WELLS	GRN WATER	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR404	DELETED		B6 UGRD TA	TANKS	SOIL	0	6	GRAB	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0
AR405		17/11/87	B212 U. TA	TANKS	SOIL	6	6	GRAB	0	0	0	0	0	0	7	6	0	0	0	0	0	0	0	0	0	0
AR406	DELETED		WELL #6	WELL	GRN WATER	0	2	BAILR	0	2	0	2	0	0	0	0	0	0	0	2	0	2	0	2	0	2
AR406		07/12/87	WELL #9	WELL	GRN WATER	2	2	PUMP	2	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	2	2
AR407	DELETED		WELL #6	WELL	SOIL	0	6	GRAB	0	6	0	6	0	0	0	0	0	0	0	6	0	6	0	6	0	6
AR407	DELETED		WELL #9	WELL	SOIL	0	6	GRAB	0	6	0	6	0	0	0	0	0	0	0	6	0	6	0	6	0	6
AR407		01/12/87	WELL #9	WELL	SOIL	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR407		02/12/87	WELL #9	WELL	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR407		03/12/87	WELL #6	WELL	SOIL	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR408	DELETED		800 LF NEW	WELL	GRN WATER	0	1	BAILR	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	1
AR408		07/12/88	800 LF NEW	WELL	GRN WATER	1	1	BAILR	0	1	0	1	0	0	0	0	0	0	0	1	0	1	1	1	0	1
AR411		17/11/87	800 LANDFI	WELL	GRN WATER	2	2	BKGRN	2	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	2	2
AR412		04/11/87	PLOT M	WELL	GRN WATER	2	4	BAILR	0	4	0	4	0	0	0	0	0	0	0	0	2	4	2	4	0	4
AR413		09/12/87	PLOT M	WELL	GRN WATER	2	2	PUMP	2	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	2	2

TABLE 4.1 ARGONNE SITE ENVIRONMENTAL SURVEY S&A REQUESTS WITH FIELD AND ANALYTICAL COMPLETION DATA

REQUEST NUMBER	STAT	DATE COLL. DD/MM/YY	LOCATION	TYPE LOCATION	MEDIA	NUMB SAMP ACT COLL	NUMB SAMP PLAN COLL	TYPE	ANIONS ACT ANAL	ANIONS PLAN ANAL	METALS ACT ANAL	METALS PLAN ANAL	O&G ACT ANAL	O&G PLAN ANAL	PET HYDRO ACT ANAL	PET HYDRO PLAN ANAL	SOIL GAS ACT ANAL	SOIL GAS PLAN ANAL	PES/H/PCB ACT ANAL	PES/H/PCB PLAN ANAL	SEMIVOLS ACT ANAL	SEMIVOLS PLAN ANAL	VOLS ACT ANAL	VOLS PLAN ANAL	RADS ACT ANAL	RADS PLAN ANAL
AR413		09/12/87	PLOT M NEW	WELL	GRN WATER	1	1	QC FL	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
AR413		09/12/87	PLOT M NEW	WELL	GRN WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR414	DELETED		DH3 & BH.4	WELL	GRN WATER	0	6	BAILR	0	6	0	6	0	0	0	0	0	0	0	0	0	6	0	6	0	6
AR415		05/11/87	PLOT M	WELL	GRN WATER	1	1	BAILR	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR415		05/11/87	PLOT M	WELL	GRN WATER	1	1	PUMP	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR416	DELETED		319 AREA	WELL	GRN WATER	0	2	BAILR	0	2	0	2	0	0	0	0	0	0	0	2	0	2	0	2	0	2
AR417	DELETED		319 LANDF.	WELL	SOIL	0	4	GRAB	0	4	0	4	0	0	0	0	0	0	0	4	0	4	0	4	0	4
AR417		07/12/87	319 LANDF.	WELL	SOIL	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR418	DELETED		PLOT M	WELL	GRN WATER	0	2	BAILR	0	2	0	2	0	0	0	0	0	0	0	0	0	2	0	2	0	2
AR418	DELETED		PLOT M	WELL	GRN WATER	0	1	QC FL	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
AR419		05/11/87	PLOT M	WELL	GRN WATER	1	1	BAILR	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR419		06/11/87	PLOT M	WELL	GRN WATER	1	1	BAILR	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR420		06/11/87	317-319 LF	WELL	GRN WATER	2	2	BKGRN	2	2	2	2	0	0	0	0	0	0	0	2	2	2	2	2	2	2
AR420		11/11/87	317-319 LF	WELL	GRN WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR500		05/11/87	RET. TANKS	WASTEWATER	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR500		05/11/87	RET. TANKS	WASTEWATER	SEALED CO	4	8	GRAB	2	4	2	4	0	0	0	0	0	0	2	4	2	4	4	8	0	0
AR500		09/11/87	RET. TANKS	WASTEWATER	SEALED CO	11	17	GRAB	6	9	6	9	0	0	0	0	0	0	6	9	6	9	11	17	0	0
AR500		10/11/87	RET. TANKS	WASTEWATER	SEALED CO	4	4	GRAB	2	2	2	2	0	0	0	0	0	0	1	2	2	2	4	4	0	0
AR500		11/11/87	RET. TANKS	WASTEWATER	SUR WATER	1	1	QC FL	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR500		11/11/87	RET. TANKS	WASTEWATER	SEALED CO	11	17	GRAB	6	9	6	9	0	0	0	0	0	0	4	9	6	9	11	17	0	0
AR500		12/11/87	RET. TANKS	WASTEWATER	SEALED CO	4	4	GRAB	2	2	2	2	0	0	0	0	0	0	2	2	2	2	4	4	0	0
AR500		13/11/87	RET. TANKS	WASTEWATER	SEALED CO	7	9	GRAB	4	5	4	5	0	0	0	0	0	0	4	5	4	5	7	9	0	0
AR500		17/11/87	RET. TANKS	WASTEWATER	SEALED CO	4	4	GRAB	2	2	2	2	0	0	0	0	0	0	2	2	2	2	4	4	0	0
AR500		18/11/87	RET. TANKS	WASTEWATER	SEALED CO	6	6	GRAB	3	3	3	3	0	0	0	0	0	0	3	3	3	3	6	6	0	0
AR501		11/11/87	DRYING BED	SLUDGE	SEDIMENT	6	6	GRAB	6	6	6	6	0	0	0	0	0	0	6	6	6	6	5	6	6	6
AR501		11/11/87	DRYING BED	SLUDGE	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR502		06/11/87	B145 FLUE	DISCHARGES	SEDIMENT	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR503		06/11/87	B145 FLUE	DISCHARGES	SUR WATER	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	3	3	0	0	0	0	0	0
AR503		06/11/87	B145 FLUE	DISCHARGES	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0
AR504		11/11/87	B148 FLUE	SEEPAGE	SOIL	6	6	GRAB	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR504		11/11/87	B148 FLUE	SEEPAGE	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR505		06/11/87	317 AREA	BURN PILE	SOIL	2	2	GRAB	2	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	0	0
AR506		06/11/87	B. 378/382	LEAD	SOIL	9	9	GRAB	0	0	9	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR507		06/11/87	BLDG 108	SILT	SEDIMENT	3	3	GRAB	0	0	3	3	0	0	0	0	0	0	3	3	3	3	3	3	0	0
AR508		06/11/87	BLDG 108	SILT	SUR WATER	1	1	QC RN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR508		06/11/87	BLDG 108	SILT	UNSEAL CO	3	3	GRAB	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3	0	0
AR800		06/11/87	319 LANDF	STREAM	SEDIMENT	6	6	GRAB	0	0	6	6	0	0	0	0	0	0	6	6	6	6	6	6	0	0
AR801		16/11/87	319 LNDF-S	LANDFILL	SOIL	3	6	GRAB	0	0	3	6	0	0	0	0	0	0	3	6	3	6	3	6	0	0
AR802		09/11/87	319 LDF-NW	BACKGROUND	SOIL	9	9	BKGRN	9	9	9	9	0	0	10	9	0	0	9	9	9	9	9	9	8	9
AR802		09/11/87	319 LDF-NW	BACKGROUND	SUR WATER	1	1	BKGRN	1	1	1	1	0	0	0	1	0	0	0	1	1	1	1	1	1	1
AR803	DELETED		317 AREA	DRAINAGE	SOIL	0	1	GRAB	0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	1	0	0
AR803		10/11/87	317 AREA	DRAINAGE	SOIL	1	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR803		12/11/87	317 AREA	DRAINAGE	SOIL	4	4	GRAB	4	4	4	4	0	0	0	0	0	0	4	4	4	4	4	4	0	0
AR804		05/11/87	SE 317 ARE	DRAINAGE	SEDIMENT	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	3	3	3	3	3	3	0	0

TABLE 4.1 ARGONNE SITE ENVIRONMENTAL SURVEY S&A REQUESTS
WITH FIELD AND ANALYTICAL COMPLETION DATA

REQUEST NUMBER	STAT	DATE COLL. DD/MM/YY	LOCATION	TYPE LOCATION	MEDIA	NUMB SAMP ACT COLL	NUMB SAMP PLAN COLL	TYPE	ANIONS ACT ANAL	ANIONS PLAN ANAL	METALS ACT ANAL	METALS PLAN ANAL	O&G ACT ANAL	O&G PLAN ANAL	PET HYDRO ACT ANAL	PET HYDRO PLAN ANAL	SOIL GAS ACT ANAL	SOIL GAS PLAN ANAL	PES/H/PCB ACT ANAL	PES/H/PCB PLAN ANAL	SEMIVOLS ACT ANAL	SEMIVOLS PLAN ANAL	VOLS ACT ANAL	VOLS PLAN ANAL	RADS ACT ANAL	RADS PLAN ANAL
AR804		05/11/87	SE 317 ARE	DRAINAGE	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR805		05/11/87	319 LANDFI	LANDFILL	SEDIMENT	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	3	3	3	3	3	3	0	0
AR806		13/11/87	570 WTP	LAGOON	SOIL	7	8	GRAB	7	8	7	8	0	0	0	0	0	0	7	8	7	8	7	8	7	8
AR806		13/11/87	570 WTP	LAGOON	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR807		16/11/87	NIKE SITE	DRAINS	SOIL	6	6	GRAB	0	0	6	6	0	0	0	0	0	0	0	0	6	6	6	6	0	0
AR807		17/11/87	NIKE SITE	DRAINS	SOIL	2	2	GRAB	0	0	2	2	0	0	0	0	0	0	0	0	2	2	2	2	0	0
AR808	DELETED		NIKE SITE	DRAINS	SOIL	0	1	GRAB	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
AR808		17/11/87	NIKE SITE	DRAINS	SOIL	3	3	GRAB	0	0	0	0	0	0	6	3	0	0	0	0	0	0	0	0	0	0
AR808		17/11/87	NIKE SITE	DRAINS	SUR WATER	1	1	QC RN	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	0
AR809		10/11/87	UNDWRTRS P	POND	SEDIMENT	3	3	GRAB	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR809		10/11/87	UNDWRTRS P	POND	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR810		14/11/87	BLDG 19/34	D&D	SOIL	9	9	GRAB	9	9	9	9	0	0	0	0	0	0	0	0	9	9	9	9	0	0
AR811		16/11/87	317 VAULT	LOW L. WAST	SOIL	6	6	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
AR812		13/11/87	CP-3 AREA	SITE A	SOIL	6	6	GRAB	0	0	6	6	0	0	0	0	0	0	0	0	6	6	6	6	0	0
AR813		13/11/87	SITE A	SITE A	SOIL	7	7	GRAB	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR814	DELETED		SITE A	SITE A	AIR	0	3	GRAB	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0
AR814		15/11/87	SITE A	SITE A	AIR	1	1	QC FL	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
AR814		15/11/87	SITE A	SITE A	AIR	3	3	GRAB	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0
AR815	DELETED		SITE A	SITE A	SOIL	0	12	GRAB	0	0	0	12	0	0	0	0	0	0	0	12	0	12	0	12	0	0
AR815		13/11/87	SITE A	SITE A	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR816		12/11/87	SUNOCO STA	GAS SPILL	SOIL	1	2	GRAB	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0
AR816		12/11/87	SUNOCO STA	GAS SPILL	AIR	3	3	QC FL	0	0	0	0	0	0	0	0	2	3	0	0	0	0	0	0	0	0
AR816		12/11/87	SUNOCO STA	GAS SPILL	AIR	4	4	GRAB	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0	0
AR817		09/11/87	B145 DRUM	DRUM	SOIL	2	2	GRAB	0	0	0	0	0	0	0	2	0	0	0	0	2	2	4	2	0	0
AR818	DELETED		PLOT M	SEEP	SUR WATER	0	1	QC RN	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0
AR818	DELETED		PLOT M	SEEP	GRN WATER	0	3	GRAB	0	3	0	3	0	0	0	0	0	0	0	0	0	3	0	3	0	0
AR819		04/11/87	PLOT M	SEEP	SEDIMENT	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	0	0	3	3	3	3	0	0
					TOTAL	259	341		129	178	191	256	17	18	23	29	10	16	123	178	160	222	186	255	54	91

4.2.1~4.2.28	Sampling and Analysis Data Summary
4.3.1~4.3.28	Analytical Data Summary by (Sample) Medium for Environmental Problem
4.4.X~4.4.X	Groundwater Sample Locations and Sample Volumes

The Table 4.2 series of tables display sampling and analytical activities and the level of activity for each type of analysis for each environmental problem. On a problem-specific basis, the Table 4.2 series presents a concise listing of medium, location, and sampling and analysis request number. In all cases, the problem-specific 4.2 series tables will include a pair of numbers for each analysis type for which at least one analyte was detected. The numbers represent the number of samples analyzed and the number of samples with at least one analyte detected, respectively. As shown in Table 4.1, each table will also include descriptive sampling and analytical information on a sample-specific basis. More detailed sample-analyte data are presented in the problem-specific Table 4.2 series. Table 4.1 can be used as a guide to the level of activity that appears in Tables 4.2.1 through 4.2.28.

Tables 4.3.1 through 4.3.28 illustrate sample-specific analyte data, using analytical chemistry methods, for each environmental problem. (The data presentation for radiological analysis using gamma spectrometry are discussed separately.) Tables 4.3.1 through 4.3.28 provide a consistent grouping by sampling and analysis request number, location, medium, and type of analysis on a problem-specific basis. Although the basic format is constant, the exact manner in which the data are displayed is determined by first having sampling and analytical personnel identify the logical groupings of the data and then having data management determine an easily readable form for the data presentation.

The headings on Tables 4.3.1 through 4.3.28 include a row designated "SDG Number." SDG (sample delivery group) is a term that evolved out of EPA CLP terminology. An SDG number is used to uniquely identify an analytical batch of samples within a given type of analysis. This is important because the QA/QC data qualifiers appearing in Tables 4.3.1 through 4.3.28 are specific to an SDG (analytical batch) and not necessarily to a particular environmental problem. QA/QC data presented in Appendix D are grouped by SDG within analysis type. For each analysis type listed in the 4.3 series tables, a directory for sample numbers and SDGs is provided (Table D.1). [The directory includes a list of sample numbers grouped by environmental problem, each sample number's corresponding SDG number (QA/QC table), and the table number and page number of the QA/QC table in Appendix D on which that sample number's data is located.] The SDG number provides the link between the concentration data in Tables 4.3.1 through 4.3.28 and the applicable QA/QC data in Appendix D. For a given sample, look up the Appendix D table number for the SDG in the directory for QA/QC tables in Volume II.

The Table 4.4 series of tables provides information on groundwater sample locations and sample volumes for those environmental problems that call for the collection of groundwater samples. The well identification, the sample number, the date the sample was collected, the sampling method used or type of sample (for example, bailer, QC rinsate), and the bore volume of the sampling apparatus in liters are provided. An estimation of the purge volume can be determined by multiplying the bore volume by a factor of three. If stable readings of pH and conductivity were obtained before the required well volume was purged, the sample was taken before the purging was completed.

4.2.2 Data Flags

In many of the data tables, the reported value is accompanied by a flag that represents a qualifying condition for a reported result, e.g., a problem with the analytical instrument or control value was encountered, or a specific method or dilution factor was used to obtain the result. This section offers a detailed explanation of the qualifying data flags listed in the data flag reference guide found at the end of the Table of Contents.

4.2.2.1 Data Flags: Inorganic Analysis

Inorganic analysis data tables have concentrations reported in milligrams per kilogram (mg/kg) for solid samples and micrograms per liter (µg/L) for multiphasic (liquids and solids) or aqueous samples.

For each reported concentration, the types of qualifiers and the designated groups are as follows:

Concentration Qualifiers: Relate the data to detection limits and to the detection or lack of detection of analytes.

B This qualifier indicates that the reported value is less than the Contract Required Detection Limit (CRDL) but greater than the Instrument Detection Limit (IDL).

U This qualifier indicates the analyte was analyzed for but not detected.

QA/QC Qualifiers: Relate to specific QA/QC problems. They are only presented in QC tables in Appendix D.

E Value estimated or not reported because of the presence of interference.

M Duplicate injection precision not met.

N Spiked sample recovery not within control limits.

S The reported value was determined by the Method of Standard Additions (MSA).

***** Duplicate analysis not within control limits.

+ Correlation coefficient for the MSA is less than 0.995.

The use of **S** or **+** is mutually exclusive. No combination of these qualifiers can accompany a single reported analyte combination.

Method Qualifiers: Analytical method used for determination of analyte concentration.

P ICP

A Flame AA

F Graphite furnace AA

CV Manual cold vapor AA

AV Automated cold vapor AA

AS Semiautomated spectrophotometric

C Manual spectrophotometric

T Titrimetric

NR If analyte is not required to be analyzed.

AE Atomic emission - ICP

4.2.2.2 Data Flags: Organic Analysis

In data tables, organic analysis analyte concentrations are reported in micrograms per liter (µg/L) for liquid or multiphasic samples or micrograms per kilogram (µg/kg) for solid samples.

Four notations are used to qualify the results from organic analysis. The qualifiers are as follows:

U Indicates the compound was analyzed for but not detected. The sample quantitation limit must be corrected for dilution and for percent moisture.

J Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds (TIC) where a 1:1 response is assumed, or when the mass spectral data indicate the presence of a compound that meets the identification criteria, and the result is less than the sample quantitation limit [the contract required quantitation limit (CRQL)] but greater than zero. For example, if the sample quantitation limit is 10 µg/L, but a concentration of 3 µg/L is calculated, it is reported as 3 **J**. The sample quantitation limit is adjusted for both dilution and percent moisture as discussed for the **U** flag. If a sample with 24% moisture and a 1:10 dilution factor has a calculated concentration of 300 µg/L and a sample quantitation limit of 430 µg/kg, the concentration is reported as 300 **J**.

B This flag is used when the analyte is found in the associated analytical blank as well as in the sample. It indicates possible/probable blank contamination and warns the data user to take appropriate action. This flag is used for a TIC and a positively identified target compound list (TCL) compound.

E This flag identifies compounds whose concentrations exceed the calibration range of the instrument for that specific analysis.

The combination of flags **BU** or **UB** is expressly prohibited. Blank contaminants are flagged **B** only when they are also detected in the sample.

4.2.3 Restrictions on Data Reporting

The general rule for data appearing in Tables 4.3.1 through 4.3.28 is that analyte specific results are presented in the tables for all analytes for which at least one sample's detected concentration was not accompanied by any QC data flag unless the analyst determines that the data should be included. A consistent, partially subjective method was employed in determining which analytical data would appear in the tables.

Data are not presented in the summary data when an analyte has been conclusively attributed to external contamination. For example, detection of acetone in a laboratory method blank, at levels corresponding to those found in applicable field samples, indicates that the acetone should be attributed to a laboratory contamination problem. As a result, the value would not be reported in the problem-specific summary data table. The complete data set, with QC data included, is found in Appendix D. The types of contamination which require an analyst to make a determination as to whether or not an analyte can be attributed to external contamination include: travel blank cross contamination, decontamination procedure contamination, method blank contamination, preparation blank contamination, and reagent contamination. Investigation of these possible sources of contamination is an integral part of the data quality assessment process conducted by the analytical chemist.

Exceptions to the above rule can occur when the analyst determines that additional data should be reported. For example, a specific analyte is detected in a blank (e.g., method blank) and in field samples, yet the relative magnitude of the levels makes it impossible to conclusively attribute the presence of the analyte to contamination. In this case, the appropriately flagged data are included in data summary tables, and an assessment of the impact on data quality is provided in the accompanying text. For example, if acetone is detected in a method blank at 20 µg/L, and in a field sample at 350 µg/L, the value of 350 µg/L flagged with a **B** to indicate method blank contamination would be provided in the data table. The data quality assessment would also provide an explanation of the fact that, despite acetone being detected in the method blank, it is likely that the elevated levels detected in field samples are representative of the actual field samples. These guidelines for reporting data apply to the following types of analysis: organics, inorganics, anions, and cations. Additional restrictions on what data appear in the table for each type of analysis are presented below.

4.2.4 Radiological Data Tables

For some environmental problems, radiological analysis of samples was performed. Data for radiological analysis are presented in problem-specific tables (the 4.3 series). The QC data relevant to each sample are retrievable and appear in Appendix E.

4.3 Analytical Data Quality Evaluation

Each problem-specific table is accompanied by a discussion of its contents, significant data points, and the reasons data have been interpreted as such.

An assessment of the overall quality level for the field and analytical data is given in the discussion of each environmental problem. The assessments are made relative to the three Data Utility Levels developed as part of the DOE Environmental Survey. The three levels are designated as Level I, Level II, and Level III, and are in descending order regarding their usefulness in making either quantitative or qualitative (judgmental) decisions regarding an environmental problem. A rating of Quality Level I signifies the highest standard of documentation and reliability of results. Even though the implementation of establishing the degree of contamination may not be ideally realized, a rating of I signifies sufficient information for prioritization. A rating of Quality Level II includes a wide range of quality, but indicates that the information is usable. A rating of Quality Level III implies serious deficiencies requiring further evaluation of the results or the problem as defined. The three levels are discussed in detail in Appendix A of the DOE Environmental Survey Manual (Ref. 1-2).

4.4 Background Values

A discussion and presentation of information on background levels of contaminants for environmental media in the ANL Site area, derived directly from ANL site environmental reports, are presented in Appendix B. ANL data will be interpreted by DOE, and final survey findings will be contained in the Environmental Survey Summary Report.

4.5 Data Tables for Additional Analysis Types

All analysis types are presented in the Table 4.3 series.

4.6 Environmental Problem 1: Wastewater Treatment Plant Effluent (NPDES Outfall 001)

Request Number: 300.

Requester: K. C. Turnbull.

Finding and Basis: ANL may be discharging unmonitored organics and inorganics through the wastewater treatment plant outfall (NPDES Outfall 001) into Sawmill Creek. This discharge could contaminate the water column and sediment of the creek and adversely affect the aquatic life and water quality of the stream. Wastewater from laboratories at ANL is generally collected in basement retention tanks. These tanks are discharged to the laboratory waste sewer system after being monitored for radioactivity only. There are no analyses performed for hazardous, nonradioactive contaminants.

4.6.1 Sampling and Analysis Objectives

Statement: Water samples were taken to determine if the concentrations of contaminants listed in Sect. 4.6.2.2 were present in the effluent from NPDES Outfall 001 to Sawmill Creek at levels exceeding federal or state water-quality criteria.

Supporting Information: Wastewater generated in laboratories was, for the most part, collected in basement retention tanks. These tanks were discharged to the laboratory waste sewer system after being monitored for radioactivity only. If nonradioactive contaminants were present in the wastewater, they were discharged to Sawmill Creek. The treatment processes at the laboratory wastewater treatment plant were pH adjustment, settling, and chlorination. These processes would not remove all contaminants that could be present. In many of the laboratories visited, there were no liquid-waste containers for chemical, and possibly hazardous, wastes. These wastes may have been disposed of in laboratory sinks, although this practice was not observed. In Building 211, chemicals in glassware were present in a laboratory sink. Laboratory sinks were used to wash glassware that had contained chemicals. Some HPLC-extraction agents, such as acetonitrile and methylene chloride, were also disposed of in laboratory sinks. Laboratory glassware was cleaned in these sinks. In Building 205, glassware was cleaned and empty chemical bottles were rinsed out in the laboratory sinks. A bottle of nitric acid was stored next to a laboratory sink. In Building 203, spent solvents were evaporated under laboratory hoods and any residue rinsed down the laboratory sink. Dilute acids and ammonia were disposed of in a laboratory sink. In Building 212, darkroom effluents were discharged to the laboratory waste sewer system. In Building 362, liquid effluents from experiments were discharged to a laboratory sink. In addition, oil and floating materials were observed at the laboratory wastewater treatment plant.

4.6.2 Sampling and Analytical Design

4.6.2.1 Sampling Design

Request 300: Facility 519, NPDES Outfall 001 - Water (Fig. 4.1). Three time-interval composite water samples were to be collected (Sampling Method: Reference E4.2.2) from NPDES Outfall 001 over the course of the on-site effort between 0800 and 1700 on Saturday of the first week and Tuesday and Thursday of the second week. Grab samples for volatiles were to be collected (Sampling Method: References E4.2.3A and E4.2.4) at the same place upon completion of the composite sample collection.

For the first day's sampling for Request 300, the Sampling Team arrived at the sampling site on 07NOV87 at 1000. It was raining slightly and the temperature was 39^{o}F. A Manning time-proportional sampler was set up to collect a 150-250 mL sample every 6 minutes 5 yds downstream of the NPDES outfall where good mixing occurred between the stream and the outfall. The discharge from the stream was assumed to be constant. Grab sample AR300011 was collected at 1020. Specific conductivity, temperature, turbidity, and pH were measured when grab sample AR300011 was collected. It was also assumed that a time-interval composite sample would provide a representative sample of the entire day's discharge. Discharge from the outfall appeared to be at maximum. Rainfall was heavy when composite sample AR300044 was collected at 1555. Measurements were made of temperature, pH, conductivity, dissolved oxygen, and turbidity. At that time, the stream had more volume, but less discharge from the NPDES outfall. The stream looked clean and healthy.

For the second day's sampling for Request 300, the Sampling Team arrived on-site on Tuesday, 10NOV87, at 1030 under sunny skies at a temperature of 30°F. The Manning sampler was set up 5 yds downstream from the NPDES outfall. Volatile sample AR300022 was collected here. At 1500, the Sampling Team returned to the site to retrieve composite sample AR300055. Discharge had increased greatly since 1030. The area downstream from NPDES showed an increase of algae growth, and water had a distinct chlorine odor.

For the third day's sampling for Request 300, the Sampling Team arrived on-site on Thursday, 12NOV87, at 1000 under clear skies at 40°F. Winds were calm. Outflow was clear but a temperature differential was evident due to coloration change in the algae of the stream. Discharge from outflow was relatively low and there was little suspended sediment. Field blank sample AR300088 for grab samples and sample AR300033 were collected at 1000. The team returned to the sampling site at 1555. Field blank sample AR300077 for composites and sample AR300066 were collected at 1602. Discharge was unchanged. The stream was still very clear (same weather conditions as earlier) with little or no suspended sediments in the sample.

Field measurements for grab sample AR300011 were measured 15 yds downstream of the Manning sampler inflow where there was good mixing of the stream. Field measurements for grab sample AR300022 were collected 20 yds below the NPDES discharge. Water was very clear. Time-composite sample AR300044 was collected from a stream slightly colored due to all day rain. For sample AR300055, although the discharge had increased since morning, the sample was clear. Samples were collected with Manning sampler 9.

4.6.2.2 Analytical Design

Request 300: Field parameters measured for Request 300 included pH, temperature, and specific conductivity. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), PCBs (CLP), and ICP metals (CLP).

4.6.3 Field and Analytical Data

Field Data: *Field data requested included pH, conductivity, and temperature. These results are shown in Table 4.3.1. The three grab samples (AR300011 through -033) and the three composite samples (AR300044 through -066) show relatively constant values for conductivity, dissolved oxygen, pH, turbidity, and temperature. Dissolved oxygen and turbidity were not required by the sampling plan. The low turbidity is consistent with the observations that the stream was clear during sampling.*

Field Data Evaluation: Because instruments used to measure pH, conductivity, and temperature were calibrated according to program standards and were found to be acceptable, readings for these three parameters are reliable. Dissolved oxygen and turbidity measurements were not required; these measurements were made without instrument calibration.

Analytical Data:

<u>Metals</u>. Analytical results for metals in surface water are presented in Table 4.3.1. Of the 16 metals detected, the following 7 were below either the CRDL or the IDL in all three samples: barium, beryllium, cadmium, chromium, nickel, silver, and vanadium. Of the remaining metals detected, copper ranged from 26 and 45 µg/L and zinc ranged from 32 to 51 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and sodium.

Extractable organics. *Analytical results for semivolatile organic compounds are presented in Table 4.3.1. Five compounds were detected in one of the samples, 11 in another, and 12 in the remaining sample. No identifiable compounds were detected in measurable quantities. One unknown had an estimated concentration of 0.11 mg/L, but all other concentrations were estimated at less than 0.025 mg/L.*

Volatile organics. *For the three samples in Environmental Problem 1, four to seven target compounds were identified. Of the total of 16 compounds, all but one (chloroform in AR300011A at 0.008 mg/L) were either determined to be below the quantitation limit or were also found in the associated field or laboratory blanks. Five determinations common to the blanks were above the quantitation limits: these included methylene chloride in all three samples and acetone in two of the samples.*

PCBs and other extractables. *No pesticides or PCBs were detected.*

Analytical Data Evaluation:

Metals. Two metals of interest, copper and zinc, were detected above the CRDL in the samples for Request 300.

Extractable organics. Some semivolatile organic compounds were indicated, but none were in sufficient quantities to be confirmed by GC/MS.

Volatile organics. Chloroform was identified in AR300011A at 0.008 mg/L. Other compounds were either determined to be below the quantitation limit or was also found in the associated field or laboratory blanks.

PCBs and other extractables. No pesticides or PCBs were detected.

4.6.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical Quality Level is II.

Field Data: The required field measurements were accomplished as requested with appropriate calibration. Although additional measurements of dissolved oxygen and turbidity were not made with calibrated instruments and quantitative values are questionable, the descriptive term "clear stream" corroborates low turbidity readings.

Analytical Data:

Metals. Analytical results were Quality Level I except for aluminum, calcium, and silver at Quality Level II, and silver at Quality Level III for sample AR300055.

Extractable organics. Acetone, methylene chloride, and toluene were detected in the field blank, but not in any of the samples. Data are of Quality Level III due to mass spectral uncertainty for tentatively identified compounds. The analysis was out of control limits with respect to recovery of the surrogate for sample AR300055.

Volatile organics. Data Quality Levels of I or II were assigned to toluene and chloroform for the samples in which those compounds were found at concentrations greater than their quantitation limits. The majority of the volatile compounds detected were of Quality Level III because concentrations were estimated values that were less than quantitation limits.

PCBs and other extractables. For samples AR300044 and AR300055, the surrogate retention time did not fall within the acceptable range. Therefore, any data for single component pesticides must be considered unusable. No pesticides or PCBs were detected.

Environmental Problem: 1
Request Number: 300

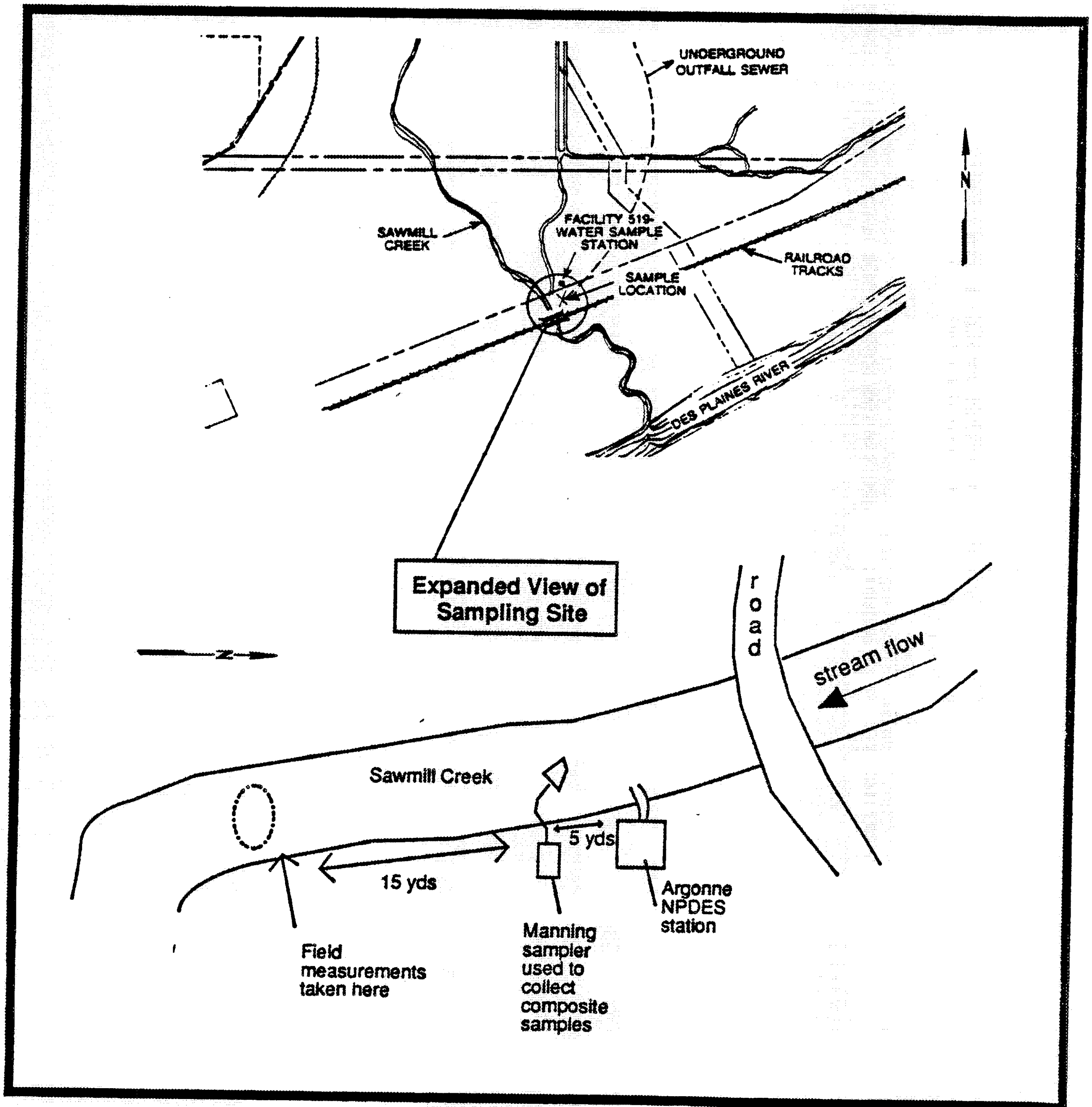

Figure 4.1. Facility 519 - NPDES Outfall 001 (Request 300)

TABLE 4.2.1 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 1

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR300	NPDESOUTF1	EFFLUENT	SUR WATER	2	2	QC FL	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR300	NPDESOUTF1	EFFLUENT	SUR WATER	3	3	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
AR300	NPDESOUTF1	EFFLUENT	SUR WATER	3	3	T COM	0	0	3	3	0	0	0	0	0	0	0	3	3	3	0	0	0	0
		MED TOTAL		8	8		0	0	3	4	0	0	0	0	0	0	0	3	3	3	4	4	0	0
		EP TOTAL		8	8		0	0	3	4	0	0	0	0	0	0	0	3	3	3	4	4	0	0

TABLE 4.3.1 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 1 WASTEWATER TREATMENT PLANT EFFLUENT (NPDES OUTFALL 001) DRAFT DO NOT CITE

S&A REQUEST: 300
LOCATION: FACILITY 519, NPDES OUTFALL 001
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR300044	AR300055	AR300066	AR300077	AR300088	
CONDUCTIVITY (MS/CM)	2.1	2.4	1.8	1.8	2.7	
DO (PPM)	8.1	10	9.3	9.3	10	
PH (UNITS)	7.6	7.8	8.3	8.3	8.3	
TEMPERATURE (DEG C)	11	11	11	11	11	
TURBIDITY (PPM)	12	13	16	16	13	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR300044B SDG NO: AR300044B TYPE: T. COMPOSITE	AR300044B AR300044K T. COMPOSITE	AR300055B AR300044B T. COMPOSITE	AR300055B AR300044K T. COMPOSITE	AR300066B AR300044B T. COMPOSITE	AR300066B AR300066K T. COMPOSITE
ALUMINUM	203 NE		161 BNE		252 NE	
BARIUM	105 B		79 B		60 B	
BERYLLIUM	0.69 B		0.56 B		0.51 B	
CADMIUM	2.1 B		2.2 B		3.8 B	
CALCIUM	207000		164000		102000	
CHROMIUM	6.1 B		6 U		6 U	
COPPER	26		18 B		45	
IRON	798		377		419	
MAGNESIUM	81100		64300		42900	
MANGANESE	107		47		36	
NICKEL	9.2 B		7.2 B		13 B	
POTASSIUM		6900		6200		4600 B
SILVER	9.7 B		6 U		6 U	
SODIUM	422000		334000		209000	
VANADIUM	14 B		14 B		19 B	
ZINC	44		32		51	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR300077A SDG NO: AR300044B TYPE: FIELD BLANK	AR300077A AR300066K FIELD BLANK				
ALUMINUM	60 UNE					
BARIUM	2 U					
BERYLLIUM	0.3 U					
CADMIUM	2 U					
CALCIUM	200 U					
CHROMIUM	6 U					
COPPER	10 U					
IRON	20 U					
MAGNESIUM	10 U					
MANGANESE	5 U					
NICKEL	6 U					

TABLE 4.3.1 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 1 WASTEWATER TREATMENT PLANT EFFLUENT (NPDES OUTFALL 001) DRAFT DO NOT CITE

S&A REQUEST: 300
LOCATION: FACILITY 519, NPDES OUTFALL 001
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR300077A / AR300044B / FIELD BLANK	AR300077A / AR300066K / FIELD BLANK
POTASSIUM			100 U
SILVER		6 U	
SODIUM		200 U	
VANADIUM		4 U	
ZINC		3 U	

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR300044A / DD23 / T. COMPOSITE	AR300055A / DD24 / T. COMPOSITE	AR300066A / DD28 / T. COMPOSITE
BIS(2-ETHYLHEXYL)PHTHALATE		11 J	6 JB	16 B
DI-N-BUTYLPHTHALATE		0.7 J	0.7 J	2 JB
DIETHYLPHTHALATE		0.8 J	11 U	1 J
* HALOGENATED UNKNOWN(26.97)		8 J		
* METHYL HEXANONE(8.10)			11 JB	
* UNKNOWN				11 J
* UNKNOWN HYDROCARBON(24.86)		4 J		
* UNKNOWN PHTHALATE				22 J
* UNKNOWN PHTHALATE(35.07)			11 J	
* UNKNOWN(8.10)		24 J		
* UNKNOWN(9.57)			13 J	
* UNKNOWN(13.02)			110 J	
* UNKNOWN(14.23)		7 J		
* UNKNOWN(19.44)		11 J		
* UNKNOWN(19.45)			6 J	
* UNKNOWN(19.81)		13 J		
* UNKNOWN(19.83)			9 J	
* UNKNOWN(23.85)		6 J		
* UNKNOWN(30.09)			5 J	
* UNKNOWN(33.82)		11 J		
* UNKNOWN(33.83)			15 J	
* UNKNOWN(41.47)			12 J	
* UNKNOWN(44.59)			19 JB	

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR300088A / ON21 / FIELD BLANK
ACETONE		8 JB
METHYLENE CHLORIDE		10 B

TABLE 4.3.1 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 1 DRAFT DO NOT CITE
WASTEWATER TREATMENT PLANT EFFLUENT (NPDES OUTFALL 001)

S&A REQUEST: 300
LOCATION: FACILITY 519, NPDES OUTFALL 001
MEDIUM: SURFACE WATER

VOLATILE ORGANICS (UG/L)		
	SAMP NO:	AR300088A
	SDG NO:	ON21
	TYPE:	FIELD BLANK
TOLUENE		5 JB

S&A REQUEST: 300
LOCATION: NPDES OUTFALL
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO:	AR300011	AR300022	AR300033
CONDUCTIVITY (MS/CM)		2.7	2.4	2.7
DO (PPM)		9.2	11	10
PH (UNITS)		7.7	7.8	8.3
TEMPERATURE (DEG C)		11	11	11
TURBIDITY (PPM)		13	13	13

VOLATILE ORGANICS (UG/L)				
	SAMP NO:	AR300011A	AR300022A	AR300033A
	SDG NO:	GN15	ON19	ON21
	TYPE:	GRAB	GRAB	GRAB
ACETONE		3 JB	64 B	26 B
BROMODICHLOROMETHANE		2 J	5 U	5 U
CARBON TETRACHLORIDE		1 J	5 U	5 U
CHLOROFORM		8	4 J	2 J
DIBROMOCHLOROMETHANE		3 J	5 U	5 U
ETHYLBENZENE		5 U	4 JB	5 U
METHYLENE CHLORIDE		16 B	44 B	23 B
TOLUENE		4 JB	6 B	3 JB

4.7 Environmental Problem 2: Lime Sludge Pond Seepage to Sawmill Creek and Reference Samples for Sawmill Creek

NOTE: This section incorporates Requests 301 and 302 previously listed in the ANL Sampling and Analysis Plan under Environmental Problem 2A.

Request Numbers: 301, 302, 303, 304, 305, and 306.

Requester: K. C. Turnbull.

Finding and Basis: Sawmill Creek water, sediment, and biota may be adversely affected because of discharges from the Lime Sludge Pond. High pH (9 to 10) water from the unlined sludge pond may be seeping into the creek. Also, during periods of severe weather, the concentration of suspended solids in the pond tends to increase due to resuspension of lime sludge into the water phase. If rain is associated with the severe weather, the pond begins to fill and may periodically discharge through the overflow pipe into Sawmill Creek via NPDES Outfall 009.

4.7.1 Sampling and Analysis Objectives

Statement: Water and sediment samples were to be collected to determine whether contaminant levels for volatiles, semivolatiles, pesticides, PCBs, CLP-metals, oil and grease, and cyanide were present in the water and sediment of Sawmill Creek above reference levels because of discharges from the unlined Lime Sludge Pond. Samples for reference levels for these analytical parameters were collected at the upstream sampling station on Sawmill Creek (Requests 301 and 302).

Supporting Information: Lime precipitate from past discharges through NPDES Outfall 009 was removed from the creek bed. Residual material may have remained in the creek. Although the lime pond is no longer used for disposal of lime sludge, discharge from the pond could still enter the creek during periods of rainfall. A past failure of the earthen dike between the lime pond and the creek resulted in the seepage of water that exceeded state water quality standards for pH. There may be seepage of high pH water from the bottom of the unlined Lime Sludge Pond through the subsurface soil into Sawmill Creek. The difference in elevation between the pond surface and the creek is approximately 10 ft. ANL monitored Sawmill Creek water for pH and other parameters. The sampling locations and sampling media were insufficient to indicate whether discharges from the pond were adversely affecting Sawmill Creek.

4.7.2 Sampling and Analytical Design

4.7.2.1 Sampling Design

Request 301: Sawmill Creek Above the Lime Sludge Pond Outfall - Water (Fig. 4.2a). Samples for Requests 301, 303, and 305 were to be collected (Sampling Method: Reference E4.2.4) on the same day within as short a time interval as possible, with sequencing of sampling from downstream to upstream. Sampling was to be done on three different days during the on-site sampling effort to establish the degree of variability of these samples. As no laboratory analyses were needed for this request, extensive analytical work was unnecessary.

For the first day's sampling for Request 301, the Sampling Team arrived on-site Wednesday, 04NOV87, at 1705. Skies were breezy and clear. The temperature was 45°F. Because the sampling site was upstream from the Lime Sludge Pond, it was presumed to be unaffected by seepage from the Lime Sludge Pond and it could serve as a background sampling site for Requests 303 and 305. Samples on all 3 days were collected approximately 100 ft upstream of NPDES Outfall 009. After dividing the area beginning 90-ft upstream of NPDES Outfall 009 into twenty 1-ft segments, one segment was selected at random for sampling. Field measurements of pH, specific conductivity, and temperature were taken for sample AR301012 collected at the center of the 20-ft wide stream upstream of sampler activity at 1710. Water was mostly clear with occasional foam. There was a small stream/bog entering the stream (see Fig. 4.2a).

On the second day of sampling for Request 301, Thursday, 05NOV87, the temperature was 45^{o}F under clear skies and winds were 10-15 mph. There was no indication of environmental stresses on vegetation. The water was approximately 3-ft deep at the sampling location (see protocol for day 1), which was 1 ft down the side closest to the pond. Sample AR301023 was collected at 1044. Measurements of temperature and pH were also made. Water was murky and backed up from a dam created by a fence. There was no film on the water.

On the third day of sampling for Request 301, the Sampling Team arrived on-site on Friday, 06NOV87, at 1109. Skies were overcast, winds were calm, and the temperature was 50^{o}F. Water was calm, not flowing, and somewhat murky. It was 3-4 ft deep. Field measurements of pH, specific conductivity, and temperature were taken with Horiba instrument 310035 (calibrated 06NOV87) from sample AR301034 at the center of the stream upstream of the sampler activity, with as little disturbance to adjacent sediments as possible. (See protocol for day 1.)

Request 302: Sawmill Creek Above the Lime Sludge Pond Outfall - Sediment (Fig. 4.2b). Sediment samples for Request 302 were to be collected in accordance with E5.3.1 to the depth of sediment immediately after and at the same general location as the first day's water samples for Request 301 to provide continuity.

For Request 302, the Sampling Team arrived on-site Wednesday, 04NOV87, at 1706. Winds were out of the west at 5-8 mph under clear skies. The temperature was approximately 65^{o}F. The sampling site was upstream of the Lime Sludge Pond and presumed to be unaffected by seepage from the pond. Upstream samples were collected last to minimize the potential effect on the two downstream sampling sites. The width of the stream at the sampling site was approximately 20 ft. At the location selected for water sampling, the stream width was divided into a 1 x 60-segment grid. Sample collection began at 1736. Sample AR302013 was collected at grid 4. Sample AR302024 was collected at grid 24. Sample AR302035 was collected at grid 44. The depth of sediment was 5-7 in. and fairly sandy at the middle and far side. The side closest to the Lime Sludge Pond was not as sandy--it had more clay. The water was particularly deep (approximately 4 ft) in this area. This sediment station served as the upgradient control for other sediment sampling locations.

Request 303: Sawmill Creek Adjacent to Lime Sludge Pond South of NPDES Outfall 009 - Water (Fig. 4.2c). Samples for Requests 301, 303, and 305 were to be collected (Sampling Method: Reference E4.2.4) on the same day within as short a time span as possible, but no greater than a 2-hr period, with sequencing of sampling from downstream to upstream. Sampling was to be done on three different days during the on-site sampling effort to establish the degree of variability of these samples.

For the first day's sampling for Request 303, the Sampling Team arrived on-site Wednesday, 04NOV87, at 1650. Skies were breezy and clear. The temperature was 50^{o}F.

As no laboratory analyses were needed for this request, extensive analytical work was unnecessary. The sample location was adjacent to the Lime Sludge Pond downstream of NPDES Outfall 009 (the Lime Sludge Pond discharge). Seepage from the pond was considered homogeneous, unless influenced by periods of increased precipitation. The Sampling Team divided the area beginning 10 ft downstream of NPDES Outfall 009 into 20, 1-ft segments and selected one segment at random for the sample location. Measurements of pH, temperature, and conductivity were taken from sample AR303014 collected from the middle of the stream with as little disturbance to adjacent sediments as possible. The water was clear with some suds at the surface. Moss covered rocks along the stream. The water was approximately 1 ft deep. The stream was sampled at the center of its 20-ft width.

On the second day of sampling for Request 303, Thursday, 05NOV87, the field measurements of pH, specific conductivity, and temperature were taken from sample AR303025 at 1029. The temperature was 45^{o}F under clear skies. Winds were 5 to 10 mph. The water was fairly clear to slightly murky, with no sheen, suds, or oil on the surface.

On the third day of sampling for Request 303, the Sampling Team arrived on-site on Friday, 06NOV87, at 1045. Field measurements of pH, specific conductivity, and temperature were taken from sample AR303036 at 1044. Skies were partly cloudy. There was no breeze. The water showed few suds and was fairly clear.

Request 304: Sawmill Creek Adjacent to Lime Sludge Pond, South of NPDES Outfall 009 - Sediment (Fig. 4.2d). The three samples collected for Request 304 were to be collected (Sampling Method: Reference E5.3.1) from the stream channel to the depth of sediment immediately after and from the same general location as the first day's water samples collected for Request 303.

For Request 304, the Sampling Team arrived on-site at 1643 on Wednesday, 04NOV87. Skies were clear, winds were out of the west at 5-8 mph, and the temperature was approximately 65°F. Seepage from the Lime Sludge Pond had settled uniformly in the sediments in the stretch of Sawmill Creek adjacent to the pond. At the location selected for sampling, a 1 x 60-segment grid was placed across the width of the stream and one segment selected at random from the first 20 segments. The second and third sample locations were determined by adding 20 segments to the preceding designated segment. Three samples were collected from the stream channel from 1658 to 1701 at a sediment depth of 4 in. Samples were collected 12-ft downstream from the outflow pipe. The stream was approximately 18-ft wide and 1-ft deep. Samples AR304015, AR304026, and AR304037 were collected at grids 4, 24, and 44, respectively, for field measurements. Sediments were light brown to dark brown--gravel with clay and silt interclasts. No samples for laboratory analyses were to be collected for Request 304.

Request 305: Downstream Sampling Location on Sawmill Creek for Seepage from the Lime Sludge Pond - Water (Fig. 4.2e). Water samples identified for Environmental Problem 2 were to be collected (Sampling Method: Reference E4.2.4) on the same day within as short a time interval as possible, but no greater than a 2-hr period, with sequencing of samples from downstream to upstream. Samples were to be collected on three different days during the on-site sampling effort to establish the degree of variability. The sampling location was south of the Lime Sludge Pond and represented the downstream site for that facility. Samples for this request were to be collected in conjunction with samples for Request 306.

For the first day's sampling for Request 305, the Sampling Team arrived on-site, 04NOV87, at 1630. Skies were clear and winds were calm. The temperature was 50-55^{o}F. Routine seepage from the pond was considered homogeneous, but could be influenced by periods of increased precipitation. Samples/measurements were taken from the middle of stream, which was approximately 17 ft wide at this location. The area between the lower end of the pond and NPDES Outfall 002 was divided into 20 segments and one segment was selected at random for the sample location. Sample AR305016 was collected at 1630. Water was clear and there were some surface suds.

On the second day of sampling for this request, 05NOV87, the Sampling Team arrived on-site at 1020. The temperature was 45^{o}F, winds were 5-10 mph, and skies were clear. Conductivity was checked approximately 2-ft from the side of each bank and at the center of the stream. Sample AR305027 was collected at 1020.

On the third day of sampling for this request, 06NOV87, the Sampling Team arrived on-site at 1040. The temperature was approximately 50^{o}F, winds were calm, and skies were partly cloudy. There were suds on the water, but no sheen or oil. The stream was approximately 20-ft wide at this sampling point. Moss covered rocks along the streambed. Sample AR305038 was collected at 1038.

Request 306: Downstream Location on Sawmill Creek for Seepage from the Lime Sludge Pond - Sediment (Fig. 4.2f). To provide continuity, the sediment samples for Request 306 were to be collected (Sampling Method: Reference E5.3.1) to the depth of sediment immediately after the first day's (04NOV87) water sampling for Request 305.

For Request 306, the Sampling Team arrived on-site 04NOV87 at 1559. Winds were out of the west at 5-8 mph under clear skies at a temperature of approximately 66^{o}F. The sampling location for this request corresponded to the location for Request 305. Seepage from the Lime Sludge Pond had settled uniformly in the stretch of Sawmill Creek downstream of the pond. At the location selected for sampling, the stream was approximately 17 ft wide. The width of the stream was divided into a 60-segment grid. Three sediment samples were collected to the depth of sediment (5-7 in.) from grids 4 (AR306017), 24 (AR306028), and 44 (AR306039) at the same time and location as the first day's water sample (AR305016 for Request 305). Sediments were dark brown in color. Gravel had clay and sand interclasts.

4.7.2.2 Analytical Design

Request 301: Field parameters measured for Request 301 included pH, specific conductivity, and temperature.

Request 302: The field parameter measured for Request 302 was pH. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, CLP-metals, oil and grease, and cyanide.

Request 303: Field parameters measured for Request 303 included pH, specific conductivity, and temperature.

Request 304: Field parameters measured for Request 304 included pH and temperature.

Request 305: Field parameters measured for Request 305 included pH, specific conductivity, and temperature.

Request 306: Field parameters measured for Request 306 included pH and temperature.

4.7.3 Field and Analytical Data

Field Data:

Request 301: *Upstream water samples serve as a reference for this problem and were taken on three successive days. Data are shown in Table 4.3.2. The pH values are all in the slightly alkaline range (7.5 to 8.3). The temperature of the water was slightly warmer on the first day (14^{o}C) than on the second and third sampling days (6 to 7^{o}C).*

Request 302: *Although only pH readings were requested, the temperature of the water is also recorded in Table 4.3.2. The pH readings of the sediment samples are in a narrow range of 7.3 to 7.5. The relatively uniform temperature of the sediment is evidence of a system which is in equilibrium.*

Request 303: *Results for the three water samples are reported. The temperature for the first day's sample is higher than the temperature readings for the second and third day samples. These temperatures are consistent with those recorded for the reference water samples.*

Request 304: *The sediment pH is slightly higher than that of the reference sediment samples, reflecting the influence of the sludge pond. The temperatures of the sediment appear to be slightly higher than the reference sediment temperatures.*

Request 305: *Samples from Request 305 were taken from Sawmill Creek as far downstream from the sludge pond as possible. The conductivity and pH measurements were similar to water samples taken upstream and from the reference site.*

Request 306: *The sediment samples from the furthest downstream site show pH and temperature similar to samples taken further upstream. A slight suggestion that the sediment temperature is slightly higher (15^{o}C vs 14^{o}C) than the upstream sediment samples is noted.*

Field Data Evaluation:

Request 301: Because the instruments used on the three days were calibrated each day prior to sampling, the results are reliable.

Request 302: Because the instruments used for pH and temperature had been calibrated, the results are reliable.

Request 303: Because the instruments used for pH, conductivity, and temperature had been calibrated, the results are reliable.

Request 304: Because the instruments used for pH and temperature measurements had been calibrated, the results are reliable.

Request 305: Because the instruments were calibrated each day, the readings are reliable.

Request 306: Because the instruments were calibrated each day, the readings are reliable.

Analytical Data:

Request 301: *No analyses were requested.*

Request 302:

Anions and cyanide. *Because the cyanide concentrations were below the action level classification for hazardous waste for Request 302, the data are not reported in the data tables.*

<u>Metals</u>. Analytical results for metals in sediment are presented in Table 4.3.2. Of the 20 metals detected, the following 4 were below either the CRDL or the IDL in all three samples: beryllium, mercury, silver, and sodium. Of the remaining metals detected, arsenic ranged from 10 to 26 mg/kg, barium ranged from 60 to 84 mg/kg, cadmium was 2 mg/kg, chromium ranged from 6.6 to 31 mg/kg, copper ranged from 9.8 to 39 mg/kg, lead ranged from 11 to 28 mg/kg, nickel ranged from 12 to 25 mg/kg, and zinc ranged from 46 to 122 mg/kg. Other metals detected were aluminum, calcium, cobalt, iron, magnesium, manganese, potassium, and vanadium.

<u>Oil and grease</u>. The oil and grease content of the three samples from Request 302 are shown in Table 4.3.2. The values range from 260 to 740 mg/kg with an average of 487 mg/kg.

<u>Extractable organics</u>. Analytical results for semivolatile organic compounds are presented in Table 4.3.2. Fifteen compounds were detected in one sample, 16 in another, and 20 in the remaining sample. Diethylphthalate was measured at 22 mg/kg in sample AR302013, but was less than 1 mg/kg in the other two samples. Unknowns were detected with estimated concentrations of greater than 10 mg/kg in all three samples, with the highest estimated concentration being 29.6 mg/kg in sample AR302024. However, only one unknown in each sample had estimated concentrations between 10 and 30 mg/kg. Sample AR302013 had several unknowns with estimated concentrations of greater than 1 mg/kg, but most unknowns in the other two samples had estimated concentrations of less than 1 mg/kg. Fluoranthene, phenanthrene, and pyrene were detected in samples AR302024 and AR302035, but not above the CRDL.

<u>PCBs and other extractables</u>. No pesticides or PCBs were detected.

<u>Volatile organics</u>. The number of compounds detected ranged from 6 to 12 in the three samples for this request. Methylene chloride was found in AR302035A at an estimated level (0.62 mg/kg) exceeding the range calibrated for quantitation. It was also present in the blank. The next highest measured or estimated concentration of any compound

detected was 0.039 mg/kg of acetone (which was also present in the blank) in sample AR302024. Of the target compounds detected, only xylene was not common to the blank and also present at a measurable level (0.009 mg/L in sample AR302013). All five tentatively identified compounds (TICs) were estimated to be present at levels less than 0.01 mg/L.

Request 303: *No analyses were requested.*

Request 304: *No analyses were requested.*

Request 305: *No analyses were requested.*

Request 306: *No analyses were requested.*

Analytical Data Evaluation:

Request 301: No analyses were requested.

Request 302:

Anions and cyanide. Because the reportable concentration for cyanide in solids is based on the hazardous level or action level which is 250 mg/kg, no data are reported in the table if the concentrations are below this level. The spectrophotometer used to determine cyanide is calibrated daily and the calibration is verified with EPA quality control solutions. In addition, calibration blanks are prepared and analyzed for each calibration and all recorded results are in compliance (i.e., 2 µg/L). All duplicate results (except SDG AR308019C) are in compliance. All holding times were met and, where duplicate analysis were performed, the results were in compliance ($\pm$20 RPD). With these quality control measures, it can be stated that all cyanide results are reliable with minor exceptions. (See results for Environmental Problem 10 for the minor exceptions).

Metals. Seven metals of interest--arsenic, cadmium, chromium, copper, lead, nickel, and zinc--were detected above the CRDL in the samples for Request 302.

Oil and grease. Normally, oil and grease are determined gravimetrically in water; the same procedure was used for these samples as with water extraction using fluorocarbon-113. Results may be biased high because sediments contain organic material.

Extractable organics. Diethylphthalate was measured at 22 mg/kg in one sample, but much lower in the other two. Some unknowns had estimated concentrations between 10 and 30 mg/kg in these samples. Diethylphthalate was the only semivolatile organic compound identified in measurable quantities in all three samples.

PCBs and other extractables. No pesticides or PCBs were detected.

Volatile organics. Methylene chloride was found in sample AR302035A at an estimated level (0.62 mg/kg) exceeding the range calibrated for quantitation. It was also present in the blank. The next highest measured or estimated concentration of any compound detected was 0.039 mg/kg of acetone. All TICs were estimated to be present at levels of less than 0.01 mg/L.

Request 303: No analyses were requested.

Request 304: No analyses were requested.

Request 305: No analyses were requested.

Request 306: No analyses were requested.

4.7.4 Limitations and Qualifications

Data Quality Level:

Request 301 through 306: The sampling plan is rated Quality Level II because requests for samples for laboratory analysis were made only for the reference site (Request 302) and not for either of the other sediment samples downstream from the Lime Sludge Pond (Requests 304 and 305). The sampling is rated Quality Level I. The analytical results are rated Quality Level I.

Field Data:

Request 301 through 306: All recorded field data are reliable because instruments used to take the requested measurements were calibrated. If analytical results for the sediment from Request 302 are to have any significance, the plan should have requested similar analysis from either or both sediment sites in the stream.

Analytical Data:

Request 301: No analyses were requested.

Request 302:

Anions and cyanide. The data Quality Level is I.

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

Oil and grease. The analysis is straightforward and the Quality Level is I.

Extractable organics. Diethylphthalate was the only compound identified in measurable quantities in any of the samples. Data are of Quality Level III due to mass spectral uncertainties for tentatively identified compounds and concentrations below quantitation limits for most of the known compounds.

PCBs and other extractables. For the three samples in this set, the surrogate retention time did not fall within the acceptable range. Therefore, any data for single component pesticides must be considered unusable. No pesticides or PCBs were detected.

Volatile organics. Xylene in AR302013 and methylene chloride in AR302035 were Quality Level I. Methyl acetate in AR302035 was Quality Level II. The remaining data were Quality Level III because concentrations were below the quantitation limits or TICs were not identified.

Request 303: No analyses were requested.

Request 304: No analyses were requested.

Request 305: No analyses were requested.

Request 306: No analyses were requested.

Environmental Problem: 2
Request Number: 301

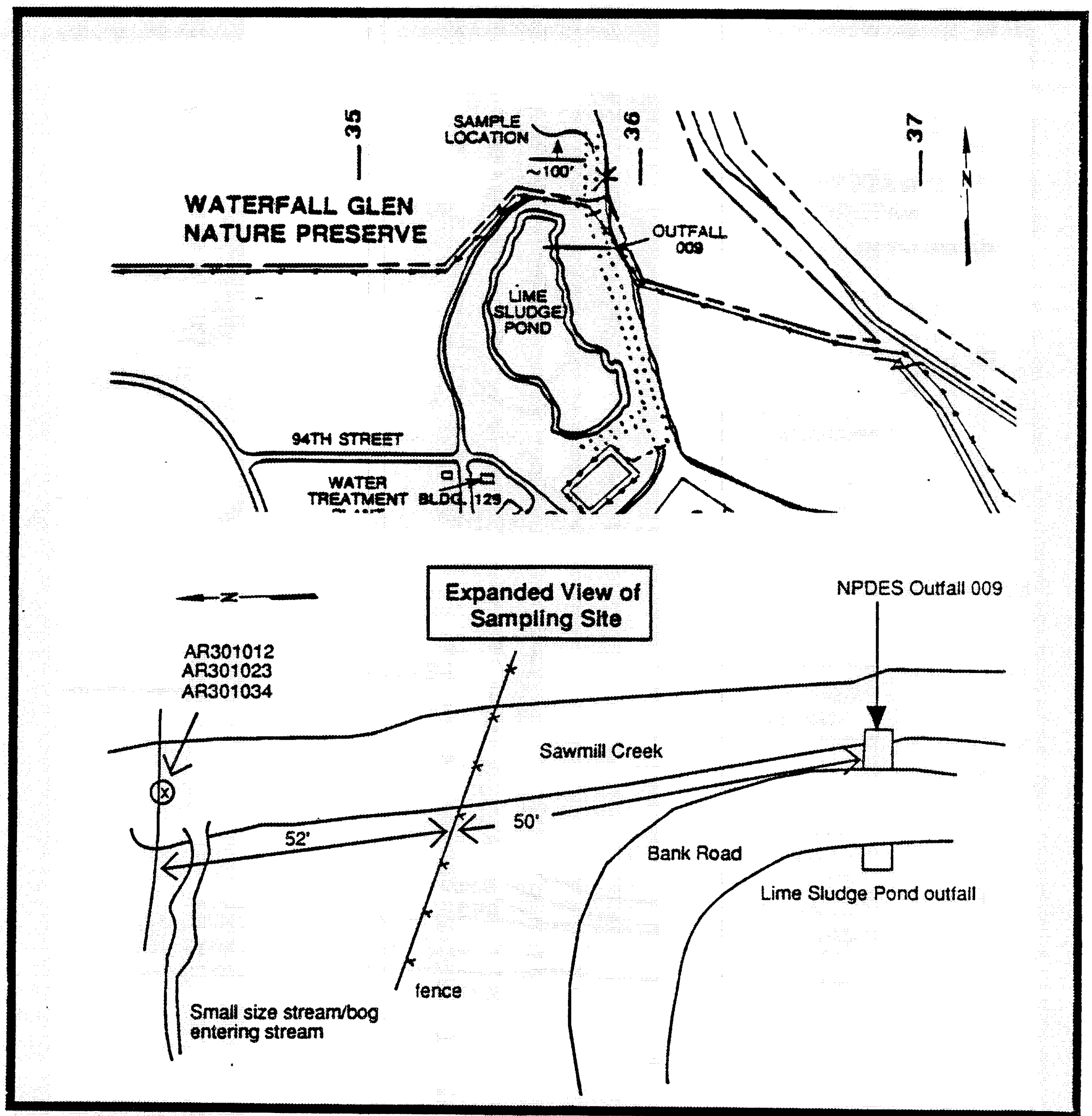

Figure 4.2a. Sawmill Creek Approximately 100 ft. Above the Lime Sludge Pond Outfall (Request 301)

Environmental Problem: 2
Request Number: 302

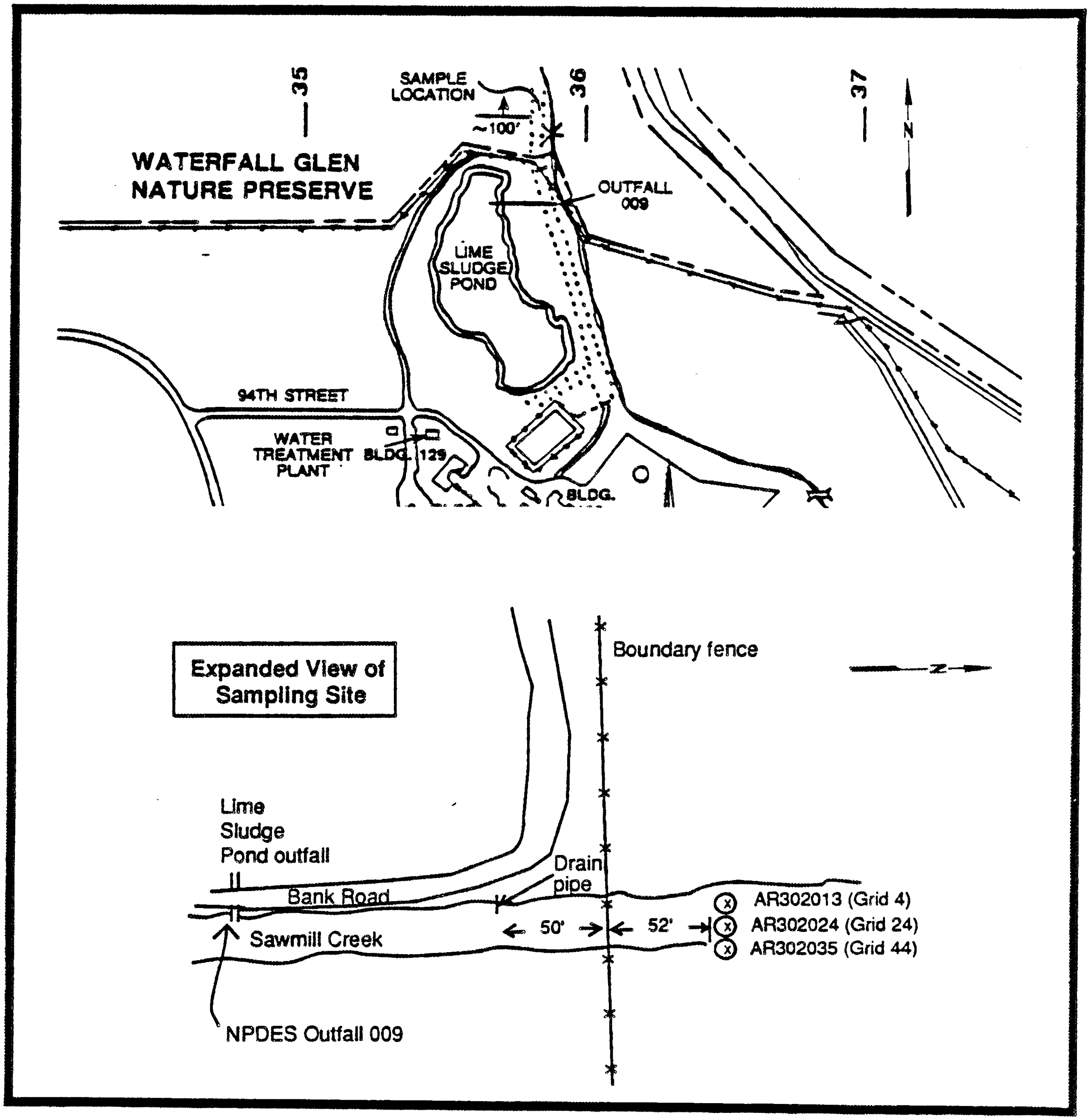

Figure 4.2b. Sawmill Creek Approximately 100 Ft. Above the Lime Sludge Pond Outfall (Request 302)

Environmental Problem: 2
Request Number: 303

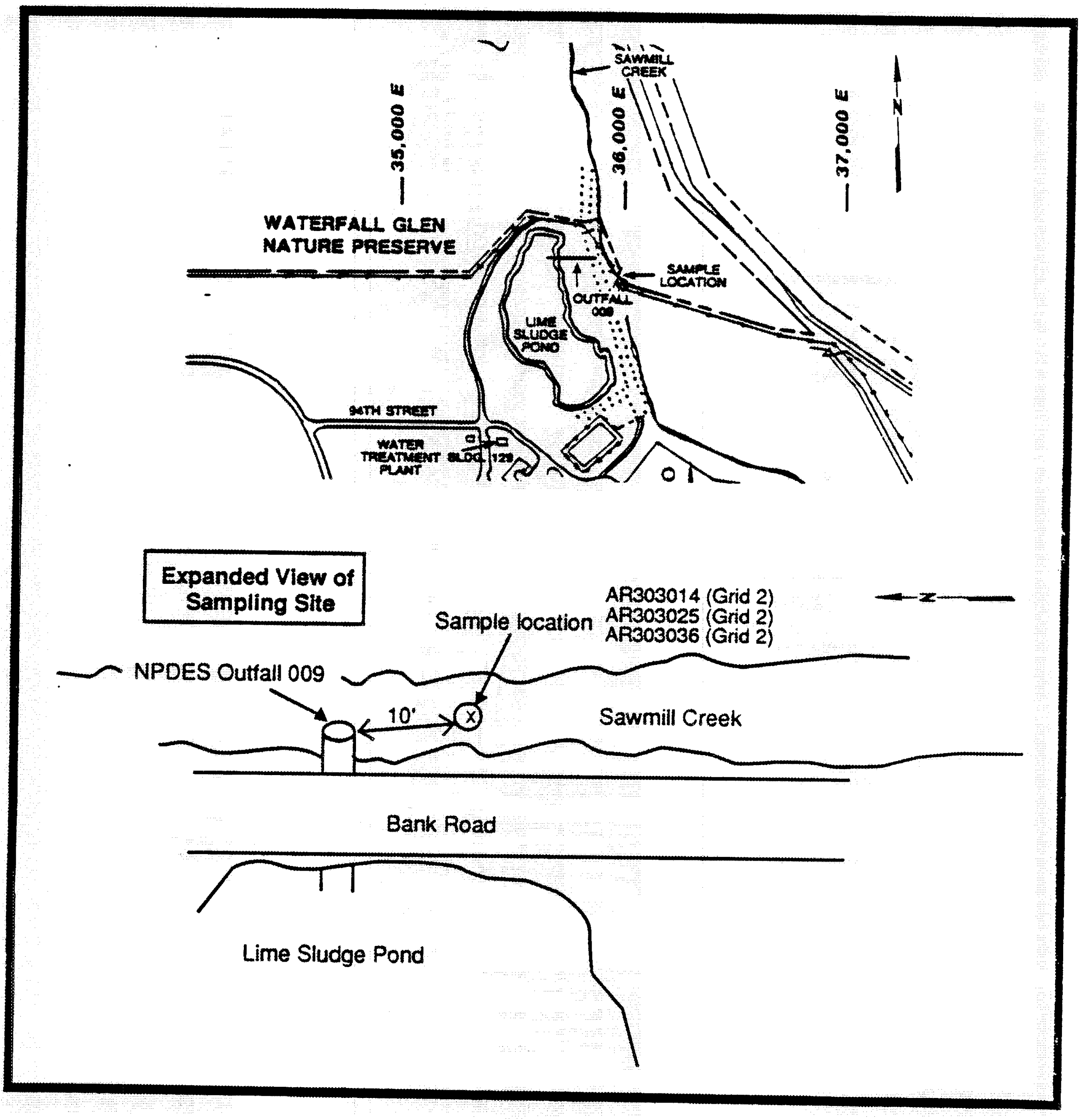

Figure 4.2c. Sawmill Creek Adjacent to Lime Sludge Pond 10 Ft. South of NPDES Outfall 009 (Request 303)

Environmental Problem: 2
Request Number: 304

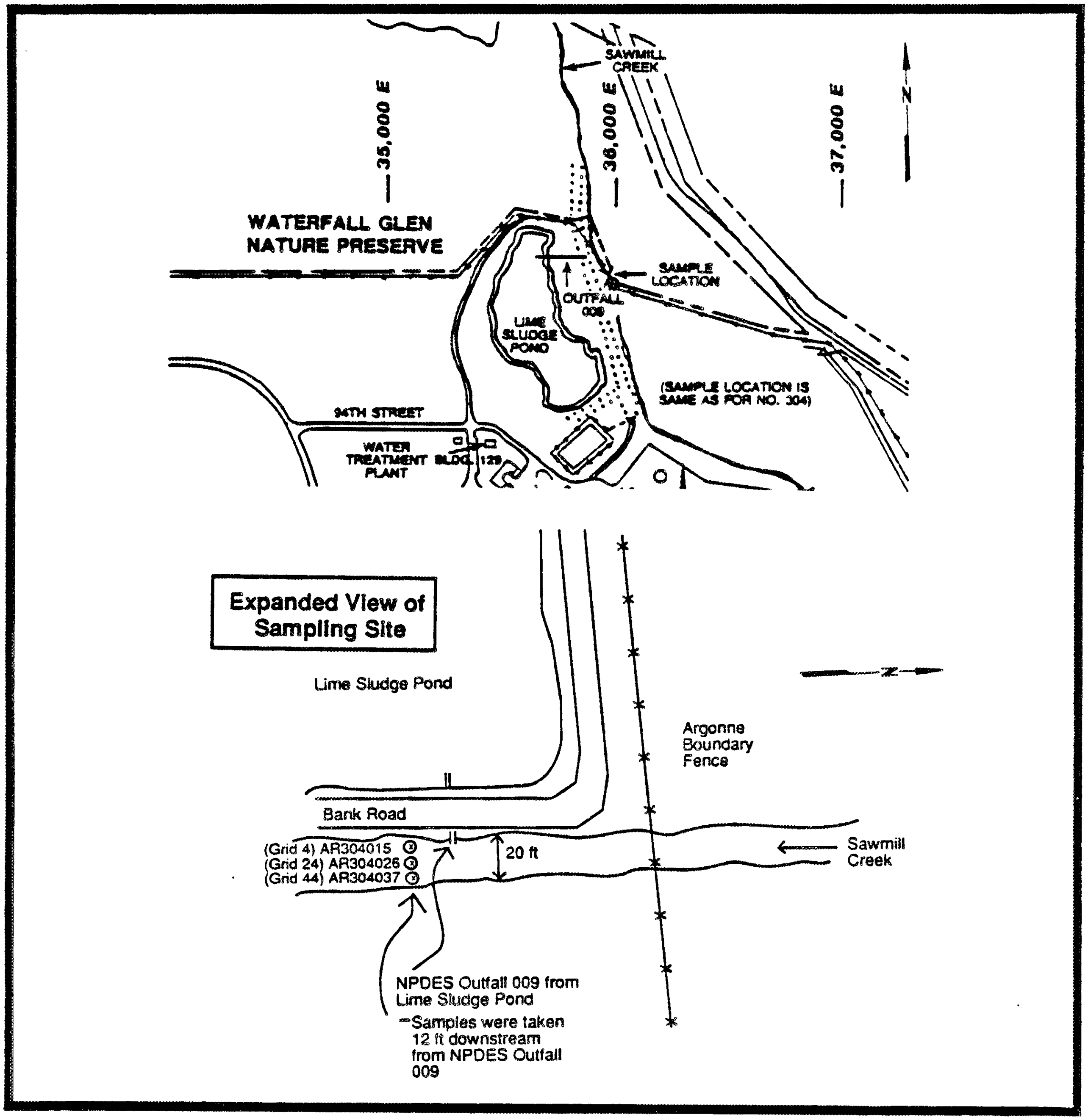

Figure 4.2d. Sawmill Creek Adjacent to Lime Sludge Pond 12 Ft. South of NPDES Outfall 009 (Request 304)

Environmental Problem: 2
Request Number: 305

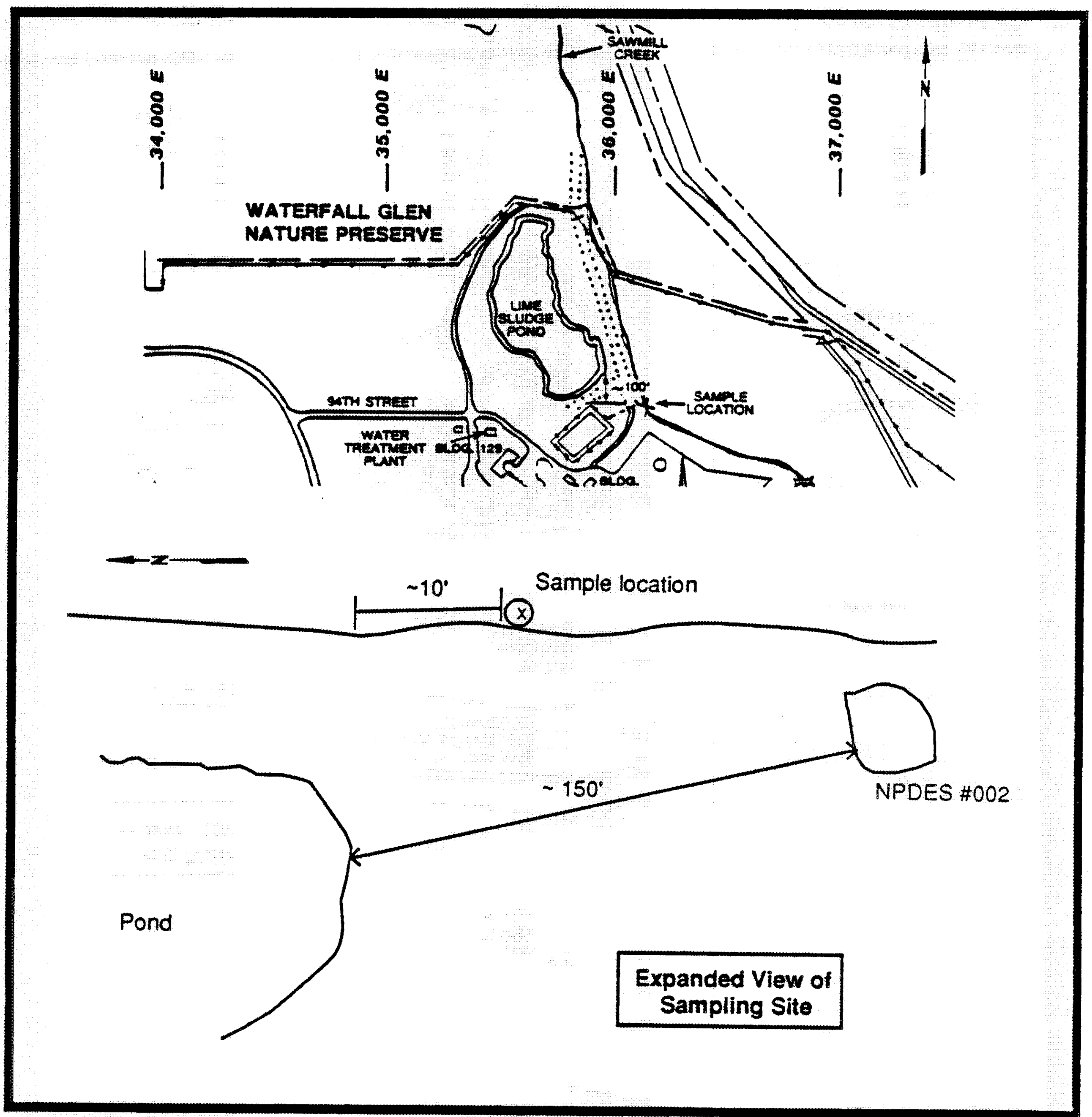

Figure 4.2e. Sawmill Creek 10 Ft. South of Lime Sludge Pond Outfall 009 (Request 305)

Environmental Problem: 2
Request Number: 306

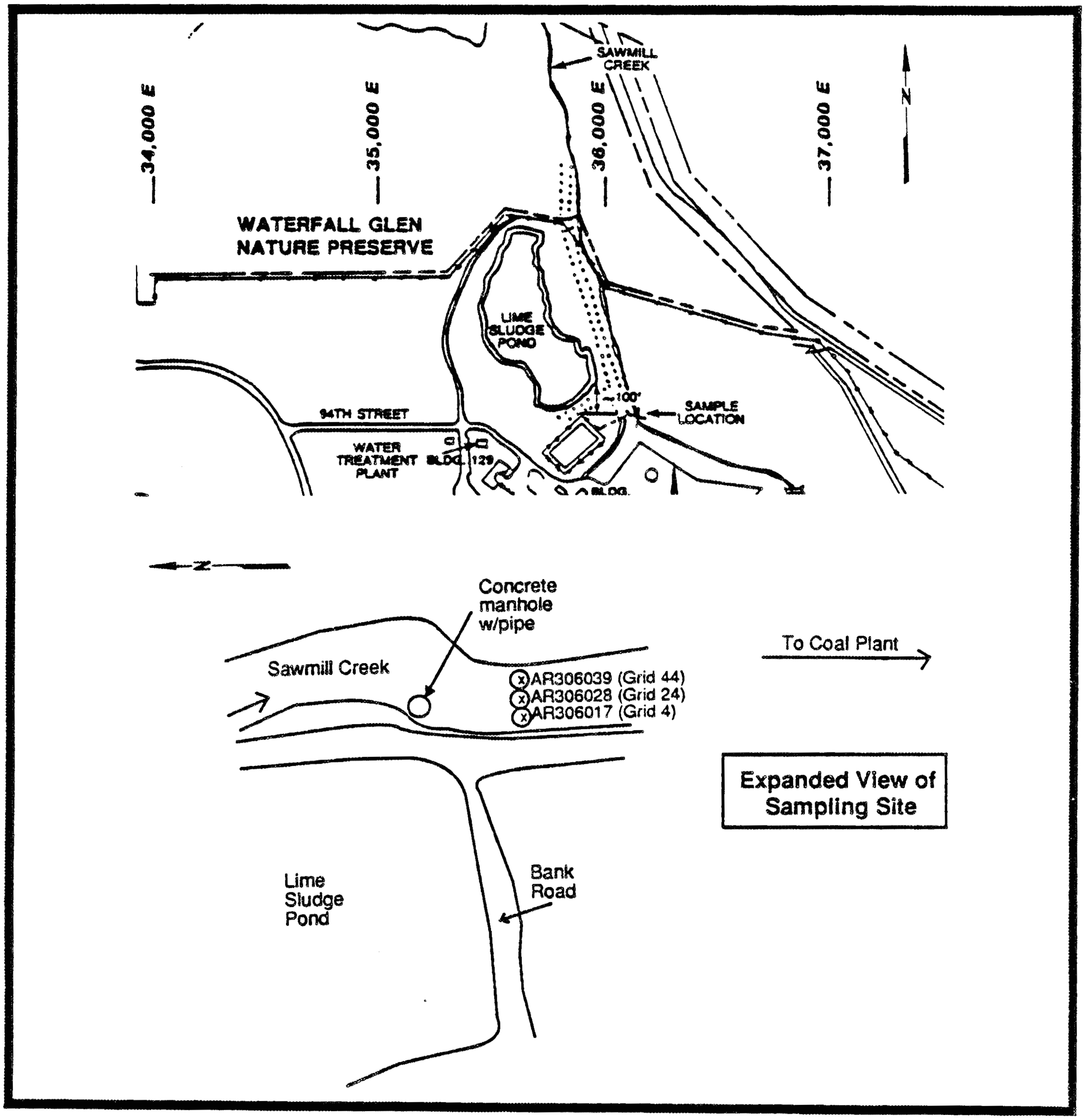

Figure 4.2f. Sawmill Creek South of Lime Sludge Pond (Request 306)

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TABLE 4.2.2 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 2

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR302	SAWMILL CR	BACKGROUND	SEDIMENT	3	3	GRAB	0	3	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
		MED TOTAL		3	3		0	3	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
		EP TOTAL		3	3		0	3	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0

TABLE 4.3.2 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 2 — DRAFT DO NOT CITE

LIME SLUDGE POND SEEPAGE TO SAWMILL CREEK

S&A REQUEST: 301
LOCATION: SAWMILL CREEK ABOVE THE LIME SLUDGE POND OUTFALL
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO:	AR301012	AR301023	AR301034			
CONDUCTIVITY (MS/CM)		0.74	0.64	0.58			
PH (UNITS)		8.3	8	7.5			
TEMPERATURE (DEG C)		14	7.2	6.1			

S&A REQUEST: 302
LOCATION: SAWMILL CREEK ABOVE THE LIME SLUDGE POND OUTFALL
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR302013	AR302024	AR302035			
PH (UNITS)		7.4	7.5	7.3			
TEMPERATURE (DEG C)		14	14	14			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR302013D AR302013D GRAB	AR302013D AR803019D GRAB	AR302013E AR302013E GRAB	AR302013E AR302013K GRAB	AR302024D AR302013D GRAB	AR302024D AR803019D GRAB
ALUMINUM				8100 E			
ARSENIC		10		17 UN		26	
BARIUM				73			
BERYLLIUM				1.1 B			
CADMIUM		2.8 B		2		2.9 B	
CALCIUM				40500			
CHROMIUM				19 N*			
COBALT				8.7 B			
COPPER				26			
IRON				20400 *E			
LEAD		34		24 B		38	
MAGNESIUM				23200			
MANGANESE				944 E			
MERCURY			0.08 B				0.04 B
NICKEL				19			
POTASSIUM					1500 B		
SILVER		1.4 U		1.7 U		1.1 U	
SODIUM				442 B			
VANADIUM				23			
ZINC				92 N*E			

TABLE 4.3.2 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 2 LIME SLUDGE POND SEEPAGE TO SAWMILL CREEK

DRAFT DO NOT CITE

S&A REQUEST: 302
LOCATION: SAWMILL CREEK ABOVE THE LIME SLUDGE POND OUTFALL
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR302024E	AR302024E	AR302035D	AR302035D	AR302035E	AR302035E
	SDG NO:	AR302013E	AR302013K	AR302013D	AR803019D	AR302013E	AR302013K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		7850 E				2880 E	
ARSENIC		12 UN		17		11 UN	
BARIUM		84				60	
BERYLLIUM		1 B				0.87 B	
CADMIUM		2		2 B		2.1	
CALCIUM		24900				87800	
CHROMIUM		31 N*				6.6 N*	
COBALT		15				9 B	
COPPER		39				9.8	
IRON		27000 *E				24200 *E	
LEAD		35 B		11		13 B	
MAGNESIUM		12000				49200	
MANGANESE		711 E				1180 E	
MERCURY					0.05 B		
NICKEL		25				12	
POTASSIUM			1400				580 B
SILVER		1.3 B		1 U		1.7 B	
SODIUM		345 B				441 B	
VANADIUM		26				14	
ZINC		122 N*E				46 N*E	

OIL AND GREASE (MG/KG)	SAMP NO:	AR302013F	AR302024F	AR302035F			
	SDG NO:	AR302013F	AR302013F	AR302013F			
	TYPE:	GRAB	GRAB	GRAB			
OIL AND GREASE		740	460	260			

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR302013B	AR302024B	AR302035B			
	SDG NO:	CD28	CD28	CD28			
	TYPE:	GRAB	GRAB	GRAB			
BIS(2-CHLOROISOPROPYL)ETHER		4300 U	46 J	69 J			
DIETHYLPHTHALATE		22000	380	380			
DIMETHYLPHTHALATE		1400 J	320 U	320 U			
FLUORANTHENE		4300 U	260 J	92 J			
PHENANTHRENE		4300 U	83 J	49 J			
PYRENE		4300 U	310 J	92 J			
* UNKNOWN(7.59)				18200 J			
* UNKNOWN(7.71)			29600 J				
* UNKNOWN(7.75)			2540 J				

TABLE 4.3.2 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 2 DRAFT DO NOT CITE
LIME SLUDGE POND SEEPAGE TO SAWMILL CREEK

S&A REQUEST: 302
LOCATION: SAWMILL CREEK ABOVE THE LIME SLUDGE POND OUTFALL
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR302013B SDG NO: CD28 TYPE: GRAB	AR302024B CD28 GRAB	AR302035B CD28 GRAB
* UNKNOWN(7.81)		620 J	
* UNKNOWN(7.88)			780 J
* UNKNOWN(7.89)		479 J	
* UNKNOWN(8.11)			1300 J
* UNKNOWN(8.13)		747 J	
* UNKNOWN(9.42)		663 J	1120 J
* UNKNOWN(9.78)			338 J
* UNKNOWN(10.31)		169 J	611 J
* UNKNOWN(12.74)			377 J
* UNKNOWN(17.94)			100 J
* UNKNOWN(18.21)	860 J		
* UNKNOWN(19.73)			85 J
* UNKNOWN(20.71)	710 J		
* UNKNOWN(21.40)			125 J
* UNKNOWN(21.46)			117 J
* UNKNOWN(21.47)	990 J		
* UNKNOWN(22.49)	1050 J		
* UNKNOWN(22.89)		296 J	
* UNKNOWN(23.56)	1490 J		
* UNKNOWN(24.45)	3450 J		
* UNKNOWN(24.48)			286 J
* UNKNOWN(24.55)	1070 J		
* UNKNOWN(24.58)		197 J	403 J
* UNKNOWN(25.01)		169 J	
* UNKNOWN(25.90)	2700 J		
* UNKNOWN(26.02)	1650 J		
* UNKNOWN(26.04)			208 J
* UNKNOWN(27.24)	2700 J		
* UNKNOWN(28.56)	1310 J		
* UNKNOWN(29.27)	12000 J		
* UNKNOWN(29.29)		959 J	2080 J
* UNKNOWN(33.61)	6900 J		

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR302013A SDG NO: 0N20 TYPE: GRAB	AR302024A 0N15 GRAB	AR302035A 0N15 GRAB
ACETONE	13 JB	39 B	22 B
ETHYLBENZENE	7 J	7 U	6 U
METHYLENE CHLORIDE	7 B	3 JB	620 BE
TOLUENE	1 JB	7 U	6 U

TABLE 4.3.2 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 2
LIME SLUDGE POND SEEPAGE TO SAWMILL CREEK

DRAFT DO NOT CITE

S&A REQUEST: 302
LOCATION: SAWMILL CREEK ABOVE THE LIME SLUDGE POND OUTFALL
MEDIUM: SEDIMENT

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR302013A SDG NO: ON20 TYPE: GRAB	AR302024A ON15 GRAB	AR302035A ON15 GRAB			
XYLENE (TOTAL)	9	7 U	6 U			
* ACETIC ACID,METHYL ESTER			2 J			
* UNKNOWN(6.21)	4 J					
* UNKNOWN(17.98)	1 J					
* UNKNOWN(19.75)	6 J					
* UNKNOWN(22.58)	4 J					

S&A REQUEST: 303
LOCATION: SAWMILL CREEK ADJACENT TO LIME SLUDGE POND, SOUTH OF NPDES OUTFALL 009
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR303014	AR303025	AR303036			
CONDUCTIVITY (MS/CM)	0.75	0.64	0.55			
PH (UNITS)	8.4	7.9	7.3			
TEMPERATURE (DEG C)	14	7	7.4			

S&A REQUEST: 304
LOCATION: SAWMILL CREEK ADJACENT TO LIME SLUDGE POND, SOUTH OF NPDES OUTFALL 009
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO: AR304015	AR304026	AR304037			
PH (UNITS)	8	8	7.9			
TEMPERATURE (DEG C)	15	14	15			

TABLE 4.3.2 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 2 DRAFT DO NOT CITE
LIME SLUDGE POND SEEPAGE TO SAWMILL CREEK

S&A REQUEST: 305
LOCATION: DOWNSTREAM SAMPLING LOCATION ON SAWMILL CREEK FOR SEEPAGE FROM THE LIME SLUDGE P
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS SAMP NO:	AR305016	AR305027	AR305038			
CONDUCTIVITY (MS/CM)	0.73	0.68	0.59			
PH (UNITS)	8.3	8.3	6.9			
TEMPERATURE (DEG C)	15	8.2	6.9			

S&A REQUEST: 306
LOCATION: DOWNSTREAM SAMPLING LOCATION ON SAWMILL CREEK FOR SEEPAGE FROM THE LIME SLUDGE P
MEDIUM: SEDIMENT

FIELD MEASUREMENTS SAMP NO:	AR306017	AR306028	AR306039			
PH (UNITS)	7.6	7.8	7.7			
TEMPERATURE (DEG C)	15	15	15			

4.8 Environmental Problem 3: Discharge from a Seep Located Near NPDES Outfall 002

Request Number: 307.

Requester: K. C. Turnbull.

Finding and Basis: Toxic and/or hazardous contaminants may be entering Sawmill Creek from a seep located near NPDES Outfall 002. The source of the seep may be from a nearby pond, discharges from which may be entering the seep from breaks in the now capped pipe at NPDES Outfall 002. Influent streams to this small pond are wastewaters generated at the water treatment plant, the boiler house, and the coal-pile storage area. These wastewaters may contain toxic and hazardous contaminants.

4.8.1 Sampling and Analysis Objectives

Statement: Water samples were collected to determine if the concentrations of pollutants listed in Sect. 4.8.2.2 in the seep that discharged to Sawmill Creek near NPDES Outfall 002 exceeded federal or state water-quality criteria.

Supporting Information: The seep located near NPDES Outfall 002 caused a slight discoloration of Sawmill Creek at the point where it entered the creek. The source of Outfall 002 was formerly a small pond between the central boiler house (Building 108) and the Lime Sludge Pond. Outfall 002 had been capped where the pipe entered the creek channel; however, if the pipe was cracked, this could have been the source of the seep. Influents to the small pond included boiler-house demineralizer regeneration waste, cooling water from the boiler house, filter backwash from the water-treatment plant, runoff from the coal-pile storage area (including oil applied to the coal pile to prevent freezing), and runoff from loading areas at the boiler house. These influents could have contained various organic and inorganic constituents.

4.8.2 Sampling and Analytical Design

4.8.2.1 Sampling Design

Request 307: Seep Located Near NPDES Outfall 002 - Water (Fig. 4.3). Three grab water samples were to be collected (Sampling Method: Reference E4.2.4) on three different days from the seep prior to the point where it entered the Sawmill Creek channel during the time the team was onsite. If samples were collected at the same time as those designated in Requests 301 through 306, Request 307 samples were to be collected first to minimize disturbance to areas upstream of the sampling site. Seepage from the vicinity of the capped NPDES Outfall 002 was considered homogeneous, unless influenced by increased precipitation.

For the first day's sampling for Request 307, the Sampling Team arrived on-site Wednesday, 04NOV87, at 1200. The temperature was 40^{o}F under clear skies and winds were 5-10 mph. The seep was located around the capped NPDES discharge, but flow was minimal. A stainless steel spade was used to dig into the bank to produce a catch basin from which samples could be collected. The team returned to the site at 1600 to collect sample AR307018. Each time a sample was collected, field measurements of pH, temperature, and conductivity were made. Soil surrounding the seep had an oily sheen on its surface--orange in coloration.

For the second day's sampling for Request 307, the Sampling Team arrived on-site Friday, 06NOV87, at 0952. The temperature was 45-50^{o}F, skies were clear, and winds were calm. The sample location at the seep had a very oily surface. The water was murky. Vegetation above the sample site did not appear stressed. Sampling was completed at 1055. QC rinsate sample AR307041 was collected at 0959. Sample AR307029 was collected at 1000.

For the third day's sampling for Request 307, the Sampling Team arrived on-site Tuesday, 10NOV87, at 0900. Skies were clear, winds were out of the northwest at approximately 10 mph, and the temperature was 51°F. Flow was very minimal. Soil and water were covered with an orange substance that flaked apart. Sample AR307030 was collected at 0900.

4.8.2.2 Analytical Design

Request 307: Field parameters measured for Request 307 included pH, temperature, and specific conductivity. Parameters analyzed for Request 307 included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, AA-mercury, oil and grease, and cyanide.

4.8.3 Field and Analytical Data

Field Data: *Water samples collected for Environmental Problem 3 showed conductivity values slightly higher than those taken upstream in Sawmill Creek. The values ranged from 2.2 to 2.7, or about three times higher than the upstream samples. The pH ranged from an acidic 2.8 to a basic 8. The lower pH was found in the third day's samples which were taken six days after the first samples and four days after the second samples. The temperature of the acidic water sample was 8.6°C, as compared to 12°C for the other two samples.*

Field Data Evaluation: Because the instrument was calibrated for these three measurements, the results are reliable.

Analytical Data:

Anions and cyanide. *Results of the cyanide analysis are presented in Table 4.3.3. All collected samples were below the detection level (2 ug/L); the rinsate sample, however, was found to contain 2 ug/L.*

Metals. *Analytical results for metals in surface water are presented in Table 4.3.3. Of the 20 metals detected, the following 5 were below either the CRDL or the IDL in all* *three samples: beryllium, cobalt, lead, mercury, and silver. Of the remaining metals the following six were found above the CRDL or IDL in sample AR307030: arsenic at 317 ug/L, barium at 607 ug/L, cadmium at 17 ug/L, chromium at 108 ug/L, copper at 109 ug/l, and nickel at 140 ug/L. Zinc ranged from 46 to 661 ug/L in two samples. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, sodium, and vanadium.*

Oil and grease. Because the oil and grease concentrations in the three samples of water from the seep near NPDES outfall 002 were less than the detection of 2 mg/L, the data are not reported in Table 4.3.3.

PCBs and other extractables. Dieldrin, endrin, and 4,4'-DDT were identified in estimated concentrations of 0.11, 0.13, and 0.66 ug/L, respectively, in sample AR307030. These three compounds were only identified in sample AR307030. No other compounds were identified in sample AR307030 or in any other sample.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.3. There were 5 compounds detected in two of the samples, and 11 compounds detected in the remaining sample. An estimated concentration of 0.027 mg/L, for an unknown in sample AR307018, was the highest estimated concentration of any semivolatile organic compound in these samples. No semivolatile organic compound was identified in measurable quantities, or detected in measurable quantities.

Volatile organics. There were five compounds detected in one of these samples and six compounds detected in the remaining two samples. No compound was identified in measurable quantities. The highest estimated concentration of any compound was 0.018 mg/L of a compound tentatively identified as 2-propanol. All other compounds detected had concentrations less than 0.01 mg/L. Acetone and methylene chloride were detected in the the field samples and also in the blank.

Analytical Data Evaluation:

Anions and cyanide. Although the identifying letter for cyanide analysis is "H," the samplers inadvertently used "I" and "J" for the collected sample and a duplicate. Verification of calibration and calibration blanks were in compliance. All holding times were met.

Metals. Seven metals of interest--arsenic, barium, cadmium, chromium, copper, nickel, and zinc--were detected above the CRDL in sample AR307030. Zinc was also detected above the CRDL in sample AR307018.

Oil and grease. The EPA oil and grease quality control solution was analyzed and the result was 102% of true value. Solvent blanks were used and the results used to subtract from the gross weight of residue. All holding times were met; and although no sample duplicates were analyzed, the results are reliable.

PCBs and other extractables. Dieldrin, endrin, and 4,4'-DDT were identified in sample AR307030 only. No other compounds were identified in that sample or in any other sample. No compounds were found in concentrations high enough to be confirmed by GC/MS.

Extractable organics. No semivolatile organic compound was identified or detected in measurable quantities in these samples.

Volatile organics. No compound was identified in measurable quantities. The highest estimated concentration of any compound was 0.018 mg/L of a compound tentatively identified as 2-propanol.

4.8.4 Limitations and Qualifications

Data Quality Level: The sampling plan is rated Quality Level I. The actual sampling is also rated Quality Level I. The analytical results are rated Quality Level II.

Field Data: The sampling plan was well written. The sampling itself was judiciously done, especially in providing a "sump" in order to accumulate sufficient seep water to take the samples.

Analytical Data:

Anions and cyanide. The analytical data quality for cyanide is Quality Level I. However, confidence in the data was diminished when incorrect codes were used and when the rinsate sample contained more cyanide than the field sample.

Metals. Analytical results were Quality Level I except for vanadium at Quality Level II.

Oil and grease. The oil and grease data are Quality Level I.

PCBs and other extractables. The surrogate retention time did not fall into the acceptable range for any of the samples in this set. Therefore, any data for single component pesticides must be considered unusable. The data for dieldrin, endrin, and 4,4'-DDT in AR307041 are Quality Level III. The identification of these three pesticides is questionable.

Extractable organics. No compounds were detected in measurable quantities. Data are of Quality Level III due to mass spectral uncertainty for tentatively identified compounds and due to concentrations being below quantitation limits for known compounds.

Volatile organics. Toluene in AR307018 was Quality Level I. Data for all other volatiles detected in this set of samples were Quality Level III because the levels for the identified compounds were less than the quantitation limits or the compounds were not identified (TICs).

Environmental Problem: 3
Request Number: 307

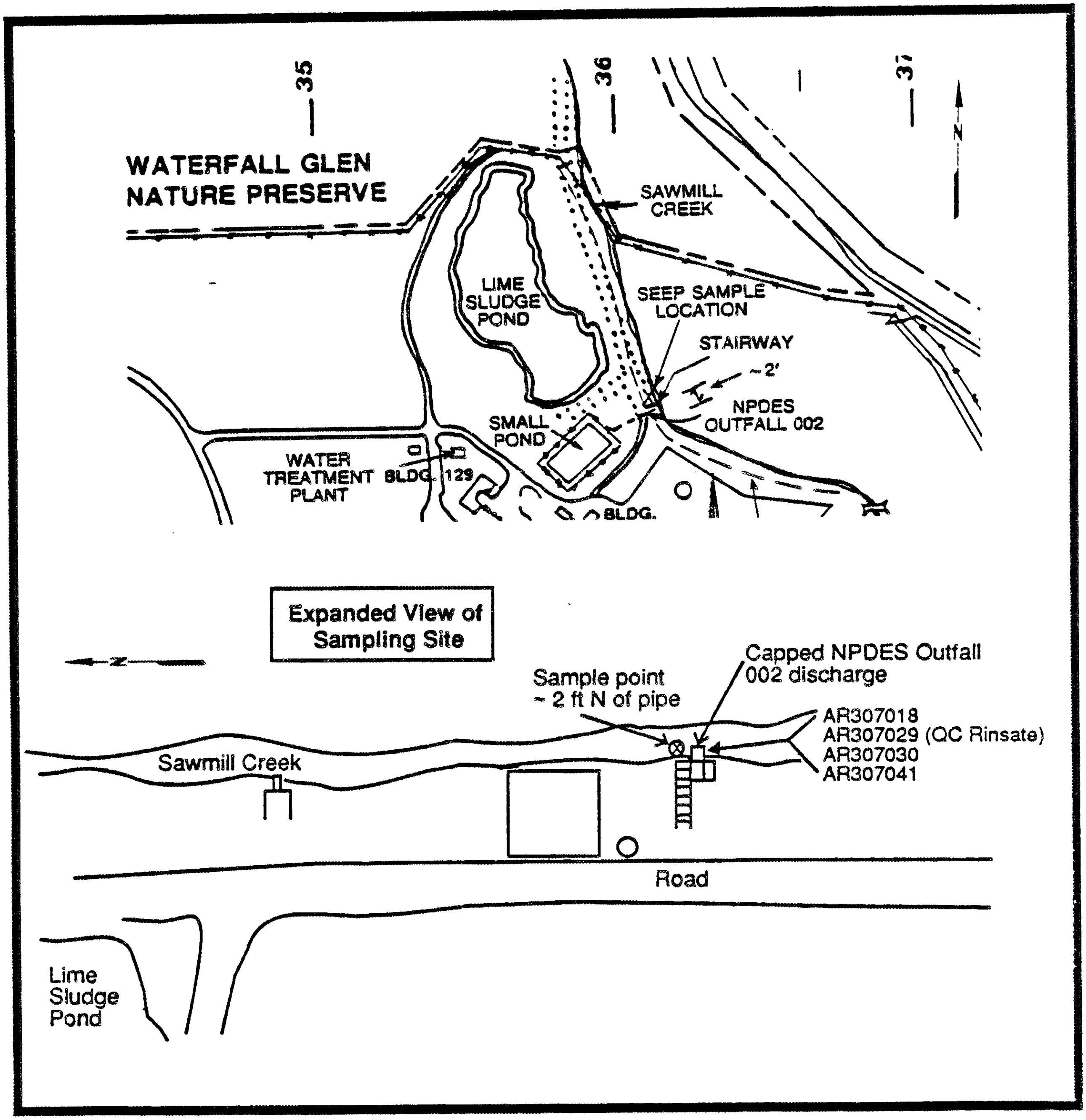

Figure 4.3. Location of NPDES Outfall 002 (Request 307)

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TABLE 4.2.3 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 3

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR307	NPDESOUTF2	SEEP	SUR WATER	3	3	GRAB	0	3	3	3	0	3	0	0	0	0	1	3	3	3	3	3	0	0
AR307	NPDESOUTF2	SEEP	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0
			MED TOTAL	4	4		1	4	4	4	0	3	0	0	0	0	1	4	4	4	4	4	0	0
			EP TOTAL	4	4		1	4	4	4	0	3	0	0	0	0	1	4	4	4	4	4	0	0

TABLE 4.3.3 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 3 DRAFT DO NOT CITE
DISCHARGE FROM A SEEP LOCATED NEAR NPDES OUTFALL 002

S&A REQUEST: 307
LOCATION: SEEP LOCATED NEAR NPDES OUTFALL 002
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR307018	AR307029	AR307030			
CONDUCTIVITY (MS/CM)	2.7	2.6	2.2			
PH (UNITS)	8	6.9	2.8			
TEMPERATURE (DEG C)	12	12	8.6			

ANIONS AND CYANIDE (UG/L)						
SAMP NO:	AR307018I	AR307018J	AR307029H	AR307030H	AR307041H	
SDG NO:	AR307018I	AR307018I	AR307018I	AR307018I	AR307018I	
TYPE:	GRAB	GRAB	GRAB	GRAB	RINSATE	
CYANIDE	2 U	2 U	2 U	2 U	2	

METALS, INCLUDING CR+6 (UG/L)						
SAMP NO:	AR307018G	AR307018H	AR307018H	AR307029F	AR307029G	AR307029G
SDG NO:	AR307018G	AR300044B	AR300044K	AR307018G	AR300044B	AR300044K
TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		3140 NE			71000 NE	
ARSENIC		121 BN			317 N	
BARIUM		124 B			607	
BERYLLIUM		0.74 B			4.7 B	
CADMIUM		3.2 B			17	
CALCIUM		181000			222000	
CHROMIUM		6 U			108	
COBALT		9.3 B			45 B	
COPPER		10 U			109	
IRON		15500			132000	
LEAD		50 U			96 B	
MAGNESIUM		72000			102000	
MANGANESE		2180			4950	
MERCURY	0.07 B			0.04 B		
NICKEL		29 B			140	
POTASSIUM			6400			19000
SILVER		6 U			9.6 B	
SODIUM		398000			372000	
VANADIUM		21 B			155	
ZINC		46			661	

METALS, INCLUDING CR+6 (UG/L)						
SAMP NO:	AR307030F	AR307030G	AR307030G	AR307041F	AR307041G	AR307041G
SDG NO:	AR307018G	AR300044B	AR300044K	AR307018G	AR300044B	AR300044K
TYPE:	GRAB	GRAB	GRAB	RINSATE	RINSATE	RINSATE
ALUMINUM		127 BNE			60 UNE	
ARSENIC		115 BN			60 UN	

TABLE 4.3.3 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 3 DRAFT DO NOT CITE
DISCHARGE FROM A SEEP LOCATED NEAR NPDES OUTFALL 002

S&A REQUEST: 307
LOCATION: SEEP LOCATED NEAR NPDES OUTFALL 002
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR307030F / AR307018G / GRAB	AR307030G / AR300044B / GRAB	AR307030G / AR300044K / GRAB	AR307041F / AR307018G / RINSATE	AR307041G / AR300044B / RINSATE	AR307041G / AR300044K / RINSATE
BARIUM			87 B			2 U	
BERYLLIUM			0.53 B			0.3 U	
CADMIUM			2.8 B			2 U	
CALCIUM			169000			200 U	
CHROMIUM			6 U			6 U	
COBALT			3 U			3 U	
COPPER			10 U			10 U	
IRON			10500			20 U	
LEAD			50 U			50 U	
MAGNESIUM			69800			10 U	
MANGANESE			1900			5 U	
MERCURY		0.03 B			0.03 B		
NICKEL			20 B			6 U	
POTASSIUM				4000 B			220 B
SILVER			6 U			6 U	
SODIUM			281000			200 U	
VANADIUM			13 B			4 U	
ZINC			12 B			3 U	

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR307018E / ARG02 / GRAB	AR307029E / ARG02 / GRAB	AR307030E / ARG02 / GRAB	AR307041E / ARG02 / RINSATE		
DIELDRIN		0.11 U	1.1 U	0.11 J	0.11 U		
ENDRIN		0.11 U	1.1 U	0.13 J	0.11 U		
4,4'-DDT		0.11 U	1.1 U	0.66 J	0.11 U		

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR307018E / DD21 / GRAB	AR307029E / DD21 / GRAB	AR307030E / DD21B / GRAB	AR307041E / DD21 / RINSATE		
ACENAPHTHENE		4 JMS	11 U	11 U	11 U		
BIS(2-ETHYLHEXYL)PHTHALATE		3 JB	7 JB	13 B	7 JB		
DI-N-BUTYLPHTHALATE		0.7 JB	0.8 JB	11 U	0.6 JB		
DIETHYLPHTHALATE		1 JB	1 JB	11 U	11 U		
N-NITROSO-DI-N-PROPYLAMINE		4 JMS	11 U	11 U	11 U		
PYRENE		5 JMS	11 U	11 U	11 U		
1,2,4-TRICHLOROBENZENE		4 JMS	11 U	11 U	11 U		
1,4-DICHLOROBENZENE		3 JMS	11 U	11 U	11 U		
2,4-DINITROTOLUENE		3 JMS	11 U	11 U	11 U		

TABLE 4.3.3 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 3 DRAFT DO NOT CITE
DISCHARGE FROM A SEEP LOCATED NEAR NPDES OUTFALL 002

S&A REQUEST: 307
LOCATION: SEEP LOCATED NEAR NPDES OUTFALL 002
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR307018E	AR307029E	AR307030E	AR307041E
	SDG NO:	DD21	DD21	DD21B	DD21
	TYPE:	GRAB	GRAB	GRAB	RINSATE
* UNKNOWN(8.06)				20 J	
* UNKNOWN(8.12)		27 J	14 J		19 J
* UNKNOWN(21.97)				9 J	6 J
* UNKNOWN(25.05)				6 J	
* UNKNOWN(27.64)		6 J			
* UNKNOWN(30.10)				9 J	
* UNKNOWN(33.68)			23 J		

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR307018A	AR307029A	AR307030A	AR307041A
	SDG NO:	GN11	GN11	GN14	GN11
	TYPE:	GRAB	GRAB	GRAB	RINSATE
ACETONE		10 U	10 U	2 JB	10 U
METHYLENE CHLORIDE		3 JB	0.9 JB	4 JB	1 JB
TOLUENE		6	4 J	3 J	5 U
* 2-PROPANOL(8.98)		18 J			

4.9 Environmental Problem 4: Runoff from the Coal Pile Storage Area in the Vicinity of NPDES Outfall 010

Request Number: 308.

Requester: K. C. Turnbull.

Finding and Basis: The Sawmill Creek stream bank in the vicinity of NPDES Outfall 010 is visibly stained. Untreated runoff from the coal storage pile was discharged through this outfall. The discharge may have contained toxic and hazardous constituents that could continue to affect the water, sediment, and biota of the creek. The creek sediment was also discolored above and below this outfall. The sediment could release contaminants to the water column.

4.9.1 Sampling and Analysis Objectives

Statement: Sediment samples were collected to determine if contaminants listed in Sect. 4.9.2.2 were present in the discolored sediment of Sawmill Creek at levels that exceeded the background levels measured at the control sampling location for Request 302 and to indicate whether this material was an unnatural sludge or bottom deposit.

Supporting Information: There were stains on the creek bank below NPDES Outfall 010, and the creek sediment was discolored above and below the outfall. This outfall formerly discharged untreated runoff from the coal storage pile to Sawmill Creek, but was only used as an emergency overflow at the time of sampling. New and used oil, formerly applied to the coal pile to prevent freezing, may have contained PCBs. Other unknown contaminants may also have been present in the oil that was applied to the coal storage pile. This oil probably discharged through the outfall with runoff. Runoff from coal storage piles was known to be acidic and may also have contained toxic organics and heavy metals.

4.9.2 Sampling and Analytical Design

4.9.2.1 Sampling Design

Request 308: Runoff from the Coal Pile Storage Area - Sediment (Fig. 4.4). Three sediment samples were to be collected (Sampling Method: Reference E5.1) from the areas of obvious stain above and below NPDES Outfall 010. The contaminants were assumed to be uniformly distributed within the suspect stained areas.

For Request 308, the Sampling Team arrived on-site on Wednesday, 04NOV87, at 1120. The temperature was 68^{O}F and winds were out of the west at 8-10 mph under clear skies. The Sampling Team divided the area of obvious stain both above and below NPDES Outfall 010 (22 ft) into a 1 x 60-segment grid on a transect measured from east to west. Sampling was begun at 1140 and completed at 1214. QC rinsate sample AR308042 was collected at 1125. Sample AR308019 was collected at grid 8 at 2 ft 10 in. Sample AR308020 was collected at grid 28 at 10 ft 5 in. Sample AR308031 was collected at grid 48 at 17 ft 7 in. Samples were collected to the depth of sediment, which was 8-10 in. At grids 8 (AR308019) and 28 (AR308020), sediment was rusty brown and yellow on top and dark brown below the surface. At grid 48 (AR308031), sediment was yellow at the surface and dark brown underneath. Limestone riprap was used to stabilize outflow of the pipe. Rinsate sample AR308042 was collected in a clean container in the field and poured into correct bottles in the laboratory.

4.9.2.2 Analytical Design

Request 308: The field parameter measured for Request 308 was pH. Parameters analyzed included volatiles, semivolatiles, PCBs, pesticides, CLP metals, oil and grease, and cyanide.

4.9.3 Field and Analytical Data

Field Data: *Sediment samples from the bank of Sawmill Creek near the outfall of an underground pipe draining the coal pile showed a range of pH from 3 to 6. The samples upstream and closer to the outfall were more acidic, and the sample furthest downstream was slightly acidic. Although temperature readings were not requested, they are also provided because temperature must be measured in order to obtain accurate pH measurements. Sediment temperatures were warmest near the outfall and colder downstream.*

Field Data Evaluation: Because the instrument was calibrated on the day samples were collected, readings are reliable.

Analytical Data:

Anions and cyanide. Because the cyanide concentrations in the sediment were less than 250 mg/kg, they are not reported in the tables.

Metals. Analytical results for metals in sediment are presented in Table 4.3.4. Of the 20 metals detected, the following 2 were below either the CRDL or IDL in all three samples: beryllium and sodium. Of the remaining metals detected, arsenic ranged from 32 to 200 mg/kg, barium from 55 to 430 mg/kg, cadmium from 2.8 to 6.8 mg/kg, chromium from 7.5 to 18 mg/kg, copper from 25 to 32 mg/kg, lead from 18 to 33 mg/kg, mercury from 0.06 to 0.07 mg/kg, nickel from 24-30 mg/kg, and zinc from 104-154 mg/kg. Selenium was 12 mg/kg. Other metals detected were aluminum, calcium, cobalt, iron, magnesium, manganese, potassium, and vanadium.

Oil and grease. The oil and grease content of the sediments from the runoff of the coal pile storage area is shown in Table 4.3.4. The values of the three samples ranged from 160 to 570 mg/kg with an average of 300 mg/kg.

PCBs and other extractables. No pesticides or PCBs were observed.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.4. There were 15 compounds detected in one sample, 21 in another, and 22 in the third sample. Sample AR308020 contained 0.59 mg/kg of 2-methylnaphthalene, but that compound was undetected in the other two samples. No other compound was identified in measurable quantities. Diethylphthalate was the only compound identified in all three samples, and concentrations were always estimated to be less than 0.25 mg/kg. Fluoranthene was detected in one sample, and phenanthrene was detected in two samples, but the estimated concentrations of these compounds were always less than 0.1 mg/kg. Estimated concentrations of all compounds identified were less than 1 mg/kg. Unknown compounds were detected in concentrations usually estimated as less than 1 mg/kg, and always less than 6.5 mg/kg.

Volatile organics. There were seven volatile organic compounds detected in one sample, eight compounds in another, and nine in the remaining sample. Of the target volatiles, only tetrachloroethene was above the quantitation limit at concentrations of 0.064 mg/kg in sample AR308019 and 0.070 mg/kg in sample AR308020. The highest estimated concentration of any other compound in these samples was 0.039 mg/kg of acetone in sample AR308019. Acetone and methylene chloride were both detected in the blank.

Analytical Data Evaluation:

Anions and cyanide. The reportable level of 250 mg/kg is based on the classification of the waste on whether it is a hazardous waste. Please see Analytical Data Evaluation for Environmental Problem 2 for quality control measures taken in cyanide analysis and the basis for stating that the results are reliable.

Metals. Ten metals of interest--arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, and zinc--were detected above the CRDL in the samples for Request 308.

Oil and grease. The data are reliable for the sediments from the coal pile storage area. These values should be compared with values obtained in Request 302 of Environmental Problem 2 which represent values obtained upstream from the coal pile.

PCBs and other extractables. No pesticides or PCBs were observed.

Extractable organics. Sample AR308020 contained 0.59 mg/kg of 2-methylnaphthalene, but that compound was undetected in the other two samples. No other compound was identified in measurable quantities. Unknown compounds were detected in concentrations usually estimated as less than 1 mg/kg, and always less than 6.5 mg/kg.

Volatile organics. Only tetrachloroethene was above the quantitation limit at concentrations of 0.064 mg/kg in sample AR308019 and 0.070 mg/kg in sample AR308020. Acetone and methylene chloride were both detected in the blank.

4.9.4 Limitations and Qualifications:

Data Quality Level: The sampling plan and sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: The results showed that coal pile runoff resulted in acidic leaching, which in turn caused the sediment to be acid in the vicinity of the outfall.

Analytical Data:

Anions and cyanide. The data Quality Level is I.

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

Oil and grease. The analysis is straightforward and the quality level for this analysis is Quality Level I.

PCBs and other extractables. No pesticides or PCBs were observed; however all samples had to be diluted 1:100 which increases the quantitation limit by a factor of 100. No usable data for pesticides or PCBs was generated.

Extractable organics. Most concentrations are estimated values. Data are of Quality Level III, due mostly to mass spectral uncertainty for tentatively identified compounds and to concentrations being too small to measure for the known compounds.

Volatile organics. Data quality was either Quality Level I or Quality Level II for most of the volatile compounds detected. Quality Level III was automatically assigned to some concentrations that were less than the corresponding quantitation limits.

Environmental Problem: 4
Request Number: 308

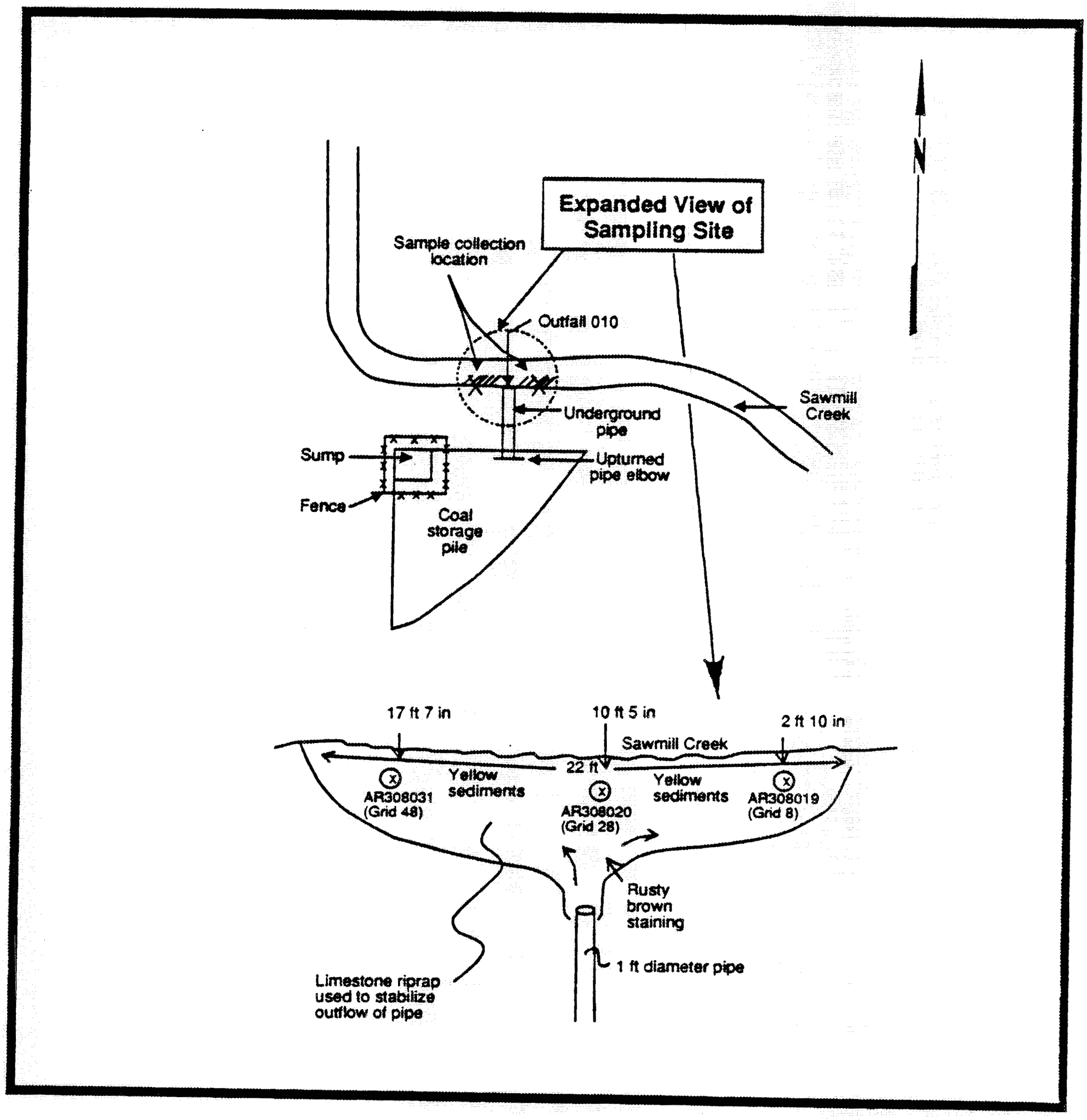

Figure 4.4. Location of NPDES Outfall 010 on Sawmill Creek (Request 308)

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TABLE 4.2.4 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 4

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR308	COAL PILE	RUNOFF	SEDIMENT	3	3	GRAB	0	3	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
			MED TOTAL	3	3		0	3	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
AR308	COAL PILE	RUNOFF	SUR WATER	1	1	QC RN	0	1	1	1	0	1	0	0	0	0	0	1	0	0	1	1	0	0
			MED TOTAL	1	1		0	1	1	1	0	1	0	0	0	0	0	1	0	0	1	1	0	0
			EP TOTAL	4	4		0	4	4	4	3	4	0	0	0	0	0	4	3	3	4	4	0	0

TABLE 4.3.4 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 4 DRAFT DO NOT CITE
RUNOFF FROM THE COAL PILE STORAGE AREA IN THE VICINITY OF NPDES OUTFALL 010

S&A REQUEST: 308
LOCATION: RUNOFF FROM THE COAL PILE STORAGE AREA
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR308019	AR308020	AR308031			
PH (UNITS)		3.2	3	6			
TEMPERATURE (DEG C)		19	16	16			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR308019D AR302013D GRAB	AR308019D AR805022D GRAB	AR308019E AR302013E GRAB	AR308019E AR302013K GRAB	AR308020D AR302013D GRAB	AR308020D AR805022D GRAB
ALUMINUM				11500 E			
ARSENIC		142		32 BN		200	
BARIUM				66			
BERYLLIUM				0.79 B			
CADMIUM		5.9 B		2.8		6.1	
CALCIUM				7040			
CHROMIUM				18 N*			
COBALT				8.2 B			
COPPER				25			
IRON				39200 *E			
LEAD		26		22 B		33	
MAGNESIUM				4290			
MANGANESE				114 E			
MERCURY			0.07				0.06
NICKEL				24			
POTASSIUM					1900		
SELENIUM		6.3 B		13 U		12	
SODIUM				454 B			
VANADIUM				26			
ZINC				104 N*E			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR308020E AR302013E GRAB	AR308020E AR302013K GRAB	AR308031D AR302013D GRAB	AR308031D AR805022D GRAB	AR308031E AR302013E GRAB	AR308031E AR302013K GRAB
ALUMINUM		7570 E				8200 E	
ARSENIC		92 N		75		32 BN	
BARIUM		55				430	
BERYLLIUM		0.86 B				0.7 B	
CADMIUM		6.8		5.5		6.2	
CALCIUM		20000				3460	
CHROMIUM		8.5 N*				7.5 N*	
COBALT		9.7				31	
COPPER		32				31	
IRON		97300 *E				92000 *E	

TABLE 4.3.4 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 4 DRAFT DO NOT CITE
RUNOFF FROM THE COAL PILE STORAGE AREA IN THE VICINITY OF NPDES OUTFALL 010

S&A REQUEST: 308
LOCATION: RUNOFF FROM THE COAL PILE STORAGE AREA
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR308020E	AR308020E	AR308031D	AR308031D	AR308031E	AR308031E
	SDG NO:	AR302013E	AR302013K	AR302013D	AR805022D	AR302013E	AR302013K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
LEAD		32 B		18		23 B	
MAGNESIUM		4490				3010	
MANGANESE		217 E				3320 E	
MERCURY					0.04 B		
NICKEL		26				30	
POTASSIUM			1600				1300
SELENIUM		11 U		4.9 U		11 U	
SODIUM		877 B				453 B	
VANADIUM		34				44	
ZINC		154 N*E				122 N*E	

OIL AND GREASE (MG/KG)	SAMP NO:	AR308019F	AR308020F	AR308031F
	SDG NO:	AR302013F	AR302013F	AR302013F
	TYPE:	GRAB	GRAB	GRAB
OIL AND GREASE		570	170	160

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR308019B	AR308020B	AR308031B
	SDG NO:	CD28	CD28	CD28
	TYPE:	GRAB	GRAB	GRAB
BIS(2-CHLOROISOPROPYL)ETHER		62 J	320 U	320 U
DIETHYLPHTHALATE		180 J	240 J	150 J
FLUORANTHENE		320 U	320 U	74 J
PHENANTHRENE		320 U	67 J	63 J
2-METHYLNAPHTHALENE		320 U	590	320 U
* UNKNOWN HYDROCARBON(9.53)			465 J	
* UNKNOWN(7.36)				660 J
* UNKNOWN(7.52)				1650 J
* UNKNOWN(7.71)			3880 J	
* UNKNOWN(7.77)			744 J	
* UNKNOWN(7.78)		162 J		
* UNKNOWN(7.84)			295 J	
* UNKNOWN(7.94)				6300 J
* UNKNOWN(8.07)			434 J	
* UNKNOWN(8.10)		1670 J		
* UNKNOWN(9.40)			1440 J	
* UNKNOWN(9.41)		1500 J		630 J
* UNKNOWN(9.73)				1500 J
* UNKNOWN(10.29)		418 J		

TABLE 4.3.4 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 4 DRAFT DO NOT CITE
RUNOFF FROM THE COAL PILE STORAGE AREA IN THE VICINITY OF NPDES OUTFALL 010

S&A REQUEST: 308
LOCATION: RUNOFF FROM THE COAL PILE STORAGE AREA
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR308019B SDG NO: CD28 TYPE: GRAB	AR308020B CD28 GRAB	AR308031B CD28 GRAB
* UNKNOWN(10.33)		154 J	
* UNKNOWN(11.19)			480 J
* UNKNOWN(11.53)		1860 J	
* UNKNOWN(11.56)	1140 J		
* UNKNOWN(11.87)	267 J		
* UNKNOWN(11.92)			795 J
* UNKNOWN(11.97)	167 J		
* UNKNOWN(12.86)			645 J
* UNKNOWN(13.76)			330 J
* UNKNOWN(14.80)			255 J
* UNKNOWN(14.89)		146 J	
* UNKNOWN(15.18)	147 J	186 J	
* UNKNOWN(18.48)	167 J	217 J	
* UNKNOWN(20.79)		135 J	
* UNKNOWN(21.42)		295 J	
* UNKNOWN(21.44)	267 J		
* UNKNOWN(23.90)	685 J		
* UNKNOWN(24.07)		388 J	
* UNKNOWN(24.25)	501 J		
* UNKNOWN(24.48)		357 J	
* UNKNOWN(24.52)	451 J		
* UNKNOWN(24.57)		999 J	
* UNKNOWN(24.61)	1840 J		
* UNKNOWN(26.04)		341 J	
* UNKNOWN(26.07)	1000 J		
* UNKNOWN(27.26)		248 J	
* UNKNOWN(27.28)	518 J		
* UNKNOWN(28.04)			420 J
* UNKNOWN(29.26)		605 J	
* UNKNOWN(29.27)	551 J		
* UNKNOWN(29.81)	1220 J		
* UNKNOWN(38.06)			1500 J
* UNKNOWN(40.02)	1590 J		

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR308019A SDG NO: ON15 TYPE: GRAB	AR308020A ON15 GRAB	AR308031A ON15 GRAB
ACETONE	39 B	28 B	23 B
METHYLENE CHLORIDE	10 B	32 B	390 BE
TETRACHLOROETHENE	64	70	5 J

TABLE 4.3.4 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 4
RUNOFF FROM THE COAL PILE STORAGE AREA IN THE VICINITY OF NPDES OUTFALL 010

DRAFT DO NOT CITE

S&A REQUEST: 308
LOCATION: RUNOFF FROM THE COAL PILE STORAGE AREA
MEDIUM: SEDIMENT

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR308019A SDG NO: ON15 TYPE: GRAB	AR308020A ON15 GRAB	AR308031A ON15 GRAB			
* ACETIC ACID,METHYL ESTER			2 J			
* METHANE, TRICHLOROFLUORO-		24 J	2 J			

S&A REQUEST: 308
LOCATION: RUNOFF FROM THE COAL PILE STORAGE AREA
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR308042F SDG NO: AR307018G TYPE: RINSATE	AR308042F AR400012G RINSATE	AR308042G AR300044K RINSATE	AR308042G AR308042G RINSATE			
BARIUM				42 B			
CADMIUM		0.16 B					
CALCIUM				314 B			
CHROMIUM				61 *			
IRON				330 E			
LEAD		1.5 B					
MAGNESIUM				149 B			
MANGANESE				8 B			
MERCURY	0.02 B						
NICKEL				36 B			
POTASSIUM			1000 B				
SODIUM				2860 BE			
ZINC				75 E			

VOLATILE ORGANICS (UG/L)	SAMP NO: AR308042A SDG NO: GN11 TYPE: RINSATE					
ACETONE	12 B					
METHYLENE CHLORIDE	1 JB					
TOLUENE	16					

4.10 Environmental Problem 5: Drainage Area from Buildings 815 and 817

Request Numbers: 309 and 310.

Requester: K. C. Turnbull.

Finding and Basis: There is potential for organic and inorganic contamination of surface water and sediment in the drainage ditch that receives untreated wastewater from the Building 815 and Building 817 degreasing operations. The grease traps in Building 815 (used for degreasing operations and other machinery maintenance) are full and are in need of cleaning. They are arranged in series and flow to a storm sewer that discharges to the drainage ditch through a culvert. Oil, grease, and other floating materials were observed in the storm sewer manhole outside of Building 815. PCBs and pesticides are also stored in this area. There are no additional discharges to the drainage ditch upstream of the culvert.

4.10.1 Sampling and Analysis Objectives

Statement: Water and sediment samples were collected to determine if contaminants listed in Sect. 4.10.2.2 were present at concentrations that exceeded detection limits in the water and sediment of the drainage ditch that received untreated wastewater from degreasing operations in Buildings 815 and 817.

Supporting Information: Oil, grease, and other floating materials were observed in the storm-sewer manhole outside of Building 815. Solvents and surfactants were used in the building. Metals used in machining operations could also have been present in the effluent. There was the potential for discharges of contaminants in untreated waste-water to the drainage ditch through the storm sewer. Road runoff also flowed to this culvert and may have contributed a small amount of contamination.

4.10.2 Sampling and Analytical Design

4.10.2.1 Sampling Design

Request 309: Drainage Area from Buildings 815 and 817 - Water (Fig. 4.5a). Three grab water samples were to be collected (Sampling Method: Reference E4.2.4) on three different days from the effluent (if present) running from the storm sewer culvert any time during the on-site sampling effort, but prior to collection of samples for Request 310.

For the first day's sampling for Request 309, the Sampling Team arrived on-site Wednesday, 04NOV87, at 1000. The temperature was approximately 60-65^{O}F and winds were 0-5 mph under partly cloudy skies. Equipment was decontaminated before sample collection. The first day's sample (AR309010) was collected at 1005 off the top of the effluent 2-3 ft due east of the culvert with a stainless steel dipper before the sediment samples for Request 310 were collected. The sample was measured in the field for pH, specific conductivity, and temperature. There was minimal flow. The water was fairly clear and approximately 1 ft deep.

For the second day's sampling for Request 309, the Sampling Team arrived on site Thursday, 05NOV87, at 0930. The temperature was 40^{O}F and winds were 5-10 mph under clear skies. The field preservative blank (AR309043) was collected first. The QC sample was collected on the second day of sampling, rather than the first, because preservatives were not brought to the field on the first day. The team used a stainless steel dipper to collect the sample (AR309021) by skimming off the top from the center of the flow. The flow was approximately 1 ft deep and an oily sheen was visible on the surface. Vegetation included cattails, reeds, and grasses; all were nonstressed.

On the third day of sampling for Request 309, the Sampling Team arrived on site Friday, 06NOV87, at 1122. The temperature was 50^{O}F, there was a slight breeze, and skies were overcast. Water was slightly murky and flow was minimal. The sample

(AR309032) was collected 2-3 ft east of the culvert and was skimmed off the top of the water. There was a slight sheen on the surface.

Request 310: Drainage Area from Buildings 815 and 817 - Sediment (Fig. 4.5b). Three sediment samples were to be collected (Sampling Method: Reference E5.3.1) to the depth of sediment in conjunction with the water samples for Request 309 in an area where deposition of materials was most likely to occur and as near the culvert as possible.

For Request 310, the Sampling Team arrived on-site on Wednesday, 04NOV87, at 0950. The temperature was approximately 65^{o}F and winds were 5-7 mph out of the west under clear skies. An area encompassing the 10 ft width of the stream and 0-5 ft from the culvert was divided into a 1 x 60-segment grid from north to south. Sample AR310013 was collected from grid 22 (3 ft 8 in.) at 1018. Sample AR310024 was collected from grid 31 (at 5 ft 2 in.) at 1036. Sample AR310035 was collected from grid 55 (9 ft 2 in.) at 1052. The depth of sediment was approximately 10 in. The sediment was very dark brown to black with oil and grease noticeable. It had a clay-like texture and an oily odor.

4.10.2.2 Analytical Design

Request 309: Field parameters measured for Request 309 included pH, temperature, and specific conductivity. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, and oil and grease.

Request 310: The field parameter measured for Request 310 was pH. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, CLP-metals, and oil and grease.

4.10.3 Field and Analytical Data

Field Data:

Request 309: *Values for pH, conductivity, and temperature of water samples are shown in Table 4.3.5. pH was slightly basic and in the range of normal drinking water. Conductivity fell in a narrow range of 1.3 to 1.5 mS/cm.*

Request 310: *Request 310 also showed a slightly basic pH indicative of calcareous sediments. The constant temperature of 16^{o}C is higher than the water temperatures for Request 309 that ranged from 10 to 14^{o}C. Values for pH and temperature are shown in Table 4.3.5.*

Field Data Evaluation: Because the meter used to take the measurements was calibrated prior to taking the samples, readings are reliable.

Analytical Data:

Request 309:

Metals. Analytical results for metals in surface water are presented in Table 4.3.5. Of the 15 metals detected, the following 5 were below either the CRDL or IDL in all three samples: barium, beryllium, copper, nickel, and potassium. Of the remaining metals detected, cadmium was 12 µg/L in one sample and below the IDL in the others; chromium was 23 µg/L in one sample and below the IDL in the others; and zinc ranged from 53 to 112 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, and sodium.

Oil and grease. The oil and grease content of samples for Request 309 are given in Table 4.3.5. Concentrations ranged from 5000 to 7000 µg/L with an average of 6000 µg/L.

PCBs and other extractables. Heptachlor was identified in an estimated concentration of 0.06 µg/L in sample AR309021. No other compounds in this classification were identified in these samples.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.5. For the surface-water samples, two compounds were detected in one sample, in concentrations estimated to be less than 0.05 mg/kg. The other two samples had, respectively, 20 and 25 compounds detected, but none of them were estimated to have a concentration greater than 0.05 mg/kg. Bis(2-ethylhexyl)phthalate was the only compound identified in all three samples (in measurable quantity in only one sample). It was also identified in the method blank.

Volatile organics. There were five compounds identified in each of the three samples for Request 309. All concentrations were below quantitation limits, and the highest estimated concentration of any compound was 0.005 mg/L. Methylene chloride was detected in the blank and in the samples.

Request 310:

Metals. Analytical results for metals in sediment are presented in Table 4.3.5. Of the 20 metals detected, the following 4 were below either the CRDL or IDL in all three samples: cobalt, sodium, and vanadium. Of the remaining metals detected, arsenic ranged from 6.1 to 12 mg/kg, barium was 69 mg/kg in one sample, beryllium ranged from 0.9 to 1.1 mg/kg, cadmium from 1.7 to 5.6 mg/kg, chromium from 9.8 to 36 mg/kg, copper from 24 to 49 mg/kg, lead from 38 to 94 mg/kg, mercury from 0.8 to 0.21 mg/kg, nickel from 8.4 to 15 mg/kg, silver from 2 to 2.3 mg/kg, and zinc from 107 to 188 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, and potassium.

Oil and grease. In the sediment samples, the concentrations ranged from 4300 to 6900 mg/kg with an average of 4600 mg/kg. The oil and grease content of samples for the drainage area of Buildings 815 and 817 are given in Table 4.3.5.

PCBs and other extractables. No compounds in this classification were identified in these samples.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.5. In the sediment samples, there were 7 compounds detected in one sample, 14 in another, and 17 in the third. No compound was identified in measurable quantities, and diethylphthalate was the only compound identified in all three samples. In samples AR310013 and AR310035, all compounds detected had estimated concentrations of less than 1 mg/kg. Sample AR310024 had eight unknowns with estimated concentrations of greater than 1 mg/kg, the greatest of these being 13.7 mg/kg.

Volatile organics. There were 13 compounds detected in two of these samples and 8 compounds detected in the remaining sample. All TIC levels were estimated at 0.012 mg/kg or less. Of the target volatiles detected, only acetone, methylene chloride, and xylene in AR310035A were determined to be present at levels greater than 0.017 mg/kg. Methylene chloride and acetone were also identified in the blank. The acetone in AR310035 (estimated at 2.7 mg/kg) was outside the calibration range. The highest concentration of methylene chloride was 0.087 mg/kg and the highest concentration of xylene was 0.042 mg/kg.

Analytical Data Evaluation:

Request 309:

Metals. Three metals of interest--cadmium, chromium, and zinc--were detected above the CRDL in the samples for Request 309.

Oil and grease. Sample AR309043B represents the field blank.

PCBs and other extractables. Heptachlor was detected in sample AR309021, but not in a high enough concentration to be confirmed by GC/MS.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound identified in measurable quantities, and only then in sample AR309032. It was also identified in the method blank.

Volatile organics. All concentrations were below quantitation limits, and the highest estimated concentration of any compound was 0.005 mg/L.

Request 310:

Metals. Eleven metals of interest--arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc--were detected above the CRDL in the samples for Request 310.

Oil and grease. The oil and grease concentration of the sediment is about an order of magnitude higher than the previous samples taken close to the coal storage runoff areas of Environmental Problems 2 and 4.

PCBs and other extractables. No compounds in this classification were identified in these samples.

Volatile organics. All TIC levels were estimated at 0.012 mg/kg or less. Of the target volatiles detected, only acetone, methylene chloride, and xylene in AR310035A were determined to be present at levels greater than 0.017 mg/kg. The highest concentration of methylene chloride was 0.087 mg/kg and the highest concentration of xylene was 0.042 mg/kg.

4.10.4 Limitations and Qualifications

Data Quality Level: Both the sampling design and sampling are straightforward and are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: The sediment appeared to contain oil and grease and also exuded an "oily" odor.

Analytical Data:

Request 309:

Metals. Analytical results were Quality Level I except for iron, sodium, and zinc at Quality Level II.

Oil and grease. The analysis is straightforward and the data quality for this analysis is Quality Level I.

PCBs and other extractables. Although heptachlor was detected in AR309021, analytical data are Quality Level III because the retention time of the surrogate standard did not meet specifications, causing the identification of heptachlor to be questionable. Although no other PCBs or pesticides were detected in the remaining samples, the results must be considered unusable because the retention time of the surrogate did not meet criteria or the sample was not analyzed in a proper calibration sequence.

Extractable organics. All concentrations are estimated values. Data are of Quality Level III, due mainly to mass spectral uncertainty for tentatively identified compounds and to concentrations below quantitation limits in identifiable compounds.

Volatile organics. All concentrations were below quantitation limits.

Request 310:

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

Oil and grease. The analysis is straightforward and the data quality for this analysis is Quality Level I.

PCBs and other extractables. Although no other PCBs or pesticides were detected in the samples, the results must be considered unusable because the retention time of the surrogate did not meet criteria or the sample was not analyzed in a proper calibration sequence.

Extractable organics. All concentrations are estimated values. Data are of Quality Level III, due mainly to mass spectral uncertainty for tentatively identified compounds and to concentrations below quantitation limits in identifiable compounds.

Volatile organics. Data quality was Quality Level I for xylene in AR310013, for ethylbenzene and xylene in AR310024, and for methylene chloride in AR310035. For the remaining compounds, the data were Quality Level III because: TICs were not identified; concentrations were either below or exceeded (acetone in AR310035) the calibration range; or, in the case of xylene in sample AR310035, the appropriate internal standard did not meet criteria.

Environmental Problem: 5
Request Number: 309

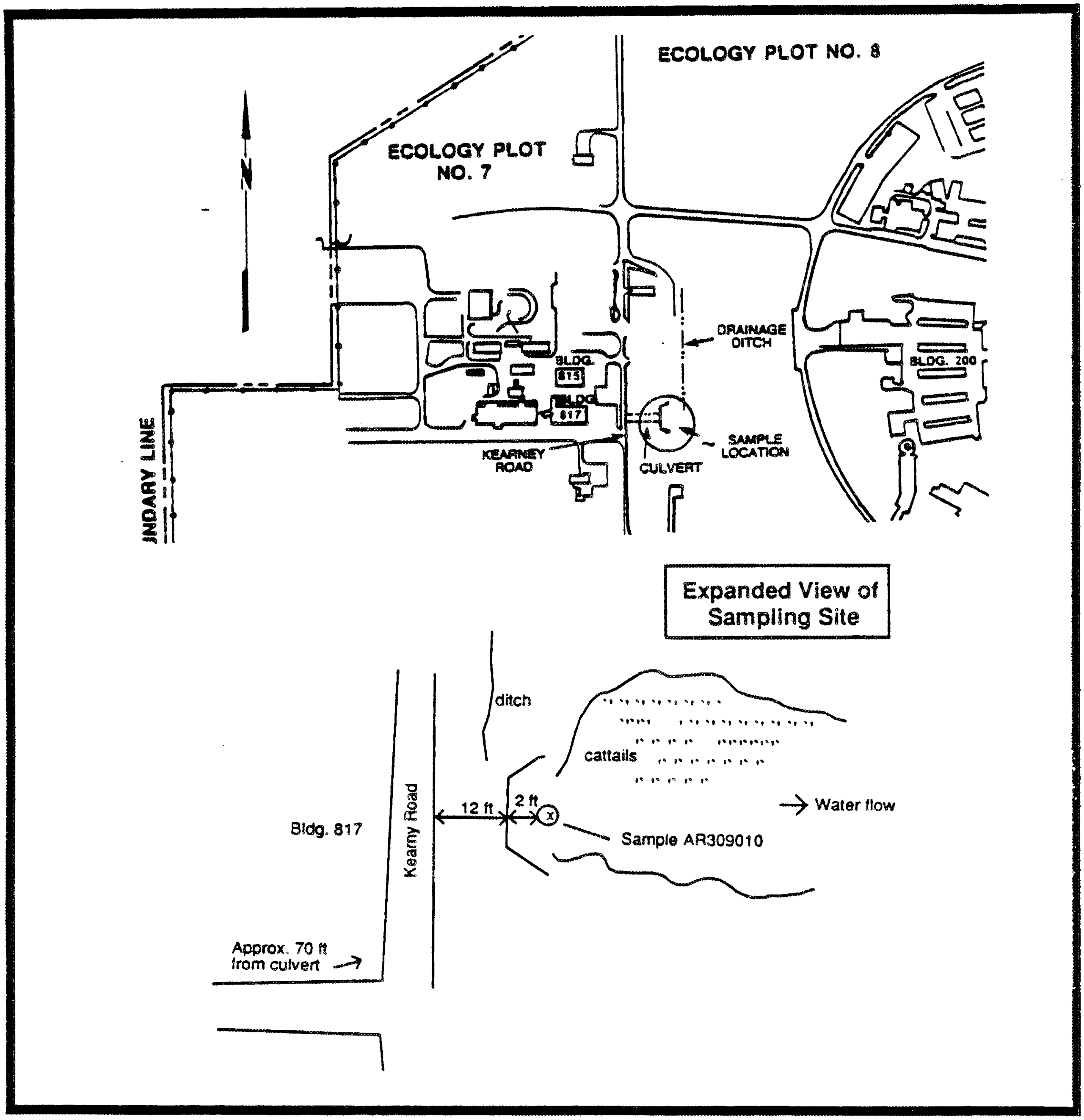

Figure 4.5a. Drainage Area From Buildings 815 and 817 (Request 309)

Environmental Problem: 5
Request Number: 310

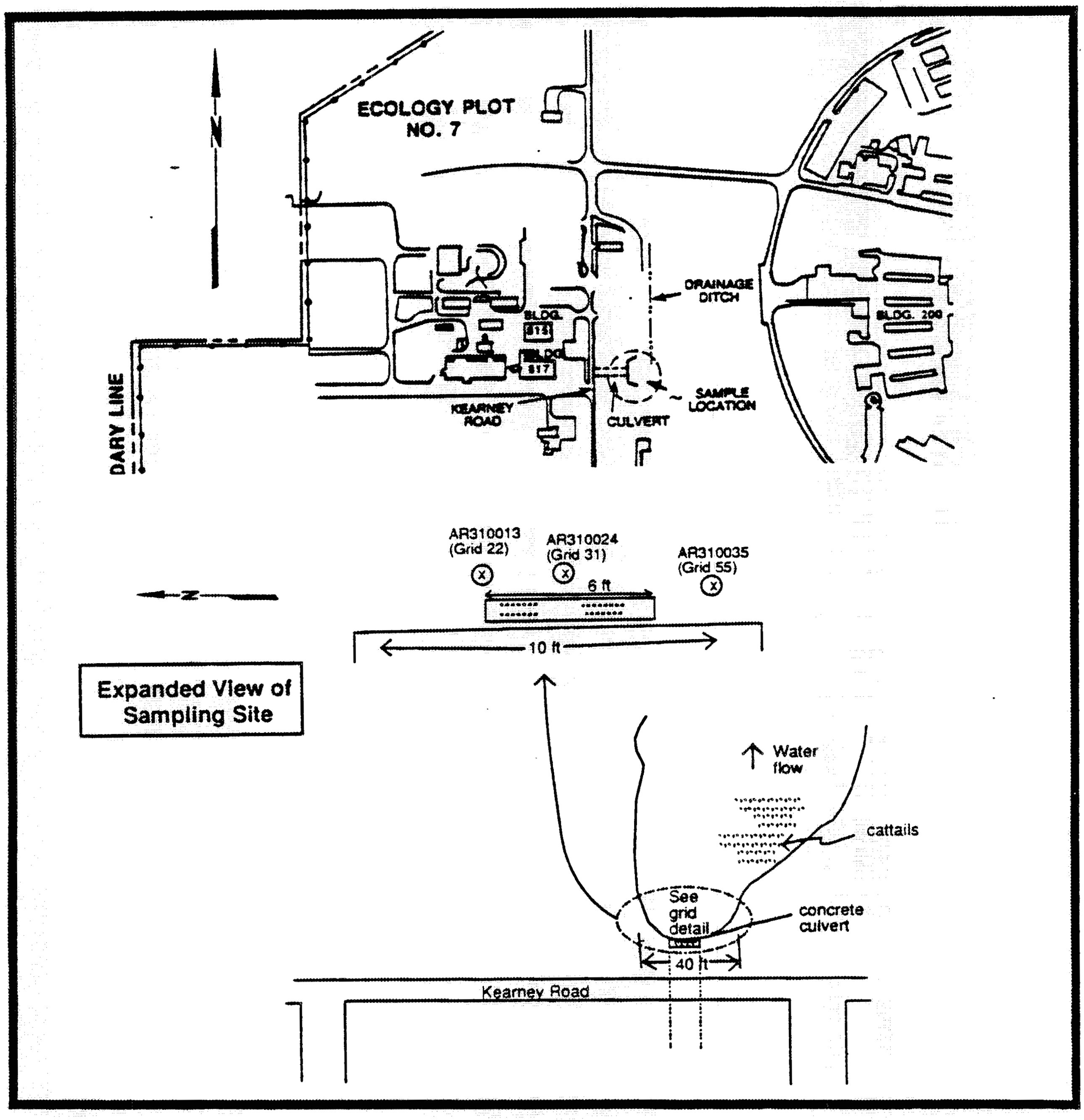

Figure 4.5b. Drainage Area From Buildings 815 and 817 (Request 310)

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TABLE 4.2.5 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 5

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR310	B815 SEWER	DRAINAGE	SEDIMENT	3	3	GRAB	0	0	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
		MED TOTAL		3	3		0	0	3	3	3	3	0	0	0	0	0	3	3	3	3	3	0	0
AR309	B815 SEWER	DRAINAGE	SUR WATER	1	1	QC FL	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
AR309	B815 SEWER	DRAINAGE	SUR WATER	3	3	GRAB	0	0	3	3	3	3	0	0	0	0	1	2	3	3	3	3	0	0
		MED TOTAL		4	4		0	0	4	4	3	4	0	0	0	0	1	2	3	3	3	3	0	0
		EP TOTAL		7	7		0	0	7	7	6	7	0	0	0	0	1	5	6	6	6	6	0	0

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAINAGE AREA FROM BUILDINGS 815 AND 817

DRAFT DO NOT CITE

S&A REQUEST: 309
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR309010	AR309021	AR309032			
CONDUCTIVITY (MS/CM)	1.3	1.4	1.5			
PH (UNITS)	8	7.7	7.3			
TEMPERATURE (DEG C)	14	10	11			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR309010G SDG NO: AR300044K TYPE: GRAB	AR309010G AR308042G GRAB	AR309021G AR300044K GRAB	AR309021G AR308042G GRAB	AR309032G AR300044K GRAB	AR309032G AR308042G GRAB
ALUMINUM		268		171 B		179 B
BARIUM		72 B		79 B		79 B
BERYLLIUM		0.4 B		0.38 B		0.4 B
CADMIUM		12		2 U		2 U
CALCIUM		113000		133000		132000
CHROMIUM		6 U*		23 *		6 U*
COPPER		18 B		10 B		12 B
IRON		883 E		1120 E		1100 E
MAGNESIUM		40400		50600		51600
MANGANESE		886		1370		1470
NICKEL		12 B		32 B		6 U
POTASSIUM	4000 B		3300 B		3100 B	
SODIUM		156000 E		161000 E		169000 E
VANADIUM		12 B		9 B		10 B
ZINC		112 E		53 E		60 E

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR309043A SDG NO: AR300044K TYPE: FIELD BLANK	AR309043A AR308042G FIELD BLANK				
ALUMINUM		60 U				
BARIUM		2 U				
BERYLLIUM		0.3 U				
CADMIUM		3.6 B				
CALCIUM		200 U				
CHROMIUM		6 U*				
COPPER		10 U				
IRON		38 BE				
MAGNESIUM		18 B				
MANGANESE		5 U				
NICKEL		6 U				
POTASSIUM	100 U					
SODIUM		200 UE				
VANADIUM		4 U				

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAFT DO NOT CITE
DRAINAGE AREA FROM BUILDINGS 815 AND 817

S&A REQUEST: 309
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)			
	SAMP NO:	AR309043A	AR309043A
	SDG NO:	AR300044K	AR308042G
	TYPE:	FIELD BLANK	FIELD BLANK
ZINC			24 E

OIL AND GREASE (UG/L)					
	SAMP NO:	AR309010H	AR309021H	AR309032H	AR309043B
	SDG NO:	AR302013F	AR302013F	AR302013F	AR302013F
	TYPE:	GRAB	GRAB	GRAB	FIELD BLANK
OIL AND GREASE		6000	5000	7000	2000 U

PCBS & OTHER EXTRACTABLES (UG/L)			
	SAMP NO:	AR309021E	AR309032E
	SDG NO:	ARG02	ARG02
	TYPE:	GRAB	GRAB
HEPTACHLOR		0.06 J	0.06 U

EXTRACTABLE ORGANICS (UG/L)				
	SAMP NO:	AR309010E	AR309021E	AR309032E
	SDG NO:	DD26	DD21	DD21
	TYPE:	GRAB	GRAB	GRAB
BIS(2-ETHYLHEXYL)PHTHALATE		2 JB	2 JB	27 B
BUTYLBENZYLPHTHALATE		11 U	11 U	1 J
DI-N-BUTYLPHTHALATE		11 U	11 U	0.8 JB
DI-N-OCTYL PHTHALATE		11 U	11 U	2 J
DIETHYLPHTHALATE		5 JB	11 U	1 JB
* UNKNOWN HYDROCARBON(11.39)				9 J
* UNKNOWN HYDROCARBON(12.13)				31 J
* UNKNOWN HYDROCARBON(12.69)				9 J
* UNKNOWN HYDROCARBON(13.51)				8 J
* UNKNOWN HYDROCARBON(13.67)				13 J
* UNKNOWN HYDROCARBON(14.45)				34 J
* UNKNOWN HYDROCARBON(24.99)				11 J
* UNKNOWN HYDROCARBON(26.41)				15 J
* UNKNOWN HYDROCARBON(26.55)				9 J
* UNKNOWN HYDROCARBON(27.75)				9 J
* UNKNOWN HYDROCARBON(29.05)				7 J
* UNKNOWN(8.10)				35 J
* UNKNOWN(12.81)				28 J
* UNKNOWN(13.07)				8 J
* UNKNOWN(14.46)		8 J		
* UNKNOWN(16.05)		7 J		

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAFT DO NOT CITE
DRAINAGE AREA FROM BUILDINGS 815 AND 817

S&A REQUEST: 309
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR309010E SDG NO: DD26 TYPE: GRAB	AR309021E DD21 GRAB	AR309032E DD21 GRAB
* UNKNOWN(19.59)	5 J		
* UNKNOWN(19.87)	6 J		
* UNKNOWN(19.97)	5 J		
* UNKNOWN(22.85)			10 J
* UNKNOWN(22.88)	5 J		
* UNKNOWN(23.64)	6 J		
* UNKNOWN(24.48)	5 J		
* UNKNOWN(25.00)	8 J		
* UNKNOWN(25.07)			8 J
* UNKNOWN(25.15)	12 J		
* UNKNOWN(25.25)			6 J
* UNKNOWN(25.27)	17 J		
* UNKNOWN(25.37)	14 J		
* UNKNOWN(25.43)	5 J		
* UNKNOWN(25.57)	8 J		
* UNKNOWN(25.69)	11 J		
* UNKNOWN(25.81)	17 J		
* UNKNOWN(26.40)	9 J		
* UNKNOWN(28.54)			26 J
* UNKNOWN(28.56)	37 J		
* UNKNOWN(30.71)			13 J
* UNKNOWN(30.98)			10 J
* UNKNOWN(38.45)		46 J	

VOLATILE ORGANICS (UG/L)	SAMP NO: AR309010A SDG NO: GN12 TYPE: GRAB	AR309021A GN12 GRAB	AR309032A GN12 GRAB
METHYLENE CHLORIDE	2 JB	2 JB	4 JB
TOLUENE	5 U	5 U	3 J

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAFT DO NOT CITE
DRAINAGE AREA FROM BUILDINGS 815 AND 817

S&A REQUEST: 310
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR310013	AR310024	AR310035			
PH (UNITS)		7.6	7.8	7.4			
TEMPERATURE (DEG C)		16	16	16			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR310013C / AR310013C / GRAB	AR310013D / AR302013E / GRAB	AR310013D / AR302013K / GRAB	AR310024C / AR302013D / GRAB	AR310024C / AR310013C / GRAB	AR310024D / AR302013E / GRAB
ALUMINUM			3530 E				2800 E
ARSENIC		12 *	11 UN		6.1		10 BN
BARIUM			30 B				28 B
BERYLLIUM			0.96				0.9
CADMIUM		3.5 B**	1.7		5.6		2.5
CALCIUM			117000				129000
CHROMIUM			9.8 N*				17 N*
COBALT			3.8 B				2.9 B
COPPER			28				24
IRON			10300 *E				7810 *E
LEAD		83 *	38		75		23 B
MAGNESIUM			66300				73500
MANGANESE			609 E				326 E
MERCURY		0.21				0.18	
NICKEL			10				8.4
POTASSIUM				960			
SILVER		1.3 B	2.1		1.7 B		2
SODIUM			624 B				609 B
VANADIUM			8.5 B				5.2 B
ZINC			117 N*E				107 N*E

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR310024D / AR302013K / GRAB	AR310035C / AR302013D / GRAB	AR310035C / AR310013C / GRAB	AR310035D / AR302013E / GRAB	AR310035D / AR302013K / GRAB	
ALUMINUM					4650 E		
ARSENIC			8.6		12 UN		
BARIUM					69		
BERYLLIUM					1.1		
CADMIUM			3.3 B		3.7		
CALCIUM					109000		
CHROMIUM					36 N*		
COBALT					5.5 B		
COPPER					49		
IRON					12800 *E		

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAFT DO NOT CITE
DRAINAGE AREA FROM BUILDINGS 815 AND 817

S&A REQUEST: 310
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR310024D AR302013K GRAB	AR310035C AR302013D GRAB	AR310035C AR310013C GRAB	AR310035D AR302013E GRAB	AR310035D AR302013K GRAB	
LEAD			74		94		
MAGNESIUM					60900		
MANGANESE					637 E		
MERCURY				0.18			
NICKEL					15		
POTASSIUM		810 B				990	
SILVER			1.1 U		2.3		
SODIUM					678 B		
VANADIUM					11		
ZINC					188 N*E		

OIL AND GREASE (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR310013E AR307018K GRAB	AR310024E AR307018K GRAB	AR310035E AR307018K GRAB			
OIL AND GREASE		6900	2600	4300			

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR310013B CD28 GRAB	AR310024B CD28 GRAB	AR310035B CD28 GRAB			
DIETHYLPHTHALATE		115 J	14 J	82 J			
FLUORANTHENE		410 U	14 J	320 U			
PHENANTHRENE		410 U	12 J	320 U			
* UNKNOWN(7.60)		297 J					
* UNKNOWN(7.99)		256 J					
* UNKNOWN(9.52)		52 J					
* UNKNOWN(12.18)			1230 J				
* UNKNOWN(12.40)			924 J				
* UNKNOWN(12.86)			1540 J				
* UNKNOWN(13.11)			924 J				
* UNKNOWN(15.13)		36 J					
* UNKNOWN(15.19)		59 J					
* UNKNOWN(16.29)		8 J					
* UNKNOWN(18.42)		24 J					
* UNKNOWN(18.49)		56 J					
* UNKNOWN(19.33)			770 J				
* UNKNOWN(20.70)		13 J					
* UNKNOWN(20.78)			1080 J				
* UNKNOWN(21.39)		7 J					

TABLE 4.3.5 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 5 DRAFT DO NOT CITE
DRAINAGE AREA FROM BUILDINGS 815 AND 817

S&A REQUEST: 310
LOCATION: DRAINAGE AREA FROM BUILDINGS 815 AND 817
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR310013B SDG NO: CD28 TYPE: GRAB	AR310024B CD28 GRAB	AR310035B CD28 GRAB			
* UNKNOWN(21.43)	43 J					
* UNKNOWN(23.72)		2930 J	101 J			
* UNKNOWN(24.07)	72 J					
* UNKNOWN(24.47)		1540 J				
* UNKNOWN(24.48)			83 J			
* UNKNOWN(24.56)		3700 J	108 J			
* UNKNOWN(26.03)			99 J			
* UNKNOWN(26.04)		2160 J				
* UNKNOWN(26.34)	55 J					
* UNKNOWN(27.25)			90 J			
* UNKNOWN(28.38)	31 J					
* UNKNOWN(29.26)		13700 J				
* UNKNOWN(29.27)			505 J			
* UNKNOWN(30.24)	44 J					
* UNKNOWN(31.94)	28 J					

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR310013A SDG NO: ON20 TYPE: GRAB	AR310024A ON20 GRAB	AR310035A GN20 GRAB			
ACETONE	12 JB	15 B	2700 BE			
ETHYLBENZENE	6 J	8	8 U			
METHYLENE CHLORIDE	9 B	17 B	87 B			
TOLUENE	1 JB	2 JB	8 U			
XYLENE (TOTAL)	9	11	42			
* UNKNOWN(6.21)	3 J					
* UNKNOWN(6.26)		3 J				
* UNKNOWN(9.15)	2 J	2 J				
* UNKNOWN(17.95)		2 J				
* UNKNOWN(17.99)	2 J					
* UNKNOWN(19.75)	5 J					
* UNKNOWN(19.76)		6 J				
* UNKNOWN(22.54)		4 J				
* UNKNOWN(22.58)	3 J					
* 2-PROPANOL(8.90)			12 J			

4.11 Environmental Problem 6: NPDES Outfall 001B Discharges

Request Number: 311.

Requester: K. C. Turnbull.

Finding and Basis: ANL may be discharging unmonitored organics and inorganics through NPDES Outfall 001B. Organic analyses are not performed. Laboratory wastewater disposed of through the sewer system may contain toxic organic and/or unmonitored inorganic contaminants.

4.11.1 Sampling and Analysis Objectives

Statement: Water samples were collected to determine if method detection levels of toxic pollutants listed in Sect. 4.11.2.2 were present in the discharges from NPDES Outfall 001B.

Supporting Information: A wide variety of chemicals were used in the laboratories at ANL and may have been discharged to the laboratory sewer system and wastewater treatment plant. Darkroom effluents and other waste streams also entered this sewer system. The treatment processes at the laboratory wastewater treatment plant (pH adjustment, settling, and chlorination) would not have removed all toxic pollutants that may have been present. (Please see discussion under Environmental Problem 1.)

4.11.2 Sampling and Analytical Design

4.11.2.1 Sampling Design

Request 311: NPDES Outfall 001B Discharges - Water (Fig. 4.6). Three time-interval composite water samples were to be collected (Sampling Method: References E4.2.2, E4.2.3A, and E.4.2.4) from NPDES Outfall 001 over the course of the on-site sampling effort to represent the entire day's discharge from 0800 to 1700 for each of the three days.

For the first day's sampling for Request 311, the Sampling Team arrived on-site Saturday, 07NOV87, at 0900. The temperature was 35^{O}F, skies were overcast, and it was raining lightly. At 0925, a Manning composite sampler was placed at the manhole through which the effluent from the laboratory waste treatment plant flowed (NPDES Outfall 001B). The sampler was set to collect a 150-250 mL sample every 6 min. Grab sample AR311014 for volatile organics was collected at 0930 from a tap inside the building next to the manhole which contained the same material as the manhole (as stated by ANL employee Lee Bergland). Sample AR311047 was collected at 1019. The Sampling Team returned to the manhole at 1615 to collect QC sample AR311070 (at 1620) and turned off the sampler. It was raining and the temperature was 38^{O}F.

On the second day of sampling for Request 311, the Sampling Team arrived on-site Tuesday, 10NOV87, at 1000. Skies were clear and the temperature was 30^{O}F. After contacting ANL employees Lee Bergland and Johnny Adaway, the team collected volatile grab sample AR311025 and placed the Manning sampler. (On sample AR311025, the septum fell out when collecting volatile sample AR311025B.) The sampler cycle was 6 min and it collected approximately 250 mL. The team returned to the site at 1425 to pick up the sampler and collect samples AR311058A and B as stated in the plan. Overall, sample AR311058 was clear with some suspended particles and a chlorine odor.

On the third day of sampling for Request 311, the Sampling Team arrived on-site Thursday, 12NOV87, at 1020. Skies were clear, winds were calm, and the temperature was 40^{O}F. The sampler was set to pull approximately 220 mL of fluid at 6 min intervals. The effluent from the waste treatment plant did not have as pungent an odor of chlorine as on 10NOV87. Grab volatile sample AR311036, collected at 1040, was clear. The team left the sample site at 1045. The team returned to the site at 1625 to collect time composite sample AR311069. The sample bottle was within 5 cm of the top of the bottle. The sample was clear, with a slight chlorine odor. The sample bottles were collected at 1630, and the Manning sampler was removed from the site. Skies were clear, winds were calm, and the temperature was 45^{O}F.

4.11.2.2 Analytical Design

Request 311: The field parameter measured for Request 311 included pH. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, and ICP-metals (CLP).

4.11.3 Field and Analytical Data

Field Data: *The field data request specified pH measurements which are shown in Table 4.3.6. In addition to pH, measurements of dissolved oxygen, conductivity, temperature, and turbidity are provided for the three grab samples (AR311014 through -036), one composite (AR311069), and for the QC sample (AR311070). Only pH is shown for composite sample AR311058.*

Field Data Evaluation: The reading of pH for composite sample AR311047, which was reported to be collected, is missing.

Analytical Data:

Metals. Analytical results for metals in surface water are presented in Table 4.3.6. Of the 15 metals detected, the following 6 were below either the CRDL or the IDL in all three samples: aluminum, barium, beryllium, cadmium, nickel, and silver. Of the remaining metals detected, copper ranged from 32 to 294 μg/L, and zinc ranged from 35-117 μg/L. Other metals detected were calcium, iron, magnesium, manganese, potassium, sodium, and vanadium.

PCBs and other extractables. An estimated 0.06 μg of heptachlor epoxide was detected in sample AR311069 and the only compound detected in these samples.

Extractable organics. Analytical data for semivolatile organic compounds are presented in Table 4.3.6. There were 4 compounds detected in two of the samples and 14 in the third sample. No compounds were identified in measurable quantities in samples AR311047 or AR311069. The remaining sample (AR311058) had 14 compounds detected, *and all of them had measured or estimated concentrations of less than 0.05 mg/L. Only one compound in this sample was identified in measurable concentration, and that was 2-chlorophenol at 0.032 mg/kg. Bis(2-ethylhexyl)phthalate was the only compound identified in all three samples and the method blank.*

Volatile organics. There were 7 compounds detected in one of the samples, 10 in another, and 15 compounds in the remaining sample. Methylene chloride and acetone were identified in concentrations of greater than 0.010, but less than 0.170, mg/kg in these samples. Both methylene chloride and acetone were also associated with the blank. An estimated concentration of acetone in AR311036 (0.360 mg/kg) was outside the calibration range of the instrument. All other measured or estimated concentrations of volatile organic compounds were less than 0.015 mg/kg.

Analytical Data Evaluation:

Metals. Two metals of interest, copper and zinc, were detected above the CRDL in the samples for Request 311.

PCBs and other extractables. Heptachlor was found in one sample, but not in concentration high enough to be confirmed by GC/MS.

Extractable organics. Only one compound in sample AR311058 was identified in measurable concentration, and that was 2-chlorophenol at 0.032 mg/kg.

Volatile organics. Methylene chloride and acetone were identified in concentrations of greater than 0.010, but less than 0.170, mg/kg in these samples. These compounds were also indicated in the blank. All other measured or estimated concentrations of volatile organic compounds were less than 0.015 mg/kg.

4.11.4 Limitations and Qualifications

Data Quality Level: The sampling plan is rated Quality Level I; the sampling is rated Quality Level II. The overall analytical data rating is Quality Level II.

Field Data: Field notes state that composite sample AR311047 was collected at 1019 after the sampler was installed at 0925. Other composite samples were collected after about 6 hours of operation, which makes the representativeness of AR311047 questionable. No pH data was given for sample AR311047.

Analytical Data:

Metals. Analytical results were Quality Level I except for aluminum, calcium, and silver at Quality Level II.

PCBs and other extractables. Although heptachlor epoxide was detected in AR311069, this data is Quality Level III because the retention time of the surrogate standard did not meet specifications, causing the identification of heptachlor epoxide to be questionable. Results for all single component pesticides must be considered unusable for samples AR311058 and AR311069 because the surrogate standard was not found in the specified retention time window.

Extractable organics. Only one compound in one sample was identified in measurable concentration--0.032 mg/L of 2-chlorophenol in sample AR311058. It is of Quality Level I. All other data are of Quality Level III due to mass spectral uncertainty (for tentatively identified compounds) or to concentrations being too small to measure for known compounds.

Volatile organics. All results are either Quality Level I or II except results for unidentified TICs and results for target volatile compounds detected at levels below the quantitation limits, which are Quality Level III.

Environmental Problem: 6
Request Number: 311

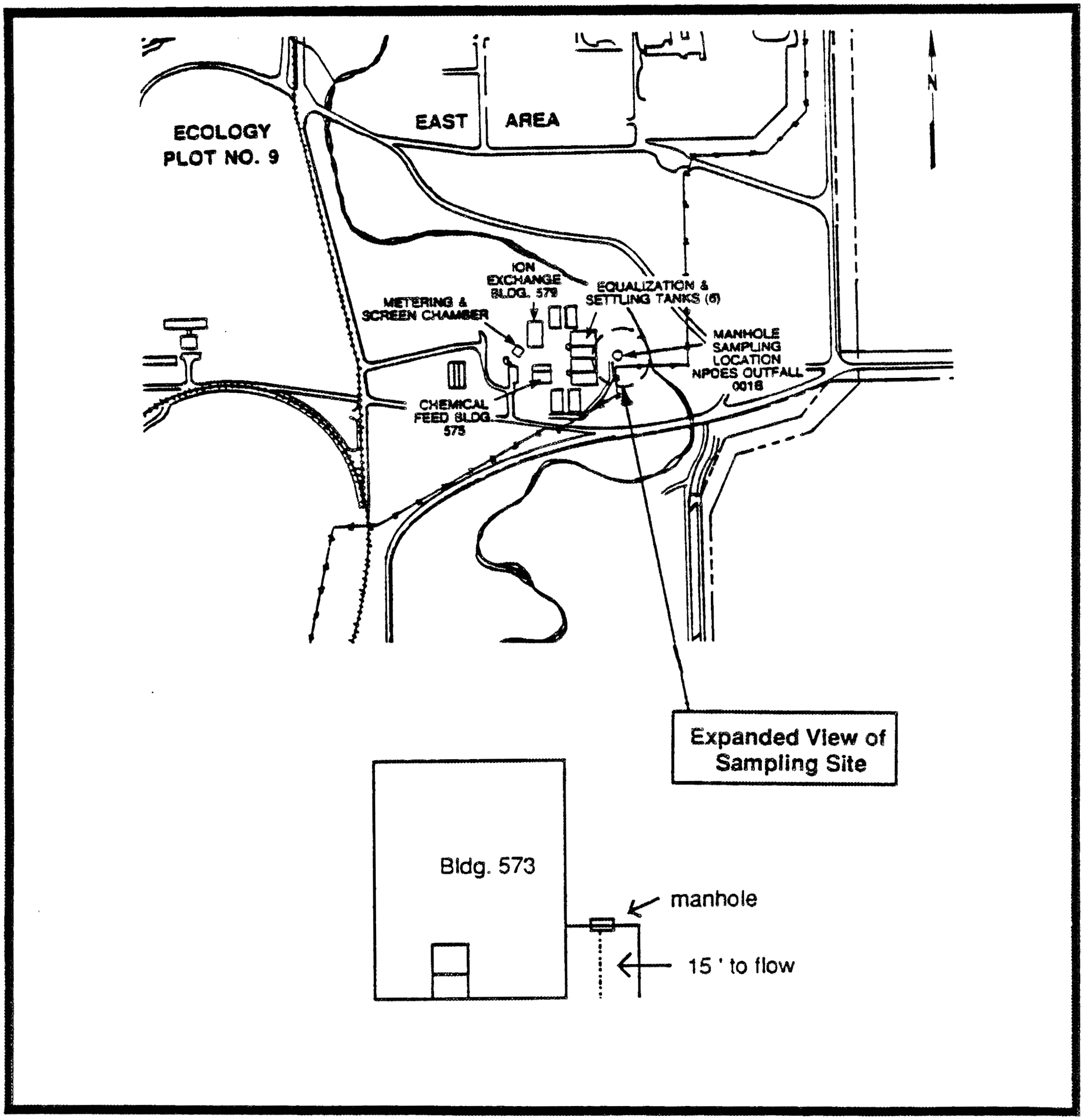

Figure 4.6. Location of NPDES Outfall 001B (Request 311)

Draft - Do Not Cite

TABLE 4.2.6 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 6

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR311	NPDES10WTP	DISCHARGES	SUR WATER	3	3	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	0	0
AR311	NPDES10WTP	DISCHARGES	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	0	1	1	1	0	0	0	0
AR311	NPDES10WTP	DISCHARGES	SUR WATER	3	3	T COM	0	0	3	3	0	0	0	0	0	0	1	3	3	3	0	0	0	0
		MED TOTAL		7	7		0	0	4	4	0	0	0	0	0	0	1	4	4	4	3	3	0	0
		EP TOTAL		7	7		0	0	4	4	0	0	0	0	0	0	1	4	4	4	3	3	0	0

TABLE 4.3.6 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 6 DRAFT DO NOT CITE
NPDES OUTFALL 001B DISCHARGES

S&A REQUEST: 311
LOCATION: NPDES OUTFALL 001B DISCHARGES
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR311014	AR311025	AR311036	AR311058	AR311069	AR311070
CONDUCTIVITY (MS/CM)	2.8	2.8	4.6		3.7	2.3
DO (PPM)	8	7.3	8.7		7.7	7.1
PH (UNITS)	7.4	7.1	7.8	7.8	8	7
TEMPERATURE (DEG C)	13	13	15		13	14
TURBIDITY (PPM)	13	13	16		17	12

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR311047B SDG NO: AR300044B TYPE: T. COMPOSITE	AR311047B AR300044K T. COMPOSITE	AR311058B AR300044B T. COMPOSITE	AR311058B AR300044K T. COMPOSITE	AR311069B AR300044B T. COMPOSITE	AR311069B AR300066K T. COMPOSITE
ALUMINUM	136 BNE		122 BNE		143 BNE	
BARIUM	76 B		90 B		85 B	
BERYLLIUM	0.63 B		0.59 B		0.63 B	
CADMIUM	2.6 B		2.9 B		2.2 B	
CALCIUM	154000		178000		169000	
COPPER	294		33		35	
IRON	1800		425		225	
MAGNESIUM	60600		69100		70200	
MANGANESE	212		82		31	
NICKEL	13 B		10 B		6.9 B	
POTASSIUM		8600		6400		5700
SILVER	8 B		6.3 B		6 U	
SODIUM	378000		384000		393000	
VANADIUM	16 B		13 B		17 B	
ZINC	117		54		36	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR311070B SDG NO: AR300044B TYPE: RINSATE	AR311070B AR300044K RINSATE				
ALUMINUM	60 UNE					
BARIUM	2 U					
BERYLLIUM	0.3 U					
CADMIUM	8.1					
CALCIUM	200 U					
COPPER	14 B					
IRON	20 U					
MAGNESIUM	10 U					
MANGANESE	5 U					
NICKEL	14 B					
POTASSIUM		100 U				
SILVER	6 U					

TABLE 4.3.6 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 6 DRAFT DO NOT CITE
NPDES OUTFALL 001B DISCHARGES

S&A REQUEST: 311
LOCATION: NPDES OUTFALL 001B DISCHARGES
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)							
	SAMP NO:	AR311070B	AR311070B				
	SDG NO:	AR300044B	AR300044K				
	TYPE:	RINSATE	RINSATE				
SODIUM		200 U					
VANADIUM		4 U					
ZINC		3 U					

PCBS & OTHER EXTRACTABLES (UG/L)							
	SAMP NO:	AR311047A	AR311058A	AR311069A	AR311070A		
	SDG NO:	ARG04	ARG04	ARG05	ARG04		
	TYPE:	T. COMPOSITE	T. COMPOSITE	T. COMPOSITE	RINSATE		
HEPTACHLOR EPOXIDE		0.06 U	0.06 U	0.06 J	0.06 U		

EXTRACTABLE ORGANICS (UG/L)							
	SAMP NO:	AR311047A	AR311058A	AR311069A	AR311070A		
	SDG NO:	DD24	DD24	DD28	DD24		
	TYPE:	T. COMPOSITE	T. COMPOSITE	T. COMPOSITE	RINSATE		
BIS(2-ETHYLHEXYL)PHTHALATE		4 J	6 JB	3 JB	3 J		
DI-N-BUTYLPHTHALATE		11 U	1 J	2 JB	11 U		
DIETHYLPHTHALATE		11 U	11 U	1 J	11 U		
PHENOL		11 U	6 J	11 U	11 U		
2-CHLOROPHENOL		11 U	32	11 U	11 U		
4-CHLORO-3-METHYLPHENOL		11 U	3 J	11 U	11 U		
* HALOGENATED UNKNOWN(26.96)					6 J		
* METHYL HEXANONE(8.10)					29 JB		
* METHYL HEXANONE(8.12)		23 JB					
* UNKNOWN				5 JB			
* UNKNOWN HYDROCARBON(8.10)			26 JB				
* UNKNOWN HYDROCARBON(12.73)			8 J				
* UNKNOWN HYDROCARBON(12.95)			10 J				
* UNKNOWN HYDROCARBON(13.65)			9 J				
* UNKNOWN(9.57)			23 J				
* UNKNOWN(13.43)			11 J				
* UNKNOWN(19.47)			10 J				
* UNKNOWN(19.81)					5 J		
* UNKNOWN(19.83)			13 J				
* UNKNOWN(33.66)		9 J					
* UNKNOWN(33.82)		45 J					
* UNKNOWN(33.83)			31 J				

TABLE 4.3.6 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 6 DRAFT DO NOT CITE
NPDES OUTFALL 001B DISCHARGES

S&A REQUEST: 311
LOCATION: NPDES OUTFALL 001B DISCHARGES
MEDIUM: SURFACE WATER

VOLATILE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR311014A GN15 GRAB	AR311025A ON19 GRAB	AR311036A ON21 GRAB			
ACETONE		17 B	99 B	360 BE			
BENZENE		5 U	5 U	0.8 J			
BROMODICHLOROMETHANE		5 U	5 U	3 J			
BROMOFORM		5 U	5 U	2 J			
CARBON TETRACHLORIDE		5 U	2 J	8			
CHLOROFORM		4 J	6	10			
DIBROMOCHLOROMETHANE		5 U	5 U	4 J			
ETHYLBENZENE		5 U	4 JB	5 U			
METHYLENE CHLORIDE		100 B	54 B	160 B			
TOLUENE		4 JB	13 B	8 B			
1,1,1-TRICHLOROETHANE		5 U	2 J	3 J			
* UNKNOWN(11.27)				2 J			
* UNKNOWN(12.31)				7 J			
* UNKNOWN(17.69)				1 J			

4.12 Environmental Problem 7: Drinking Water Supply Wells

Request Numbers: 400, 401, 402, and 403.

Requester: F. H. Miller.

Finding and Basis: Groundwater contamination of the dolomite aquifer may be occurring as a result of releases from the active and inactive waste sites and could result in direct exposure to contaminants of persons who use this aquifer as a drinking water source. Numerous unlined waste sites at ANL contain radioactive, inorganic, organic, and hazardous waste. Because the underlying clay-till soils are permeable and allow vertical migration of groundwater, contamination of the dolomite aquifer is probable. Present ANL monitoring protocols do not analyze for all contaminants that might be present.

4.12.1 Sampling and Analysis Objectives

Statement: Well water samples were collected from several ANL wells to determine if the groundwater contained organic, inorganic, or radiological contaminants. Requests 400, 401, 402, and 403 were considered as a group for purposes of evaluating potential contamination of the dolomite aquifer. For comparison purposes, it was essential that sampling protocols and procedures be consistent for Requests 400 through 403.

Supporting Information: In 1986, these wells were sampled and the water analyzed for radiological, but not organic or inorganic, contaminants. This request also broadened the range of radionuclide analyses. These wells ranged from 87 m (284 ft) to 104 m (341 ft) in depth. Contaminants may have been leaching into the dolomite aquifers from the various unlined disposal areas throughout the site which contained radioactive, organic, and inorganic wastes.

4.12.2 Sampling and Analytical Design

4.12.2.1 Sampling Design

NOTE: Because one sample from each well identified in Environmental Problem 7 will give no information on the variability of sampling and analysis of the individual well and, thus, will not allow for statistical evaluation of the data from each well, the data from wells identified in Requests 400, 401, 402, and 403 may be evaluated as a group.

Request 400: Drinking Water Supply Well 1 - Water (Fig. 4.7a). One grab sample was to be collected from Drinking Water Well 1 in Building 31 (Sampling Method: Reference E4.3.2) to determine the presence of radiological, organic, and inorganic contaminants in the dolomite aquifer.

The Sampling Team arrived on-site on 10NOV87. Skies were blue with a slight breeze at approximately 35°F. Grab sample AR400012 was collected at 1025 directly from the pump via a small tap in Building 31. There was no odor and it was well aerated. The formation water was considered homogeneous with respect to contaminant concentrations. The sample was collected from the Drinking Water Supply Well 1 tap as close as possible to the source. The tap was to be opened and allowed to run for 10 minutes before sampling to evacuate stagnant water in the water lines.

Request 401: Drinking Water Supply Well 2 - Water (Fig. 4.7b). One grab sample was to be collected (Sampling Method: Reference E4.3.2) from the tap for Drinking Water Well 2 located in Building 32.

The Sampling Team arrived on-site 10NOV87 at 1043. Skies were partly cloudy with a slight breeze and a temperature of approximately 35°F. QC field preservative blank sample AR401024 was collected at 1043. Grab sample AR401013 was collected at 1043 from the tap off the main pump. It had no color or odor. The well depth was approximately 300 ft. The water was less aerated than Request 400 in Building 31. The formation water was considered homogeneous with respect to contaminant concentrations. The tap was to be opened and allowed to run 10 minutes before sample collection.

Request 402: Drinking Water Supply Well 3 - Water (Fig. 4.7c). One random grab water sample was to be collected (Sampling Method: Reference E4.3.2) from a tap in Building 163 to determine the presence of radiological, organic, and inorganic contaminants in the dolomite aquifer.

The Sampling Team arrived on-site 10NOV87 at 1250. Skies were overcast, there was a mild breeze, and the temperature was approximately 35°F. Sample AR402014 was collected at 1250 from a service tap in Building 163 as close as possible to the source. The well depth was approximately 300 ft and flow was approximately 500 gpm. The water sample was collected from a tap off of the well pump. Water was clear with no odor. The tap was opened and allowed to run for 10 minutes prior to sampling to evacuate stagnant water in the line. One million gallons per day were used for the entire facility. The formation water was considered homogeneous with respect to contaminant concentrations.

Request 403: Drinking Water Supply Well 4 - Water (Fig. 4.7d). One random grab water sample was to be collected (Sampling Method: Reference E4.3.2) from a service tap in Building 264 as close as possible to the source of the well. The sample was to be used to determine the presence of radiological, organic, and inorganic contaminants in the dolomite aquifer.

The Sampling Team arrived on-site on 10NOV87 at 1310. Skies were overcast, breezes were slight, and the temperature was 32°F. Sample AR403015 was collected at 1310 from a spicket off the main pump line. The tap was to be flushed for 10 minutes prior to sampling. The well was more than 300 ft deep and flow was approximately 300 gpm. Formation water was considered homogeneous with respect to contaminant concentrations.

4.12.2.2 Analytical Design

Request 400: Field parameters measured for Request 400 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), CLP-metals (CLP), cyanide (CLP), gross alpha, gross beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

Request 401: Field parameters measured for Request 401 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), CLP-metals (CLP), cyanide (CLP), gross alpha, gross beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

Request 402: Field parameters measured for Request 402 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), CLP-metals (CLP), cyanide, gross alpha, gross beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

Request 403: Field parameters measured for Request 403 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), CLP-metals (CLP), cyanide (CLP), gross alpha, gross beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

4.12.3 Field and Analytical Data

Field Data:

Request 400: Results of pH, conductivity, and temperature measurements for Request 400 are given in Table 4.3.7. All four samples show pH and temperatures to be quite uniform--about pH 7.2 and 11^{o}C. Conductivity ranges from 0.18 to 0.9 with an average of 0.60.

Request 401: *Results of pH, conductivity, and temperature measurements for Request 401 are given in Table 4.3.7. All four samples show pH and temperatures to be quite uniform--about pH 7.2 and 11°C. Conductivity ranges from 0.18 to 0.9 with an average of 0.60.*

Request 402: *Results of pH, conductivity, and temperature measurements for Request 402 are given in Table 4.3.7. All four samples show pH and temperatures to be quite uniform--about pH 7.2 and 11°C. Conductivity ranges from 0.18 to 0.9 with an average of 0.60.*

Request 403: *Results of pH, conductivity, and temperature measurements for Request 403 are given in Table 4.3.7. All four samples show pH and temperatures to be quite uniform--about pH 7.2 and 11°C. Conductivity ranges from 0.18 to 0.9 with an average of 0.60.*

Field Data Evaluation:

Request 400: Because the instrument was calibrated prior to making the measurements, the results are reliable.

Request 401: Because the instrument was calibrated prior to making the measurements, the results are reliable.

Request 402: Because the instrument was calibrated prior to making the measurements, the results are reliable.

Request 403: Because the instrument was calibrated prior to making the measurements, the results are reliable.

Analytical Data:

Request 400:

Anions and cyanide. The cyanide concentration in the water sample for Request 400 was below the detection level of 2 μg/L.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.7. Of the 17 metals detected, the following 11 were below the CRDL in the sample collected: aluminum, arsenic, barium, beryllium, cadmium, lead, mercury, nickel, potassium, vanadium, and zinc. Other metals detected were calcium, iron, magnesium, manganese, sodium, and uranium (1 μg/L).

PCBs and other extractables. No pesticides were detected.

Extractable organics. Analytical results for semivolatile organic compounds are given in Table 4.3.7. The sample from Well 1 had six compounds detected, with the highest estimated concentration being 0.026 mg/L of an unknown that was also present in the blank.

Volatile organics. There were six compounds identified in three of the samples and seven in the remaining sample from these four wells. No tentatively identified compounds were detected. Of the volatile compounds detected for this problem, only one had a concentration in excess of 0.01 mg/L. Acetone, which was also found in the blank associated with this environmental problem, was determined to be present at a concentration of 0.18 mg/L in AR403015A.

Radiochemistry. Plutonium-239 (0.03 pCi/L), tritium (180 pCi/L), and total strontium (1.4 pCi/L) were detected.

Request 401:

Anions and cyanide. The cyanide concentration in the water sample for Request 401 was below the detection level of 2 µg/L.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.7. Of the 16 metals detected, the following 10 were below either the CRDL or the IDL in the sample collected: aluminum, arsenic, barium, cadmium, lead, mercury, nickel, potassium, vanadium, and zinc. Other metals detected were calcium, iron, magnesium, manganese, sodium, and uranium (1 µg/L).

PCBs and other extractables. No pesticides were detected.

Extractable organics. Analytical results for semivolatile organic compounds are given in Table 4.3.7. The sample from Well 2 had 11 compounds detected, the highest concentration being estimated as 0.035 mg/L of an unknown. The unknown with the highest extimated concentrations for Well 1 (Request 400) had the same retention time and was also indicated as being present in the blank.

Volatile organics. There were six compounds identified in three of the samples and seven in the remaining sample from these four wells. No tentatively identified compounds were detected. Of the volatile compounds detected for this problem, only one had a concentration in excess of 0.01 mg/L. Acetone was found in the blank associated with this environmental problem.

Radiochemistry. Tritium (230 pCi/L), plutonium-238 (0.035 pCi/L), and total strontium (1.2 pCi/L) were found in the Well 2 water grab sample.

Request 402:

Anions and cyanide. The cyanide concentration in the water sample for Request 402 was below the detection level of 2 µg/L.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.7. Of the 14 metals detected, the following 9 were below the CRDL in the sample collected: aluminum, arsenic, barium, cadmium, lead, mercury, potassium, silver, and vanadium. Other metals detected were calcium, iron, magnesium, manganese, and sodium. No uranium was detected in this request.

PCBs and other extractables. No pesticides were detected.

Extractable organics. Analytical results for semivolatile organic compounds are given in Table 4.3.7. The sample from Well 3 had two compounds detected, both in estimated concentrations of less than 0.01 mg/L.

Volatile organics. There were six compounds identified in three of the samples and seven in the remaining sample from these four wells. No tentatively identified compounds were detected. Of the volatile compounds detected for this problem, only one had a concentration in excess of 0.01 mg/L. Acetone was found in the blank associated with this environmental problem.

Radiochemistry. Gross alpha (4 pCi/L), gross beta (2 pCi/L), plutonium-238 (0.02 pCi/L), and total strontium (0.5 pCi/L) were detected.

Request 403:

Anions and cyanide. The cyanide concentration in the water sample for Request 403 was below the detection level of 2 µg/L.

Metals. *Analytical results for metals in groundwater are presented in Table 4.3.7. Of the 16 metals detected, the following 11 were below the CRDL in the sample collected: aluminum, arsenic, barium, cadmium, lead, manganese, mercury, potassium, silver, thallium, and vanadium. Other metals detected were calcium, iron, magnesium, sodium, and uranium (1 µg/L).*

PCBs and other extractables. No pesticides were detected.

Extractable organics. Analytical results for semivolatile organic compounds are given in Table 4.3.7. The sample from Well 4 had four compounds detected with the highest concentration (0.085 mg/L) belonging to an unknown. (This unknown had a different retention time from the unknowns detected in samples from the other wells.) There was an estimated 0.006 mg/L of 2-chlorophenol identified in sample AR403015.

Volatile organics. There were six compounds identified in three of the samples and seven in the remaining sample from these four wells. No tentatively identified compounds were detected. Of the volatile compounds detected for this problem, only one had a concentration in excess of 0.01 mg/L. Acetone, which was also found in the blank associated with this environmental problem, was determined to be present at a concentration of 0.18 mg/L in AR403015A.

Radiochemistry. Gross alpha (11 pCi/L), gross beta (980 pCi/L), tritium (230 pCi/L), plutonium-238 (0.06 pCi/L), and total strontium (1.9 pCi/L) were detected.

Analytical Data Evaluation:

Request 400:

Anions and cyanide. The detection level for water samples is 2 µg/L. The instrument was calibrated and quality control solutions confirmed that the instrument was in compliance. Calibration blanks were also in compliance. Other quality control measures taken to assure reliability of results are covered in Environmental Problem 2; these considerations make the results of cyanide analysis of water reliable.

Metals. No metals of interest were detected in the sample collected for this request except uranium at 1 µg/L.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound detected in all four samples, with the highest estimated concentration being 0.003 mg/L. No compound was identified in measurable concentration in any of these samples.

Volatile organics. The level of acetone was 0.180 mg/L in the sample from Well 4. No other compound had a measured or estimated concentration of greater than 0.01 mg/L.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of their initial instrument calibration. Because laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 401:

Anions and cyanide. The detection level for water samples is 2 µg/L. The instrument was calibrated and quality control solutions confirmed that the instrument was in compliance. Calibration blanks were also in compliance. Other quality control measures taken to assure reliability of results are covered in Environmental Problem 2; these considerations make the results of cyanide analysis of water reliable.

Metals. No metals of interest were detected in the sample collected for this request except uranium at 1 µg/L.

PCBs and other extractables. Data for samples AR401013, AR401014, and AR401015 must be considered unusable because the surrogate standard was not found in the specified retention time window.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound detected in all four samples, with the highest estimated concentration being 0.003 mg/L. No compound was identified in measurable concentration in any of these samples.

Volatile organics. The level of acetone was 0.180 mg/L in the sample from Well 4. No other compound had a measured or estimated concentration of greater than 0.01 mg/L.

Radiochemistry. A QC field blank sample collected at the same time contained 6.1 pCi/L of gross beta activity, 0.008 pCi/L of plutonium-238, and 2.4 pCi/L of total strontium. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of their initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 402:

Anions and cyanide. The detection level for water samples is 2 μg/L. The instrument was calibrated and quality control solutions confirmed that the instrument was in compliance. Calibration blanks were also in compliance. Other quality control measures taken to assure reliability of results are covered in Problem 2; these considerations make the results of cyanide analysis of water reliable.

Metals. No metals of interest were detected in the sample collected for Request 402.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound detected in all four samples, with the highest estimated concentration being 0.003 mg/L. No compound was identified in measurable concentration in any of these samples.

Volatile organics. The level of acetone was 0.180 mg/L in the sample from Well 4. No other compound had a measured or estimated concentration of greater than 0.01 mg/L.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 403:

Anions and cyanide. The detection level for water samples is 2 µg/L. The instrument was calibrated and quality control solutions confirmed that the instrument was in compliance. Calibration blanks were also in compliance. Other quality control measures taken to assure reliability of results are covered in Environmental Problem 2; these considerations make the results of cyanide analysis of water reliable.

Metals. No metals of interest were detected in the sample collected for Request 403 except uranium at 1 µg/L.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound detected in all four samples, with the highest estimated concentration being 0.003 mg/L. No compound was identified in measurable concentration in any of these samples.

Volatile organics. The level of acetone was 0.180 mg/L in the sample from Well 4. No other compound had a measured or estimated concentration of greater than 0.01 mg/L.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.12.4 Limitations and Qualifications

Data Quality Level: The sampling plan and the sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data:

Request 400: The sampling plan is straightforward and the sampling was conducted as planned.

Request 401: The sampling plan is straightforward and the sampling was conducted as planned.

Request 402: The sampling plan is straightforward and the sampling was conducted as planned.

Request 403: The sampling plan is straightforward and the sampling was conducted as planned.

Analytical Data:

Request 400:

Anions and cyanide. The data quality level for these samples is Quality Level I.

Metals. Analytical results were Quality Level 1 except for vanadium at Quality Level II.

Extractable organics. All compounds detected were in small concentrations so the values were below quantitation limits. That problem, plus mass spectral uncertainty for the tentativiely identified compounds, led to all data being assigned a Quality Level of III.

Volatile organics. Results for toluene are Quality Level I in AR401013 and Quality Level II in AR403015. All remaining results for volatile compounds detected are Quality Level III because the reported concentrations are estimates which fall below the quantitation limits or the continuing calibration did not meet specifications.

Radiochemistry. Analytical results were Quality Level I.

Request 401:

Anions and cyanide. The data quality level for these samples is Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum and calcium at Quality Level II and silver at Quality Level III.

PCBs and other extractables. Data for samples AR401013, AR401014, and AR401015 must be considered unusable because the surrogate standard was not found in the specified retention time window.

Extractable organics. All compounds detected were in small concentrations so the values were below quantitation limits. That problem, plus mass spectral uncertainty for the tentatively identified compounds, led to all data being assigned a Quality Level of III.

Volatile organics. Results for toluene are Quality Level I in AR401013 and Quality Level II in AR403015. All remaining results for volatile compounds detected are Quality Level III because the reported concentrations are estimates which fall below the quantitation limits or the continuing calibration did not meet specifications.

Radiochemistry. Analytical results were Quality Level I.

Request 402:

Anions and cyanide. The data quality level for these samples is Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum and calcium at Quality Level II and silver at Quality Level III.

Extractable organics. All compounds detected were in small concentrations so the values were below quantitation limits. That problem, plus mass spectral uncertainty for the tentativlely identified compounds, led to all data being assigned a Quality Level of III.

Volatile organics. Results for toluene are Quality Level I in AR401013 and Quality Level II in AR403015. All remaining results for volatile compounds detected are Quality Level III because the reported concentrations are estimates which fall below the quantitation limits or the continuing calibration did not meet specifications.

Radiochemistry. Analytical results were Quality Level I.

Request 403:

Anions and cyanide. The data quality level for these samples is Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum and calcium at Quality Level II and silver at Quality Level III.

Extractable organics. All compounds detected were in small concentrations so the values were below quantitation limits. That problem, plus mass spectral uncertainty for the tentativlely identified compounds, led to all data being assigned a Quality Level of III.

Volatile organics. Results for toluene are Quality Level I in AR401013 and Quality Level II in AR403015. All remaining results for volatile compounds detected are Quality Level III because the reported concentrations are estimates which fall below the quantitation limits or the continuing calibration did not meet specifications (e.g., acetone in AR403015).

Radiochemistry. Analytical results were Quality Level I.

Environmental Problem: 7
Request Number: 400

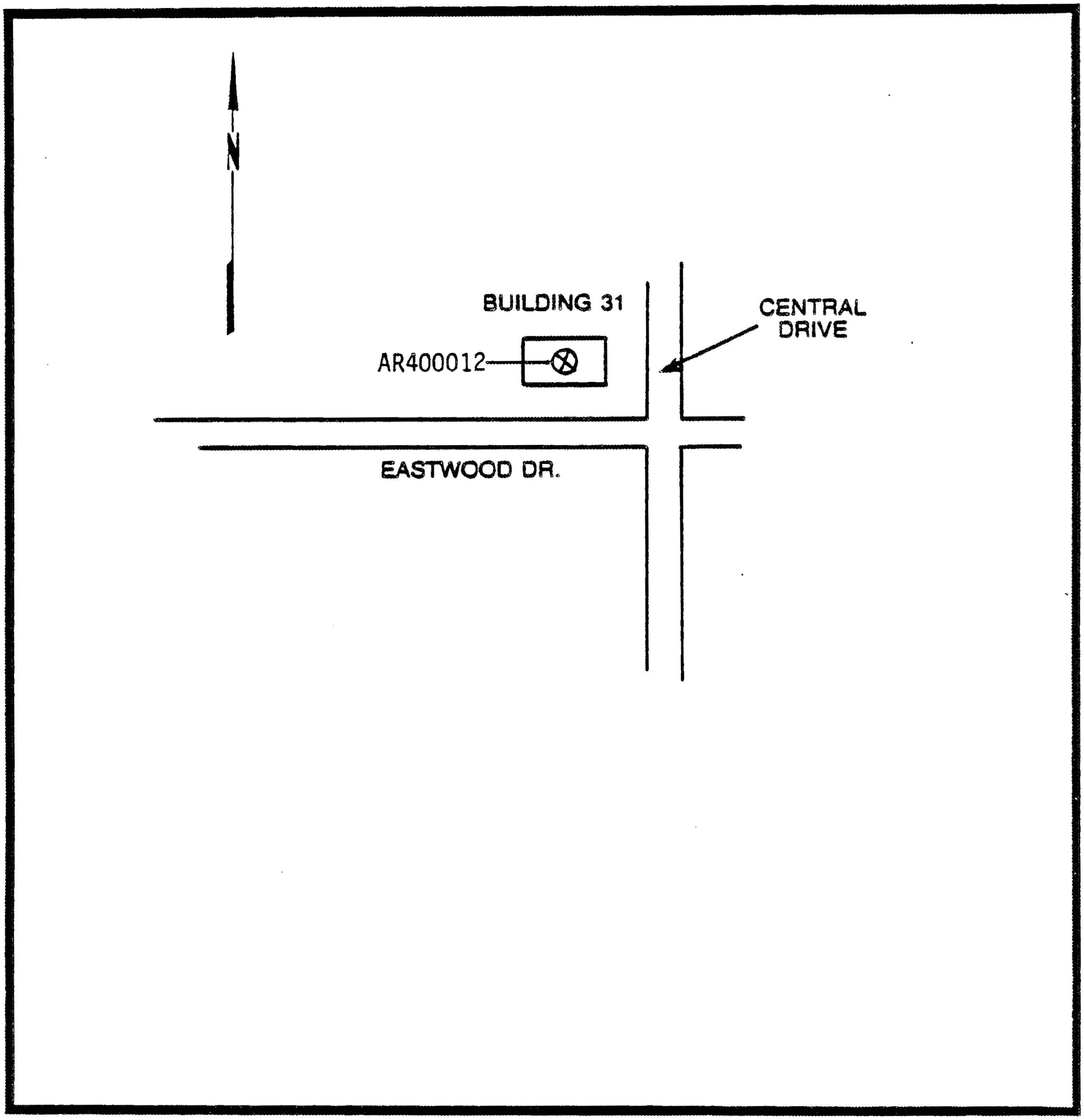

Figure 4.7a. Building 31: Location of Drinking Water Well 1 (Request 400)

Environmental Problem: 7
Request Number: 401

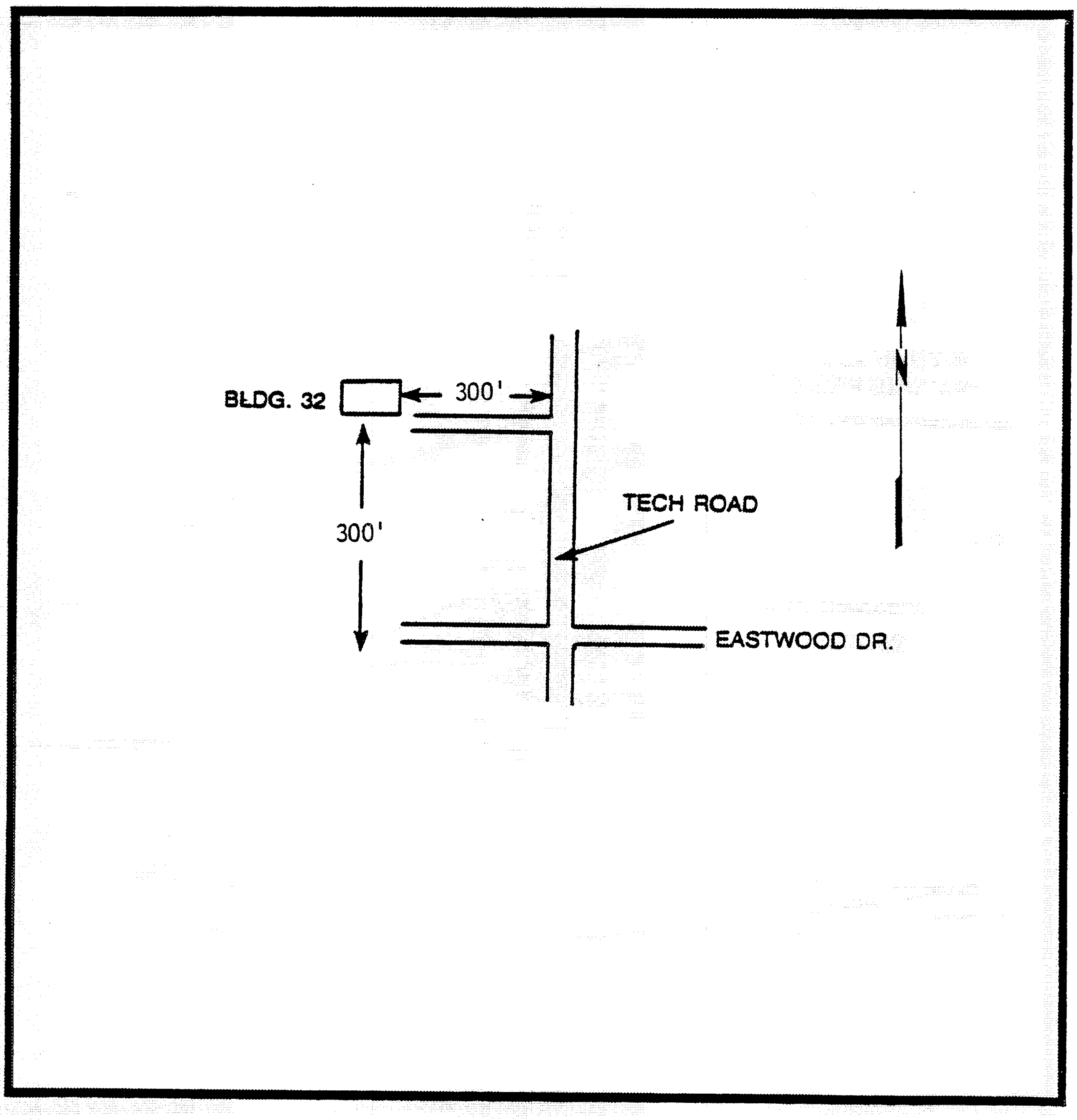

Figure 4.7b. Building 32: Location of Drinking Water Well 2 (Request 401)

Environmental Problem: 7
Request Number: 402

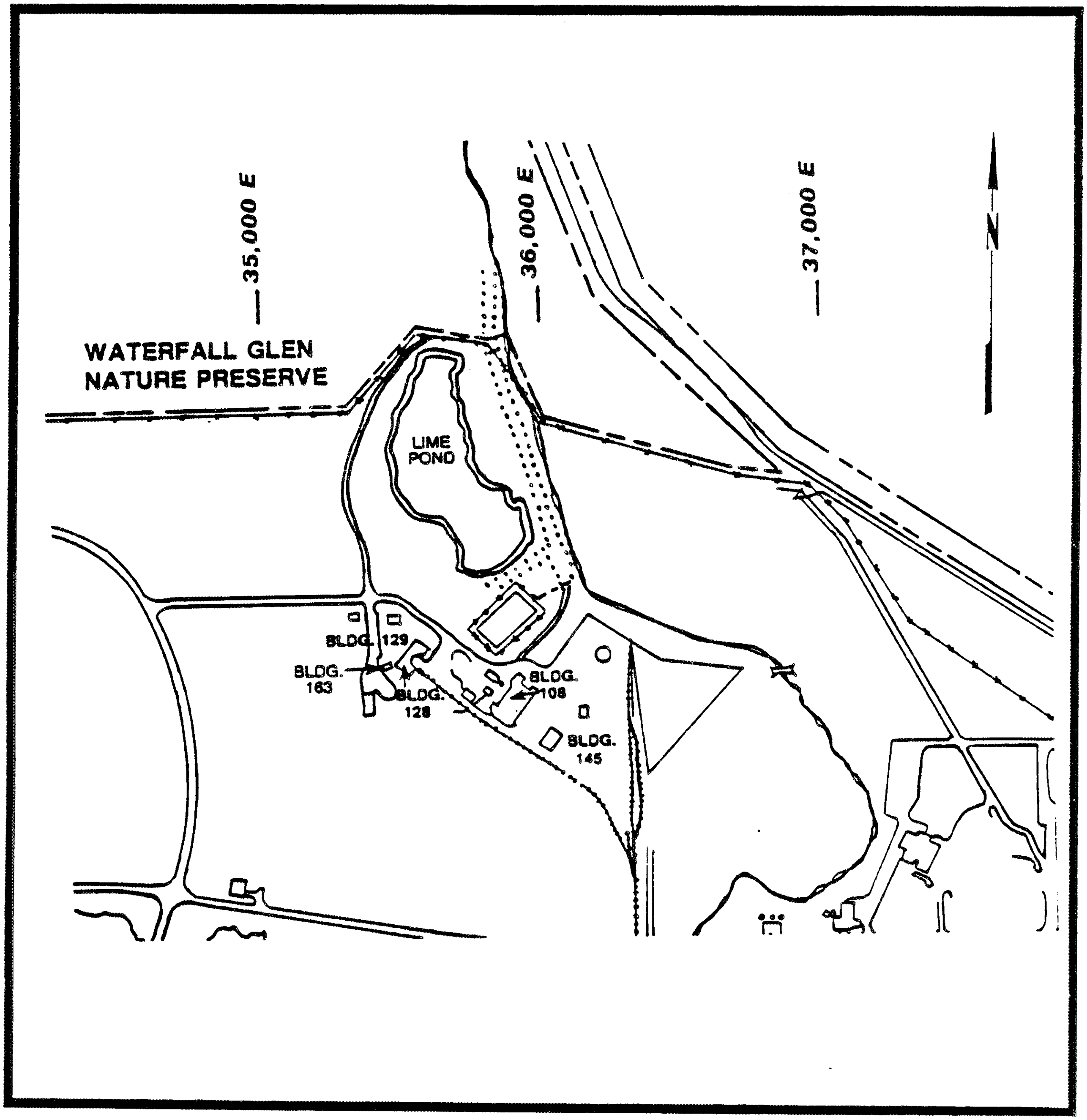

Figure 4.7c. Building 163: Location of Drinking Water Well 3 (Request 402)

Environmental Problem: 7
Request Number: 403

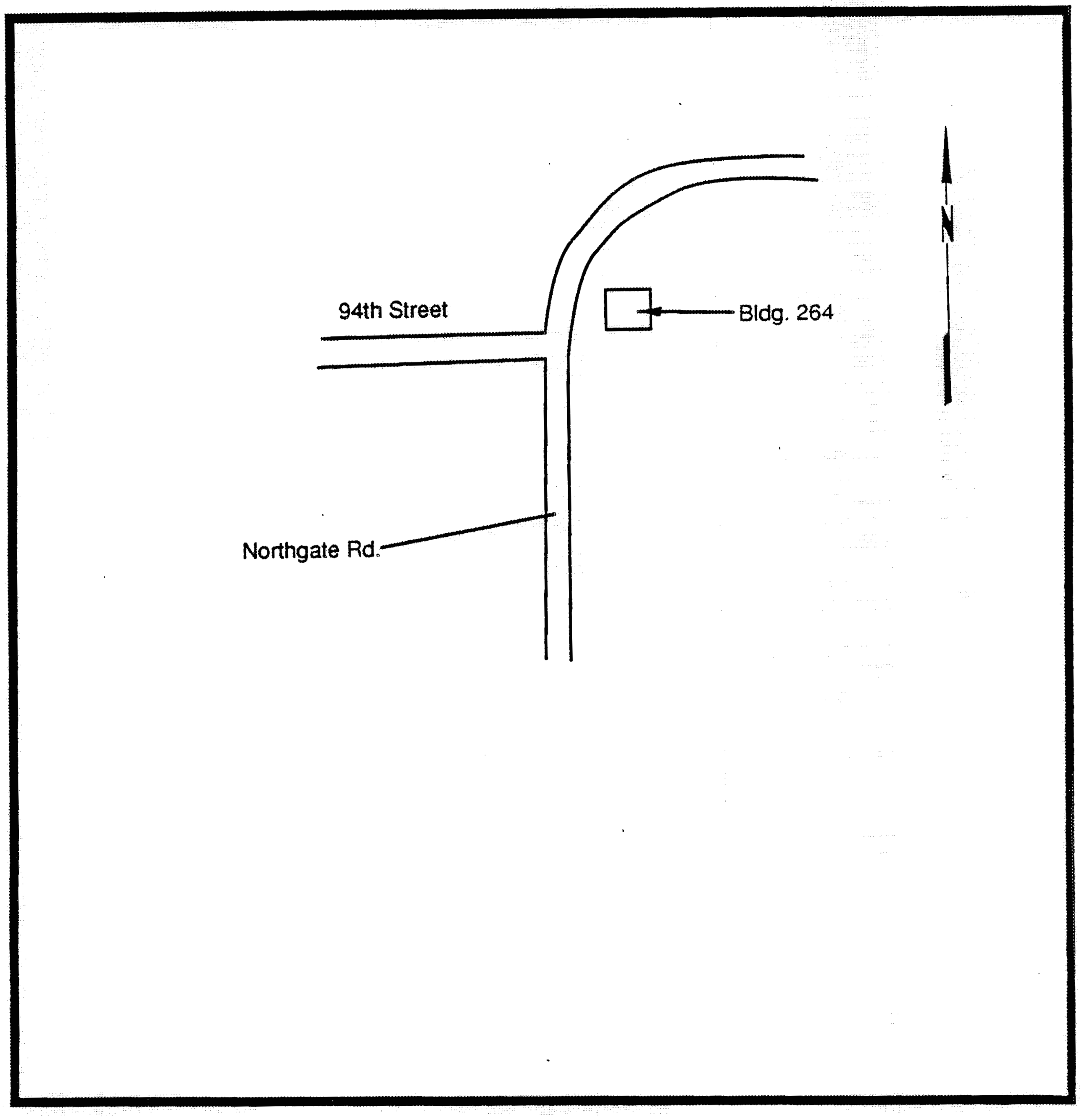

Figure 4.7d. Building 264: Location of Drinking Water Well 4 (Request 403)

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TABLE 4.2.7 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 7

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR400	B31 TAP WA	WELLS	GRN WATER	1	1	GRAB	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR401	B32 TAP WA	WELLS	GRN WATER	1	1	QC FL	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
AR401	B32 TAP WA	WELLS	GRN WATER	1	1	GRAB	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR402	B163 TAP W	WELLS	GRN WATER	1	1	GRAB	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR403	B264 TAP W	WELLS	GRN WATER	1	1	GRAB	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
			MED TOTAL	5	5		0	5	5	5	0	0	0	0	0	0	0	4	4	4	4	4	5	5
			EP TOTAL	5	5		0	5	5	5	0	0	0	0	0	0	0	4	4	4	4	4	5	5

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS

DRAFT DO NOT CITE

S&A REQUEST: 400
LOCATION: DRINKING WATER SUPPLY WELL NO. 1
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO: AR400012					
CONDUCTIVITY (MS/CM)	0.9					
PH (UNITS)	7.3					
TEMPERATURE (DEG C)	10					

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR400012G SDG NO: AR307018G TYPE: GRAB	AR400012G AR400012G GRAB	AR400012H AR300044B GRAB	AR400012H AR300044K GRAB	AR400012H AR400012H GRAB	
ALUMINUM			78 BNE			
ARSENIC		1.3 B				
BARIUM			76 B			
BERYLLIUM			2.7 B			
CADMIUM		0.45 B				
CALCIUM			119000			
IRON			837			
LEAD		2.5 B				
MAGNESIUM			51900			
MANGANESE			31			
MERCURY	0.03 B					
NICKEL			7.5 B			
POTASSIUM				3000 B		
SODIUM			29100			
URANIUM, TOTAL					1	
VANADIUM			16 B			
ZINC			7.3 B			

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR400012E SDG NO: DD22 TYPE: GRAB					
BIS(2-ETHYLHEXYL)PHTHALATE	2 J					
DI-N-BUTYLPHTHALATE	0.6 J					
DIETHYLPHTHALATE	0.8 J					
* UNKNOWN(7.63)	23 J					
* UNKNOWN(8.17)	26 JB					
* UNKNOWN(30.08)	4 J					

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS — DRAFT DO NOT CITE

S&A REQUEST: 400
LOCATION: DRINKING WATER SUPPLY WELL NO. 1
MEDIUM: GROUND WATER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR400012A SDG NO: 0N15 TYPE: GRAB					
ACETONE	0.9 JB					
METHYLENE CHLORIDE	4 JB					
TOLUENE	4 JB					

RADIOCHEMISTRY (PCI/L)	SAMP NO: AR400012J SDG NO: LLL7664 TYPE: GRAB	AR400012K LLL7664 GRAB	AR400012L LLL7664 GRAB			
GROSS ALPHA	0					
GROSS BETA	0					
H-3			180			
PU-238	0					
PU-239	0.03					
SR-TOT		1.4				

S&A REQUEST: 401
LOCATION: DRINKING WATER SUPPLY WELL NO. 2
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO: AR401013					
CONDUCTIVITY (MS/CM)	0.18					
PH (UNITS)	7.3					
TEMPERATURE (DEG C)	10					

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR401013G SDG NO: AR401024A TYPE: GRAB	AR401013G AR500353F GRAB	AR401013H AR300044B GRAB	AR401013H AR300044K GRAB	AR401013H AR400012H GRAB	AR401024A AR401024A FIELD BLANK
ALUMINUM			109 BNE			
ARSENIC		1.2 B				
BARIUM			84 B			
CADMIUM		0.07 U				
CALCIUM			126000			
IRON			1260			
MAGNESIUM			55800			

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS — DRAFT DO NOT CITE

S&A REQUEST: 401
LOCATION: DRINKING WATER SUPPLY WELL NO. 2
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR401013G AR401024A GRAB	AR401013G AR500353F GRAB	AR401013H AR300044B GRAB	AR401013H AR300044K GRAB	AR401013H AR400012H GRAB	AR401024A AR401024A FIELD BLANK
MANGANESE				18			
MERCURY		0.04 B					0.02 B
NICKEL				6.2 B			
POTASSIUM					3000 B		
SILVER			1 B				
SODIUM				21300			
URANIUM, TOTAL						1	
VANADIUM				16 B			
ZINC				9.2 B			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR401024A AR500353F FIELD BLANK	AR401024B AR300044B FIELD BLANK	AR401024B AR300044K FIELD BLANK	AR401024B AR400012H FIELD BLANK		
ALUMINUM			60 UNE				
ARSENIC		0.66 U					
BARIUM			4.4 B				
CADMIUM		0.16 B					
CALCIUM			200 U				
IRON			43 B				
MAGNESIUM			16 B				
MANGANESE			5 U				
MERCURY							
NICKEL			7.6 B				
POTASSIUM				100 U			
SILVER		3 B					
SODIUM			200 U				
URANIUM, TOTAL					1		
VANADIUM			4 U				
ZINC			181				

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR401013E DD22 GRAB	AR401013E DD23 GRAB				
BIS(2-ETHYLHEXYL)PHTHALATE		2 J	1 J				
DI-N-BUTYLPHTHALATE		0.6 J	11 U				
DIETHYLPHTHALATE		1 J	11 U				
* HALOGENATED UNKNOWN(26.96)		9 J					
* UNKNOWN(7.63)		30 J					

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS — DRAFT DO NOT CITE

S&A REQUEST: 401
LOCATION: DRINKING WATER SUPPLY WELL NO. 2
MEDIUM: GROUND WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR401013E / DD22 / GRAB	AR401013E / DD23 / GRAB				
* UNKNOWN(8.17)		35 JB					
* UNKNOWN(14.22)		14 J					
* UNKNOWN(14.42)		6 J					
* UNKNOWN(29.34)		5 J					
* UNKNOWN(30.08)		5 J					
* UNKNOWN(33.74)		19 J					

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR401013A / 0N15 / GRAB					
ACETONE		0.7 JB					
CARBON DISULFIDE		0.9 J					
METHYLENE CHLORIDE		2 JB					
TOLUENE		10 B					

RADIOCHEMISTRY (PCI/L)	SAMP NO: / SDG NO: / TYPE:	AR401013J / LLL7661 / GRAB	AR401013K / LLL7661 / GRAB	AR401013L / LLL7661 / GRAB	AR401024D / LLL7661 / FIELD BLANK	AR401024E / LLL7661 / FIELD BLANK	
GROSS ALPHA		0			0		
GROSS BETA					6.1		
H-3				230			
PU-238		0.035			0.008		
PU-239		0			0		
SR-90			1.2			2.4	

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS

DRAFT DO NOT CITE

S&A REQUEST: 402
LOCATION: DRINKING WATER SUPPLY WELL NO. 3
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO: AR402014
CONDUCTIVITY (MS/CM)	0.67
PH (UNITS)	7.2
TEMPERATURE (DEG C)	11

METALS, INCLUDING CR+6 (UG/L)				
SAMP NO:	AR402014G	AR402014G	AR402014H	AR402014H
SDG NO:	AR401024A	AR500353F	AR300044B	AR300044K
TYPE:	GRAB	GRAB	GRAB	GRAB
ALUMINUM			82 BNE	
ARSENIC		1.2 B		
BARIUM			60 B	
CADMIUM		0.08 B		
CALCIUM			132000	
IRON			1000	
LEAD		1.5 B		
MAGNESIUM			52700	
MANGANESE			17	
MERCURY	0.02 B			
POTASSIUM				3300 B
SILVER		1 B		
SODIUM			18300	
VANADIUM			13 B	

EXTRACTABLE ORGANICS (UG/L)	
SAMP NO:	AR402014E
SDG NO:	DD23
TYPE:	GRAB
BIS(2-ETHYLHEXYL)PHTHALATE	3 J
* UNKNOWN(19.81)	5 J

VOLATILE ORGANICS (UG/L)	
SAMP NO:	AR402014A
SDG NO:	GN15
TYPE:	GRAB
ACETONE	4 JB
METHYLENE CHLORIDE	3 JB

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRINKING WATER SUPPLY WELLS

DRAFT DO NOT CITE

S&A REQUEST: 402
LOCATION: DRINKING WATER SUPPLY WELL NO. 3
MEDIUM: GROUND WATER

RADIOCHEMISTRY (PCI/L)	SAMP NO: SDG NO: TYPE:	AR402014J LLL7668 GRAB	AR402014K LLL7668 GRAB	AR402014L LLL7668 GRAB			
GROSS ALPHA		4					
GROSS BETA		2					
H-3				0			
PU-238		0.02					
PU-239		0					
SR-TOT			0.5				

S&A REQUEST: 403
LOCATION: DRINKING WATER SUPPLY WELL NO. 4
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO:	AR403015					
CONDUCTIVITY (MS/CM)		0.67					
PH (UNITS)		7.2					
TEMPERATURE (DEG C)		12					

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR403015G AR401024A GRAB	AR403015G AR403015G GRAB	AR403015H AR300044B GRAB	AR403015H AR300044K GRAB	AR403015H AR400012H GRAB	
ALUMINUM				77 BNE			
ARSENIC			1.9 B				
BARIUM				52 B			
CADMIUM			0.4 B				
CALCIUM				127000			
IRON				1130			
LEAD			0.8 B				
MAGNESIUM				51200			
MANGANESE				14 B			
MERCURY		0.02 B					
POTASSIUM					3200 B		
SILVER			1 B				
SODIUM				17400			
THALLIUM			1.8 B				
URANIUM, TOTAL						1	
VANADIUM				15 B			

TABLE 4.3.7 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 7 DRAFT DO NOT CITE
DRINKING WATER SUPPLY WELLS

S&A REQUEST: 403
LOCATION: DRINKING WATER SUPPLY WELL NO. 4
MEDIUM: GROUND WATER

EXTRACTABLE ORGANICS (UG/L)						
SAMP NO:	AR403015E					
SDG NO:	DD23					
TYPE:	GRAB					
BIS(2-ETHYLHEXYL)PHTHALATE	1 J					
2-CHLOROPHENOL	6 J					
* UNKNOWN(8.10)	25 J					
* UNKNOWN(8.92)	85 J					

VOLATILE ORGANICS (UG/L)						
SAMP NO:	AR403015A					
SDG NO:	GN15					
TYPE:	GRAB					
ACETONE	180 B					
METHYLENE CHLORIDE	3 JB					
TOLUENE	10 B					

RADIOCHEMISTRY (PCI/L)						
SAMP NO:	AR403015J	AR403015K	AR403015L			
SDG NO:	LLL7667	LLL7667	LLL7667			
TYPE:	GRAB	GRAB	GRAB			
GROSS ALPHA	11					
GROSS BETA	0					
H-3			230			
PU-238	0.06					
PU-239	0					
SR-TOT		1.9				

4.13 Environmental Problem 8: Underground Storage Tanks at Building 6 and Building 212

Request Numbers: 404 and 405.

Requester: F. H. Miller.

Finding and Basis: There is a potential for release of hydrocarbons from aged underground steel storage tanks, which could contaminate the groundwater and soil. The integrity of many of the steel underground storage tanks is in question because they have no cathodic protection, are unlined, over twenty years of age, and situated in corrosive soil.

4.13.1 Sampling and Analysis Objectives

Statement: Soil samples were collected to determine if hydrocarbons were present in the soil around steel tanks located at Buildings 6 and 212.

Supporting Information: The tanks at Building 6 formerly contained gasoline and diesel fuel. The tanks had a capacity of 4,050 gal. At the time of the Survey, one tank had been filled with water; the other tank contained diesel fuel. At the time of the Survey, the tanks at Building 212 had a capacity of 9,000 gal. and contained diesel fuel. If surface spills had occurred, the soils near the ground surface would be contaminated. If leaks had occurred, the soil below the tanks would be contaminated with some product that should be detected in the tests. Sampling was conducted near the ground surface and just below the level of the tanks because this was where the highest contaminant levels were expected.

4.13.2 Sampling and Analytical Design

4.13.2.1 Sampling Design

Request 404: West of Building 6 Adjacent to Existing Tanks - Soil (Fig. 4.8a). Six soil cores were to be collected (Sampling Method: Reference E5.2.3) in sets of two from each of three randomly selected sites adjacent to the existing tank as Building 6.

The Sampling Team arrived on-site 17NOV87. After close examination of the area, the Sampling Team decided to cancel (or possibly postpone) this request because of the presence of concrete 2 in. below the asphalt. In the absence of special equipment needed to break through the concrete to take samples, samples AR404016, -027, -038,-049, -050 and -061 were not collected 17NOV87.

Request 405: South of Building 212 Adjacent to Existing Tanks - Soil (Fig. 4.8b). Six cores were to be collected (Sampling Method: Reference E5.2.3) in sets of two from each of three randomly selected sites adjacent to the existing tank south of Building 212.

The Sampling Team arrived on-site 17NOV87 at 1420 to begin augering at the points identified in the ANL digging permit. After dividing the area into a 3 x 20, 60-segment grid, 3 segments were to be selected (each the previous grid plus 20) and soil samples collected at intervals from 3 to 8 ft and from 18 to 23 ft (to a maximum depth of 23 ft). At the time of actual augering, however, equipment would not permit augering to the requested depth. The ANL Sampling and Analysis Plan was modified to sample 3 to 8 ft and 8 to 16 ft. Weather was bitter cold with occasional rain and heavy wind. The temperature was approximately 40^{o}F. Water was encountered in all holes. At grid 11, grab sample AR405017 was collected at 1435 from 3 to 8 ft and grab sample AR405040 was collected at 1445 from 8 to 12 ft (when water was encountered). At grid 31, sample AR405028 was collected at 1510 from 3 to 8 ft and grab sample AR405051 was collected at 1520 from 8 to 15 ft (when water was encountered). At grid 51, sample

AR405039 was collected at 1625 from 3 to 8 ft and sample AR405062 was collected at 1635 from 8 to 12 ft (when water was encountered). A radiation scan of the area indicated 20-50 cpm. At the depth of water encountered, the substrate was primarily sand (probably from fill surrounding the tanks).

4.13.2.2 Analytical Design

Request 404: The parameter to have been analyzed for Request 404 was hydrocarbons by GC analysis.

Request 405: The parameter analyzed for Request 405 included hydrocarbons by GC analysis.

4.13.3 Field and Analytical Data

Field Data:

Request 404: *No requests for field data were made.*

Request 405: *No requests for field data were made.*

Field Data Evaluation:

Request 404: Not applicable.

Request 405: Not applicable.

Analytical Data:

Request 404:

Petroleum hydrocarbons. Request 404 could not be implemented because a concrete layer was found 2 in. below the asphalt and no samples were collected.

Request 405:

Petroleum hydrocarbons. Because results for Request 405 showed that the petroleum hydrocarbon were below the detection limit of 100 µg/g, no 4.3 series table was generated for this environmental problem.

Analytical Data Evaluation:

Request 404:

Petroleum hydrocarbons. No samples were collected.

Request 405:

Petroleum hydrocarbons. The instrument was calibrated with JP-4 using the method of internal standard and one of the samples was tested with DF-2. Blanks were also run and were found to be clean. Spike recovery was 82%. These considerations make the data for petroleum hydrocarbons reliable.

4.13.4 Limitations and Qualifications

Data Quality Level:

Request 404: The sampling plan is rated Quality Level II; the field sampling is rated Quality Level III. The overall analytical rating is Quality Level III.

Request 405: The sampling plan is rated Quality Level I; the field is rated Quality Level I. The overall analytical rating is Quality Level I.

Field Data:

Request 404: The sampling plan is rated Quality Level II. Because Request 404 could not be honored due to the presence of concrete 2 in. below the asphalt, only one-half of the problem could be investigated. Field samples and the analytical rating are Quality Level III because no samples are available to analyze.

Analytical Data:

Request 404:

Petroleum hydrocarbons. No samples were collected.

Request 405:

Petroleum hydrocarbons. The data Quality Level is I.

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ANL Data Document
Issue Date: June 1989
Revision: 01

Environmental Problem: 8
Request Number: 404

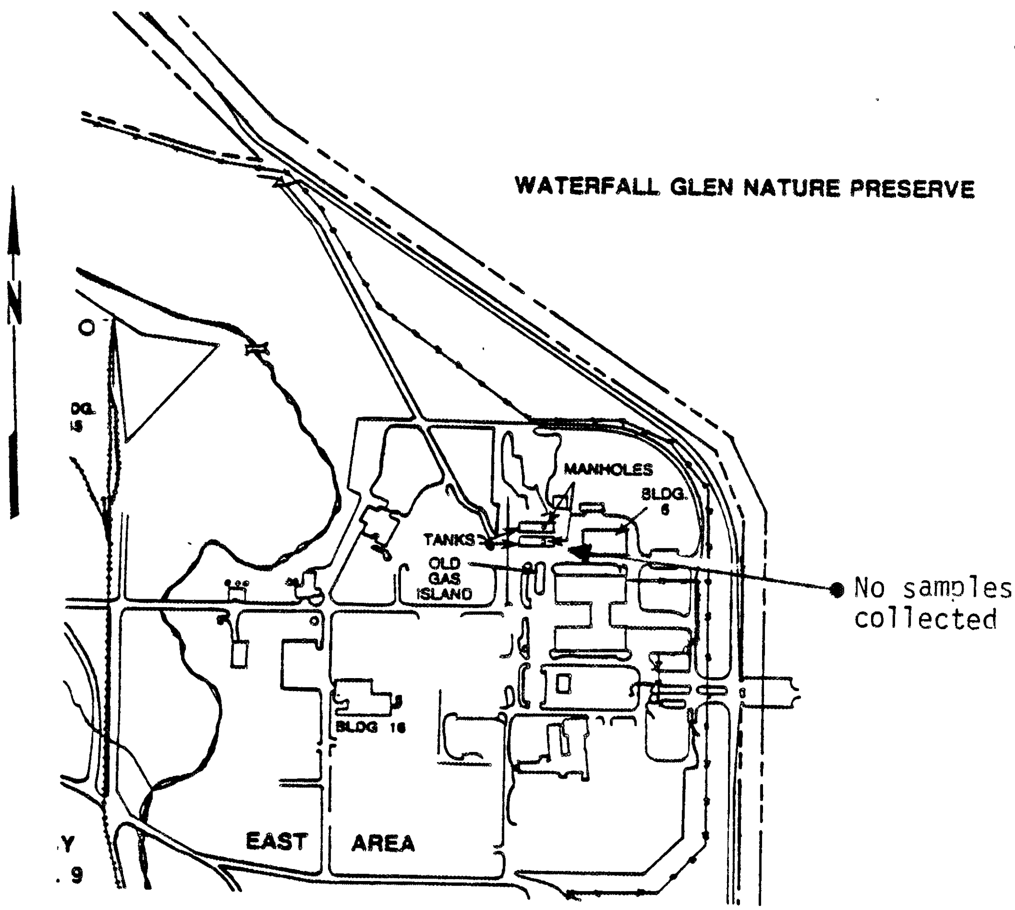

Figure 4.8a. Fuel Tanks Located Adjacent to Building 6 (Request 404)

Environmental Problem: 8
Request Number: 405

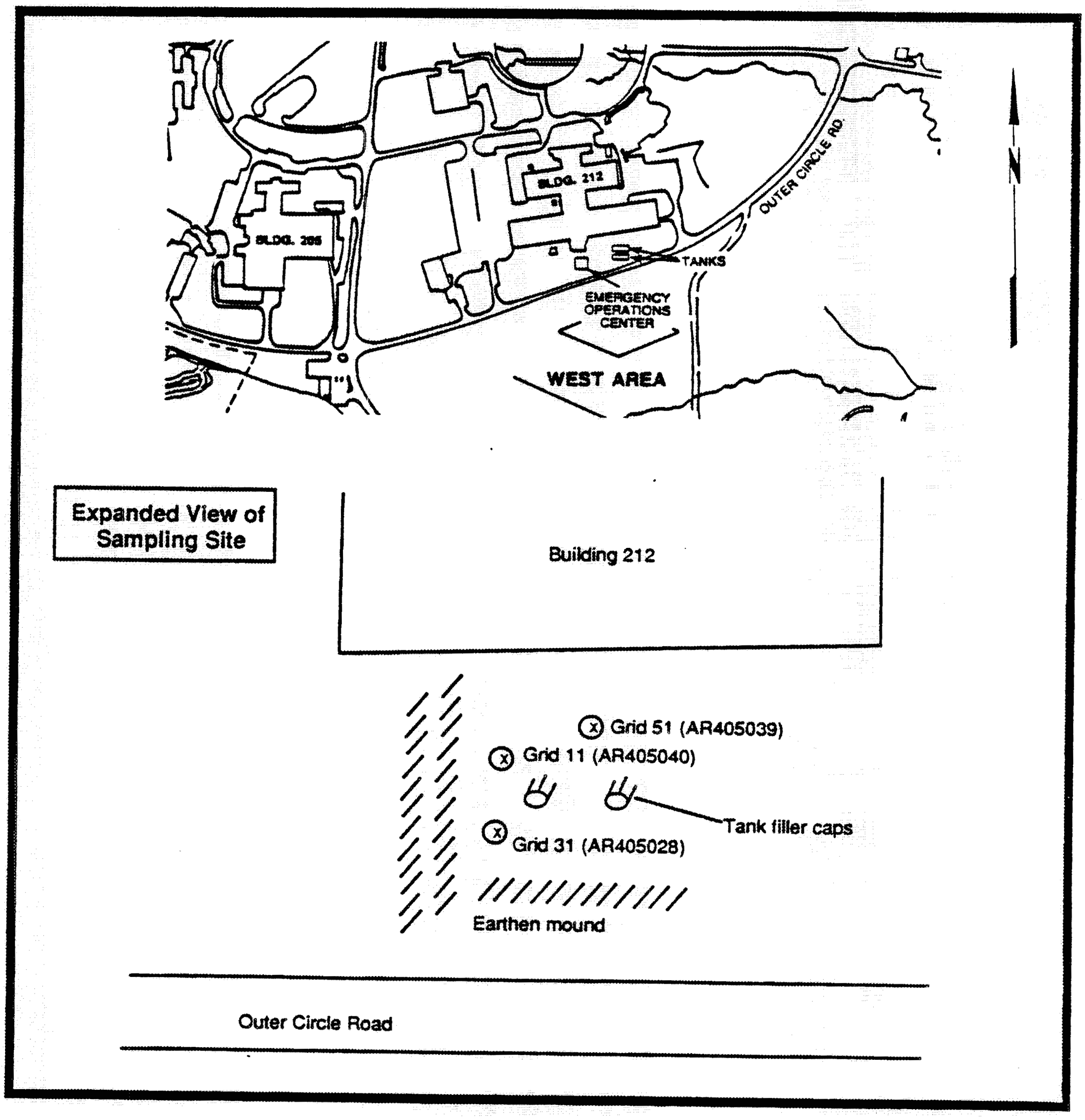

Figure 4.8b. Fuel Tanks Located Adjacent to Building 212 (Request 405)

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TABLE 4.2.8 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 8

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR404	B6 UGRD TA	TANKS	SOIL	6	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR405	B212 U. TA	TANKS	SOIL	6	6	GRAB	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	12	6		0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0
			EP TOTAL	12	6		0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0

4.14 Environmental Problem 9: Plot M, 317-319 Area, and 800 Area Landfill Wells and Reference Samples for Area Wells for the 800 and 317-319 Landfill Areas

Request Numbers: 406, 407, 408, 411, 412, 413, 414, 415, 416, 417, 418, 419, and 420.
Requester: F.H. Miller.
Finding and Basis: Undetected hazardous materials disposed of at Plot M, the 317-319 Area, and the 800 Area Landfill may be contaminating the soil and groundwater. Organic, inorganic, and radioactive wastes have been disposed of at each of these sites. However, records indicating the amounts are not complete.

4.14.1 Sampling and Analysis Objectives

Statement: Water and soil samples were to be collected to determine the presence, at method detection limits, of contaminants, i.e., organics, metals, radionuclides, that may have migrated from ANL landfills into surrounding soils and groundwater. Background samples for area wells for the 800 and 317-319 Landfill areas were to be collected to determine the reference level of groundwater in the 319 and 800 Areas.

Supporting Information: At the time of the Survey, groundwater monitoring programs did not include the entire range of contaminants suspected at the site. In addition, wells were located in a manner that may not have fully allowed monitoring in all directions of contaminant movement and at all stratigraphic levels. At the 800 Area Landfill, wells were not located at depths that would allow monitoring of potential vertical migration of the groundwater and contaminants. At Plot M, wells were not located in a manner that would intercept the phreatic surface of the groundwater table, which may have contained floating organics. Existing wells in the 317-319 Area were not located in a manner that would allow monitoring of the surface of the dolomite aquifer and the potential for vertical migration of the groundwater.

4.14.2 Sampling and Analytical Design

4.14.2.1 Sampling Design

Request 406: New Wells Adjacent to Existing Wells 6 and 9 - Water (Figs. 4.9a and 4.9b). Two new wells, one adjacent to existing Well 6 and the second adjacent to Well 9, were to be installed to aid in monitoring potential vertical migration of the groundwater. The locations were chosen based on earlier monitoring results. The recommended parameters were reasonably expected to be present, but some had not been monitored at the time of the Survey. The new wells were to be drilled to a depth of 75 ft with a screen bottom at 10 ft (from the 65- to 75-ft depth). Four-in. stainless steel casing, pea gravel for the filter, a bentonite seal 3-ft above the top of the screen, and a screen slot size of 0.02 in. were to be used. The appropriate permit for well placement was obtained (Norbert Golchert of ANL was the contact). The installation of a dedicated pump was preferable to bailing to collect samples.

Two sets of samples were to be collected [Sampling Method: Reference E4.4.4.1 (if submersible pump) or E4.4.4.4 (if bailer)] from each well. Samples could be collected consecutively for each parameter, or on separate days. Groundwater elevation was measured before sampling to determine the well volume. Because the wells were to be purged before sampling, three to five volumes were to be removed by pumping or bailing. However, because of low permeability soils (particularly Well 6), recharge may not have allowed more than one well volume to be purged. Full recharge may have taken several hours. If possible, measurements of temperature, pH, and specific conductivity were made in the field before and after sample collection as a check on the stability of the water sampled over time. Sample aliquots were to be collected in the order of their sensitivity to volatilization, e.g., volatiles, semivolatiles, tritium oxide, pesticides, PCBs, ICP-metals, and cyanide. Each well was considered its own population.

Sample IDs for Request 406 are AR406018 and -029 (for Well 6) and -030, -041, -052, and -063 (for Well 9). Samples AR406018 and AR406029 were not collected because Well 6 was considered a dry well.

<u>New Well Adjacent to Well 6</u>. The Battelle Team and Patterson Drilling Company (Bowser Morner) arrived at the drilling site (10 ft north of existing Well 6) on 03DEC87 at 1200. The team drilled to 10 ft and sampled OVA. There was no increase above instrument background. Headspace analysis on the 10 ft sample showed 90 ppm, so it was sampled. At 20 ft, 30 ft, and 40 ft, the sample in the spoon showed no increase in OVA readings above instrument background. At 49 ft, a boulder was hit. The sample collected at 10-12 ft was gray to brown clayey silt, with large rock fragments. The 20-22 ft sample was gray clay with iron staining, pebbles and rock fragments, and traces of silt. The 30-32 ft sample was gray clay with iron staining, sand, and clay stringers about 1-3 in. thick starting at 31 ft. There were pebbles and rock fragments throughout. The 40-42 ft sample was gray clay with traces of silt. The team drilled to 51 ft and stopped for the day at 1800.

On the second day's drilling for the new well adjacent to Well 6, samples collected at 51-53 and 60-62 ft showed no increase above instrument background with an OVA or Eberline 120 instrument. The sand and silt zone at 60-62 ft was unsaturated. The sample collected at 70-72 ft showed no OVA increase above instrument background. The sample collected at 51-53 ft was gray clay with traces of silt and some rock fragments. The sample collected from 60-62 ft was clayey silt grading into silty sand. The sand was 2.5 in. thick followed by silt and was unsaturated. The 70-72 ft sample was gray clay with pebbes and traces of silt. The team decided to pack sand to 55 ft to increase screen yield. Boring was stopped at 78 ft.

The new well was given ID number 12. Installation was completed 04DEC87. Well cap elevation was 756.10 ft. Ground surface elevation was 754.42 ft. The borehole diameter was 7 in. from 78 to 0 ft. Filler type was Volclay from 50 to 0 ft. Casing was 316 SS from 68 to 0 ft. Tap water was added to Bentonite pellets to ensure a seal (56.5 to 50 ft). The screen was 316 SS 20 slot (78 to 68 ft). Pack was #4 silica sand (78 to 56.5 ft).

The Battelle Team arrived to sample the well on 09DEC87 at 1025. At 1040, the OVA reading taken from the top of the well casing showed 0 ppm. At 1050, the water level in the well was 80 ft from the top of the casing. There was only 1-2 in. of water in the well. Because this well was considered a dry well, no samples were taken.

New Well Adjacent to Well 9. The Battelle Team arrived at the drilling site adjacent to Well 9 on 01DEC87. The Patterson Drilling Company (Bowser Morner) was to perform the work. The team began set-up at 1200 and drilling at 1300. An OVA check at 9 ft indicated more than 1000 ppm. At first, there was no sample recovery from 9-11 ft or 11-13 ft. Because OVA readings from the drum and closed spoon were greater than 1000 ppm, the drilling crew put on respirators. Level C work began. The driller sent the spoon back down the hole and tried to resample from 9-11 ft, but there was no recovery. They drilled to 11 ft and took the next sample from 11-13 ft. It was dark gray to black, with heavy organic material and some pebbles. OVA readings were greater than 300 ppm. The next sample interval was 19-21 ft. At 1420, the team drilled to 20 ft, but there was still poor sample recovery. The team suspected that the trap in the spoon may have been causing the problem. They then decided to drill to 22 ft and resample with no trap. The 22-24 ft sample was heavy gray to black clay with many rock fragments. OVA readings were 20 ppm down the hole. Because ambient readings were zero (no increase above instrument background), the team decided to go *back to Level D work. There was still poor recovery from 22-24 ft, so the team went back to using the trap. They drilled to 30 ft and sampled again. The sample was dark gray to black clay with abundant rock fragments. OVA showed no increase above instrument background. At 30-32, 40-42, and 50-52 ft there were no OVA readings from the spoon. The team stopped for the day. The 40-42 ft sample was dark gray clay with traces of sand. Rock fragments were abundant; some were greater than 5 cm in diameter. The 50-52 ft sample was dark gray clay, with traces of sand and abundant rock fragments (some as large as 5 cm in diameter).

The Battelle Team and Patterson Drilling Company (Bowser Morner) arrived on site for the second day's drilling on 02DEC87 at 0730. The team took rinsate samples of the spoon/composite pan, etc. Drilling was difficult because of boulders. At 1030, a sample was collected at 60 ft. The sample was gray sand and gravel saturated with clay stringers grading into dark gray clay. Groundwater was first encountered at 60 ft. The 70 ft level was reached at 1115 and the drill was out of the boulder zone. The media was gray clay with minor amounts of pebbles and trace sand. At 75 ft, it was still clay, so the team decided to drill to 77-78 ft to check for sandier media. At 78 ft, the drilling rate changed and indicated the possibility of sand and gravel. The bottom of the well was set at 78 ft and the screen from 68 to 78 ft. The sand pack went to 57 ft. Because of the clay, a large vertical interval was needed to collect water. Sand packing to 55 ft yielded a pseudo-screen of 21 ft that would intercept the saturated sand lense at 60-62 ft.

The new well was given ID number 11. Installation of the well was completed on 04DEC87. Well cap elevation was 756.10 ft. Ground surface elevation was 754.52 ft. The borehole diameter was 7 in. to 78 ft. Filler was Volclay from 50 to 0 ft. The casing was 316 SS from 68 to 0 ft. The seal was composed of Bentonite pellets to which tap water had been added to ensure a seal. The screen was 316 SS 20 slot. The pack was #4 silica sand. There was no water in the borehole as of 04DEC87.

The Battelle Team arrived on-site 07DEC87 at 1300. A total of 160-165 gal. of water was removed with a pump and collected in three 55-gal. barrels. One 55-gal. barrel was filled previously and two on 07DEC87. It was raining, very cold, and overcast. The water level had previously been pumped down to approximately 65 ft. It was pumped down to 65 ft three times on 07DEC87. The well recovered to about 45 ft from the top of the casing and was then pumped down to about 5 ft. After the well was developed, it was considered purged. The well was allowed to fill and samples AR406030 and AR406041 were collected between 1330 and 1430. Conductivity was monitored towards the end of development.

Request 407: Analysis of Wells 6 and 9 Identified in Request 406 - Soil (Figs. 4.9c and 4.9d). Split-spoon grab soil samples were to be collected (Sampling Method: Reference E5.2.1) at every 10-ft interval to the bottom of the boring (75 ft) to aid in understanding soil lithology, leachate flow, and contaminant attenuation. Field screening was to be conducted using a PID (OVA or HNU) to indicate the presence of organic constituents. Triplicate samples for volatiles were to be collected at each 10-ft interval. One of the samples was then to be placed in a closed container in the sun or a heated area for 15 to 20 minutes. After that time, the air in the container was to be tested with an OVA or HNU. If levels were measurable, the remaining two volatile samples were retained for laboratory analysis. The heated sample was to be disposed of by ANL. If the OVA or HNU indicated the absence of organic vapor, the samples were to be discarded. Each interval was also to be inspected for visible layers; each layer was to be composited for analysis. If visible layers were not encountered, each 15-ft layer was composited. Two sets of samples from each composite were to be collected and analyzed (see Sect. 4.14.2.2), except for volatiles.

Samples were to be collected in the order of their sensitivity to volatilization, and the interest of the DOE Survey team. The order was volatiles, semivolatiles, tritium oxide, pesticides/PCBs, ICP-metals, and cyanide. In the case of insufficient sample recovery, sample media for ICP-metals and cyanide was not collected. Each well was considered its own population. Approximately seven grab soil samples were to have been collected during well drilling from each location specified in Figures 4.9c and 4.9d.

Sample AR407019 was collected on 01DEC87 at 1420 from a sample depth of 11-13 ft at the new well adjacent to Well 9. OVA readings for the soil sample collected at 1420 indicated greater than 300 ppm based on an OVA headspace analysis. The radiation meter background reading was 30 cpm. QC rinsate sample AR407155 was collected on 02DEC87 at 0845. On 04DEC87, the OVA reading at the top of the well was 1 ppm. The water level was 42.6 ft. One well volume was calculated to be approximately 23 gal. of liquid. Samples AR407020, -031, -042, -053, -064, -075, -097, -100, -111, -122,-133, and -144 were not collected because OVA readings were at instrument background. Sample AR407086 was collected from the new well adjacent to Well 6 on 03DEC87 at 1315. The OVA measurement indicated 90 ppm after heating the sample to 68^{o}F. Sample bottles were refrigerated during collection, holding, and shipping.

Request 408: New Well Adjacent to Existing Well 6 - Water (Fig. 4.9e). This new well was to be located 10 ft south of existing Well 6 on the east side of the 800 Area Landfill to aid in monitoring shallow leachate contamination. Three wells in a cluster at this location would allow for monitoring of the change in hydraulic head with depth in glacial deposits and for monitoring of the recommended parameters (see Sect. 4.14.2.2). Appropriate permits were obtained (contact Norbert Golchert, ANL). The installation of a dedicated pump was preferable to bailing each time a sample was collected.

Samples were to be collected [Sampling Method: Reference E4.4.4.1 (if submersible pump) or E4.4.4.4 (if bailer)] consecutively for each parameter, instead of sampling on separate days. Groundwater elevation was to be measured before sampling was initiated to determine the well volume. The well was to be purged three to five volumes by pumping or bailing before sampling. If a dedicated pump was not used, the well was to be purged with a stainless steel or Teflon bailer. However, because of low permeability soils, recharge may not have allowed more than one volume to be purged. If purged dry, sampling began when the well recovered. If insufficient volume was available to complete sampling, the Survey team and/or the laboratory were to be notified. If possible, measurements of temperature, pH, and specific conductivity were made in the field before and after sample collection as a check on the stability of the water sampled over time. Samples were collected in the order of their sensitivity to volatilization, e.g., volatiles, semivolatiles, tritium oxide, pesticides, PCBs, ICP-metals, and cyanide. The well was considered its own population.

The Battelle Team and Patterson Drilling Company (Bowser Morner) arrived at the well drilling site on 17NOV87. Drilling was begun at 1300. Instrument background readings were determined with a PAC-4 (250 cpm), an Eberline-120 (25 cpm), and OVA (3-5 ppm). The team drilled 5 ft and measured OVA in the hole at 3-5 ppm above instrument background. (The PAC-4 instrument was erratic and affected by the cold. The temperature at 1400 was 48^{O}F). The Eberline-120 showed no increase above instrument background. At 10 ft, OVA downhole was 50-100 ppm above instrument background, but the Eberline-120 showed no increase above instrument background. At 15 ft, OVA downhole was 500-1000 ppm above instrument background, but the Eberline-120 showed no increase above instrument background. At 20 ft, OVA downhole was greater than 1000 ppm above instrument background, but the Eberline-120 showed no increase. At 25 ft, OVA downhole was 250-500 ppm above instrument background, but the Eberline-120 showed no increase. At 30 ft, OVA downhole was 100-150 ppm above background, but the Eberline-120 showed no increase. No water was encountered at 30 ft. Glacial till was very tight and dry. The team decided to drill to 33 ft and let the hole sit overnight to see if water filled the borehole. (This well represented the shallow well in the nest of three. The intermediate well set at 50 ft was already in place. The deep well of 75 ft was installed 10 ft from the other wells and was to be sampled every 10 ft.)

On the second day's drilling for this well, the team arrived on 18NOV87 at 0800. The temperature was 35-40^{o}F. Approximately 3 ft of water was in the borehole. The water table was approximately 30 ft below ground surface. The screen was set at 33-28 ft. To ensure sufficient water for sampling, the well was sanded to 20 ft. (This action produced a pseudo-screen of 13 ft.) The team also decided to alter the grout. With the cold weather, the normal cement/Bentonite grout would take too long to dry and set, such that the shrinkage that takes place with this type of grout would occur over time. Volclay grout was chosen as the replacement. This grout was a high solid, Bentonite-based clay grout that was stable, did not migrate through coarse material, eliminated grout contamination, and did not shrink.

On 18NOV87, the drillers installed the well. Installation was completed at 1130. This well was given well ID number 13. Well cap elevation was 757.09 ft. Ground surface elevation was 752.42 ft. Borehole diameter was 11 in. from 0-33 ft. Filler type was Volclay grout from 18-1 ft. Casing type was 316 SS from 27.5 to 0 ft. Seal type was Bentonite pellets from 21.5 to 18 ft. Screen type was 316 SS from 32.5 to 27.5 ft. Pack type was pea gravel from 33 to 21.5 ft. There was very little water in the well.

The Battelle Team arrived at the new well adjacent to existing Well 6 on 19NOV87 at 1415 to develop the well. The pump was a hand pump modified with an electric motor.

OVA readings at the well head varied from 5-35 ppm. The water level was 29.5 in. in the 35-ft deep well. The team pumped out 9 gal., then measured the water in a graduated stainless-steel bucket and poured it into a 55-gal. drum. The purged water was radiation screened with an Eberline-120 radiation meter. At the end of pumping, the depth to water was 34 ft 8 in. Turbidity at the end of development was very cloudy.

On 20NOV87, the water level depth measured 34 ft 6 in. Because there was slow recovery, water was not purged. On 04DEC87, the Battelle Team returned to the site at 1459. The OVA reading was 15 ppm. The water level was 33.85 ft. One gal. of liquid was removed from the well. On 07DEC87, the Sampling Team collected sample AR408010 and trip blank -032 at 1005. The well was not purged at this time and the team could only collect four volatiles samples because water in the well was insufficient. AR408021 was not collected for this reason.

Request 411: Upgradient Well 1 in the 800 Landfill Area - Water (Fig. 4.9f). Two sets of samples were to be collected from the well consecutively for each parameter. Measurements of temperature, pH, and specific conductivity were to be made in the field before and after sample collection (Sampling Method: Reference E4.4.4.1 or E4.4.4 or E4.5) as a check on the stability of the water sampled over a period of time. Samples were to be collected in the order of their sensitivity to volatilization (Sampling Method: References E4.4.4.1 and E4.4.4.4).

The Sampling Team arrived at the sampling location 04NOV87 at 0935 after making arrangements for the well to be unlocked by Tom Duffy. Skies were partly cloudy and the temperature was 65^{o}F. A radiation scan of the area showed a reading of 50 cpm. A measurement of groundwater elevation was made before sampling to determine the volume to be purged. Because the well was slow to recharge, samples were collected after sufficient volume was available for a sample for each parameter. Although only 4 L was necessary to purge the well dry, sampling was rescheduled to 17NOV87 to allow the well time to recharge. Samples AR411015 and AR411026 were collected on 17NOV87 at 0800.

Request 412: Existing Boreholes 3 and 10 at the Plot M Site (Fig. 4.9g). Boreholes 3 and 10 were to be sampled because they have had some of the highest concentrations of tritium observed at the site. The two boreholes are also part of the Palos Park Surveillance program conducted by ANL. Because the chemical hazard associated with sampling these wells was not specified on the sampling and analysis request form, the air in the wellhead was to be sampled for organic vapors by PID to determine if the vapors were present. All measurements were recorded. Two sets of samples were to be collected from each well consecutively for each parameter. Groundwater elevation was to be measured before sampling to determine the volume to be purged from the wells before sampling. Measurements of pH, temperature, and specific conductivity were made before and after sample collection. Samples were to be collected (Sampling Method: Reference E4.4.4.1 or E4.4.4.4) in the order of their sensitivity to volatilization.

The Sampling team arrived at the sampling location for Request 412 on 04NOV87 at 1500. Skies were clear and the temperature was 70^{o}F. A radiation scan showed a level of 50 cpm. Borehole 10 was checked first and found to be dry. A PID reading of 0.00 was taken at 1520. Because the well was dry, samples AR412038 and AR412049 could not be collected. After checking Borehole 3 daily for 3 wks, the team found it to recharge slowly (about 50 mL per 48 hrs). Based on further discussions with Tom Duffy of ANL, the team found that it would take a considerable amount of time to obtain a complete set of samples. The Team Leader decided to take samples as the well recharged. Borehole 3 was purged and volatile and semivolatile samples were collected after sufficient volume recharged. Samples AR412016 and AR412027 were collected from Borehole 3 on 04NOV87 at 1540.

Request 413: New Well Between DH-3 and Borehole 4 - Water (Fig. 4.9h). This new well was to be located midway between existing Well DH-3 and Borehole 4, approximately 75 to 100 ft north of Plot M to intercept the phreatic surface to determine the presence of inorganics, radionuclides, and floating organics. In addition, this well, in conjunction with DH-3 and Borehole 4, would produce a cluster of wells that monitored hydraulic head drop with depth. Appropriate permits were obtained (Norbert Golchert of ANL was the contact) before placement of the well.

The primary sampling concern was the detection of any floating organics. Following well development, the well was not to be purged before sampling so that the team could determine if "floaters" were present.

Prior to evacuation of the well for conventional sampling, the air in the wellhead was to be measured for organic vapors using OVA and all measurements recorded. An interface probe was also to be lowered into the well to determine the existence of any immiscible layer. (The probe would register as it was exposed to an organic liquid and as it passed through the layer of the well water.) If the layer was present, the thickness was to be registered, and two samples of the immiscible layer were to be collected by bottom valve bailer (Teflon or stainless steel) if the thickness was greater than 2 ft, or by peristaltic pump if less than 2 ft.

Following any necessary floater determination/collection, samples were to be collected [Sampling Method: Reference E4.4.4.1 (if submersible pump) or E4.4.4.4 (if bailer)] consecutively for each parameter instead of sampling on separate days. Groundwater elevation was to be measured before sampling was initiated to determine the well volume. If possible, three to five volumes were to be removed by pumping or bailing the well. After being purged dry, sampling was to begin when the well recovered. Measurements of temperature, pH, and specific conductivity were to be made in the field before and after sample collection to check on the stability of the water sampled over time. Samples were to be collected in the order of their sensitivity to volatilization, and the interest of the DOE Survey Team, as follows: volatiles, semivolatiles, tritium oxide, pesticides/PCBs, ICP-metals, cyanide, gross alpha, gross beta, and gamma scan. The well was considered its own population.

The Battelle Team and Patterson Drilling Company (Bowser Morner) arrived at the site of the new well (ID number 40) to be located between DH-3 and Borehole 4 on 19NOV87 at 0700. The drilling team began drilling by 0800 and reached 10 ft by 0815. OVA was measured at 5 ppm and a radiation scan with an Eberline meter showed 50 cpm. The first sample collected from 9-11 ft showed no increase above instrument background in and around the drilling rig. It was brown to tan clay with some pebbles noted. There was a 6-in. seam of sand at 10 ft grading into a sandy, silty clay. The sand seam was saturated. Per the sampling and analysis request, the team did not sample. The team drilled to 19 ft. Cuttings showed more water content. The sample collected at 19-21 ft also showed no OVA or radiation increase and, therefore, was discarded. It was gray clay with rock fragments, some cobble size. At 20 ft, there was a change in drilling rate such that the saturated zone may have been reached. The team decided to set the well at 25 ft to help in getting the well flush mounted and to help ensure that enough water was available for sampling. Well construction was begun at 1030.

For Well 40, well cap elevation was 682.15 ft. Ground surface elevation was 682.15 ft. Borehole diameter was 11 in. from 0 to 25 ft. Filler type was Volclay grout from 9 to 0 ft. Casing type was 316 SS from 14.5 to 0 ft. Seal type was Bentonite pellets from 12 to 9 ft. Screen type was 316 SS 20 slot (24.5 to 14.5 ft). Pack type was pea gravel from 25 to 12 ft.

The team arrived at Well 40 on 30NOV87 to develop the well. The silt was so thick, the hand-operated pump could not pump out the well. A Teflon bailer was used to pull out about 120 L of water. The beginning water level was 32 in. to the top of the well casing. OVA and radiation meter readings were the same as instrument background.

On 02DEC87, the team arrived at the site at 1410 to further develop the well. The depth to water was 1.3 ft. The OVA and radiation meter readings were not above instrument background. Initial conductivity before bailing was 576 umhos. After 70 L of water were removed, it was 577 umhos. After 140 L, it was 591 umhos in the well, and the depth to water was 9.2 ft and recovering quickly. The team left the site at 1630. Total water removed during development equalled 36 gal.

On 09DEC87, the team arrived at Well 40 at 1306 to develop and purge the well dry with a submersible pump and then sample it. Skies were overcast and there was mud everywhere. Well water was screened for tritium by ANL and showed 1500 nCi/L. By 1400, the team had dressed out, set-up a decontamination area, and decontaminated sampling equipment. Approximately 67 gal. were pumped from the well and collected between 1402 and 1445. By 1500, the well had recovered to the top of the well casing and was overflowing. The bailer used to develop the well was decontaminated and used to collect the QC rinsate prior to sampling. Samples AR413017 and -028 were collected at 1500. Trip blanks AR413039 and -040 were collected at 1500. Field blank sample AR413051 was collected at 0915. QC rinsate sample AR413062 was collected at 1425.

Request 414: New Well Between DH-3 and Borehole 4 - Soil (Fig. 4.9i). Split-spoon soil samples were to be collected as the well was drilled to aid in understanding soil lithology, leachate flow, and contaminant attenuation. Field screening was to be conducted using an OVA to indicate the presence of organic constituents. Soil samples were to be collected (Sampling Method: Reference E5.2.1) at every 10-ft interval to the bottom of the boring (a minimum depth of 21 ft) with a split-spoon sampler.

Triplicate samples for volatiles were to be collected at each 10-ft interval. One sample container was to be placed in a closed container in the sun for 15-20 min. The air in the container was then to be tested with an OVA or HNU. If levels were measurable, the remaining two volatiles samples were to be retained, as well as the rest of the samples, for laboratory analysis. The heated volatile sample was to be disposed of by ANL. If organic vapor levels were not measurable, the remaining two volatile samples and all other samples were to be discarded.

Samples were to be collected in the order of their sensitivity to volatilization, and the interest of the DOE Survey team, as follows: volatiles, semivolatiles, tritium oxide, pesticides/PCBs, ICP-metals, cyanide, gross alpha, gross beta, and gamma scan. If there was insufficient sample recovery, cyanide, gross alpha, gross beta, and gamma scan were not to be collected. The well was considered its own population.

Approximately two grab soil samples were to have been collected from the location shown in Fig. 4.9i. Because no OVA readings above instrument background were found, samples AR414018, -029, -030, -041, -052, and -063 were not retained for analyses.

Request 415: Red Gate Woods Picnic Area Well - Water (Fig. 4.9j). This well had not been monitored for the presence of recommended parameters. The samples collected for this request would serve as a baseline for the future and as a means of determining contaminant concentrations.

The Sampling Team arrived at the sampling location for Request 415 on 05NOV87 at 0945. Skies were clear with gusty winds and a temperature of 45°F. The well at the picnic area was used by the public and had a hand pump mechanism for easy access. In order to sample the well in the conventional manner, the pump should have been removed; however, samples were taken from the well using the existing hand pump. pH, specific conductivity, and temperature were measured (Sampling Method: References E4.4.3 and E4.4.4) at the beginning of the evacuation and at periodic intervals until it was apparent that the values for these three parameters had stabilized (to a maximum of 10 min). If parameters had not stabilized after 10 min of hand pumping, the well was to be sampled at that time and the volume of water pumped from the well prior to sampling recorded. After the parameters stabilized, conventional sampling was initiated according to the protocol listed for Request 420. Purging of the well was done by pumping water from the well using the hand pump. Water appeared clear throughout sampling. Two sets of samples were collected from the well. Samples were collected consecutively for each parameter. Samples AR415019 and -020 were collected at 0945.

Request 416: New Well Along South Edge of 319 Area Landfill - Water (Fig. 4.9k). The well was to be located along the south edge of the 319 Landfill approximately 50 ft south of the base of the landfill slope and 200 ft east of the 317 Area fence. The well was to be used to monitor potential vertical migration of contaminated groundwater into the dolomite aquifer. The total depth of the well was estimated to be 50 ft. The appropriate permits were obtained before placement of the well. (The ANL contact was Norbert Golchert.)

The Battelle Team and the Patterson Drilling Company (Bowser Morner) arrived at the site for the new well to be located along the south edge of the 319 Area Landfill on 07DEC87 at 1000. The first split-spoon sample was collected at 10-12 ft. It was silty, gray clay with iron staining and some pebbles. Headspace analysis for volatiles indicated greater than 15 ppm. The OVA reading was 3.6 ppm down the hole. Sample collection was attempted at 20-22 and 22-24 ft, but the team encountered loose gravel that clogged the spoon and prevented sample collection. A split-spoon sample collected at 30-32 ft gave an OVA reading of 2.2 ppm. The sample was silty, sandy clay; gray; very soft; and saturated. At 39-41 ft, the sample was only loose gravel, so a sample was collected at 41-43 ft. It was silty gray clay, very soft, with some pebbles noted. Background radiation was 40 cpm. Because the team did not hit bedrock at the target depth of 40 ft, they continued to drill to 50 ft per F. Miller's instructions.

On 08DEC87, drilling began at 0800. The team tried to sample from 50-52 ft, but there was no recovery. The waste in the split-spoon was very soupy clay. At 53 ft, the team hit bedrock and decided to drill 10 more ft into bedrock and set the well at 63 ft. This would help to verify the DOE Survey Team (F. Miller) concept that water in this area was moving straight down to the bedrock and then horizontally out to the regional discharge area.

On 09DEC87, the Battelle Team returned to the field to collect samples. Skies were overcast and it was cold and windy. Two grab water samples were to be collected [Sampling Method: Reference E4.4.4.1 (submersible pump) or E4.4.4.4 (if bailer)] from the well location shown in Fig. 4.9k. The water level was at 60 ft 10 1/2 in. This represented 2 ft, 1 1/2-in. of water in the well. The water in the well was felt to be left from the washings during the drilling procedures. Because there was insufficient water in the well, samples AR416010 and AR416021 could not be collected.

Request 417: New Well Along the South Edge of the 319 Area Landfill - Soil (Fig. 4.9l). Approximately five grab soil samples were to be collected from the location shown in Fig. 4.9l to aid in observing leachate flow and contaminant attenuation. Samples were to be collected (Sampling Method: Reference E5.2.1) as the well was drilled at every 10-ft interval to the top of the bedrock (estimated at 40 ft) with a split-spoon sampler. Triplicate samples were to be collected for volatiles at each 10-ft interval. One sample container was to be placed in the sun or a heated area for 10 to 15 minutes. After that time, the air in the container was to be tested with an OVA or HNU. If levels were measurable, the remaining two volatile samples, as well as the rest of the samples, were to be retained for laboratory analysis. The heated volatile sample was then disposed of by ANL. If the OVA or HNU indicated the absence of organic vapor, the remaining two volatiles and all other associated samples were to be discarded. Samples were to be collected in the order of their sensitivity to volatilization, and the interest of the DOE Survey Team, as follows: volatiles, semivolatiles, tritium oxide, pesticides/PCBs, ICP-metals, and cyanide. If there was insufficient sample recovery, samples for ICP-metals and cyanide were not to be collected. The well was considered its own population.

Sample AR417011 was collected on 07DEC87 at 1137 from 10-12 ft below the surface. The reading by OVA headspace analysis was 15 ppm. A rad scan of the area indicated 40 cpm. Samples were refrigerated during collection and while holding and shipping. Installation of the new well located along the south edge of the 319 Area Landfill was completed by Patterson Drilling Company (Bowser Morner) on 08DEC87. Borehole diameter was 7 in. from 0 to 53 ft. Filler type was Volclay grout from 46 to 0 ft. Casing type was 316 SS from 53 to 0 ft. Seal type was Bentonite pellets from 51 to 46 ft. Screen type was 316 SS 20 slot from 63 to 53 ft. Pack type was #4 silica sand. Tap water was added to the Bentonite pellets to ensure a seal. Development water was left over from the previous day. After pumping, approximately 2 1/2 ft of water was left in the well. Samples AR417022, -033, -044, and -055 were not collected because loose gravel prevented sample collection or OVA readings were at or below background.

Request 418: Monitoring Well MW-3 Located South of the 319 Area Landfill - Water (Fig. 4.9m). The Sampling Team arrived at the sampling site on 05NOV87 at 1410. The temperature was 50^{o}F under clear skies with high winds. Samples AR418012, AR418023, and AR418034 (a field preservative blank) could not be collected [Sampling Method: Reference E4.4.4.1 (if submersible pump) or E4.4.4.4 (if bailer)] because the well was dry.

Request 419: Well MW-2 Located South of the 317 Area Landfill - Water (Fig. 4.9n). Samples were to be collected from Well MW-2, located south of the 317 Landfill Area at the site boundary, to indicate whether or not hazardous substances had migrated to the site boundary. The recommended parameters (see Sect. 4.14.2.2) were reasonably expected to be present, but some were not monitored at the time of the Survey. The Sampling Team arrived at the sampling site on 05NOV87 at 1420. The temperature was 50°F under clear skies with high winds. A radiation scan of the area showed a background reading of 50 cpm. At 1425, Well MW-2 was purged to dryness. The water was colorless in appearance. Because the well recharged slowly, samples were collected as sufficient volume was available for each parameter (Sampling Method: Reference E4.4.4.1 or E4.4.4.4). A quartz interface probe was used to measure the depth to water.

The Sampling Team arrived at Well MW-2 on 06NOV87 at 1055. The temperature was 50°F and skies were clear. The water was colorless in appearance. Samples AR419013 and AR419024 were collected from 1055 to 1345. Two sets of samples were to be collected from the well. Samples were collected consecutively for each parameter. Measurements of temperature, pH, and specific conductivity were to be made in the field before and after sample collection as a check on the stability of the water sampled over time. Samples were to be collected in the order of their sensitivity to volatilization as follows: volatiles, semivolatiles, ICP-metals, cyanide, and radionuclides. Several checks of water were made throughout the week to obtain all sample aliquots.

Request 420: Upgradient Well MW-1 Located at the 317-319 Landfill Area - Water (Fig. 4.9o). Samples were to be collected from Well MW-1 to compare with samples from other wells in the 317-319 Area to aid in determining the effect of these disposal sites on the groundwater. Two to three volumes of the well were to be purged before sampling. The well was reported to recharge slowly after purging. Samples were to be collected (Sampling Method: Reference E4.4.4.1 or E4.4.4.4) as soon as sufficient volume was available for the aliquot for each parameter.

The team arrived at the 317-319 Landfill Area on 05NOV87 at 1350. The temperature was 50°F under clear, windy skies. Measurements of pH, temperature, and specific conductivity were to be made in the field before and after sample collection to check on the stability of the water over time. The team purged 0.8 gal. of water from the well before sampling. The water was clear. The team decided to allow the well to recharge until the next day. A quartz interface probe was used to measure the depth to water in the well. The team returned several times during the day (the last time at 1700 hrs). Water was recharging at about 4 in. per hour.

The team returned to the site 06NOV87 at 1015. The temperature was 50^{o}F under clear skies. Depth to water was 38.3 in. Volatiles were collected first. Other samples were collected as the well recharged. The water appeared clear for the first samples, turning to cloudy as the additional samples were collected. Collection for volatiles for samples AR420016 and AR420027 began at about 1017. The well ran dry after container F (ICP metals/uranium) aliquots were collected for AR420016 and AR420027. Because the well was slow to recharge, the team returned to the field on 09NOV87 through 11NOV87 to make several checks on well volume.

On 09NOV87, the team returned to the field at 1000. Depth to water was 37.2 in. Skies were clear with a temperature around 40^{o}F. Water was clear, turning to cloudy as the additional sample aliquots were taken. Only cyanide and tritium could be collected because there was insufficient water for the rest. Although the team checked throughout the day to determine when additional sample aliquots could be collected, strontium-90 could not be collected until 1545 on 10NOV87 and rads at 1215 on 11NOV87. QC rinsate sample AR420038 was collected on 11NOV87 at 1230.

4.14.2.2 Analytical Design

Request 406: The field parameters measured for Request 406 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, PCBs, pesticides, ICP-metals, cyanide, and tritium oxide.

Request 407: The field parameter measured for Request 407 was organic vapor using a photoionization detector (OVA). Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, cyanide, and tritium oxide.

Request 408: The field parameters measured for Request 408 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, tritium oxide, pesticides, PCBs, ICP-metals, and cyanide.

Request 411: The field parameters measured for Request 411 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, ICP-metals, pesticides, PCBs, cyanide, and tritium oxide.

Request 412: The field parameters measured for Request 412 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, ICP-metals, cyanide, tritium oxide, gross alpha, gross beta, and gamma scan.

Request 413: The field parameters measured for Request 413 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, ICP-metals, cyanide, tritium oxide, pesticides/PCBs, gross alpha, gross beta, and gamma scan.

Request 414: The field parameter to be measured for Request 414 was organic vapor with a photoionization or flame ionization detector (OVA or HNU). Parameters to be analyzed included volatiles, semivolatiles, ICP-metals, cyanide, tritium oxide, pesticides/PCBs, gross alpha, gross beta, and gamma scan.

Request 415: The field parameters measured for Request 415 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, CLP-metals (CLP), cyanide, tritium oxide, gross alpha, gross beta, and gamma scan.

Request 416: The field parameters measured for Request 416 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, cyanide, gross alpha and beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

Request 417: The field parameter measured for Request 417 was organic vapor with a PID or flame ionization detector (OVA or HNU). Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, cyanide, and tritium oxide.

Request 418: The field parameters to have been measured for Request 418 included pH, specific conductivity, and temperature. Parameters to have been analyzed included volatiles, semivolatiles, ICP-metals, cyanide, gross alpha and beta, gamma scan, plutonium, tritium oxide, total uranium, and strontium-90.

Request 419: The field parameters measured for Request 419 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, ICP-metals, cyanide, gamma scan, tritium oxide, and strontium-90.

Request 420: The field parameters measured for Request 420 included pH, specific conductivity, and temperature. Parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, ICP-metals, cyanide, gross alpha and beta, gamma scan (cobalt-60 and cesium-137), plutonium, tritium oxide, total uranium, and strontium-90.

4.14.3 Field and Analytical Data

Field Data:

Request 406: *The field data for Environmental Problem 9 are shown in Table 4.3.9. Measurements for pH, conductivity, and temperature were requested for two wells. Measurements were to be taken before and after collecting the laboratory samples from each well. The measurements in the table are from the well (Well ID 11) adjacent to Well 9. No measurements were made for the new well (Well ID 12) adjacent to Well 6 because it was considered a dry well.*

Request 407: *The field data for Environmental Problem 9 are shown in Table 4.3.9. The field measurement requested is the PID readings for the new wells adjacent to Wells 6 (Well ID 12) and 9 (Well ID 11). Values of 90 were obtained for the well adjacent to Well 6 (Well ID 12) and 300 ppm for the well adjacent to Well 9 (Well ID 11). Although not requested, radiation measurements were reported and ranged from 30 to 40 cpm.*

Request 408: *The field data for Environmental Problem 9 are shown in Table 4.3.9. Only one reading for the requested measurements of pH, conductivity, and temperature is given. Of particular significance is the conductivity reading of 1240 mS/cm. The second reading, to be taken after the sampling, was not reported.*

Request 411: *The field data for Environmental Problem 9 are shown in Table 4.3.9. pH, conductivity, and temperature readings taken before and after sample collection show very uniform values of 2.8, 7.8, and 6.6 for the conductivity, pH, and temperature, respectively.*

Request 412: *The field data for Environmental Problem 9 are shown in Table 4.3.9. pH, conductivity, and temperature values are from Borehole 3; Borehole 10 was dry and readings could not be taken. Although two sets of readings were requested for each borehole, the slow recharge required days to complete and precluded the second set of measurements.*

Request 413: *The field data for Environmental Problem 9 are shown in Table 4.3.9. Measurements for pH, conductivity, temperature, and PID readings are given. The identical values for before and after sample collection attest to the equilibrium of the water.*

Request 414: *PID readings were requested, but were not recorded. Because no OVA readings above instrument background were found by the sampling team, no samples were retained for analyses.*

Request 415: *The field data for Environmental Problem 9 are shown in Table 4.3.9. One set of measurements for conductivity, pH, and temperature was recorded. The relatively low conductivity value, as compared with other samples in the problem is notable. This request required that the three measurements be taken periodically until the readings stabilized; with only one reading, the objective was not satisfied.*

Request 416: *Although conductivity, pH, and temperature measurements were requested, no values were reported.*

Request 417: *The field data for Environmental Problem 9 are shown in Table 4.3.9. One PID reading of 15 ppm is given for this request which called for a maximum of eight readings.*

Request 418: *Because the well was dry, no readings for conductivity, pH, and temperature could be made.*

Request 419: *No readings for conductivity, pH, and temperature were reported for this request.*

Request 420: *No readings for conductivity, pH, and temperature were reported for this request.*

Field Data Evaluation:

Request 406: Because two trip blanks were assigned the same numbers (AR40630 and -041) as the samples, the reported data are suspect.

Request 407: The PID readings showed that volatile organics were present. If the sample numbers correspond to successive depths, they represent the first 3 ft (AR407019) and the 21-24 ft (AR407086) depth. Readings were requested down to the 75 ft depth of the well. (Note: The ANL Sampling and Analysis Plan and the sampling do not agree in terms of combining segments.)

Request 408: The request required two field readings (before and after sampling). With only one reading, the high conductivity measured cannot be verified.

Request 411: Because the instruments were calibrated, the measurements are reliable.

Request 412: Because Borehole 10 was dry, no measurements could be made. Only one reading was recorded for Borehole 3, but the data are reliable because the instrument was calibrated prior to taking the readings.

Request 413: The PID readings were requested in the Sampling Design rather than the Analytical Design section. The recorded data show that no vaporized organics were present.

Request 414: The field PID readings requested were included as part of Request 413. As noted, no vaporized organics were detected.

Request 415: The values listed are the stabilized values after pumping the well. Because the instrument was calibrated prior to field use, the data are reliable. (Note: The ANL Sampling and Analysis Plan should have called for recording the values before and after sampling so that stability could be demonstrated with actual values.)

Request 416: Because there was insufficient water in the well, samples AR416010 and -021 could not be collected.

Request 417: The plan called for a maximum of five PID measurements as the sampling proceeded. Four samples were not collected and/or retained for analysis because loose gravel prevented collection or OVA readings were at or below instrument background. The readings were only recorded for sample AR417011.

Request 418: Because the well was dry, measurements could not be made.

Request 419: Not applicable because no field data were reported.

Request 420: Not applicable because no field data were reported.

Analytical Data:

Request 406:

Anions and cyanide. There were 13 requests for cyanide in this category. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 μg/L (water) or the hazardous waste classification level of 250 mg/kg for solids. For this request, the samples are AR406030 and AR406041.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the 12 metals detected, the following 5 were below either the CRDL or the IDL in both samples: barium, beryllium, cadmium, potassium, and vanadium. Zinc was detected at 33 and 40 μg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, and sodium.

PCBs and other extractables. 4,4'-DDD was found in an estimated concentration of 0.031 μg/L in sample AR406030.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. Because Well 6 was dry, no data are given for samples AR406018 or AR406029. Samples AR406030 and AR406041 from Well 9 each had six detectable compounds present, but only bis(2-ethylhexyl)phthalate could be identified in measurable amounts in both samples. Concentrations of bis(2-ethylhexyl)phthalate were 0.030 and 0.023 mg/L in these two samples. Those were the highest measured or estimated concentrations of any compound in the two samples. Butylbenzylphthalate was identified in sample AR406030 with a concentration of 0.015 mg/L. All other compounds detected in these samples were tentatively identified and occurred in estimated concentrations of 0.020 mg/L or less.

Volatile organics. There were four compounds identified in one sample and six compounds in the other. All concentrations were estimated at under 0.010 mg/L.

Radiochemistry. Water from the new well adjacent to Well 9 (Well ID 11) contained no detectable tritium.

Request 407:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 μg/L (water) or the hazardous waste classification level of 250 mg/kg for solids. The soil samples for this request are AR407086 and Ar407019.

Metals. Analytical results for metals in soil are presented in Table 4.3.9. Of the 20 metals detected, the following 5 were below either the CRDL or the IDL in both samples: cadmium, cobalt, lead, selenium, and sodium. Of the remaining metals detected, antimony ranged from 62 to 71 mg/kg, arsenic was 66 mg/kg, barium ranged from 82 to 101 mg/kg, beryllium was 1.3 mg/kg, chromium was 18 mg/kg, copper ranged from 27 to 29 mg/kg, nickel from 18 to 30 mg/kg, and zinc from 72 to 77 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

PCBs and other extractables. There were four PCB/pesticide compounds identified in sample AR407019 with concentrations below the quantitation limit. The estimated concentration of endrin in sample AR407019 was 3.5 μg/kg.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. Sample AR407086 contained seven detectable semivolatile organic compounds. No compound was identified in measurable concentrations in this soil sample. There were two unknowns with estimated concentrations of 1.2 and 3.6 mg/kg, but all other compounds detected had estimated concentrations of less than 1 mg/kg. Only bis(2-ethylhexyl)phthalate and pyrene were identified. Concentrations of *both were estimated at less than 0.25 mg/kg. Sample AR407019 had 27 detectable semivolatile organic compounds. Unknowns were detected in estimated concentrations of 11 and 12 mg/kg in this soil sample. Most of the other compounds identified were measured or estimated in concentrations of from 1 to 10 mg/kg. Bis(2-ethylhexyl)phthalate and naphthalene were the only compounds identified in measurable quantities (2.5 and 7.6 mg/kg, respectively).*

Volatile organics. There were seven compounds detected in one sample and eight in the other. Methylene chloride and 1,1,1-trichloroethane were detected in the blank and in the samples. Methylene chloride had its highest concentration (0.015 mg/kg) in AR407019. The 1,1,1-trichloroethane had its highest concentration (0.013 mg/kg) in AR407019. Concentrations of all other compounds detected were estimated at less than 0.020 mg/kg. Chloroform was detected in concentration of 0.018 mg/kg in the rinsate. Tetrahydrofuran was tentatively identified in both samples.

Radiochemistry. Soil from the new well adjacent to Well 6 (Well ID 12) (samples AR407086 and AR407019) contained no detectable tritium. Rinsate sample AR407155 also contained no tritium.

Request 408:

Anions and cyanide. No samples were collected due to insufficent well volume.

Extractable organics. No samples were collected due to insufficent well volume.

Volatile organics. There were four compounds identified in this bailer sample. Of these four, toluene was also present in the blank. All concentrations were below quantitation limits and were all estimated at less than 0.010 mg/L.

Radiochemistry. No samples were collected due to insufficent well volume.

Request 411:

<u>Anions and cyanide</u>. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

<u>Metals</u>. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the 16 metals detected, the following 3 were below either the CRDL or the IDL in both samples: beryllium, cobalt, and vanadium. Of the remaining metals detected, barium ranged from 223 and 292 µg/L, cadmium was at 5.1 µg/L, chromium was at 123 µg/L, copper was at 32 µg/L, nickel was at 87 µg/L, and zinc was at 83 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and sodium.

<u>PCBs and other extractables</u>. Heptachlor epoxide was detected in an estimated concentration of 0.06 µg/L in sample AR411026.

<u>Extractable organics</u>. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. These upgradient samples were taken to provide control data. There were nine compounds identified in sample AR411015 and seven in sample AR411026. An unknown phthalate was present in an estimated concentration of 0.11 mg/L in one of these groundwater samples (AR411015) and was also detected in the analytical blank. No other compounds were detected in estimated concentrations of greater than 0.010 mg/L. No compounds were identified in measurable quantities in either sample.

<u>Volatile organics</u>. There were six compounds identified in each of these two groundwater samples. Of these six, methylene chloride and acetone were identified in the blank. Methylene chloride was measured at 0.023 mg/L in one sample and at 0.015 mg/L in the other. All other concentrations were less than 0.010 mg/L.

Radiochemistry. Two water samples in upgradient Well 1 contained 110 and 250 pCi of tritium per liter.

Request 412:

Anions and cyanide. Samples were not collected due to low level volume.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. There was one compound detected in one of these (bailer) samples and six compounds were detected in the other. Bis(2-ethylhexyl)phthalate was detected in concentrations too small to measure (estimated 0.008 mg/L) in both samples. The other 5 compounds (all unknowns) were detected in sample AR412027. The greatest estimated concentration of these unknowns was 0.012 mg/L.

Volatile organics. There were six compounds identified in each of these bailer samples. Two of these compounds (methylene chloride and acetone) were also present in the associated blank. All concentrations were estimated at less than 0.010 mg/L.

Radiochemistry. Samples were not collected due to low level volume.

Request 413:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the ten metals detected, the following four were below the CRDL in both samples: barium, beryllium, iron, and vanadium. Other metals detected were aluminum, calcium, magnesium, manganese, potassium, and sodium.

<u>PCBs and other extractables</u>. Alpha BHC was detected in an estimated concentration of 0.006 µg/L in sample AR413017.

<u>Extractable organics</u>. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. There were two unknown compounds identified in each of the two samples for this request. No semivolatile organic compound was positively identified in these samples. No tentatively identified or unknown semivolatile organic compound was estimated to have concentrations higher than 0.031 mg/L. A compound tentatively identified as a possible decane had that estimated concentration in the rinsate, and an unknown was estimated at that concentration in sample AR413028. All other estimated concentrations were lower than 0.031 mg/L.

<u>Volatile organics</u>. There were four compounds identified in each of these two pump samples. All concentrations were estimated at 0.005 mg/L or less.

<u>Radiochemistry</u>. Two water samples from the new well between DH-3 and Borehole 4 contained small, detectable amounts of actinium-228 (58 to 59 pCi/L), lead-212 (37-51 pCi/L), and lead-214 (19 pCi/L). Tritium contamination ranged from 1×10^6 to $1.1. \times 10^6$ pCi/L.

Field blank samples AR413051C-H contained <1 pCi/L of plutonium-239, strontium-90, and gross alpha activity. Uranium was detected at 0.3 µg/L. Tritium at 6.5 pCi/L and lead-212 at 44 pCi/L were also detected. The rinsate (AR413062I-K) contained bismuth-214 (36 pCi/L), tritium (220 pCi/L), and lead-212 (46 pCi/L).

Request 414:

<u>Anions and cyanide</u>. Because samples were not retained by BCD for analysis (no OVA readings above instrument background), no analytical data are available for this request.

Extractable organics. Because samples were not retained by BCD for analysis (no OVA readings above instrument background), no analytical data were available for this request.

Radiochemistry. Because samples were not retained by BCD for analysis (no OVA readings above instrument background), no analytical data were available for this request.

Request 415:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the 17 metals detected, the following 11 were below either the CRDL or IDL in both samples: aluminum, arsenic, barium, cadmium, copper, mercury, nickel, potassium, selenium, thallium, and vanadium. Other metals detected were iron, magnesium, manganese, sodium, and zinc (1790 µg/L).

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. There were four compounds selected in one of these samples and seven compounds in the other. There were three identified compounds and two unknown compounds detected in the blank which were also detected in estimated concentrations of less than 0.1 mg/L in one or both of the samples. Only two compounds were detected in the samples and not in the blank, and these compounds were both unknowns with estimated concentrations of less than 0.075 mg/L.

Volatile organics. There were five compounds identified in each of these two groundwater samples. Methylene chloride was also detected in the blank. All concentrations were estimated at 0.005 mg/L or less.

Radiochemistry. Two water samples from the well at the Red Gate Woods picnic area contained from 5 to 15 pCi/L of gross alpha and 0 to 1000 pCi/L of gross beta activity. Tritium was detected at 610 to 1100 pCi/L.

Request 416:

Samples were not collected because of insufficient sample media. Therefore, no analytical data are available for this request.

Request 417:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

Metals. Analytical results for metals in soil are presented in Table 4.3.9. Of the 20 metals detected, the following 7 were below the CRDL in the sample collected: arsenic, barium, beryllium, cadmium, lead, selenium, and sodium. Of the remaining metals detected, arsenic was 58 mg/kg, chromium 16 mg/kg, cobalt 12 mg/kg, copper 34 mg/kg, nickel 34 mg/kg, and zinc 101 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. There were 20 compounds detected in the one sample collected for this request (sample AR417011). In sample AR417011 there were five unknowns with concentrations estimated to be at least 1 mg/kg, the highest of these being 4.1 mg/kg. Bis(2-ethylhexyl)phthalate was the only compound identified, but the concentration was estimated (at 0.32 mg/kg) because it was too small to measure.

Volatile organics. There were seven compounds detected in this soil sample. Methylene chloride and a compound tentatively identified as tetrahydrofuran were also detected in *the blank. All concentrations were measured or estimated at less than 0.070 mg/kg. The highest estimated concentration was toluene at 0.069 mg/kg. All others were less than 0.030 mg/kg.*

Radiochemistry. Grab sample AR417011 from this new well contained 185 pCi/L of tritium.

Request 418:

No samples were collected from this well because the well was dry.

Request 419:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the 17 metals detected, the following 9 were below either the CRDL or the IDL in both samples: aluminum, barium, cadmium, chromium, copper, lead, nickel, potassium, and vanadium. Other metals detected were calcium, iron, magnesium, manganese, sodium, and zinc (42 µg/L).

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. Bis(2-ethylhexyl)phthalate was identified in both of these bailer samples, and an unknown (which was also detected in the method blank) was also detected in both samples. The highest measured or estimated concentration of these compounds was 0.050 mg/L of bis(2-ethylhexyl)phthalate in sample AR419013.

Volatile organics. There were ten compounds identified in each of these two bailer samples. The highest measured concentrations were 1,1-dichloroethane at 0.029 and

0.030 mg/L. There were also 0.012 and 0.013 mg/L of 1,1,1-trichloroethane measured in these respective samples. All other measured or estimated concentrations were less than 0.010 mg/L. Methylene chloride was also present in the blank.

Radiochemistry. Two samples from Well MW-2 contained from 60 to 280 pCi/L of tritium. One sample contained 1.9 pCi/L of strontium-90.

Request 420:

Anions and cyanide. There were 13 requests for this problem. Of these, 10 were requests for cyanide in water systems and 3 were in soil systems. All samples were less than the detection level of 2 µg/L (water) or the hazardous waste classification level of 250 mg/kg for solids.

Metals. Analytical results for metals in groundwater are presented in Table 4.3.9. Of the 14 metals detected, the following 8 were below either the CRDL or the IDL in both samples: aluminum, barium, beryllium, cadmium, nickel, potassium, vanadium, and zinc. Other metals detected were calcium, iron, magnesium, manganese, sodium, and uranium (1 µg/L).

Extractable organics. Analytical results for semivolatile organic compounds are presented in Table 4.3.9. Bis(2-ethylhexyl)phthalate was detected in quantities too small to measure in three samples. It was also detected in the rinsate and in the method blank. That was the only compound detected in sample AR420038. One other compound, an unknown, was also detected in sample AR420027 in very small estimated concentration.

Volatile organics. In these two groundwater samples, there were five volatile compounds detected in one sample and six in the other. Of these, acetone and methylene chloride were also present in the blank. All measured or estimated concentrations were 0.010 mg/L or less except for the rinsate which had an estimated 0.018 mg/L of toluene.

Radiochemistry. Two upgradient Well MW-1 water samples contained from 350 to 670 pCi/L of tritium. One sample contained 1.9 pCi of strontium-90. Uranium-234 (3 x 10^{-4} µg/L), uranium-235 (from 0.03 to 0.06 µg/L) and uranium-238 (4.5 - 4.7 µg/L) also were detected. Rinsate sample AR420038 contained tritium total strontium (2.2 pCi/L), and uranium-234 (3 x 10^{-5} µg/L) and uranium-238 (0.27 µg/L).

Analytical Data Evaluation:

Request 406:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Zinc was the only metal of interest detected above the CRDL in the samples for Request 406.

PCBs and other extractables. None of the PCBs/pesticides detected in these samples were in concentrations high enough for confirmation by GC/MS. Sample AR407019 contained an estimated 3.5 µg/L of endrin.

Extractable organics. Only bis(2-ethylhexyl)phthalate could be identified in measurable amounts in both samples. Concentrations of bis(2-ethylhexyl)phthalate were 0.030 and 0.023 mg/L in these two samples. Those were the highest measured or estimated concentrations of any compound in the two samples. Butylbenzylphthalate was identified in sample AR406030 with a concentration of 0.015 mg/L. All other compounds detected in these samples were tentatively identified and occurred in estimated concentrations of 0.020 mg/L or less.

Volatile organics. All concentrations were estimated at under 0.010 mg/L. The analysis holding time was exceeded by 50-95 days.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 407:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Eight metals of interest--antimony, arsenic, barium, beryllium, chromium, copper, nickel, and zinc--were detected above the CRDL in both samples.

PCBs and other extractables. None of the PCBs/pesticides detected in these samples were in concentrations high enough for confirmation by GC/MS. Sample AR407019 contained an estimated 3.5 µg/kg of endrin.

Extractable organics. No compound was identified in measurable concentrations in soil sample AR407086. There were two unknowns with estimated concentrations of 1.2 and 3.6 mg/kg, but all other compounds detected had estimated concentrations of less than 1 mg/kg. Only bis(2-ethylhexyl)phthalate and pyrene were identified. Concentrations of both were estimated at less than 0.25 mg/kg. Unknowns were detected in estimated concentrations of 11 and 12 mg/kg in soil sample AR407019. Most of the other compounds identified were measured or estimated in concentrations of from 1 to 10 mg/kg. Bis(2-ethylhexyl)phthalate and naphthalene were the only compounds identified in measurable quantities (2.5 and 7.6 mg/kg, respectively).

Volatile organics. Methylene chloride had its highest concentration at 0.015 mg/kg, and 1,1,1-trichloroethane had its highest concentration at 0.013 mg/kg. These were measured concentrations. Concentrations of all other compounds detected in the samples were estimated at less than 0.020 mg/kg. Chloroform was detected in concentration of 0.018 mg/kg in the rinsate. Tetrahydrofuran was tentatively identified in both samples.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 408:

Anions and cyanide. NA.

Extractable organics. NA.

Volatile organics. All concentrations were estimated at less than 0.010 mg/L. The analytical holding time was exceeded by 50-95 days.

Radiochemistry. NA.

Request 411:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Six metals of interest--barium, cadmium, chromium, copper, nickel, and zinc--were detected above the CRDL in the samples for Request 411.

PCBs and other extractables. None of the PCBs/pesticides detected in these samples were in concentrations high enough for confirmation by GC/MS. Sample AR407019 contained an estimated 3.5 μg/L of endrin.

Extractable organics. An unknown phthalate was present in an estimated concentration of 0.11 mg/L in sample AR411015 and was also detected in the analytical blank. No other compounds were detected in estimated concentrations of greater than 0.010 mg/L. No compounds were identified in measurable quantities in either sample.

Volatile organics. Methylene chloride was measured at 0.023 mg/L in one sample and at 0.015 mg/L in the other. It was also present in the blank. All other concentrations were less than 0.010 mg/L.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 412:

Anions and cyanide. NA.

Extractable organics. Bis(2-ethylhexyl)phthalate was detected in concentrations too small to measure (estimated 0.008 mg/L) in both samples. Other unknowns were detected in sample AR412027. The greatest estimated concentration of these unknowns was 0.012 mg/L.

Volatile organics. All concentrations were estimated at less than 0.010 mg/L.

Radiochemistry. NA.

Request 413:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Barium and beryllium were detected below the CRDL in the samples for Request 413.

PCBs and other extractables. None of the PCBs/pesticides detected in these samples were in concentrations high enough for confirmation by GC/MS. Sample AR407019 contained an estimated 3.5 μg/L of endrin.

Extractable organics. No semivolatile organic compound was positively identified in these samples. No tentatively identified or unknown semivolatile organic compound was estimated to have concentrations higher than 0.031 mg/L.

Volatile organics. All concentrations were estimated at 0.005 mg/L or less. All analytical holding times were exceeded by 50-95 days.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 414:

Anions and cyanide. NA.

Extractable organics. NA.

Radiochemistry. NA.

Request 415:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Only five metals were detected above the CRDL in the samples for Request 415.

Extractable organics. Only two compounds were detected in the samples and not in the blank, and these compounds were both unknowns with estimated concentrations of less than 0.075 mg/L.

Volatile organics. Methylene chloride was detected in the blank. All concentrations were estimated at 0.005 mg/L or less.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 416: NA.

Request 417:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Six metals of interest--antimony, chromium, cobalt, copper, nickel, and zinc--were detected above the CRDL in the sample collected.

Extractable organics. In sample AR417011 there were five unknowns with concentrations estimated to be at least 1 mg/kg, the highest of these being 4.1 mg/kg. Bis(2-ethylhexyl)phthalate was the only compound identified, but the concentration was too small to measure.

Volatile organics. All concentrations were measured or estimated at less than 0.070 mg/kg. The highest estimated concentration was toluene at 0.069 mg/kg. All others were less than 0.030 mg/kg. All analytical holding times were exceeded by 50-95 days.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 418: NA.

Request 419:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Only six metals were detected above the CRDL in the samples for Request 419.

Extractable organics. The highest measured or estimated concentration of these compounds was 0.050 mg/L of bis(2-ethylhexyl)phthalate in sample AR419013.

Volatile organics. The highest measured concentrations of 1,1-dichloroethane were 0.029 and 0.030 mg/L. There were also 0.012 and 0.013 mg/L of 1,1,1-trichloroethane measured in these respective samples. All other measured or estimated concentrations were less than 0.010 mg/L. Methylene chloride was also present in the blank.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

Request 420:

Anions and cyanide. Instrument calibration with subsequent quality control solution confirmation and calibration blanks were in compliance; these and other considerations (refer to Environmental Problem 2) make the results reliable.

Metals. Only five metals were detected above the CRDL in the samples for Request 420.

Extractable organics. Bis(2-ethylhexyl)phthalate was detected in both samples in quantities too small to measure. One other compound, an unknown, was also detected in sample AR420027 in an estimated concentration of 0.004 mg/L.

Volatile organics. Acetone and methylene chloride were present in the blank. All measured or estimated concentrations were 0.010 mg/L or less except for the rinsate which had an estimated 0.018 mg/L of toluene.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.14.4 Limitations and Qualifications

Request 406: The sampling plan is rated Quality Level I. The field sampling is rated Quality Level III. The overall analytical rating is Quality Level II.

Request 407: The sampling plan is rated Quality Level I. The field sampling is rated Quality Level II. The overall analytical rating is Quality Level III.

Request 408: The sampling plan and field sampling are rated Quality Level II. The overall analytical rating is Quality Level III.

Request 411: Both the sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level I.

Request 412: The sampling plan is rated Quality Level I. Although only one reading is recorded, the sampling is rated Quality Level I because the recharge rate of the well was extremely slow, i.e., 25 mL per day, and final measurements would require inordinate waiting time. The overall analytical rating is Quality Level II.

Request 413: The sampling plan is rated Quality Level I; the field sampling is rated Quality Level II. The overall analytical rating is Quality Level II.

Request 414: The sampling plan is rated Quality Level I; the field sampling is rated Quality Level III. An overall analytical rating is not applicable.

Request 415: The sampling design is rated Quality Level II; and the sampling is rated Quality Level I. The overall analytical rating is Quality Level I.

Request 416: The sampling plan is rated Quality Level I; the field sampling is rated Quality Level II. An overall analytical rating is not applicable.

Request 417: The sampling plan is rated Quality Level I, the field sampling is rated Quality Level II. The overall analytical rating is Quality Level II.

Request 418: The sampling plan is rated Quality Level I. There is no rating for field sampling and analytical chemistry because the well was dry.

Request 419: The sampling plan is rated Quality Level I. The rating for the field sampling is Quality Level II. The overall analytical rating is Quality Level I.

Request 420: The sampling plan is rated Quality Level I. The rating for the field sampling is Quality Level II. The overall analytical rating is Quality Level I.

Field Data: When a rating is less than Quality Level I, the basis for the lower rating is explained for each request.

Request 406: Because samples and trip blanks were assigned the same sample code, even the two out of four readings that were obtained cannot be used to characterize the well.

Request 407: The sampling plan for compositing samples and the field compositing did not agree. More PID readings would have provided valuable information on the depth of vaporized organics found.

Request 408: The PID reading is highest for this problem; the second requested reading would have been extremely valuable in confirming the initial reading.

Request 411: The Quality Level rating is I.

Request 412: The Quality Level rating is I.

Request 413: The rating of Quality Level II is based on poor documentation regarding the labeling of the sample bottles.

Request 414: The rating of Quality Level III is based on poor documentation regarding the labeling of the sample bottles and for not retaining samples.

Request 415: The rating of Quality Level II is based on the recommendation that the establishment of stabilization in the sampling plan be more specific, such as requesting the recording of two or more successive stable measurements over a given time or volume span.

Request 416: The rating of Quality Level II is mainly based on the absence of requested field data.

Request 417: The rating of Quality Level II is mainly based on insufficient field data.

Request 418: The Quality Level rating is I.

Request 419: The Quality Level II rating is based mainly on the absence of requested field information.

Request 420: The Quality Level II rating is based mainly on the absence of requested field information.

Analytical Data:

Request 406:

Anions and cyanide. The data are Quality Level I.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level III.

Radiochemistry. All data are Quality Level I.

Request 407:

Anions and cyanide. The data are Quality Level I.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. All data are Quality Level I.

Request 408:

Anions and cyanide. NA.

Extractable organics. NA.

Volatile organics. All results are Quality Level III.

Radiochemistry. NA.

Request 411:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum and vanadium at Quality Level II.

PCBs and other extractables. Data for AR411026 and AR420038 are Quality Level III because the surrogate standard was not found in the specified retention time window.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. All data are Quality Level I.

Request 412:

Anions and cyanide. NA.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. NA.

Request 413:

Anions and cyanide. The data are Quality Level I.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level III.

Radiochemistry. All data are Quality Level I.

Request 414:

No analytical data were available for this request because samples were not retained by the sampling team.

Request 415:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for iron, sodium, and zinc at Quality Level II.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. All results are Quality Level I.

Request 416:

Because there was insufficient water in the well, samples could not be collected.

Request 417:

Anions and cyanide. The data are Quality Level I.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level III.

Radiochemistry. All data are Quality Level I.

Request 418:

Because the well was dry, no water samples could be collected.

Request 419:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for iron, sodium, and zinc at Quality Level II.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. All results are Quality Level I.

Request 420:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum at Quality Level II.

PCBs and other extractables. Data for AR411026 and AR420038 are Quality Level III because the surrogate standard was not found in the specified retention time window.

Extractable organics. Data were of Quality Level III due mainly to mass spectral uncertainty (for tentatively identified compounds) and occasionally to surrogate recovery problems or concentrations being below quantitation limits.

Volatile organics. All results are Quality Level I except results for target volatile compounds detected at levels below the quantitation limits.

Radiochemistry. All results are Quality Level I.

Environmental Problem: 9
Request Number: 406

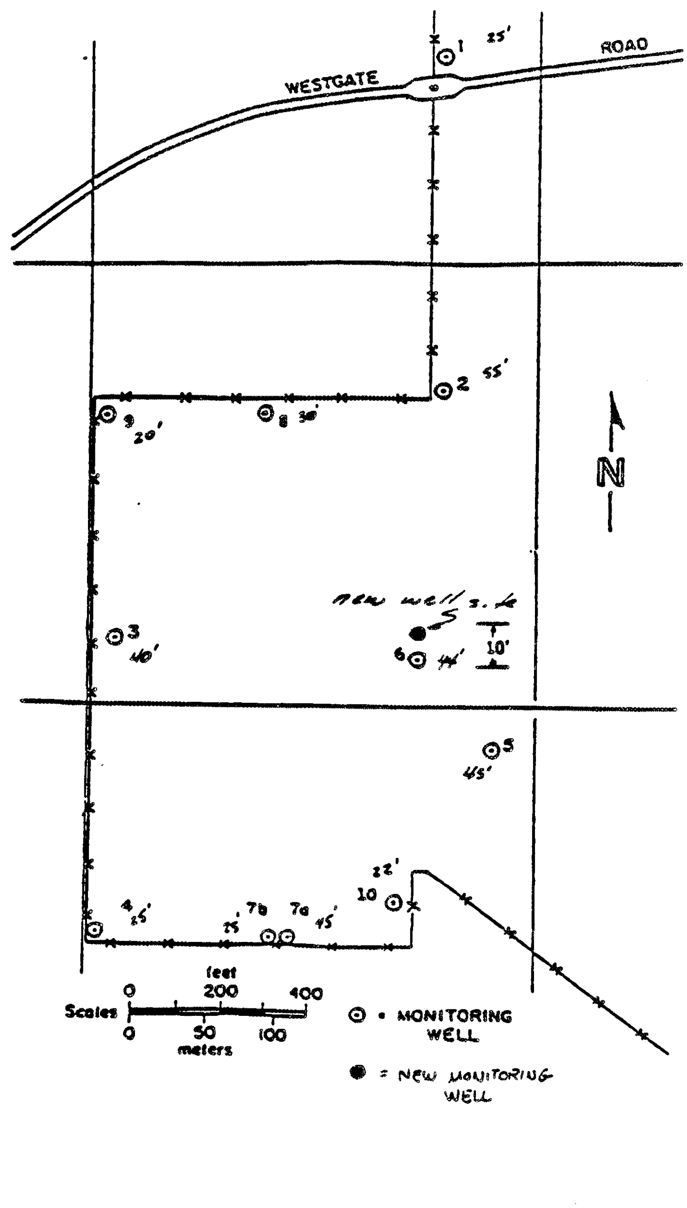


Figure 4.9a. New Well Site in the 800 Landfill Area
10 Ft. North of Existing Well 6 (Request 406)

Environmental Problem: 9
Request Number: 406

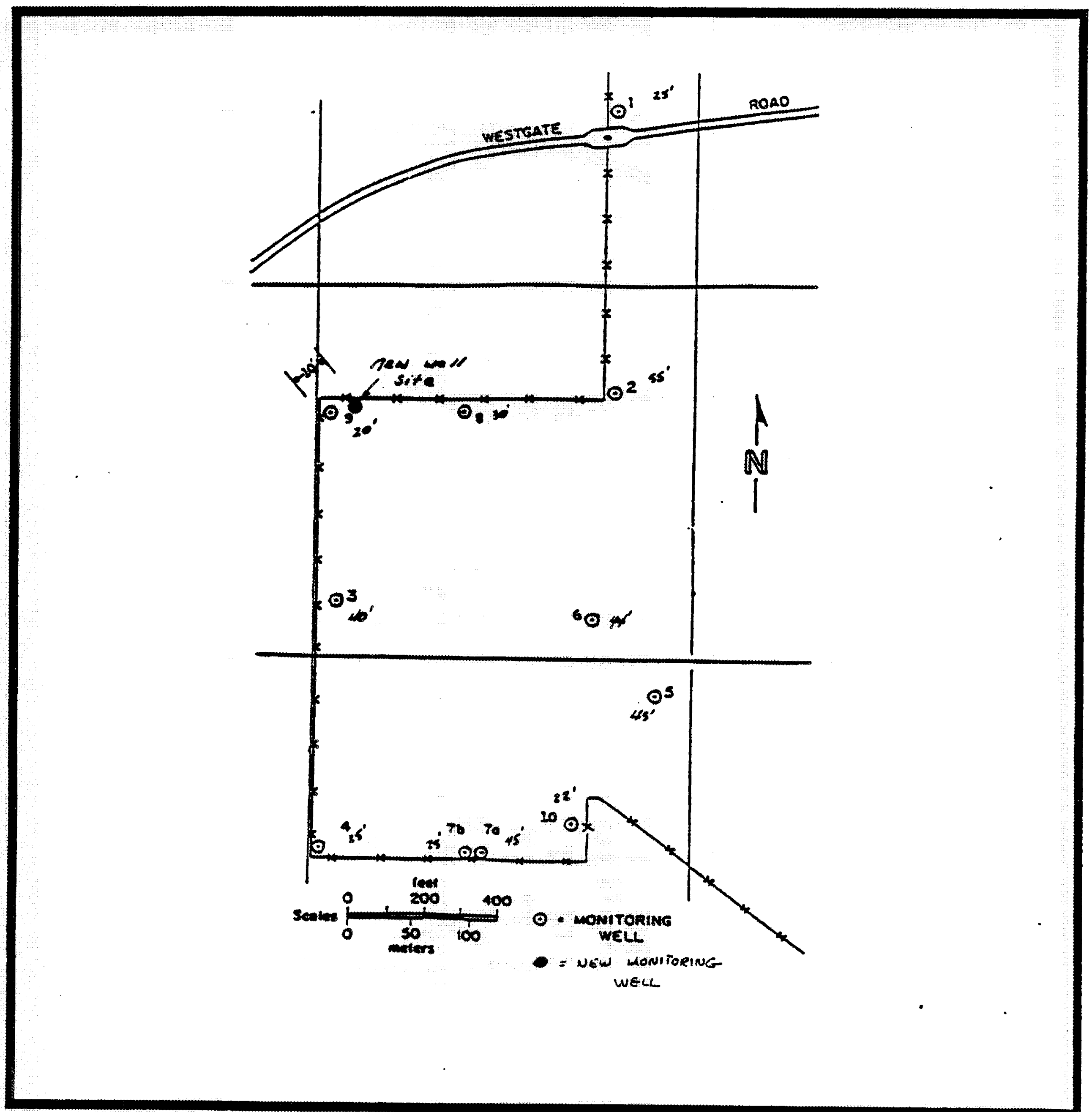


Figure 4.9b. New Well Site in the 800 Landfill Area
10 Ft. Northeast of Existing Well 9 (Request 406)

Environmental Problem: 9
Request Number: 407

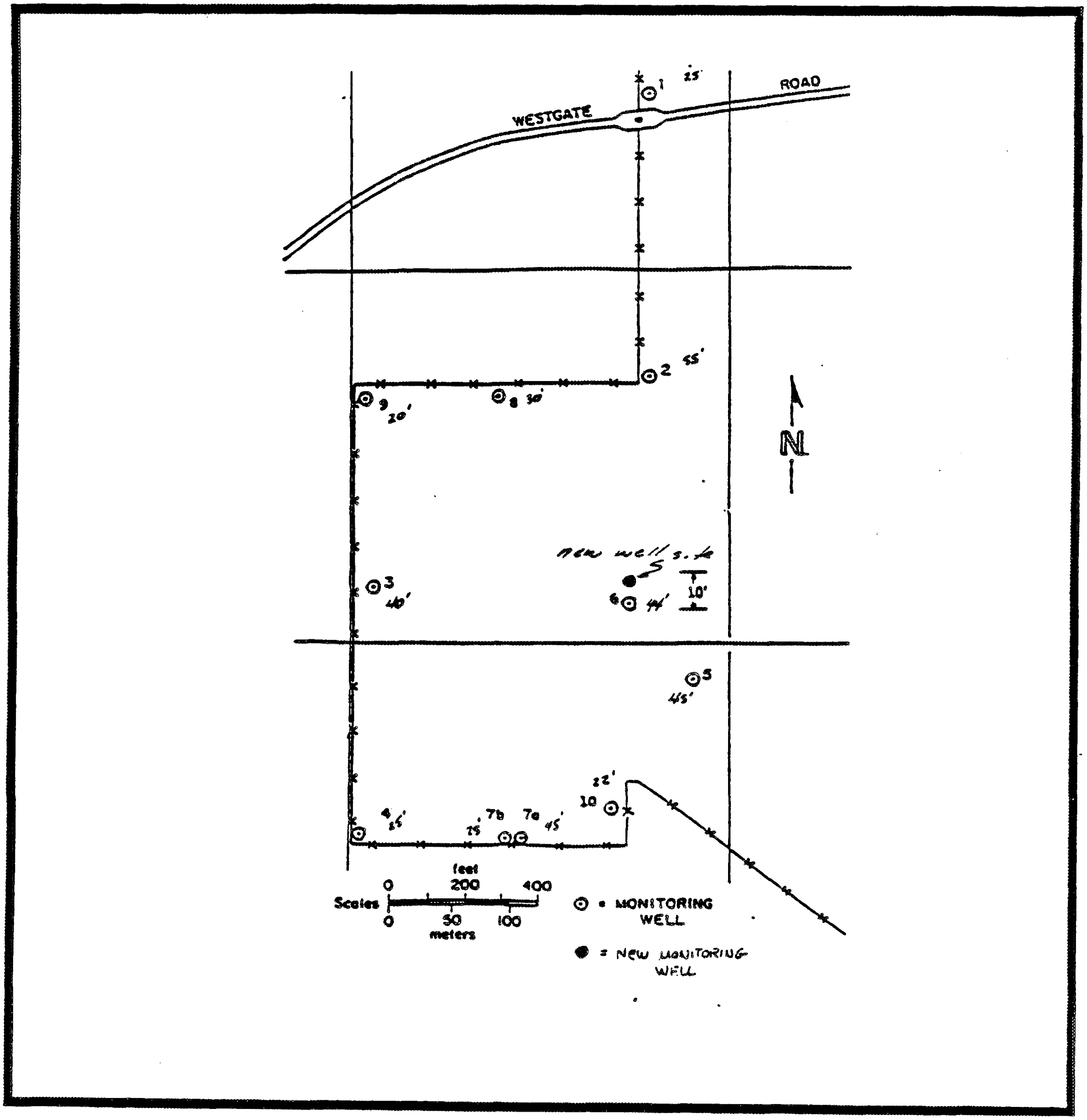


Figure 4.9c. New Well Site in the 800 Landfill Area
10 Ft. North of Existing Well 6 (Request 407)

Environmental Problem: 9
Request Number: 407

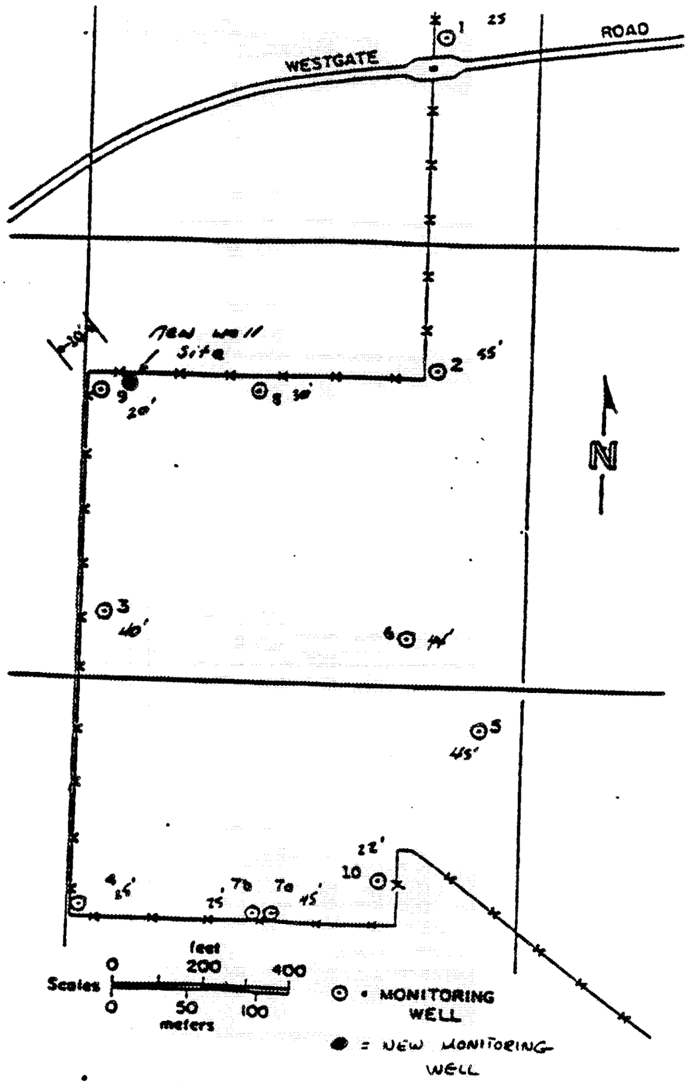


Figure 4.9d. New Well Site in the 800 Landfill Area
10 Ft. North of Existing Well 9 (Request 407)

Environmental Problem: 9
Request Number: 408

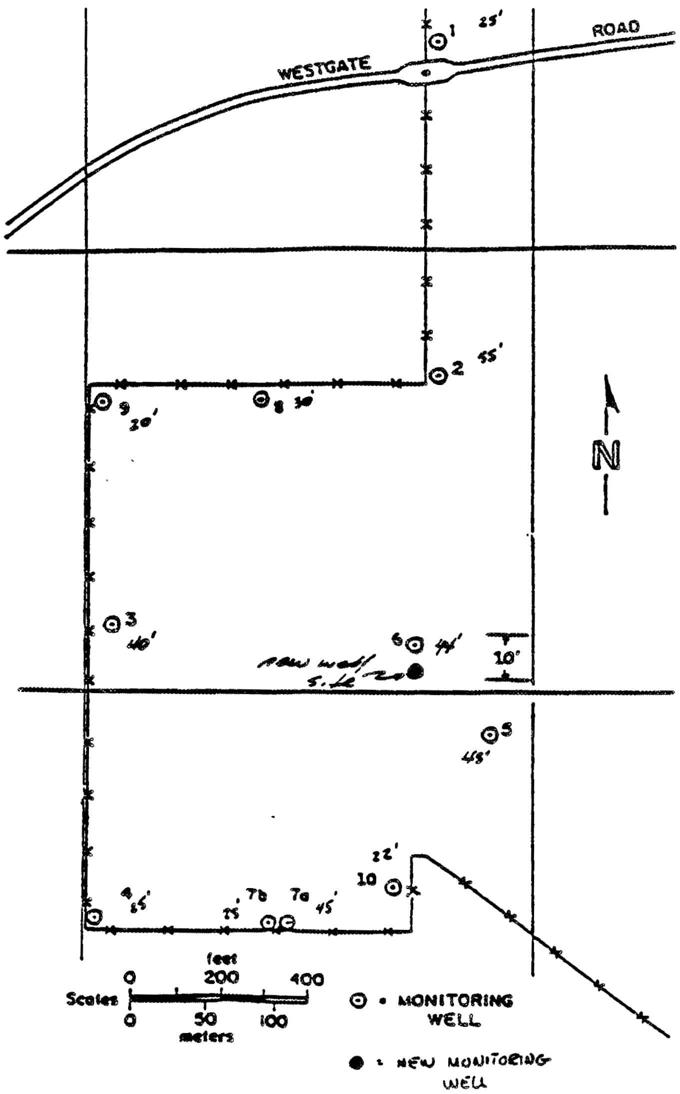


Figure 4.9e. New Well Site in the 800 Landfill Area
10 Ft. South of Existing Well 6 (Request 408)

Environmental Problem: 9
Request Number: 411

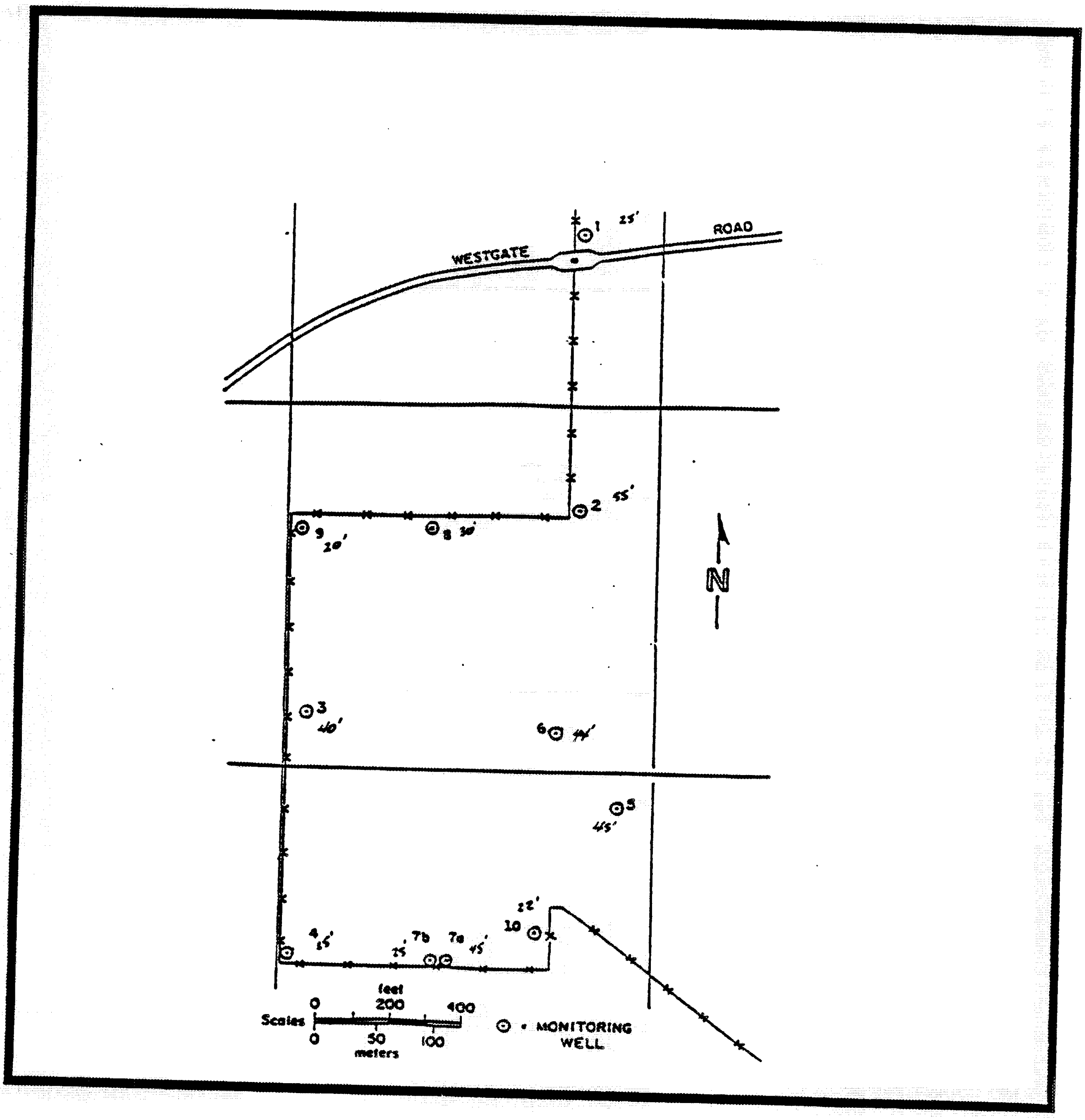


Figure 4.9f. Upgradient Well 1 in the 800 Landfill Area (Request 411)

Environmental Problem: 9
Request Number: 412

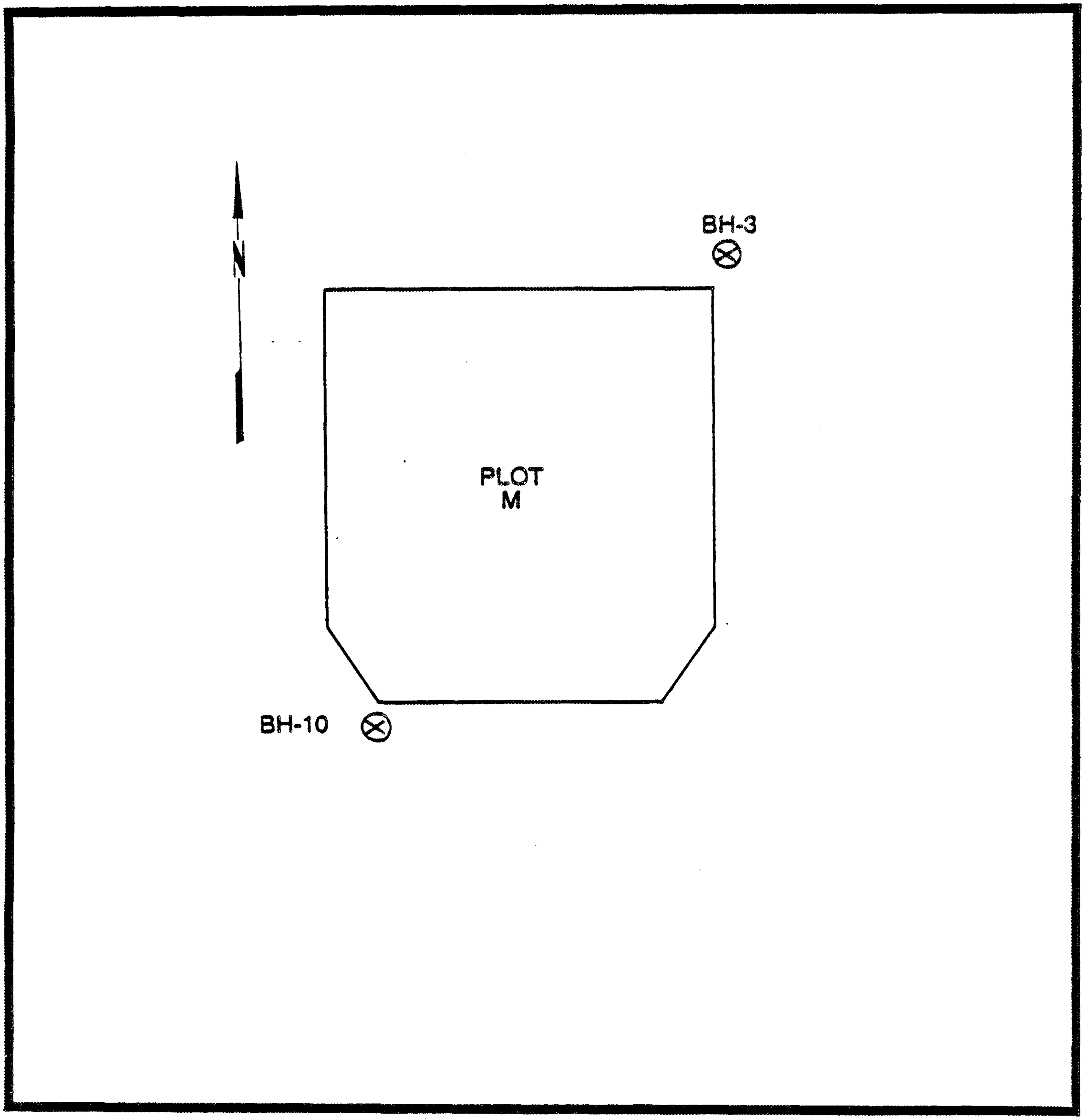


Figure 4.9g. Boreholes 3 and 10 Adjacent to Plot M (Request 412)

Environmental Problem: 9
Request Number: 413

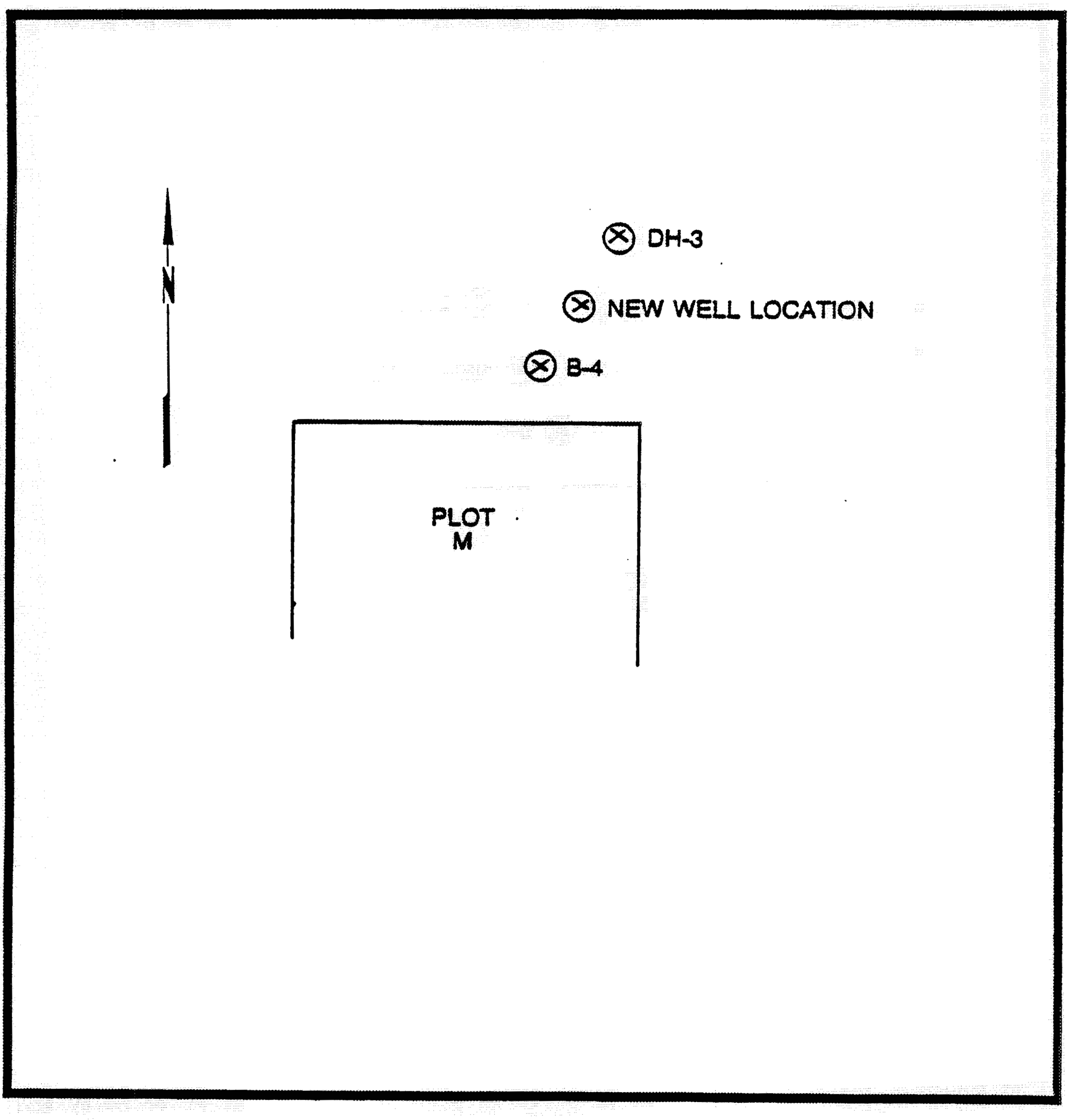


Figure 4.9h. New Well Between DH-3 and B-4 at Plot M (Request 413)

Environmental Problem: 9
Request Number: 414

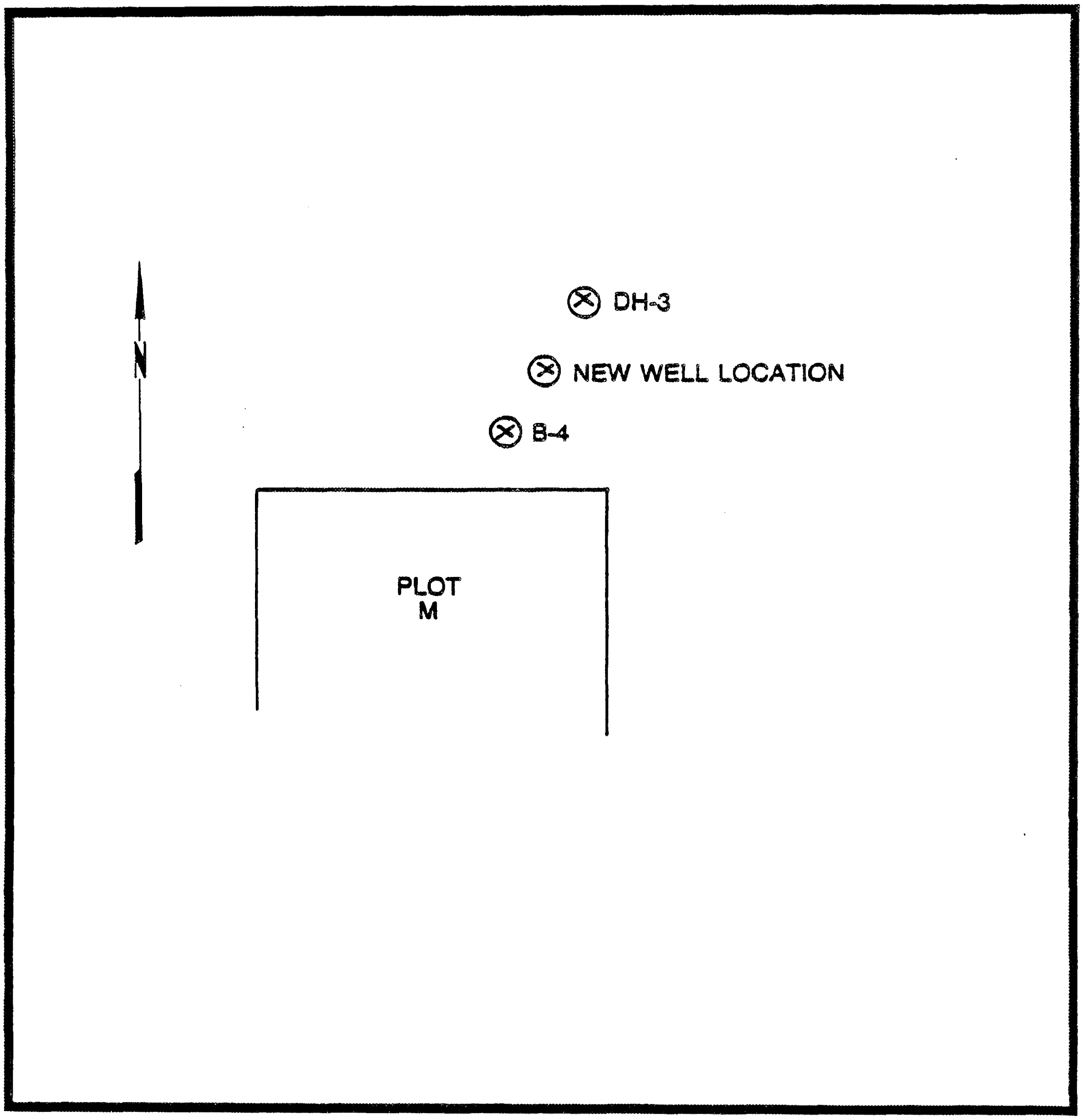


Figure 4.9i. New Well Between DH-3 and Borehole 4 at Plot M (Request 414)

Environmental Problem: 9
Request Number: 415

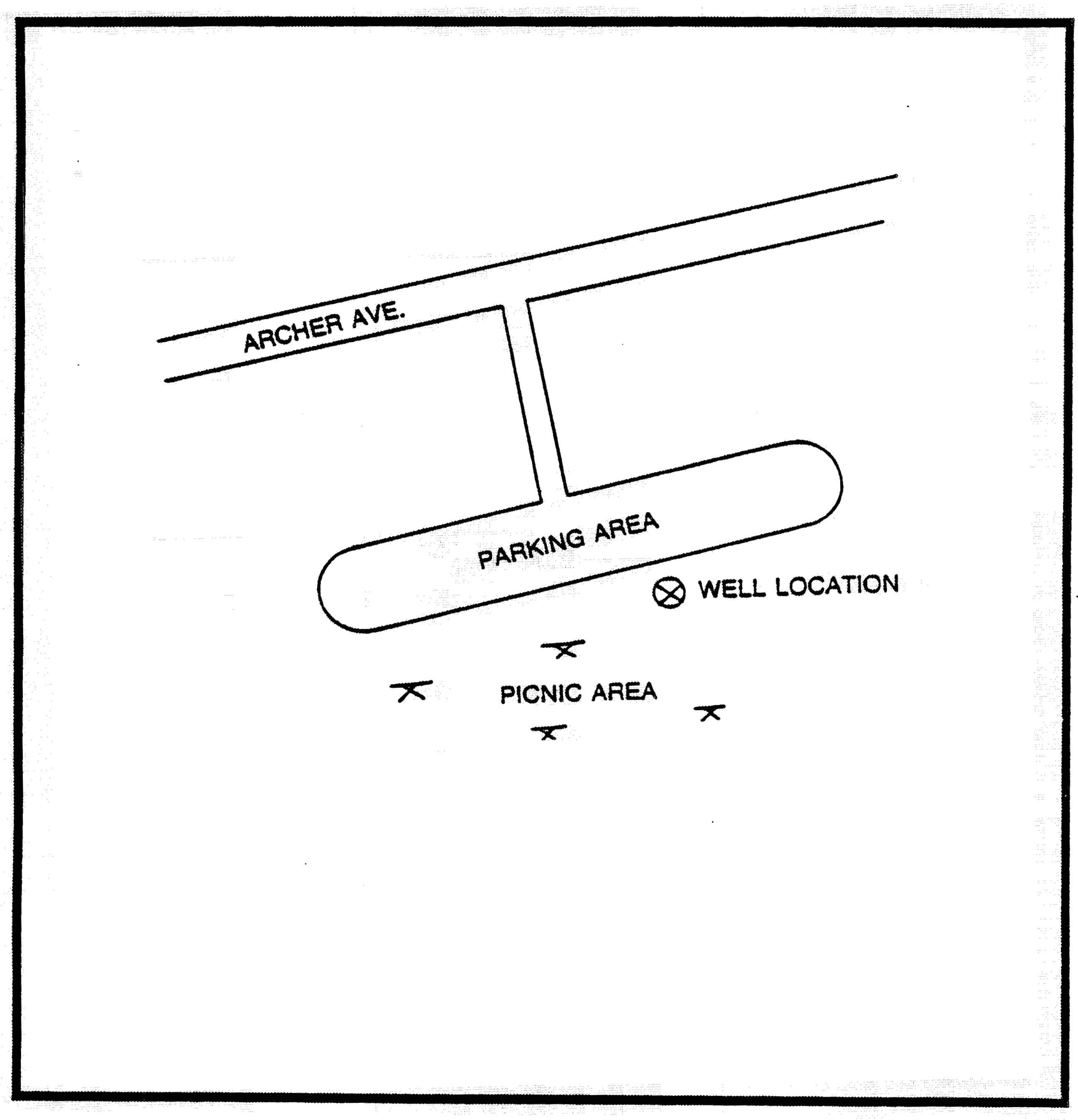


Figure 4.9j. Water Well at the Red Gate Woods Picnic Area (Request 415)

Environmental Problem: 9
Request Number: 416

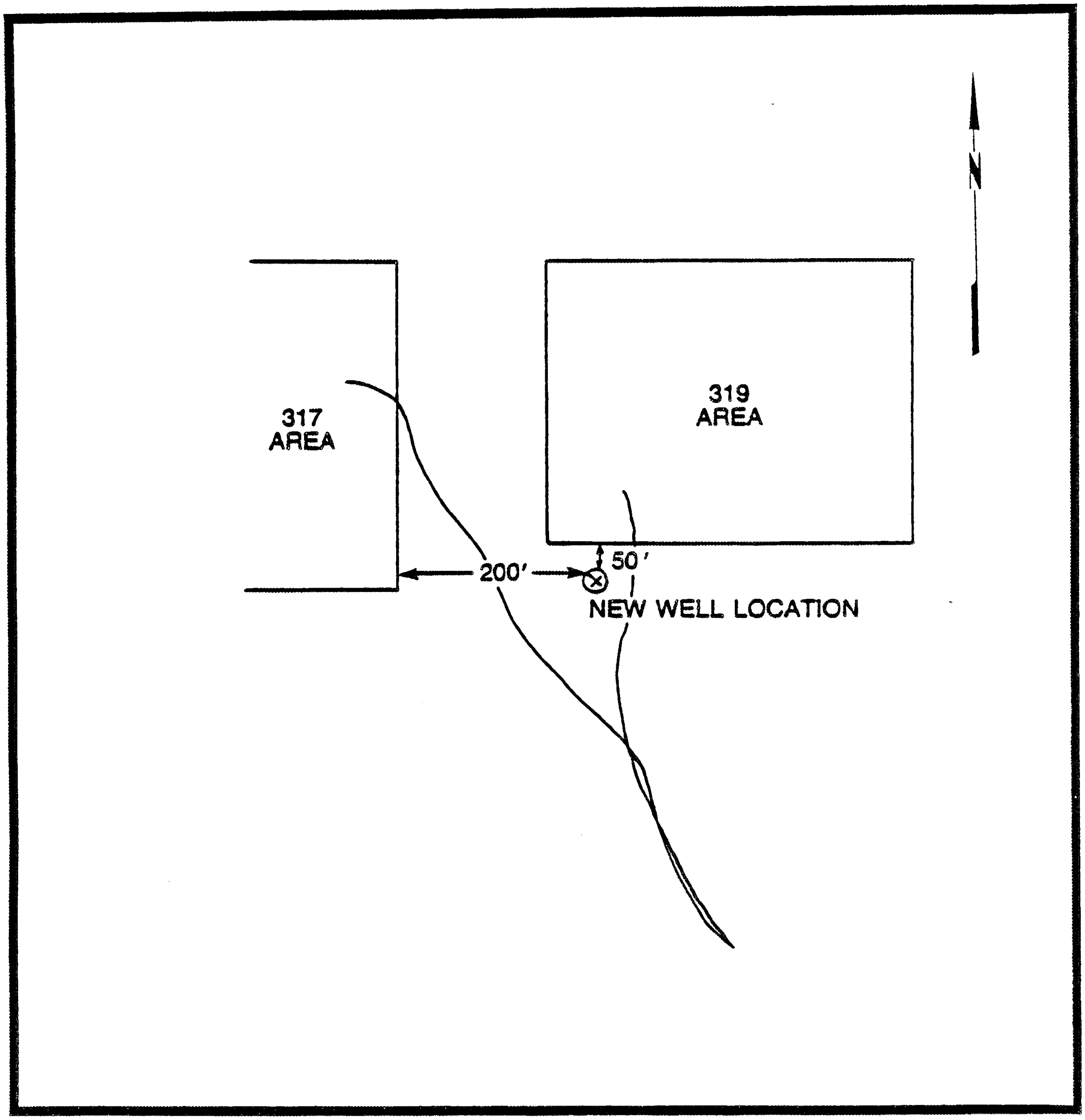


Figure 4.9k. New Well Located Along South Edge of the 319 Landfill Area (Request 416)

Environmental Problem: 9
Request Number: 417

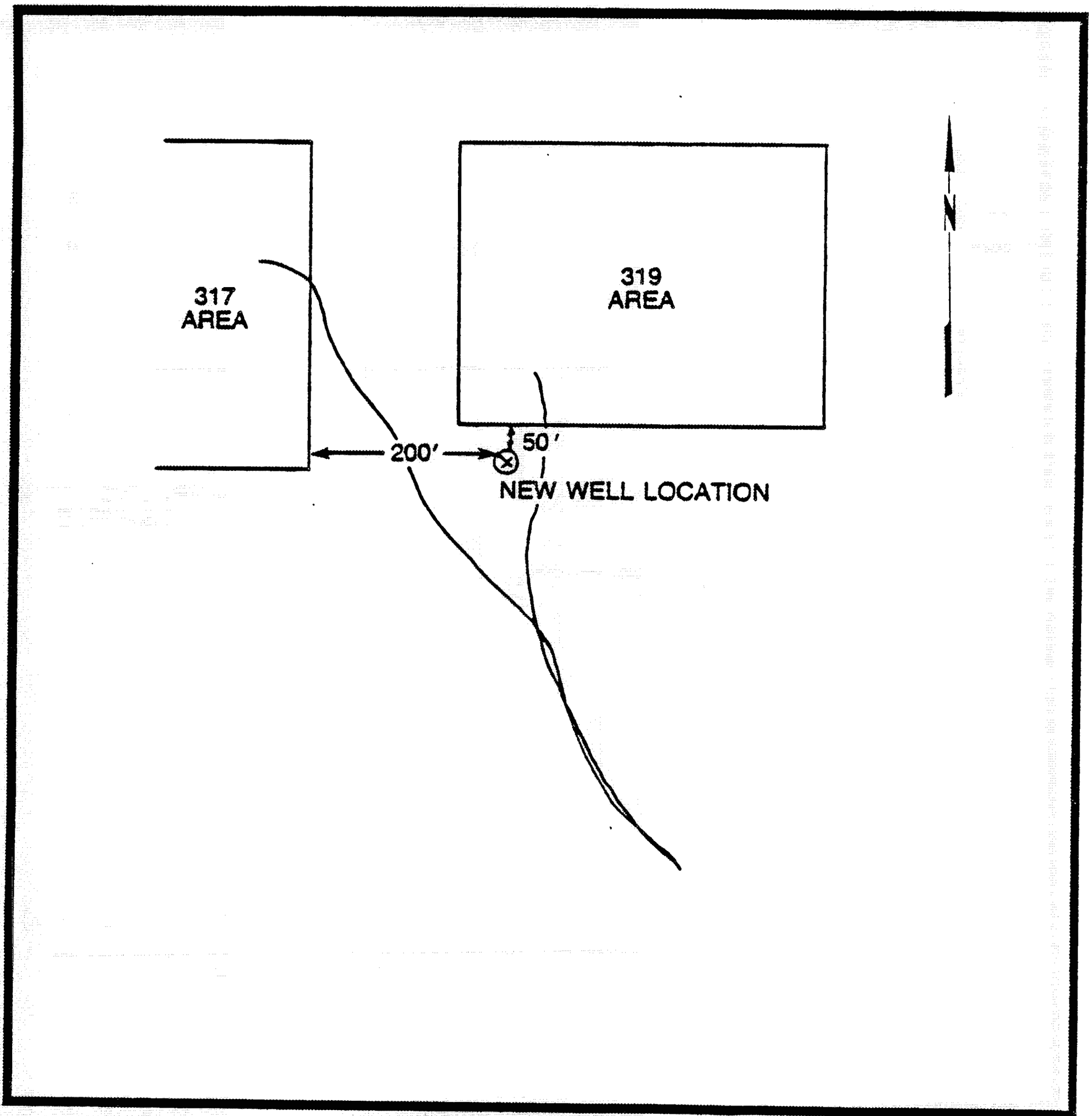


Figure 4.9l. New Well Located Along South Edge of 319 Landfill Area (Request 417)

Environmental Problem: 9
Request Number: 418

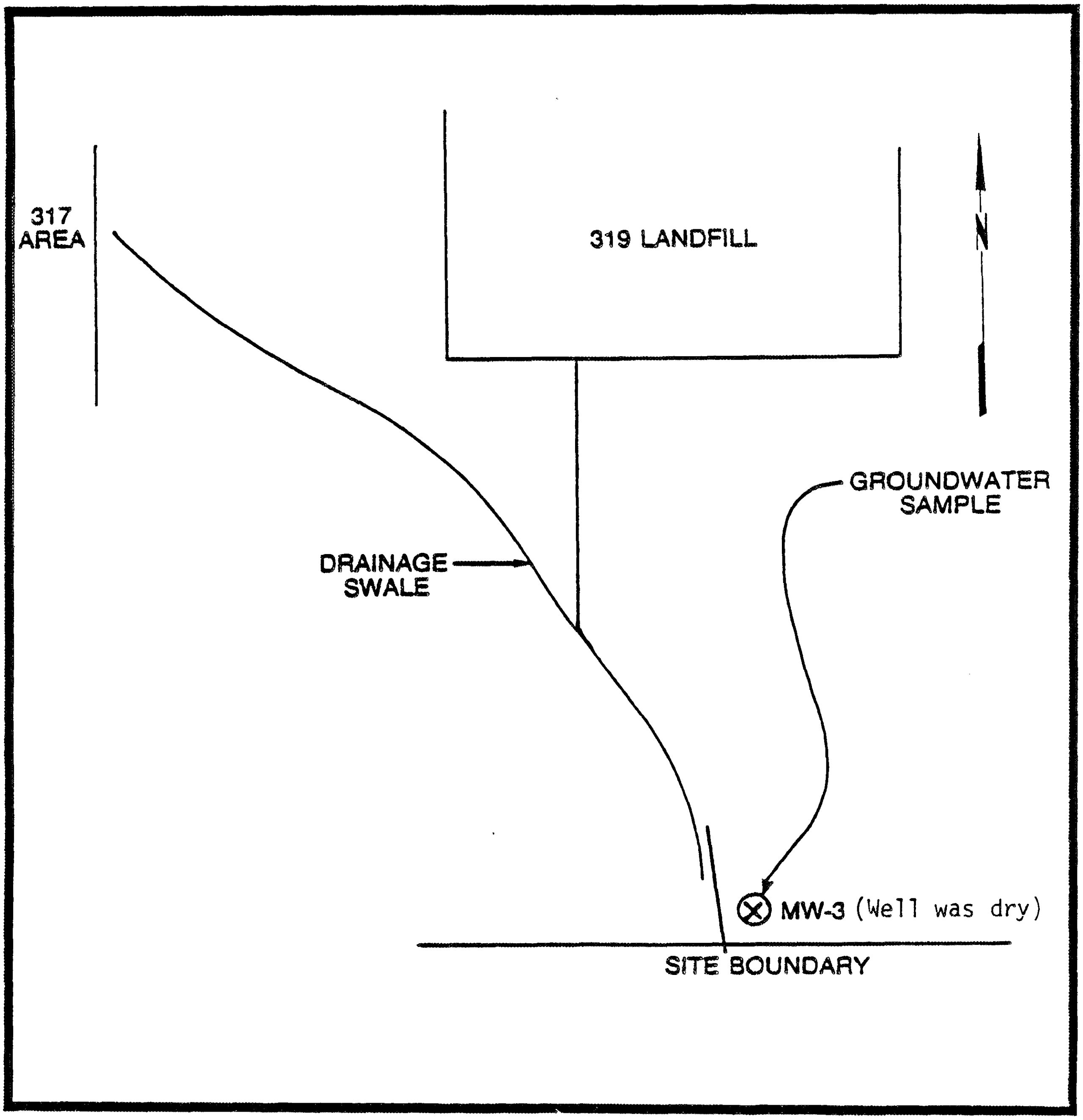


Figure 4.9m. Monitoring Well MW-3 South of the 319 Area Landfill (Request 418)

Environmental Problem: 9
Request Number: 419

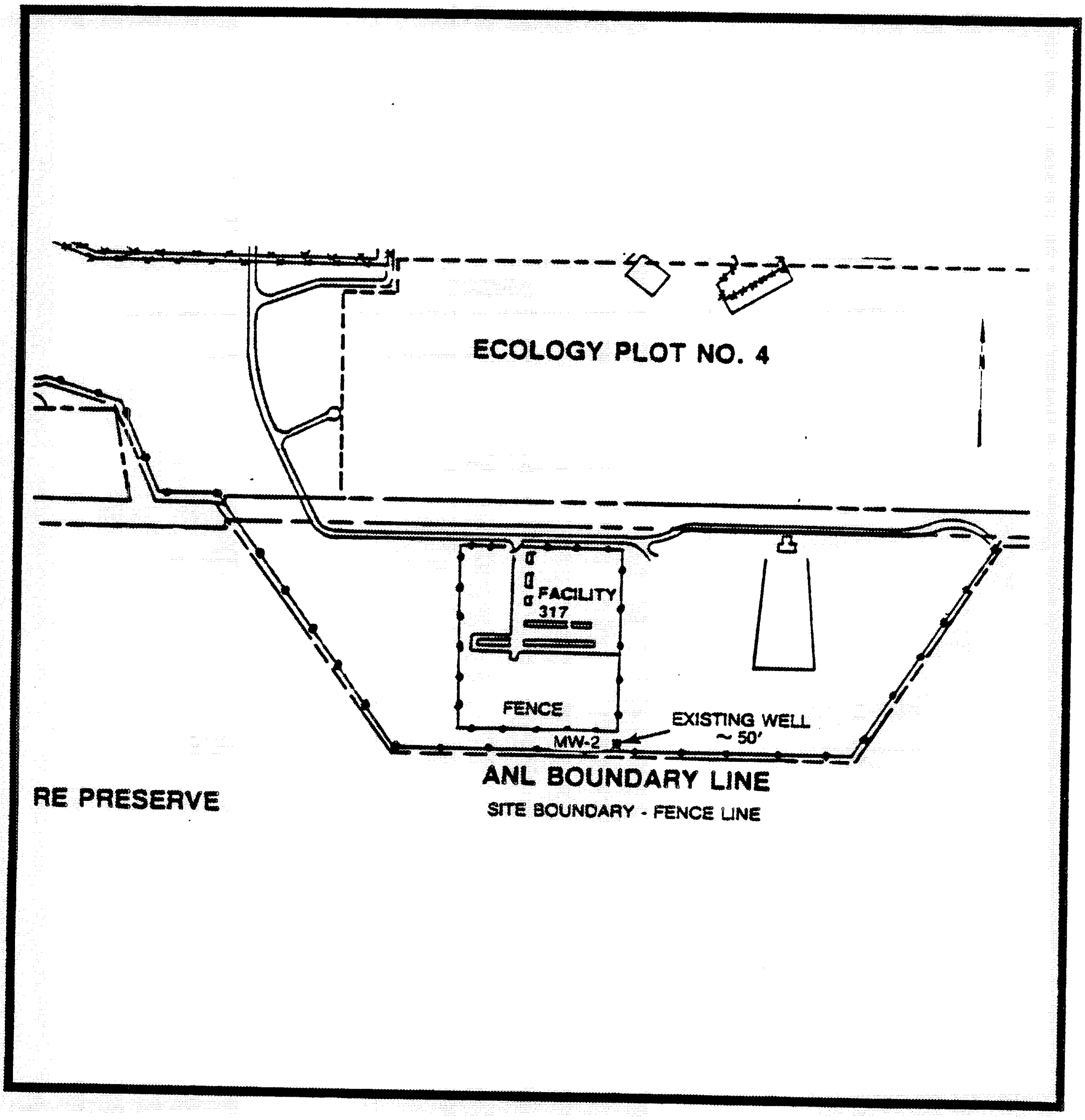


Figure 4.9n. Monitoring Well MW-2 South of the 317 Area Landfill (Request 419)

Environmental Problem: 9
Request Number: 420

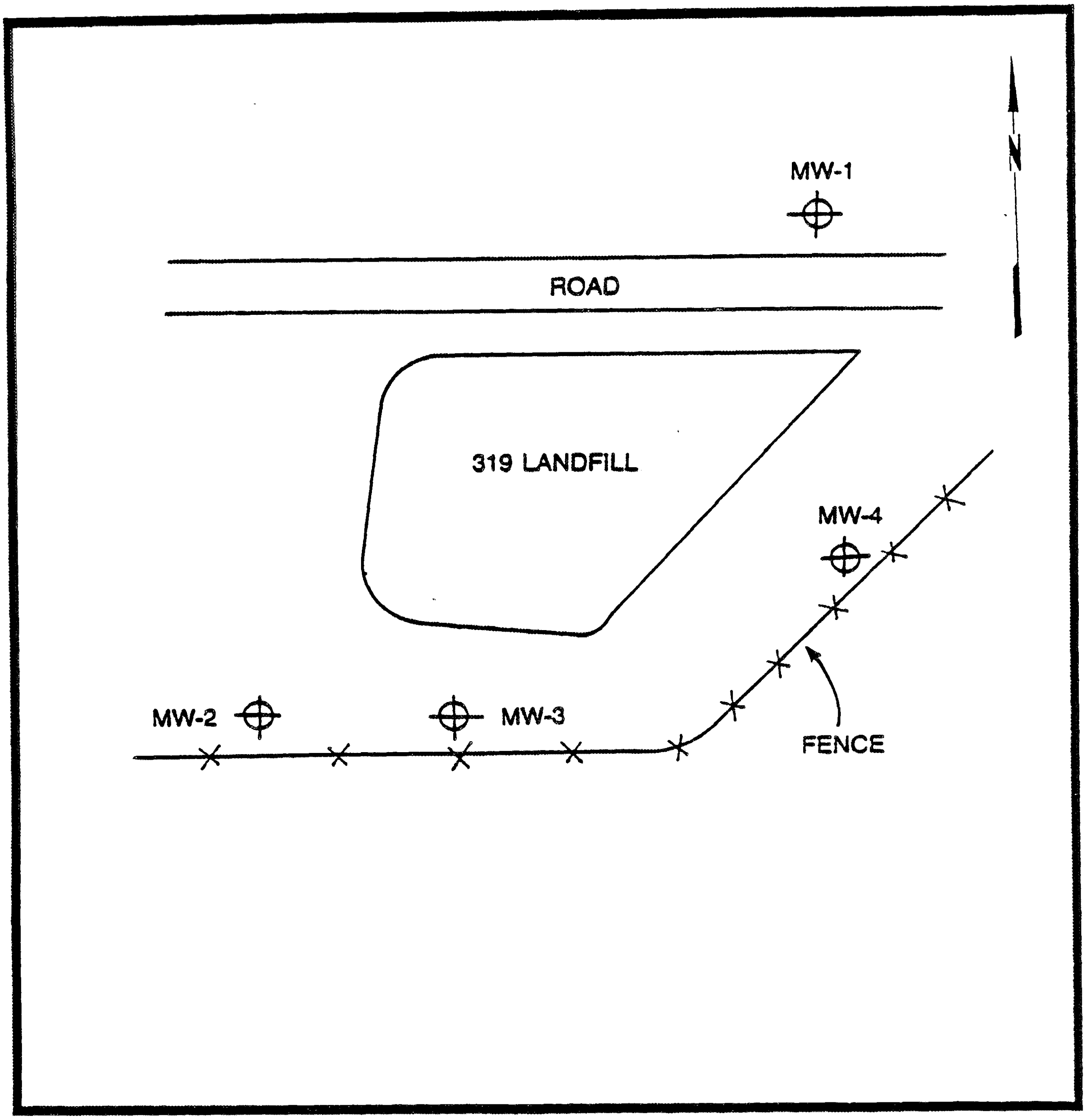


Figure 4.9o. Existing Monitoring Well MW-1 (Request 420)

TABLE 4.2.9 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 9

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR407	WELL #6	WELL	SOIL	7	1	GRAB	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR407	WELL #9	WELL	SOIL	7	1	GRAB	1	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
AR417	319 LANDF.	WELL	SOIL	5	1	GRAB	1	1	1	1	0	0	-0	0	0	0	0	1	1	1	1	1	1	1
			MED TOTAL	19	3		3	3	3	3	0	0	0	0	0	0	1	3	3	3	3	3	3	3
AR407	WELL #9	WELL	SUR WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
			MED TOTAL	1	1		1	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
AR406	WELL #6	WELL	GRN WATER	2	0	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR406	WELL #9	WELL	GRN WATER	2	2	PUMP	2	2	2	2	0	0	0	0	0	0	1	2	2	2	1	2	2	2
AR408	800 LF NEW	WELL	GRN WATER	2	1	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AR411	800 LANDFI	WELL	GRN WATER	2	2	BKGRN	0	2	2	2	0	0	0	0	0	0	1	2	2	2	2	2	2	2
AR412	PLOT M	WELL	GRN WATER	4	2	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0
AR413	PLOT M	WELL	GRN WATER	2	2	PUMP	2	2	2	2	0	0	0	0	0	0	1	2	2	2	1	2	2	2
AR413	PLOT M NEW	WELL	GRN WATER	1	1	QC FL	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
AR413	PLOT M NEW	WELL	GRN WATER	1	1	QC RN	1	1	1	1	0	0	0	0	0	0	0	1	1	1	0	1	1	1
AR414	DH3 & BH.4	WELL	GRN WATER	6	0	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR415	PLOT M	WELL	GRN WATER	1	1	BAILR	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR415	PLOT M	WELL	GRN WATER	1	1	PUMP	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
AR416	319 AREA	WELL	GRN WATER	2	0	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR410	PLOT M	WELL	GRN WATER	2	0	BAILR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR418	PLOT M	WELL	GRN WATER	1	0	QC FL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR419	PLOT M	WELL	GRN WATER	2	2	BAILR	0	2	2	2	0	0	0	0	0	0	0	0	2	2	2	2	2	2
AR420	317-319 LF	WELL	GRN WATER	2	2	BKGRN	0	2	2	2	0	0	0	0	0	0	0	0	2	2	2	2	2	2
AR420	317-319 LF	WELL	GRN WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	1	1
			MED TOTAL	34	18		6	15	14	15	0	0	0	0	0	0	4	8	16	16	14	17	15	15
			EP TOTAL	54	22		10	19	18	19	0	0	0	0	0	0	5	12	20	20	18	21	19	19

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 406
LOCATION: NEW WELL AT WELL #9
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO: AR406030	AR406041
CONDUCTIVITY (MS/CM)	6.3	6.3
FID/PID (PPM)	0	0
PH (UNITS)	7.2	7.2
RADIOACTIVITY (CPM)	0	0
TEMPERATURE (DEG C)	9.9	10

ANIONS AND CYANIDE (UG/L)	SAMP NO: AR406030N SDG NO: AR406030N TYPE: PUMP	AR406041N AR406030N PUMP
CYANIDE	-1.7	-1.7

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR406030K SDG NO: AR406030K TYPE: PUMP	AR406030K AR406030M PUMP	AR406041K AR406030K PUMP	AR406041K AR406030M PUMP
ALUMINUM		296		279
BARIUM		134 BE		130 BE
BERYLLIUM		1.4 B		1.5 B
CADMIUM		2.4 B		2 U
CALCIUM		101000 E		100000 E
IRON		1390		1460
MAGNESIUM		47600 E		46700 E
MANGANESE		59		57
POTASSIUM	1900 B		1800 B	
SODIUM		15200 E		13400 E
VANADIUM		8.1 B		8.3 B
ZINC		40		34

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: AR406030H SDG NO: AR406030J TYPE: PUMP	AR406041H AR406030J PUMP
4,4'-DDD	0.031 J	0.1 U

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR406030E SDG NO: AR406030G TYPE: PUMP	AR406041E AR406030G PUMP
BIS(2-ETHYLHEXYL)PHTHALATE	30	23

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 DRAFT DO NOT CITE
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 406
LOCATION: NEW WELL AT WELL #9
MEDIUM: GROUND WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	
	SAMP NO: AR406030E	AR406041E
	SDG NO: AR406030G	AR406030G
	TYPE: PUMP	PUMP
BUTYLBENZYLPHTHALATE	15	10 U
* UNKNOWN HYDROCARBON(7.63)	20 J	17 J
* UNKNOWN(16.57)	11 J	
* UNKNOWN(17.43)		8 J
* UNKNOWN(22.98)	16 J	
* UNKNOWN(23.02)		11 J
* UNKNOWN(24.63)		10 J
* UNKNOWN(26.92)	19 J	
* UNKNOWN(26.93)		14 J

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	
	SAMP NO: AR406030B	AR406041B
	SDG NO: AR406030D	AR406030D
	TYPE: PUMP	PUMP
BROMODICHLOROMETHANE	3 J	5 U
TOLUENE	1 JB	5 U
1,1,2,2-TETRACHLOROETHANE	1 J	10 U

RADIOCHEMISTRY (PCI/L)	SAMP NO: / SDG NO: / TYPE:	
	SAMP NO: AR406030M	AR406041M
	SDG NO: 004	004
	TYPE: PUMP	PUMP
H-3	-54	-256

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #6
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO: AR407086
FID/PID (PPM)	90
RADIOACTIVITY (CPM)	40

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #6
MEDIUM: SOIL

ANIONS AND CYANIDE (MG/KG)	SAMP NO: AR407086E SDG NO: AR406030N TYPE: GRAB					
CYANIDE	-0.042					

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR407086D SDG NO: AR407019D TYPE: GRAB					
ALUMINUM	11500					
ANTIMONY	62 N					
ARSENIC	44 B					
BARIUM	82					
BERYLLIUM	1.3					
CADMIUM	2.8 B					
CALCIUM	70000 *					
CHROMIUM	18					
COBALT	12 B					
COPPER	29					
IRON	25600					
LEAD	17 B					
MAGNESIUM	36900 *					
MANGANESE	1010					
NICKEL	30					
POTASSIUM	1580					
SODIUM	823 B					
VANADIUM	26					
ZINC	72 E					

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR407086C SDG NO: AR406030G TYPE: GRAB					
BIS(2-ETHYLHEXYL)PHTHALATE	200 BJ					
PYRENE	140 J					
* UNKNOWN(6.33)	3600 J					
* UNKNOWN(7.35)	360 J					
* UNKNOWN(24.70)	600 J					
* UNKNOWN(25.23)	580 J					
* UNKNOWN(27.47)	1200 J					

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #6
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR407086A SDG NO: AR406030D TYPE: GRAB					
METHYLENE CHLORIDE	10 B					
TOLUENE	2 BJ					
1,1,1-TRICHLOROETHANE	7 B					
* TETRAHYDROFURAN	11 J					

RADIOCHEMISTRY (PCI/KGH)	SAMP NO: AR407086F SDG NO: 004 TYPE: GRAB					
H-3	-77					

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #9
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO: AR407019					
FID/PID (PPM)	300					
RADIOACTIVITY (CPM)	30					

ANIONS AND CYANIDE (MG/KG)	SAMP NO: AR407019E SDG NO: AR406030N TYPE: GRAB					
CYANIDE	0.3					

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR407019D SDG NO: AR407019D TYPE: GRAB					
ALUMINUM	13000					
ANTIMONY	71 N					
ARSENIC	66					
BARIUM	101					
BERYLLIUM	1.2 B					

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #9
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR407019D SDG NO: AR407019D TYPE: GRAB
CADMIUM	2.3 B
CALCIUM	46500 *
CHROMIUM	18
COBALT	8.3 B
COPPER	27
IRON	21800
LEAD	26 B
MAGNESIUM	25200 *
MANGANESE	423
NICKEL	18
POTASSIUM	1190 B
SELENIUM	32 B
SODIUM	815 B
VANADIUM	33
ZINC	77 E

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: AR407019C SDG NO: AR407019C TYPE: GRAB
ENDOSULFAN II	3.2 JB
ENDRIN	3.5 J
GAMMA CHLORDANE	2.1 J
4,4'-DDE	8.6 J

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR407019C SDG NO: AR406030G TYPE: GRAB
BIS(2-ETHYLHEXYL)PHTHALATE	2500 B
NAPHTHALENE	7600
PHENANTHRENE	490 J
PYRENE	380 J
2-METHYLNAPHTHALENE	470 J
4-METHYLPHENOL	650 J
* POSS HEXADECANOIC ACID	7800 J
* POSS HEXADECANOIC ACID(19.22)	7800 J
* POSS METHYLPHENYLETHANO(10.33)	3000 J
* POSS SUBST BENZENE C18H(18.43)	4000 J
* POSS 1H-INDEN-1ONE,2,3-(11.95)	4700 J

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #9
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR407019C SDG NO: AR406030G TYPE: GRAB					
* UNKNOWN HYDROCARBON(16.57)	3500 J					
* UNKNOWN HYDROCARBON(22.93)	3900 J					
* UNKNOWN HYDROCARBON(23.72)	5300 J					
* UNKNOWN(6.32)	3500 J					
* UNKNOWN(15.85)	1900 J					
* UNKNOWN(16.68)	2900 J					
* UNKNOWN(18.33)	3100 J					
* UNKNOWN(18.73)	5700 J					
* UNKNOWN(20.90)	8600 J					
* UNKNOWN(22.02)	12000 J					
* UNKNOWN(24.90)	5700 J					
* UNKNOWN(26.93)	4600 J					
* UNKNOWN(27.53)	7400 J					
* UNKNOWN(29.05)	5700 J					
* UNKNOWN(31.67)	7000 J					
* UNKNOWN(33.25)	11000 J					

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR407019B SDG NO: AR406030D TYPE: GRAB					
ETHYLBENZENE	2 J					
METHYLENE CHLORIDE	15 B					
TOLUENE	3 BJ					
1,1,1-TRICHLOROETHANE	13 B					
* TETRAHYDROFURAN	14 J					

RADIOCHEMISTRY (PCI/KGM)	SAMP NO: AR407019F SDG NO: 004 TYPE: GRAB					
H-3	-163					

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 DRAFT DO NOT CITE
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #9
MEDIUM: SURFACE WATER

ANIONS AND CYANIDE (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR407155G / AR406030N / RINSATE
CYANIDE		0.04

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR407155J / AR406030M / RINSATE	AR407155J / AR407019D / RINSATE
ARSENIC		60 UN	62 B
BARIUM		2.5 BE	4.9 B
CADMIUM		2 U	4 B
CALCIUM		200 UE	118 B*
IRON		104	105
MAGNESIUM		40 BE	36 B*
MANGANESE		5 U	4.3 B
SODIUM		280 BE	2990 B
THALLIUM			49 B
ZINC		7 U	16 BE

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR407155E / AR406030G / RINSATE
BIS(2-ETHYLHEXYL)PHTHALATE		24
BUTYLBENZYLPHTHALATE		6 J
* POSS DECANE(7.62)		40 J
* UNKNOWN(24.63)		17 J
* UNKNOWN(26.90)		66 J

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR407155D / AR406030D / RINSATE
CHLOROFORM		18
TOLUENE		1 BJ
* TETRAHYDROFURAN		14 J

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 407
LOCATION: NEW WELL ADJACENT TO EXISTING WELL #9
MEDIUM: SURFACE WATER

RADIOCHEMISTRY (PCI/L)	SAMP NO: AR407155K SDG NO: 004 TYPE: RINSATE
H-3	-70

S&A REQUEST: 408
LOCATION: NEW WELL AT 800 LNDF
MEDIUM: GROUND WATER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR408010C SDG NO: AR406030D TYPE: BAILER
TOLUENE	1 BJ

S&A REQUEST: 411
LOCATION: 800 LANDFILL AREA-BG
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO: AR411015	AR411026
CONDUCTIVITY (MS/CM)	2.8	2.8
PH (UNITS)	7.8	7.8
TEMPERATURE (DEG C)	6.6	6.6

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR411015F SDG NO: AR300044B TYPE: BACKGROUND	AR411015F AR300066K BACKGROUND	AR411026F AR300044B BACKGROUND	AR411026F AR300066K BACKGROUND
ALUMINUM	7970 NE		557 NE	
BARIUM	292		223	
BERYLLIUM	1.1 B		0.61 B	
CADMIUM	5.2		2.1 B	
CALCIUM	221000		180000	
CHROMIUM	123		6 U	
COBALT	3.8 B		3 U	

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 411
LOCATION: 800 LANDFILL AREA-BG
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR411015F SDG NO: AR300044B TYPE: BACKGROUND	AR411015F AR300066K BACKGROUND	AR411026F AR300044B BACKGROUND	AR411026F AR300066K BACKGROUND		
COPPER	32		12 B			
IRON	20300		734			
MAGNESIUM	92800		74600			
MANGANESE	695		313			
NICKEL	87		8 B			
POTASSIUM		12000		5700		
SODIUM	429000		424000			
VANADIUM	37 B		18 B			
ZINC	83		4.4 B			

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: AR411015E SDG NO: ARG05 TYPE: BACKGROUND	AR411026E ARG05 BACKGROUND				
HEPTACHLOR EPOXIDE	0.06 U	0.06 J				

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR411015E SDG NO: DD29 TYPE: BACKGROUND	AR411026E DD29 BACKGROUND				
BIS(2-ETHYLHEXYL)PHTHALATE	4 JB	2 JB				
PHENOL	11 U	3 J				
* UNKNOWN HYDROCARBON(30.08)		4 J				
* UNKNOWN PHTHALATE(35.07)		11 JB				
* UNKNOWN(8.07)	6 JB					
* UNKNOWN(8.09)		6 JB				
* UNKNOWN(19.45)		8 JB				
* UNKNOWN(19.46)	6 JB					
* UNKNOWN(19.81)	6 JB	8 JB				
* UNKNOWN(29.34)	6 J					
* UNKNOWN(30.08)	7 J					
* UNKNOWN(31.55)	6 J					
* UNKNOWN(33.66)	8 J					
* UNKNOWN(37.95)	10 J					

S&A REQUEST: 411
LOCATION: 800 LANDFILL AREA-BG
MEDIUM: GROUND WATER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR411015A	AR411026A				
	SDG NO:	GN30	GN30				
	TYPE:	BACKGROUND	BACKGROUND				
ACETONE		3 JB	4 JB				
METHYLENE CHLORIDE		23 B	15 B				

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR411015H	AR411026H				
	SDG NO:	LLL7704	LLL7704				
	TYPE:	BACKGROUND	BACKGROUND				
H-3		110	250				

S&A REQUEST: 412
LOCATION: PLOT M SITE
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO:	AR412016					
CONDUCTIVITY (MS/CM)		0.7					
PH (UNITS)		7.1					
TEMPERATURE (DEG C)		13					

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR412016E	AR412027E				
	SDG NO:	DD23	DD23				
	TYPE:	BAILER	BAILER				
BIS(2-ETHYLHEXYL)PHTHALATE		8 J	8 J				
* UNKNOWN HYDROCARBON(13.41)			6 J				
* UNKNOWN(7.93)			8 J				
* UNKNOWN(8.07)			12 J				
* UNKNOWN(19.45)			8 J				
* UNKNOWN(19.81)			8 J				

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR412016A	AR412027A				
	SDG NO:	GN14	GN14				
	TYPE:	BAILER	BAILER				
ACETONE		1 JB	1 JB				

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 412
LOCATION: PLOT M SITE
MEDIUM: GROUND WATER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR412016A GN14 BAILER	AR412027A GN14 BAILER				
METHYLENE CHLORIDE		3 JB	2 JB				

S&A REQUEST: 413
LOCATION: PLOT M NEW WELL
MEDIUM: GROUND WATER

FIELD MEASUREMENTS	SAMP NO:	AR413017	AR413028				
CONDUCTIVITY (MS/CM)		612	612				
FID/PID (PPM)		0	0				
PH (UNITS)		7.2	7.2				
RADIOACTIVITY (CPM)		40	40				
TEMPERATURE (DEG C)		10	10				

ANIONS AND CYANIDE (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR413017N AR406030N PUMP	AR413028N AR406030N PUMP	AR413051B AR406030N FIELD BLANK	AR413062H AR406030N RINSATE		
CYANIDE		-1.5	-3.2	-1.5	1.7		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR413017K AR406030K PUMP	AR413017K AR406030M PUMP	AR413028K AR406030K PUMP	AR413028K AR406030M PUMP	AR413051A AR406030K FIELD BLANK	AR413051A AR406030M FIELD BLANK
ALUMINUM			310		291		60 U
BARIUM			41 BE		41 BE		2 UE
BERYLLIUM			1.3 B		1.3 B		0.3 U
CALCIUM			69100 E		68300 E		200 UE
IRON			63 B		40 B		20 U
MAGNESIUM			67900 E		66900 E		10 UE
MANGANESE			79		77		5 U
POTASSIUM		5300		5200		100 U	
SODIUM			7240 E		7130 E		200 UE
VANADIUM			8.8 B		8.1 B		4 U

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 413
LOCATION: PLOT M NEW WELL
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR413062G SDG NO: AR406030K TYPE: RINSATE	AR413062G AR406030M RINSATE
ALUMINUM		60 U
BARIUM		3.1 BE
BERYLLIUM		0.3 U
CALCIUM		200 UE
IRON		20 U
MAGNESIUM		19 BE
MANGANESE		5 U
POTASSIUM	100 U	
SODIUM		200 UE
VANADIUM		4 U

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: AR413017H SDG NO: AR406030J TYPE: PUMP	AR413028H AR406030J PUMP	AR413062E AR406030J RINSATE
ALPHA-BHC	0.006 J	0.051 U	0.051 U

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR413017E SDG NO: AR406030G TYPE: PUMP	AR413028E AR406030G PUMP	AR413062F AR406030G RINSATE
* POSS DECANE(7.62)			31 J
* UNKNOWN HYDROCARBON(7.60)	30 J		
* UNKNOWN HYDROCARBON(7.62)		22 J	
* UNKNOWN(24.60)	11 J		16 J
* UNKNOWN(26.85)		31 J	
* UNKNOWN(26.88)			17 J

VOLATILE ORGANICS (UG/L)	SAMP NO: AR413017C SDG NO: AR406030D TYPE: PUMP	AR413028C AR406030D PUMP	AR413062B AR406030D RINSATE
TOLUENE	5 U	2 BJ	5 U

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 413
LOCATION: PLOT M NEW WELL
MEDIUM: GROUND WATER

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR413017L	AR413017L	AR413017M	AR413017M	AR413028L	AR413028L
	SDG NO:	005	006	004	008	005	006
	TYPE:	PUMP	PUMP	PUMP	PUMP	PUMP	PUMP
AC-228					59		
BI-214							
GROSS ALPHA		7.4				11	
GROSS BETA			24				17
H-3				1040000			
PB-212					51		
PB-214							
PU-239							
SR-90							

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR413028M	AR413028M	AR413051C	AR413051E	AR413051E	AR413051F
	SDG NO:	004	008	004	005	006	008
	TYPE:	PUMP	PUMP	FIELD BLANK	FIELD BLANK	FIELD BLANK	FIELD BLANK
AC-228			58				
BI-214							
GROSS ALPHA					0.12		
GROSS BETA						4.7	
H-3		1110000		6.6			
PB-212			37				44
PB-214			19				
PU-239							
SR-90							

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR413051G	AR413051H	AR413062I	AR413062J	AR413062K	
	SDG NO:	009	010	004	005	008	
	TYPE:	FIELD BLANK	FIELD BLANK	RINSATE	RINSATE	RINSATE	
AC-228							
BI-214						36	
GROSS ALPHA					2.1		
GROSS BETA							
H-3				220			
PB-212						46	
PB-214							
PU-239		0.072					
SR-90			0.68				

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 413
LOCATION: PLOT M NEW WELL
MEDIUM: GROUND WATER

RADIOCHEMISTRY (UG/L)						
SAMP NO:	AR413051D					
SDG NO:	007					
TYPE:	FIELD BLANK					
URANIUM-TOT	0.32					

S&A REQUEST: 415
LOCATION: REDGATE PICNIC AREA
MEDIUM: GROUND WATER

FIELD MEASUREMENTS						
SAMP NO:	AR415019					
CONDUCTIVITY (MS/CM)	0.97					
PH (UNITS)	7					
TEMPERATURE (DEG C)	9.2					

METALS, INCLUDING CR+6 (UG/L)						
SAMP NO:	AR415019F	AR415019F	AR415019G	AR415019G	AR415020F	AR415020F
SDG NO:	AR307018G	AR400012G	AR300044K	AR308042G	AR307018G	AR400012G
TYPE:	PUMP	PUMP	PUMP	PUMP	BAILER	BAILER
ALUMINUM				178 B		
ARSENIC		0.9 B				0.7 B
BARIUM				34 B		
CADMIUM		0.2 B				0.07 U
CALCIUM				180000		
COPPER				18 B		
IRON				2930 E		
MAGNESIUM				101000		
MANGANESE				24		
MERCURY	0.03 B				0.02 B	
NICKEL				8.3 B		
POTASSIUM			2000 B			
SELENIUM		1.3 U				2.5 B
SODIUM				11300 E		
THALLIUM		0.8 B				0.8 B
VANADIUM				7.1 B		
ZINC				1790 E		

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 DRAFT DO NOT CITE
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 415
LOCATION: REDGATE PICNIC AREA
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR415020G SDG NO: AR300044K TYPE: BAILER	AR415020G AR308042G BAILER				
ALUMINUM		155 B				
ARSENIC						
BARIUM		31 B				
CADMIUM						
CALCIUM		177000				
COPPER		12 B				
IRON		2870 E				
MAGNESIUM		99300				
MANGANESE		24				
MERCURY						
NICKEL		6 U				
POTASSIUM	2000 B					
SELENIUM						
SODIUM		11300 E				
THALLIUM						
VANADIUM		7.6 B				
ZINC		1780 E				

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR415019E SDG NO: DD26 TYPE: PUMP	AR415020E DD26 BAILER				
BIS(2-ETHYLHEXYL)PHTHALATE	16 JB	36 JB				
DI-N-BUTYLPHTHALATE	100 U	7 JB				
DIETHYLPHTHALATE	89 JB	65 JB				
* UNKNOWN(19.48)	31 JB	39 JB				
* UNKNOWN(19.84)	39 JB	49 JB				
* UNKNOWN(29.18)		74 J				
* UNKNOWN(30.27)		54 J				

VOLATILE ORGANICS (UG/L)	SAMP NO: AR415019A SDG NO: GN12 TYPE: PUMP	AR415020A GN12 BAILER				
METHYLENE CHLORIDE	2 JB	2 JB				

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 415
LOCATION: REDGATE PICNIC AREA
MEDIUM: GROUND WATER

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR415019I	AR415019J	AR415020I	AR415020J
	SDG NO:	LLL7660	LLL7660	LLL7660	LLL7660
	TYPE:	PUMP	PUMP	BAILER	BAILER
GROSS ALPHA			5		15
GROSS BETA			0		0
H-3		140		1100	

S&A REQUEST: 417
LOCATION: NEW WELL LOCATED ALONG SOUTH EDGE OF 319 LANDFILL AREA
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR417011
FID/PID (PPM)		15
RADIOACTIVITY (CPM)		40

ANIONS AND CYANIDE (MG/KG)	SAMP NO:	AR417011E
	SDG NO:	AR406030N
	TYPE:	GRAB
CYANIDE		-0.037

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR417011D
	SDG NO:	AR407019D
	TYPE:	GRAB
ALUMINUM		8480
ANTIMONY		58 N
ARSENIC		52 B
BARIUM		46 B
BERYLLIUM		1.2 B
CADMIUM		2.7 B
CALCIUM		68400 *
CHROMIUM		16
COBALT		12
COPPER		34
IRON		25500
LEAD		21 B
MAGNESIUM		37600 *

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 DRAFT DO NOT CITE
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 417
LOCATION: NEW WELL LOCATED ALONG SOUTH EDGE OF 319 LANDFILL AREA
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR417011D SDG NO: AR407019D TYPE: GRAB
MANGANESE	704
NICKEL	34
POTASSIUM	2100
SELENIUM	33 B
SODIUM	853 B
VANADIUM	19
ZINC	101 E

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR417011C SDG NO: AR406030G TYPE: GRAB
BIS(2-ETHYLHEXYL)PHTHALATE	320 J
* UNKNOWN HYDROCARBON(13.92)	390 J
* UNKNOWN HYDROCARBON(14.35)	370 J
* UNKNOWN HYDROCARBON(15.48)	390 J
* UNKNOWN HYDROCARBON(16.63)	1700 J
* UNKNOWN HYDROCARBON(17.58)	680 J
* UNKNOWN HYDROCARBON(17.72)	1100 J
* UNKNOWN HYDROCARBON(18.58)	750 J
* UNKNOWN HYDROCARBON(19.52)	710 J
* UNKNOWN HYDROCARBON(20.42)	730 J
* UNKNOWN HYDROCARBON(21.28)	770 J
* UNKNOWN HYDROCARBON(22.12)	800 J
* UNKNOWN HYDROCARBON(22.93)	880 J
* UNKNOWN HYDROCARBON(23.68)	740 J
* UNKNOWN HYDROCARBON(24.50)	520 J
* UNKNOWN HYDROCARBON(25.37)	700 J
* UNKNOWN(6.33)	4100 J
* UNKNOWN(16.05)	1100 J
* UNKNOWN(16.55)	560 J
* UNKNOWN(26.85)	1100 J

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR417011B SDG NO: AR406030D TYPE: GRAB
METHYLENE CHLORIDE	17 B
TOLUENE	69 BJ
1,1,1-TRICHLOROETHANE	28 B

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 417
LOCATION: NEW WELL LOCATED ALONG SOUTH EDGE OF 319 LANDFILL AREA
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR417011B SDG NO: AR406030D TYPE: GRAB					
* TETRAHYDROFURAN	16 J					

RADIOCHEMISTRY (PCI/KGW)	SAMP NO: AR417011F SDG NO: 004 TYPE: GRAB					
H-3	185					

S&A REQUEST: 419
LOCATION: S OF 317 AREA
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR419013F SDG NO: AR300044K TYPE: BAILER	AR419013F AR308042G BAILER	AR419024F AR300044K BAILER	AR419024F AR308042G BAILER		
ALUMINUM		149 B		162 B		
BARIUM		37 B		36 B		
CADMIUM		2.4 B		3.3 B		
CALCIUM		97400		90400		
CHROMIUM		8.3 B*		11 *		
COPPER		18 B		11 B		
IRON		248 E		120 E		
LEAD		50 U		74 B		
MAGNESIUM		47500		44100		
MANGANESE		126		115		
NICKEL		11 B		9.8 B		
POTASSIUM	2100 B		2000 B			
SODIUM		10500 E		10400 E		
VANADIUM		11 B		12 B		
ZINC		16 BE		42 E		

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 DRAFT DO NOT CITE
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

S&A REQUEST: 419
LOCATION: S OF 317 AREA
MEDIUM: GROUND WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR419013E DD22 BAILER	AR419024E DD22 BAILER				
BIS(2-ETHYLHEXYL)PHTHALATE		50	2 J				
* UNKNOWN(8.09)		15 JB	10 JB				

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR419013A GN12 BAILER	AR419024A GN12 BAILER				
CARBON TETRACHLORIDE		2 J	2 J				
CHLOROFORM		2 J	2 J				
METHYLENE CHLORIDE		2 JB	1 JB				
TOLUENE		6	2 J				
1,1-DICHLOROETHANE		30	29				
1,1,1-TRICHLOROETHANE		13	12				
1,2-DICHLOROETHANE		6	6				

RADIOCHEMISTRY (PCI/L)	SAMP NO: / SDG NO: / TYPE:	AR419013H LLL7645 BAILER	AR419013I LLL7645 BAILER	AR419024H LLL7644 BAILER	AR419024I LLL7644 BAILER		
H-3		280		60			
SR-90			0		1.9		

S&A REQUEST: 420
LOCATION: 317-319 LANDFIL
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR420016F AR300044B BACKGROUND	AR420016F AR300066K BACKGROUND	AR420016F AR400012H BACKGROUND	AR420027F AR300044B BACKGROUND	AR420027F AR300066K BACKGROUND	AR420027F AR400012H BACKGROUND
ALUMINUM		160 BNE			142 BNE		
BARIUM		36 B			38 B		
BERYLLIUM		0.3 U			0.32 B		
CADMIUM		2 U			2.1 B		
CALCIUM		127000			131000		
IRON		119			154		

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 420
LOCATION: 317-319 LANDFIL
MEDIUM: GROUND WATER

METALS, INCLUDING CR+6 (UG/L)						
SAMP NO:	AR420016F	AR420016F	AR420016F	AR420027F	AR420027F	AR420027F
SDG NO:	AR300044B	AR300066K	AR400012H	AR300044B	AR300066K	AR400012H
TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
MAGNESIUM	67500			70000		
MANGANESE	30			37		
NICKEL	7.4 B			8.8 B		
POTASSIUM		2000 B			2100 B	
SODIUM	18500			12900		
URANIUM, TOTAL			1			1
VANADIUM	17 B			15 B		
ZINC	3 U			6.7 B		

METALS, INCLUDING CR+6 (UG/L)			
SAMP NO:	AR420038F	AR420038F	AR420038F
SDG NO:	AR300044B	AR300066K	AR400012H
TYPE:	RINSATE	RINSATE	RINSATE
ALUMINUM	60 UNE		
BARIUM	2 U		
BERYLLIUM	0.3 U		
CADMIUM	2.5 B		
CALCIUM	200 U		
IRON	25 B		
MAGNESIUM	10 U		
MANGANESE	5 U		
NICKEL	6 U		
POTASSIUM		100 U	
SODIUM	200 U		
URANIUM, TOTAL			1
VANADIUM	4 U		
ZINC	3 U		

PCBS & OTHER EXTRACTABLES (UG/L)	
SAMP NO:	AR420038E
SDG NO:	ARG05
TYPE:	RINSATE
AROCLOR-1260	36 J

EXTRACTABLE ORGANICS (UG/L)			
SAMP NO:	AR420016E	AR420027E	AR420038E
SDG NO:	DD28	DD28	DD29
TYPE:	BACKGROUND	BACKGROUND	RINSATE
BIS(2-ETHYLHEXYL)PHTHALATE	9 JB	7 JB	2 JB

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9
PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 420
LOCATION: 317-319 LANDFIL
MEDIUM: GROUND WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR420016E DD28 BACKGROUND	AR420027E DD28 BACKGROUND	AR420038E DD29 RINSATE			
* UNKNOWN			4 JB				
* UNKNOWN HYDROCARBON(8.13)				7 JB			
* UNKNOWN PHTHALATE(35.08)				9 J			
* UNKNOWN(19.47)				9 JB			
* UNKNOWN(19.82)				12 JB			
* UNKNOWN(21.48)				3 J			
* UNKNOWN(22.20)				23 J			
* UNKNOWN(29.35)				3 J			
* UNKNOWN(37.49)				10 J			

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR420016A ON21 BACKGROUND	AR420027A ON21 BACKGROUND	AR420038A ON21 RINSATE			
ACETONE		7 JB	10 U	4 JB			
BENZENE		5 U	5 U	1 J			
ETHYLBENZENE		5 U	5 U	2 J			
METHYLENE CHLORIDE		10 B	8 B	8 B			
TOLUENE		1 JB	0.8 JB	18 B			

RADIOCHEMISTRY (PCI/L)	SAMP NO: / SDG NO: / TYPE:	AR420016H LLL7686 BACKGROUND	AR420016I LLL7686 BACKGROUND	AR420016J LLL7686 BACKGROUND	AR420027H LLL7686 BACKGROUND	AR420027I LLL7686 BACKGROUND	AR420027J LLL7686 BACKGROUND
GROSS ALPHA				22			4
GROSS BETA				0			0
H-3		350			670		
PU-238				0			0
PU-239				0			0
SR-TOT			1.9			0	

RADIOCHEMISTRY (PCI/L)	SAMP NO: / SDG NO: / TYPE:	AR420038H LLL7686 RINSATE	AR420038I LLL7686 RINSATE	AR420038J LLL7686 RINSATE			
GROSS ALPHA				3.3			
GROSS BETA				0			
H-3		90					
PU-238				0			

TABLE 4.3.9 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 9 PLOT M, 317-319 AREA, AND 800 AREA LANDFILL WELLS

DRAFT DO NOT CITE

S&A REQUEST: 420
LOCATION: 317-319 LANDFIL
MEDIUM: GROUND WATER

RADIOCHEMISTRY (PCI/L)	SAMP NO: SDG NO: TYPE:	AR420038H LLL7686 RINSATE	AR420038I LLL7686 RINSATE	AR420038J LLL7686 RINSATE			
PU-239				0			
SR-TOT			2.2				

RADIOCHEMISTRY (UG/L)	SAMP NO: SDG NO: TYPE:	AR420016J LLL7686 BACKGROUND	AR420027J LLL7686 BACKGROUND	AR420038J LLL7686 RINSATE			
U-234		3E-04	3E-04	3E-05			
U-235		0.026	0.06	0			
U-238		4.7	4.5	0.27			

TABLE 4.4.9 GROUNDWATER SAMPLE LOCATIONS AND SAMPLE VOLUMES
ENVIRONMENTAL PROBLEM 9

WELL ID	SAMPLE NUMBER	DATE	SAMPLING METHOD	VOLUME (L)
	AR406018	.	BAILER	0.0
	AR406029	.	BAILER	0.0
	AR406030	07DEC87	PUMP	93.9
	AR406041	07DEC87	PUMP	93.9
	AR408010	07DEC88	BAILER	0.0
	AR408021	.	BAILER	0.0
1	AR411015	17NOV87	BAILER	4.5
1	AR411026	17NOV87	BAILER	4.5
3	AR412016	04NOV87	BAILER	4.9
3	AR412027	04NOV87	BAILER	4.9
10	AR412038	04NOV87	BAILER	0.0
10	AR412049	04NOV87	BAILER	0.0
	AR413017	09DEC87	PUMP	0.0
	AR413028	09DEC87	PUMP	0.0
	AR413051	09DEC87	PUMP	0.0
	AR413062	09DEC87	PUMP	0.0
	AR414018	.	BAILER	0.0
	AR414029	.	BAILER	0.0
	AR414030	.	BAILER	0.0
	AR414041	.	BAILER	0.0
	AR414052	.	BAILER	0.0
	AR414063	.	BAILER	0.0
	AR415019	05NOV87	PUMP	0.0
	AR415020	05NOV87	BAILER	0.0
	AR416010	09DEC87	BAILER	0.0
	AR416021	.	BAILER	0.0
MW-3	AR418012	.	BAILER	0.0
MW-3	AR418023	.	BAILER	0.0
MW-3	AR418034	.	BAILER	0.0
MW-2	AR419013	05NOV87	BAILER	6.2
MW-2	AR419024	06NOV87	BAILER	6.2
MW-1	AR420016	06NOV87	BAILER	3.0
MW-1	AR420027	06NOV87	BAILER	3.0
MW-1	AR420038	11NOV87	BAILER	3.0

4.15 Environmental Problem 10: Laboratory Sewer Wastewater Treatment Facilities

Request Number: 500.

Requester: D. Worley.

Finding and Basis: Hazardous wastes may be discharged into unregulated retention tanks and subsequently into the laboratory sewer wastewater treatment facility. The research laboratories and the waste operations facility are using a multitude of retention tanks to receive the chemical wastes, glassware cleaning wastewaters, and dilute reagent solutions from various projects. There is an ANL Waste Management Operations Procedure which restricts the use of the laboratory sewer for chemical waste disposal. It is believed by the Survey that ANL staff are not fully implementing the approved procedure because certain staff members are unfamiliar with the content, are not adequately identifying their wastes, and in some instances, do not know that the procedure even exists. Furthermore, in some laboratories, approved liquid waste containers are not available for use and there was evidence that the laboratory sinks were heavily used for chemical waste disposal.

4.15.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if the hazardous wastes listed in Sect. 4.15.2.2 were present at minimum detection limits in the various retention tanks that subsequently discharged into the laboratory sewer wastewater treatment facility.

Supporting Information: Various spent solvents were present throughout the laboratories at ANL. The discharging of these materials into the system above concentrations defined in Section 2613 and Subpart D of the Resource Conservation and Recovery Act (RCRA) would define the wastewaters as hazardous. Efforts to determine whether or not the wastewaters were hazardous had not been performed by ANL, and it was assumed by ANL that the ANL staff was pouring only "de minimus" quantities down the laboratory drains. (Additional information is discussed under Request 300 in Sect. 4.6.)

4.15.2 Sampling and Analytical Design

4.15.2.1 Sampling Design

Request 500: Laboratory Sewer Wastewater Treatment Facilities - Water (Figs. 4.10a through 4.10m). Three grab samples were to be collected (Sampling Method: References E4.2.4 and E4.3.2) from one full retention tank in each area identified in the ANL Sampling and Analysis Plan and from the meter and screen chamber at the laboratory sewer wastewater treatment plant. Samples for volatile organic components were to be collected before and after circulating the contents of the tanks. Retention tanks were to be recirculated approximately 20 min before sampling to ensure complete mixing of the tank's contents. Sampling times were to be selected on three (or more) non-consecutive days to complement the sampling schedule. It was assumed that the discharge of the retention tanks was essentially random, dependent upon the activities in each facility, and that the random selection of sampling times would provide data representative of routine discharges. pH, temperature, and specific conductivity were to be measured each time a sample was collected.

NOTE: When necessary, various tanks referenced throughout the sampling design description for Request 500 are referred to by <u>all</u> tank numbers associated with their supporting documentation, e.g., Survey requests, sampling logs, and ANL tank numbers. Example: ANL Sampling and Analysis Plan Tank Location 2 is Argonne Tank number M-13 and will be referred to as Tank 2 [M-13].

<u>Building 200 Retention Tanks</u>--Tank Locations 1 through 4 (Fig. 4.10a). The Sampling Team arrived at Building 200 on 09NOV87 at 1115. The team contacted Bruce Necker and Larry Ballard from the Building 200 maintenance department. The tanks were reportedly radioactive. A gamma/beta scan was conducted around the tanks and samples. No elevated readings were detected. Although samples were scheduled to be collected from three M-wing tanks (Tank Location 2 [ANL Tank Number M-13], Tank Location 3 [ANL Tank Number M-14], Tank Location 4 [ANL Tank Number M-15]), the

Argonne operator (Larry Ballard) was very concerned about the potential for cross-contamination from Tank M-13 to the outer tanks as the contents of the tanks were transferred for the post-circulation samples. Because Tank M-13 was reported by Larry Ballard to have contained the most highly contaminated waste, samples were only collected from Tank M-13. Tanks 3 (M-14) and 4 (M-15) held 400 and 0 gal., respectively.

Please see text associated with a specific location for detailed information on specific samples collected in Building 200.

Building 200 Retention Tanks off Wing M Tank Locations 2, 3, and 4 (ANL Tanks M-13, M-14, and M-15) (Fig. 4.10b.) For reasons previously stated, only Tank 2 (M-13) was sampled from Wing M on this day. On the first day's sampling for this location, grab sample AR500148 was collected from Tank Location 2 (ANL Tank M-13) on 09NOV87 at 1127 before tank circulation. The sample appeared to be cloudy, gray-colored water with dark gray particulates. Sample AR500024 was collected from Tank 2 (M-13) at 1155 after mixing the tank's contents and appeared cloudy gray with suspended particles. Grab samples AR500159 and AR500035 could not be collected from Tank 3 (Tank M-14), as originally requested in the sample log, because of ANL Lab Operator Larry Ballard's concern that the tanks could be cross-contaminated if they were pumped for sampling. Grab samples AR500160 and AR500046 were not collected from Tank 4 (Tank M-15) on 09NOV87 (see 18NOV87) because the tank was empty. There was a chemical odor in the tank.

The second day's sampling for Wing M began on 11NOV87 at 1038. Pre-circulation sample AR500375 was collected from Tank Location 2 (ANL Tank M-13) at 1057. The sample was gray in color and had a chemical odor. After circulation of Tank 2 (M-13) contents, sample AR500251 was collected at 1112. The sample was fairly clean after circulation, but the chemical odor was still present. Grab samples AR500386 and AR500262 from Tank 3 (M-14) were not collected because of cross-contamination concerns by ANL Lab Operator Larry Ballard. Grab samples AR500397 and -273 were not collected from Tank 4 (M-15) on 11NOV87 (see 18NOV87) because the tank was still empty.

On the third day's sampling for Wing M, the Sampling Team arrived on 13NOV87 at 0900 to collect samples from Wing M Tank Location 2 (M-13) (capacity 1500 gal.). The GM survey meter registered 50-70 cpm near the spicket where samples were taken. Sample AR500604, collected at 0904 before circulation, was gray in color with a strong chemical odor. Sample AR500488, collected at 0920 after circulation, was relatively clean and had fewer suspended materials, but it still had a strong chemical odor. Larry Ballard was the ANL contact. Grab samples AR500615 and AR500499 were not collected from Tank 3 (M-14) on 13NOV87 because of cross-contamination concerns of ANL Lab Operator Larry Ballard. Grab samples AR500626 and AR500502 could not be collected from Tank 4 (M-15) on 13NOV87 (see 18NOV87) because it was still empty.

On 18NOV87, the Sampling Team revisited Tank Location 4 (ANL Tank Number M-15) in Wing M of Building 200. The team spoke with John Wederitch and John Nelson. The team learned that 1000 gal. of liquid were in the tank (capacity 1700 gal.) on the morning of 18NOV87. The operator had begun to pump out waste prior to the team's arrival. At the time of sampling, Tank 4 (M-15) contained approximately 600 gal. At approximately 1400, the team collected pre-circulation samples AR500160, -397, and -626 and post-circulation samples -046, -273, and -502. All samples for Tank 4 (M-15) were collected at the same time because the volume in the tank represented the only waste accumulated over a 2-1/2 week period.

Building 200 Retention Tanks Off Wing R (Tank Location 1 [ANL Tank Numbers 1 and 6]) (Fig. 4.10c). On the first day's sampling at Tank Location 1, sample AR500137 was collected on 09NOV87 at 1405 from C Wing Argonne Tank 6 (Tank Location 1 as specified in the sample log) before tank circulation. The sample appeared to be clear and foamy with a strong metallic odor. All six tanks in this room were in sequence and held approximately the same amount and type of contamination much of the time. The operator, Mr. Larry Ballard, said that the tanks collected wastes from Wings A, B, and C in Building 200. Tank 6 (ANL Tank Location 1) had a capacity of 1600 gal. and held

1300 gal. on 09NOV87. Following tank circulation, sample AR500013 was collected at 1423.

On the second day's sampling for this location, sample AR500364 was collected on 11NOV87 at 1042 prior to mixing the lower-level Tank 1 in Wing R. Although this tank was not the same tank as the tank sampled on 09NOV87, the two tanks were in sequence. Therefore, the Argonne lower-level Tank 1 received the same waste as the Argonne Tank Number 6 sampled on 09NOV87. It was a clear foamy sample with a metallic odor. Sample AR500240 was collected at 1150 after mixing of the tank contents. The sample was clear and had a metallic odor.

On the third day's sampling for this tank, sample AR500591 was collected on 13NOV87 at 0936 prior to mixing of the Argonne lower-level Tank 1 contents. The water was clear, with minute suspended material and had a light color. Sample AR500477 was collected at 0955 after tank circulation. The sample was clear with a very light odor.

Building 202 Retention Tanks (Figs. 4.10d through 4.10f). The following tank locations were to be sampled in Building 202:

(1) Tank Location 5 - A tank on the main floor off Wing 0.
(2) Tank Location 6 - A tank on the service floor in Room E067.
(3) Tank Location 7 - A tank on the service floor off Wing Q.

The Tank 5 location was not sampled on 05NOV87 because the tanks on the main floor off Wing 0 were empty. The tanks at this location were checked again on 09NOV87, 11NOV87, and 18NOV87. They were found to be dry or nearly empty. No samples were collected at this location.

Samples from Tank Location 6 were collected on 05NOV87 from Argonne Tank 8 in Room E067. Of the eight tanks in this room, only Argonne Tank 8 contained liquid waste on this day. On 09NOV87, Argonne Tank 7 was sampled instead of Argonne Tank 8 because Tank 7 was two-thirds full and Tank 8 (capacity 3000 gal.) contained only

200 gal. Tanks 5, 6, 7, and 8 all received waste from the same wings (A, B, and C) of the building and were considered comparable. Samples were again collected from this location on 11NOV87 from Argonne Tank 5 (3000 gal. capacity) which contained approximately 2500 gal. of liquid. All of the other tanks at this location were dry.

The tanks at Tank Location 7 were checked on 05NOV87, 09NOV87, 11NOV87, and 18NOV87 and were found to be empty each time. No samples were collected from Tank Location 7.

Please see text associated with a specific location for detailed information on specific samples collected in Building 202.

<u>Building 202 Retention Tanks Off Wing O (Tank Location 5)</u> (Fig. 4.10.d). The Sampling Team arrived at this location on 05NOV87 at 1530. Samples AR500171 and AR500057 were not collected from the Tank Location 5 because the tanks were empty.

On 09NOV87, the team returned to this location at 1055. The operator, Charles Brown, indicated that the tanks (5 and 6) were empty. After physically checking, the team determined that samples AR500400 and AR500284 could not be collected. Tanks 9 and 10 received waste from Wings O and W of Building 202. Tank 9 had a small amount approximately 200 gal. out of a 1500 gal. capacity of liquid, but not enough to sample.

On 11NOV87 the team arrived at 1000. Samples AR500637 and AR500513 could not be collected because the tanks were empty or contained too small a volume to sample. Tank 9 had approximately 400 gal. out of a 1500 gal. capacity.

The team again visited the tanks on 18NOV87 between 1030 and 1130 and found that the tanks were empty or contained too small a volume to sample. The Tank 5 location was, therefore, not sampled.

<u>Building 202 Retention Tanks on Service Floor in Room E067 (Tank Locations 6, 7, and 8)</u> (Figs. 4.10e and 4.10f). On 05NOV87, the team collected Tank Location 6 samples

from ANL Tank 8 in Building 202. Charles Brown was in charge of tank operation. Argonne Tank 8 held the cumulative wastewater generated by Building 202 for 05NOV87. The tank was a 1600 gal. tank and the recycle time was between two days and a few hours. Sample AR500182 was collected at 1527 before circulation of the tank contents. The liquid had a clear consistency, but smelled like methane. Tanks 3-8 are filled at different times, but were in sequence and, therefore, contained the same wastes. Tanks 1 and 2 were pumped dry. Sample AR500068 was collected at 1512 after circulation of Argonne Tank 8. There was a sulfur smell.

On 09NOV87, the Sampling Team arrived at Tank Location 6 at 1023. On this day, Argonne Tank 7 was sampled rather than Tank 8 because Tank 7 had been filled to about two-thirds of its capacity (2000 gal. out of a 3000 gal. capacity) since the first sampling of these tanks on 05NOV87. Sample AR500411 was collected from Tank 7 at 1023 prior to mixing. After mixing, sample AR500295 was collected at 1046. The media was cloudy.

On 11NOV87, the team returned to Room E067 to obtain the third set of samples. Argonne Tank 5, containing 2500 gal. out of 3000 gal., was sampled. Sample AR500648 was collected before tank circulation and AR500524 was collected after circulation. All other tanks were empty at this location on 11NOV87.

<u>Building 202 Retention Tank on Service Floor on Wing Q (Tank Location 7)</u> (Fig. 4.10e). The Sampling Team arrived on 05NOV87 at 1545. Samples AR500193 and AR500079 could not be collected because the tanks on the service floor on Wing Q were empty (Argonne Tanks 11 and 12).

For the second sampling, the Sampling Team arrived on 09NOV87 at 1120. Samples AR500422 and AR500308 could not be collected because Tank 7 was empty.

The Sampling Team returned to this location on 11NOV87 at 1015. Samples AR500659 and AR500535 could not be collected because the tanks were empty.

The Sampling Team returned to the Tank 7 location on 18NOV87 at 1030. Again, samples could not be collected because the tanks were empty.

<u>Building 203 Retention Tanks 1 and 2 Off Central Corridor</u> (Tank Location 8) (Figs. 4.10g and 4.10h). The Sampling Team arrived at this location on 05NOV87 at 1052. Samples were to be obtained from two 1600 gal. capacity tanks located next to Cooling Tower 21 A/Z. The tanks (Argonne Tanks 1 and 2) were found east of the central corridor in a containment sump. Tanks 1 and 2 were in series, with Argonne Tank 1 being the main retention tank.

QC rinsate sample AR500717 was collected at 1052. Sample AR500206 was collected from Tank 1 at 1100 prior to tank circulation. It appeared to be murky brown in color. Sample AR500080 was collected at 1150 after circulation. The sample was a clear liquid. The temperature at the time of sampling was 75-80^{o}F.

For the second day's sampling, the team arrived 09NOV87. Argonne Tank 2 was sampled (see Fig. 4.10g). Sample AR500433 was collected at 0903 before tank circulation. The sample was translucent with suspended particles. Sample AR500319, collected at 0920 after circulation, was clear gray with suspended particles.

For the third set of samples, the team arrived on 11NOV87 at approximately 0845. Sample AR500660 was collected from Argonne Tank 1 at 0845 before circulation of the tank contents. Sample AR500546 was collected at 0900 following circulation of the tank contents.

<u>Building 205 Retention Tanks (Tank Location 9)</u> (Figs. 4.10i and 4.10j). The Sampling Team arrived at Building 205 on 09NOV87 at approximately 1000. The team contacted John Curtain of the ANL Maintenance Department. There were ten tanks in the Building 205 retention tank area. Samples AR500217 and AR500091 were collected from Argonne Tank B-4, which handled most of the waste in the Building 205 Laboratory (B-Wing). Sample AR500217, collected at 1013 prior to circulation, was clear with a yellow tint. Sample AR500091, collected at 1042 after circulation, had a yellow tint with

suspended particles. Tank B-4 held approximately 800 gal., which was about one-half of the tank's capacity.

For the second day's sampling, the team arrived at the sampling location on 11NOV87 at 0940. Sample AR500444, collected from Tank B-4 at 0946, was black with a strong odor. The tank contained approximately 400 gal. Sample AR500320 (collected at 0955) was clearer and more of a gray color, but it still had a strong odor. The team left at 1012. (Note: Aliquots AR500320B and D were broken in transit.)

For the third day's sampling, the team arrived on 13NOV87 at about 1053. Argonne Tank B-3 held 850 gal. and was chosen for sampling. Sample AR500671 was collected at 1053 before tank circulation and AR500557 was collected at 1108 after tank circulation. Both samples were gray colored with a musty scent. The area was scanned with a GM survey meter. A reading of 50-70 cpm was obtained.

Building 306 Chemical Acid Waste Retention Tanks 1 and 2 (Tank Locations 10 and 11) (Figs. 4.10k and 4.10l). For the first day's sampling, the team arrived at the sampling location on 10NOV87 at 1420. The operator showed the team the two acid waste tanks and indicated that both tanks were half full (2500 gal. in each tank) and had been open to each other for approximately two months. Therefore, the media was probably homogeneous. The operator indicated that there was 1 ft of sludge in each tank. Each tank held 4000 gal. when full. The time required to fill the tanks was 3-4 days. Sample AR500228, collected at 1430 prior to mixing acid waste Tank 1 (Tank Location 10), was cloudy and had a chemical odor. Sample AR500104, collected at 1440 after mixing, was also cloudy and had a chemical odor. Samples AR500239, collected at 1430 prior to mixing the contents of Tank 2 (Tank Location 11), and AR500115, collected at 1440 after mixing, were also cloudy with a chemical odor.

For the second day's sampling, the team arrived at the sampling location 12NOV87 at 1500. The operator indicated that approximately 1000 gal. of waste had been received since 10NOV87. Acid waste Tanks 1 (Tank Location 10) and 2 (Tank Location 11) had an open line between them and were considered homogeneous. Each tank contained

3200 gal. Sample AR500455, collected from Tank 1 before circulation, was murky and slightly brown in coloration with a slight chemical odor. Sample AR500331, collected at 1500 after circulation, was less murky, a light amber color, and had a slight chemical odor. Sample AR500466, collected from Tank 2 before mixing, was less murky, a slight amber color, and had a slight chemical odor. Sample AR500342, collected from Tank 2 after mixing, was slightly cloudy, yellowish in color, and had a slight chemical odor.

For the third day's sampling, the team arrived on location 17NOV87 at approximately 1030. ANL personnel again took the team to the tanks to be sampled (acid waste Tanks 1 and 2 (Tank Locations 10 and 11). The operator indicated that each tank held approximately 3600 gal. The area was radiation scanned. A stainless steel beaker was used to collect the sample, which was taken from a spicket between the two tanks. Three full beakers comprised one sample set. Personnel and equipment were checked for surface contamination before leaving the building. Sample AR500682 was collected from Tank 1 at 1030 before tank circulation. The sample was cloudy with a strong chemical odor. Sample AR500568 was collected at 1120 after Tank 1 circulation and was cloudy with a chemical odor. Sample AR500693 was collected from Tank 2 at 1055 prior to tank circulation. The sample was cloudy with a strong chemical smell. Sample AR500579 was collected from Tank 2 at 1120. The sample was cloudy with a chemical smell.

<u>Laboratory Sewer Wastewater Treatment Plant Meter and Screen Chamber</u> (Fig. 4.10m). The team arrived at the Laboratory Sewer Wastewater Treatment Plant meter and screen chamber on 09NOV87. The plant operator was contacted and showed the team the sample location. Sample AR500126 was collected at 1423. The media was clear, but had a chemical odor. The sample was collected with a decontaminated stainless steel dipper.

On the second day of sampling, the team arrived at the sampling location on 11NOV87 at approximately 0955. Field preservative blank AR500706 was collected at 0955 with a glass beaker. Grab sample AR500353 was collected at 1000 with a stainless steel dipper.

The media was clear with a slight chemical odor. The rate of flow was the same as 09NOV87. The temperature was 35°F under calm, partly cloudy skies.

The team arrived at the Laboratory Sewer Wastewater Plant meter and screen chamber on 13NOV87 at 1128. The weather was cool and cloudy. A gamma/beta scan performed with a GM survey tube showed 30-50 cpm in the area of the meter and the screen. Sample AR500580 was collected at 1128. It was clear with minimal suspended particles.

4.15.2.2 Analytical Design

Request 500: Field parameters measured for Request 500 included pH, temperature, and specific conductivity. Parameters analyzed included volatiles (CLP), semivolatiles (CLP), pesticides (CLP), PCBs, CLP-metals, and cyanide.

4.15.3 Field and Analytical Data

Field Data: *Most of the discussion for Environmental Problem data will be organized by tank location. These locations are normally characterized by tanks associated with buildings. The field information requested include conductivity, pH, and temperature. The data are provided in Table 4.3.10.*

<u>Building 200 Retention Tanks</u>:

Tanks off Wing M--Samples were collected on three separate days from ANL tanks M-13, M-14, and M-15. Samples were collected from Tank M-13 for three successive days. Conductivity ranged from 1.1 to 2.5 mS/cm, and pH ranged from 7.5 to 8.8. Two higher pH readings of 8.5 and 8.8 and conductivity readings of 2.5 and 2.4 (prior to and after mixing the solution) were obtained on the third day. Tank M-14 was never sampled because ANL representatives were concerned about cross contamination if the tank was mixed. Tank M-15 remained dry during the three separate days when samples were taken from M-13; however, five days after cessation of sampling, the team revisited the site and noted waste in Tank M-13. Six samples were then collected at *approximately the same time. The results showed that the conductivity ranged between 1.3 and 1.4, and the pH was slightly acid at 6.1-6.2.*

Tanks off Wing R--Two samples were collected each day on three separate days--one taken prior to mixing and the other after mixing. Conductivity ranged from 1.1 to 1.6 mS/cm, pH from 7.5 to 8.4, and the temperature from 19 to 21^{o}C. The largest variation occurred on the second set of samples, before and after mixing. The conductivity was 1.6 before and 1.1 after mixing, and the pH changed from 7.5 to 8.1. In the other samples, the change was about 0.1 units in conductivity and pH.

Building 202 Retention Tanks:

Tanks off Wing 0--The six samples to be taken over three days before and after mixing were not collected from Tank Location 5 because the tank was empty.

Tanks on Service Floor in Room E067--On the first day of sampling at this location, the sample was obtained from Tank Location 8; the readings (before and after) were 1.7 and 1.8 for conductivity, 8.0 and 7.8 for pH, and 25 and 28^{o}C for temperature. On the second sampling day, the team obtained samples from Tank Location 7 because the tank was two-thirds full. The readings before and after mixing were 0.83 and 1.6 for conductivity; 8.0 and 7.8 for pH; and 20^{o}C for the three readings noted above. The third set of measurements, taken from Tank Location 7, were 1.6 and 1.8 for conductivity; 7.5 and 7.6 for pH; and 29^{o}C.

Tank on Service Floor in Wing Q--The tank was empty for the three separate days the sampling team visited Tank Location 7.

Building 203 Retention Tanks off Central Corridor:

There were two tanks at this location on the first and third day's sampling. The waste came from ANL Tank 1. The conductivity readings were constant for both the pre- and post-mixed samples on the different days at 1.5 mS/cm. The pH ranged from 7.6 to 8.2 *and the temperature from 25 to 27^{o}C. On the second day's sampling the field readings were taken from ANL Tank 2; the conductivity was 1.6, the pH 7.4 and 8.1, and the temperature was 27 and 28^{o}C.*

Building 205 Retention Tanks:

Two tanks were sampled at this location. On the first and third day's sampling, ANL Tank B-4 was selected. For both sampling times, the field measurements were very close for the four readings. Conductivity ranged from 1.4 to 1.5; pH ranged from 7.2 to 7.8; and temperature ranged from 22-23^{o}C. The most extreme pH reading was collected on the second day's sampling before (7.2) and after (7.8) mixing. On the third day's sampling, the samples were taken from ANL Tank B-3. Before and after mixing, readings were 1.6 for conductivity, 7.9 and 8.1 for pH, and 22 and 21^{o}C.

Building 306 Chemical Retention Tanks:

Two tanks were sampled and field measurements were taken. They are reported together because they are interconnected and the waste is considered homogeneous. Tank 1 and Tank 2 had similar field properties. Conductivity in Tank 1 changed from 3.7 (prior) to 3.1 (after) mixing, the pH changed from 8.6 to 7.2, and the temperature increased from 21 to 22^{o}C. In Tank 2 the conductivity readings were 3.7 and 5.4; pH ranged from 8.6 to 8.3; and the temperature ranged from 21 to 22^{o}C.

On the second sampling day after more waste was received, the three sets of readings were 6.9 and 7.3 for conductivity, 9.8 to 9.5 for pH, and 24 to 23^{o}C for Tank 1. Tank 2 also showed increases in conductivity (8.7 and 6.3) as noted for Tank 1 compared to the first day's measurement. The pH showed a marked decrease prior to mixing at 5.6; after mixing it was 8.0. The temperature also showed a slight increase of about 1^{o}C.

The third sampling showed a slight decrease in conductivity from the second sampling; 5.6 and 4.4 for Tank 1, and 5.8 and 6.4 for Tank 2. The pH of the waste prior to mixing was neutral (7.0 for Tank 1 and 7.1 for Tank 2) but became slightly acid after *mixing (6.1 for Tank 1 and 5.3 for Tank 2). The temperatures in Tank 1 were 21 and 22^{o}C. For Tank 2, they were 23 and 25^{o}C.*

Laboratory Sewer Wastewater Treatment Plant Meter and Screen Chamber:

Three samples were collected from this location on three separate days. On the first day, the conductivity was 5.3 and the pH was 4. On the next sampling day, the conductivity decreased to 1.6 and the pH increased to 8.1. On the third sampling day, the conductivity further decreased and measured 0.33, whereas the pH remained relatively constant at 8.0. The temperature increased one degree each time from 16 to 17 to 18^{o}C.

Field Data Evaluation: Field measurements were made over a two-week time span involving approximately 6 days when actual measurements were taken. Because the instrument used to make measurements was calibrated before use, the data are reliable. Changes observed are associated with the changing character of the waste products as they are being added to the tanks during the sampling period.

Analytical Data:

Anions and cyanide. The results of the cyanide analysis are shown in Table 4.3.10. Each tank location analysis is discussed separately. The results represent samples taken after mixing.

Building 200 Retention Tanks:

Retention Tanks Off Wing M--With the exception of the first day's sampling from Tank Location 2 (AR500024) which contained 3 µg/L of cyanide, the remaining samples from Tank Location 2 were at or below the detection level of 2 µg/L. It should be noted that samples from Tank Location 4 (AR500046, -273, -502) were taken on the same day because the tank had been empty on the first three sampling visits. A special visit was *made 5 days after the other samples had been collected. The tank (M-15) was being emptied at the time samples were collected.*

Retention Tanks Off Wing R--All samples were below the detection limit of 2 µg/L (500013, -240,-477).

<u>Building 202 Retention Tanks</u>:

Retention Tanks Off Wing O--No samples were collected because the tanks were dry.

Tanks on Service Floor in Room E067--Small quantities of cyanide were detected in two (AR500068, -295) of the samples, but the sample taken on the third sampling day was below detection level.

Tank on Service Floor on Wing Q--The tank was dry and no samples were taken.

<u>Building 203 Retention Tanks:</u>

Building 203 Retention Tanks Off Central Corridor--All three samples showed cyanide presence; in Tank 1 the concentrations were 3 and 5 µg/L for the first and third day's sampling (AR500080, -546). The sampling on the second day was from Tank 2 which contained 2 µg/L (AR500319).

<u>Building 205 Retention Tanks:</u>

Building 205 Retention Tanks--Results were provided for two of three samples taken from Tank B-4. The first day contained 3 µg/L (AR500091) and the second day contained 7 µg/L (AR500320). No results were given for Tank B-3 which was sampled on the third day (AR500557).

Building 306 Chemical Retention Tanks:

Building 306 Chemical Retention Tanks--Tanks 1 and 2 were sampled on three different days. On the first day, Tank 1 contained 13 µg/L (AR500104) and Tank 2 contained 21 µg/L (AR500115). On the second and third day, both tanks were at detection levels (AR500331, -342, -568, -579).

Laboratory Sewer Waste Water Treatment Plant--Three samples were collected. They all contained cyanide during the sampling period. The first day's sample contained 10 µg/L (AR500126); the second, 9 µg/L (AR500353); and the third day, 8 µg/L (AR500580).

Metals. Analytical results for metals for Request 500 samples from sealed containers are presented in Table 4.3.10.

Samples AR500013, -24, -46, -68, -80, and -91--Of the 23 metals detected, the following 8 were below either the CRDL or IDL in all six samples: antimony, arsenic, barium, beryllium, cobalt, selenium, thallium, and vanadium. Of the remaining metals detected, cadmium ranged between 14 and 19 µg/L, chromium from 29 to 274 µg/L, copper from 282 to 738 µg/L, lead from 9 to 156 µg/L, mercury from 0.58 to 34 µg/L, nickel from 44 to 178 µg/L, silver from 15 to 23 µg/L, and zinc from 24 to 2880 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and sodium.

Samples AR500104, -115, -126, -240, -251, and -273--Of the 26 metals detected, the following 4 were below either the CRDL or the IDL in all six samples: antimony, selenium, arsenic, and thallium. Of the remaining metals detected, arsenic was 13 µg/L in one sample, barium ranged between 256 and 2580 µg/L, beryllium was 38 µg/L, cadmium ranged from 15 to 1340 µg/L, chromium ranged from 16 to 17,600 µg/L, cobalt was 136 µg/L, copper ranged from 26 to 165,000 µg/L, lead ranged from 5 to 87,500 µg/L, mercury ranged from 0.28 to 45 µg/L, nickel ranged from 52 to 2630 µg/L, and zinc ranged from 26 to 53,300,000 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, sodium, and vanadium.

Samples AR500295, -319, -320, -331, -342, and -353--Of the 26 metals detected, the following 7 were below either the CRDL or the IDL in all six samples: antimony, arsenic, beryllium, cobalt, selenium, thallium, and vanadium. Of the remaining metals detected, barium was 424 µg/L, cadmium ranged from 5.8 to 45 µg/L, chromium ranged from 64 to 457 µg/L, copper ranged from 101 to 1610 µg/L, lead ranged from 13 to 3250 µg/L, mercury ranged from 1.2 to 15 µg/L, nickel ranged from 129 to 379 µg/L, silver ranged from 25 µg/L, and zinc ranged from 28 to 43,400 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and sodium.

Samples AR500477, -488, -502, -524, -546, -557, -568, -579, and 580--Of the 23 metals detected, the following 8 were below either the CRDL or the IDL in all nine samples: antimony, arsenic, barium, beryllium, cobalt, selenium, thallium, and vanadium. Of the remaining metals detected, cadmium ranged from 5.9 to 30 µg/L, chromium ranged from 24 to 8520 µg/L, copper ranged from 27 to 11,800 µg/L, lead ranged from 9 to 2430 µg/L, mercury ranged from 0.21 to 63 µg/L, nickel ranged from 45 to 812 µg/L, silver was 13 µg/L, and zinc ranged from 30 to 26,800 µg/L. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and sodium.

PCBs and other extractables. PCBs and other extractables were detected, in estimated concentrations of less than 0.3 µg/L, in 12 of the samples. There were five compounds identified in sample AR500295, four each in samples AR500579 and AR500319; two compounds detected in three of the other samples; and only one compound detected in six other samples. All were estimated concentrations, because they were below the quantitation limit.

Extractable organics. From 3 to 33 compounds were identified in the 27 respective samples for this environmental problem. Almost all of the tentatively identified or unknown compounds had estimated concentrations of less than 1 mg/L. There were only eight exceptions, and the highest estimated concentration of any unknown was 2.8 mg/L in sample AR500320. For the compounds that could be identified, the highest estimated concentration was 0.380 mg/L of di-n-butylphthalate in sample AR500320; the highest measured concentration of any identifiable compound was 0.330 mg/L of phenol *in sample AR500342. Benzoic acid was estimated at 0.250 mg/L in sample AR500115 and measured at 0.130 mg/L in sample AR500331. Other compounds were almost always measured or estimated in concentrations of less than 0.1 mg/L.*

Volatile organics. The number of compounds detected in individual samples (of 51 samples) ranged from 6 to 24, with 11 being the median value. Only eight samples had 17 or more compounds detected.

Acetone was present in all the samples and also in blanks. Acetone often exceeded the calibration range. In these cases, the highest estimated concentration was 8.7 mg/L in sample AR500397. The highest measured concentration was 1.42 mg/L in sample AR500693, but all other measured concentrations were less than 1 mg/L.

Benzene was present in all samples, with the highest estimated concentration at 0.130 mg/L.

Carbon disulfide was occasionally present in samples and also in the blank.

Chloroform was measured at 0.140 mg/L in three samples, at 0.145 mg/L in another, and exceeded 0.100 mg/L in several other samples. It also exceeded the calibration range in several samples, and in two of those cases it was estimated in concentrations of over 0.600 mg/L.

Methylene chloride was present in some blanks and in all samples. The highest measured concentration was 0.4 mg/L in AR500502. When methylene chloride exceeded the calibration range, its highest estimated concentration was 1.6 mg/L.

Toluene was present in all samples, with a highest estimated concentration of 0.11 mg/L in sample AR500444. All other concentrations were estimated at less than 0.100 mg/L.

Tetrachloroethene was present in some samples, with measured concentrations as high as 0.170 mg/L in sample AR500115. Tetrachloroethene concentrations were estimated as high as 1.4 mg/L (AR500455) when concentrations were out of the calibration range.

Trichloroethene was detected in all samples, with estimated concentrations as high as 0.200 mg/L or more in four of the samples.

Carbon tetrachloride was measured in concentrations of between 0.010 and 0.020 mg/L in samples AR500477 and AR500568.

Xylene was measured at 0.036 mg/L in sample AR500455, and was beyond the calibration range but estimated at 0.270 mg/L in sample AR500648.

1,2-dichloroethene was measured at 0.140 mg/L in AR500013.

4-methyl-2-pentanone was measured as high as 0.332 mg/L in AR500579.

2-butanone was detected in several samples and was measured in concentrations as high as 0.120 mg/L in AR500455.

1,1,1-trichloroethane was measured at 0.136 mg/L in AR500477.

In these 51 samples, there were more than 100 cases in which a compound was tentatively identified. Of these TICs, there were only four examples of an estimated concentration being more than 1 mg/L. Three of these occurred in AR500579 and the other occurred in sample AR500466. The highest of these estimated concentrations was 1.9 mg/L in AR500466.

Analytical Data Evaluation:

Anions and cyanide. The detection limit for cyanide in water is 2 µg/L. The spectrophotometer used was calibrated daily and the calibration verified with EPA quality control solutions. In addition, calibration blanks were prepared and analyzed for each calibration. All recorded results are in compliance (i.e., less than 2 µg/L). All duplicate results determined in this problem are in compliance (±20 RPD). Five of the spikes used in evaluating this problem were not in control (discussed in respective locations). All holding times were met. With these quality control measures, the results are reliable except where noted in respective locations.

Building 200 Off Wing M--Sample AR500488, taken on the third day from Tank Location 2, had spike recovery that was not in compliance. Samples AR500046 and AR500273, taken from Tank Location 4 (Tank M-15), also showed spike recoveries that were not in compliance.

Building 200 Off Wing R--All results are reliable.

Building 202 Retention Tanks Off Wing O--No samples were collected.

Building 202 Retention Tanks On Service Floor in Room E067--All results are reliable.

Building 202 Retention Tanks in Service Floor Wing Q--No samples were collected.

Building 203 Retention Tanks Off Central Corridor--All results are reliable.

Building 205 Retention Tanks--The two results given are reliable.

Building 306 Chemical Retention Tanks--Samples taken on the third day from tanks 1 and 2 (AR500568, -579) showed spike recovery not in compliance. Previous days' samples were also below detection limits.

Laboratory Sewer Wastewater Treatment Plant--All results are reliable.

Metals. Samples AR500013, -24, -46, -68, -80, and -91--Eight metals of interest--cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc--were detected above the CRDL.

Samples AR500104, -115, -126, -240, -251, -273--Eleven metals of interest--arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc--were detected above the CRDL.

Samples AR500295, -319, -320, -331, -342, and -353--Nine metals of interest--barium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc--were detected above the CRDL.

Samples AR500477, -488, -502, -524, -546, -557, -568, -579, and 580--Eight metals of interest--cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc--were detected above the CRDL.

PCBs and other extractables. Although several compounds were detected, none could be confirmed by GC/MS.

Extractable organics. The highest measured or estimated concentration of an identifiable compound was 0.330 mg/L of phenol in sample AR500342. Benzioc acid was estimated at 0.250 mg/L in one sample and measured at 0.130 mg/L in another. Other compounds were almost always measured or estimated in concentrations of less than 0.1 mg/L.

Volatile organics. Benzene was present in all samples, with the highest estimated concentration at 0.130 mg/L. Carbon disulfide was occasionally present in samples and also in the blank. Carbon tetrachloride was measured in concentrations of between 0.010 and 0.020 mg/L in samples AR500477 and AR500568. Chloroform concentration was measured or estimated in excess of 0.100 mg/L in several samples. Methylene chloride was present in some blanks and in all samples. The highest measured concentration of methylene chloride was 0.4 mg/L. When methylene chloride exceeded the calibration range, its highest estimated concentration was 1.6 mg/L. Toluene was present in all samples, with a highest estimated concentration of 0.11 mg/L. Tetrachloroethene concentrations were estimated as high as 1.4 mg/L. 1,2-dichloroethene was measured as high as 0.140 mg/L. 4-methyl-2-pentanone was measured as high as 0.332 mg/L. 1,1,1-trichloroethane was measured as high as 0.136 mg/L. Tentatively identified compounds were always estimated at less than 2 mg/L.

4.15.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: No limitations or qualifications are apparent.

Analytical Data:

Anions and cyanide. Results for Building 200 retention tanks off Wing M are rated Quality Level II because three of six results have poor spike recoveries. Results from Building 306 chemical retention tanks are also rated Quality Level II because the third day's sampling, which experienced poor spike recoveries, were from tanks which, on the first day, showed cyanide concentrations. The waste on the third day represented the accumulation of more waste in the tanks. The remaining tank analyses are rated Quality Level I.

Metals. Samples AR500013, -24, -46, -68, -80, and -91--Analytical results were Quality Level I except for iron, sodium, and zinc at Quality Level II. Sample AR500046 was Quality Level I except for calcium, magnesium, sodium, and vanadium at Quality Level II.

Samples AR500104, -115, -126, -240, -251, and -273--Samples AR500104 and -115 were Quality Level I except for vanadium at Quality Level II. Sample -126 was Quality Level I except for iron, sodium, and zinc at Quality Level II. Sample -240 was Quality Level I except for aluminum, calcium, and silver at Quality Level II. Sample -273 was Quality Level I except for calcium, magnesium, sodium, and vanadium at Quality Level II. (No quality data were available for sample -251.)

Samples AR500295, -319, -320, -331, -342, and -353--Sample AR500295 was Quality Level I. Sample -319 was Quality Level I except for iron, sodium, and zinc at Quality Level II. Sample -320 was Quality Level I except for aluminum at Quality Level II. Samples -331 and -342 were Quality Level I except for aluminum and vanadium at Quality Level II. Sample -353 was Quality Level I except for aluminum and calcium at Quality Level II and silver at Quality Level III.

Samples AR500477, -488, -502, -524, -546, -557, -568, -579, and 580--Sample AR500524 was Quality Level I except for calcium and silver at Quality Level II. Sample -546 was Quality Level I except for aluminum at Quality Level II. Remaining samples were Quality Level I except for calcium, magnesium, sodium, and vanadium at Level II.

PCBs and other extractables. The results for heptachlor epoxide in AR500273, AR500579, and AR500717 are Quality Level II. All other data are Quality Level III or unusable because the continuing calibration did not meet criteria, or the surrogate standard was not observed within the specified retention time window.

Extractable organics. The vast majority of the data were of Quality Level III due to mass spectral uncertainty for tentatively identified compounds, concentrations too small to measure accurately, and occasional other problems such as surrogate recovery. Data with Quality Level II come from samples AR500068 (phenol); AR500104 (phenols, naphthalene); AR500295 (phenol); AR500320 (di-n-butylphthalate); AR500331 (benzoic acid, naphthalene, phenol); AR500342 (phenols, benzoic acid, naphthalene, 2-methylnaphthalene); AR500524 (phenol); AR500557 (di-n-butylphthalate); and AR500579 (naphthalene). One datum of Quality Level I was the 0.180 mg/L of phenol identified in sample AR500579.

Volatile organics. The majority of the target volatile compounds detected in this sample set were Quality Level I or II. Acetone in AR500013, AR500091, AR500105, AR500115, AR500228, AR500524, AR500546, AR500604, AR500648, and AR500682 was Quality Level III because the associated continuing calibration did not meet specifications. 2-butanone in AR500331, AR500342, AR500455, AR500466, and AR500693 was Quality Level III because both the initial calibration and the continuing calibration did not agree closely enough with the specifications. Chloroform in AR500524 and AR500648 was Quality Level III because the associated surrogate did not meet criteria. Toluene, ethylbenzene, and xylene in AR500524 and AR500648 were Quality Level III because both the associated internal standard and the surrogate did not meet criteria. The remaining data which were rated Quality Level III were in two categories: (1) estimated concentrations that were below quantitation limits, and (2) TIC compounds that were unidentified.

Environmental Problem: 10
Request Number: 500

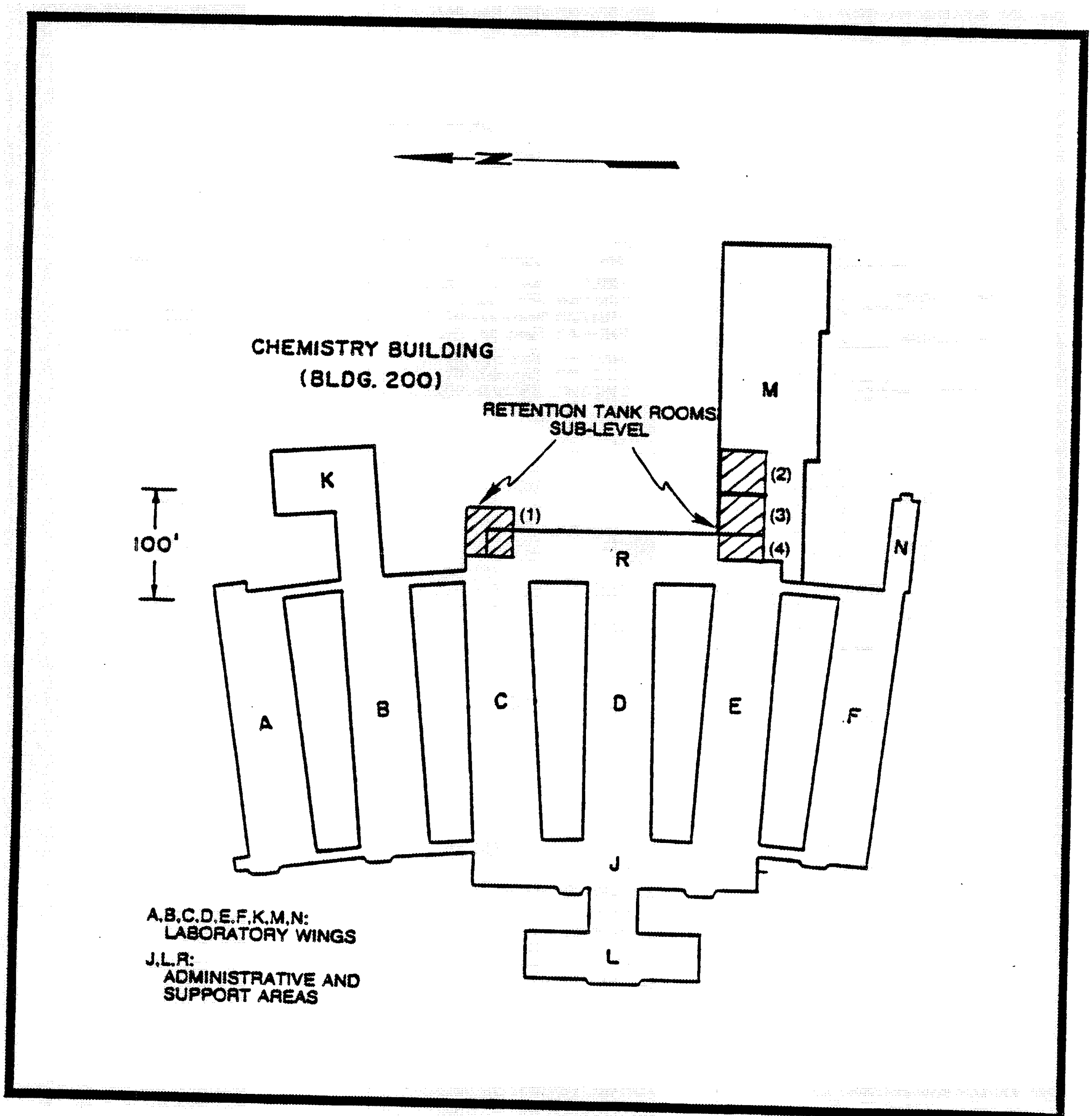


Figure 4.10a. Waste Retention Tanks in Building 200: Tank Locations 1, 2, 3, and 4 (Request 500)

Environmental Problem: 10
Request Number: 500

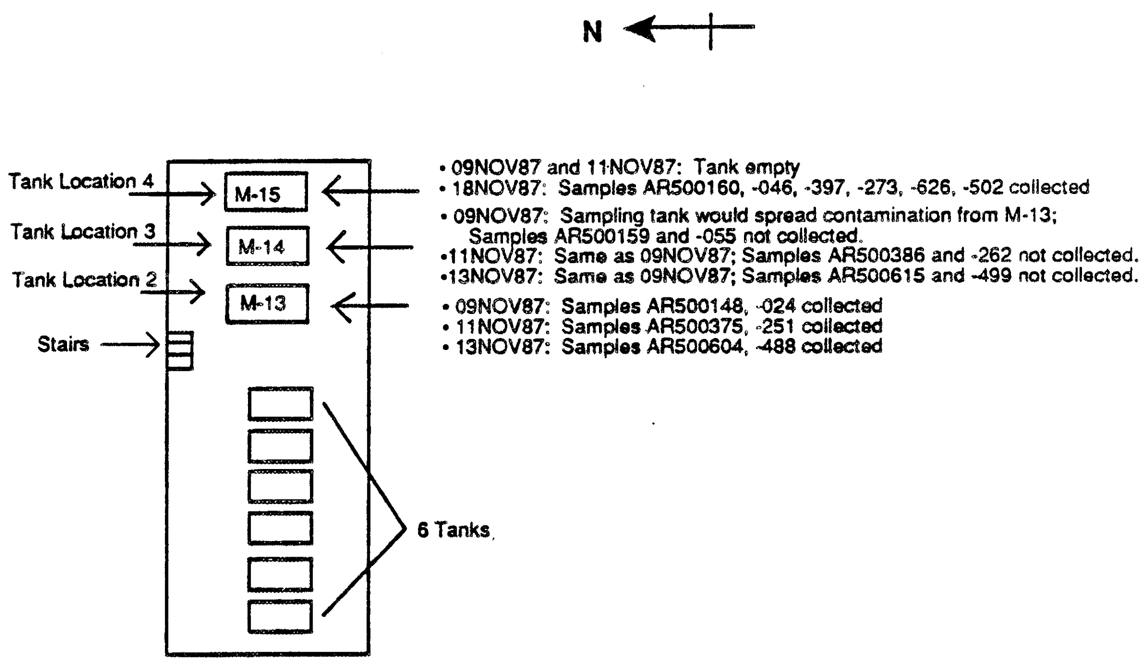


Figure 4.10b. Building 200 Retention Tanks Off Wing M (Tank Locations 2, 3, and 4 [Argonne Tank Numbers M-13, M-14, and M-15]) (Request 500)

Environmental Problem: 10
Request Number: 500

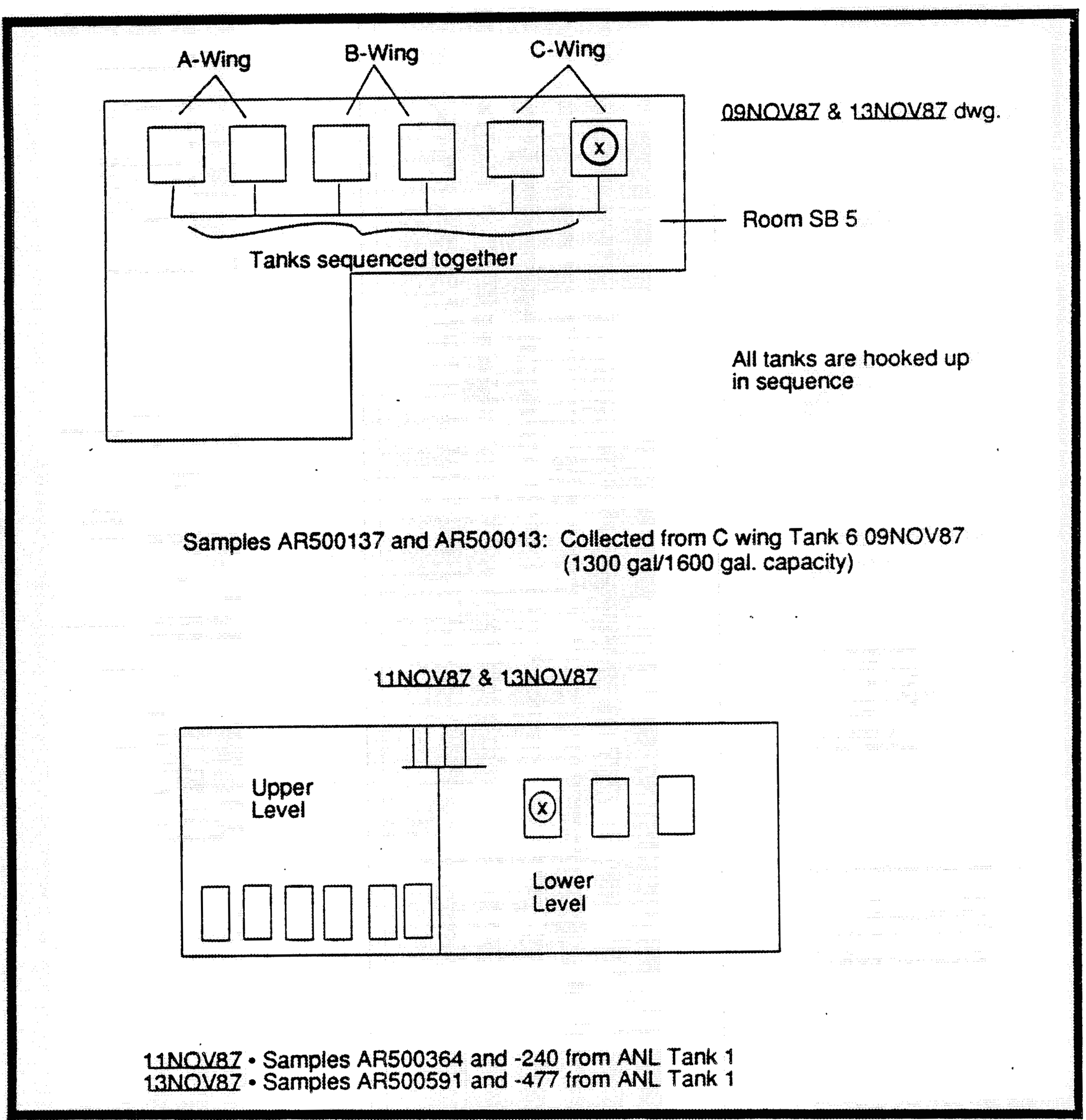


Figure 4.10c. Building 200 Retention Tank Off Wing R (Tank Location 1 [ANL Tanks 1 and 6]) (Request 500)

Environmental Problem: 10
Request Number: 500

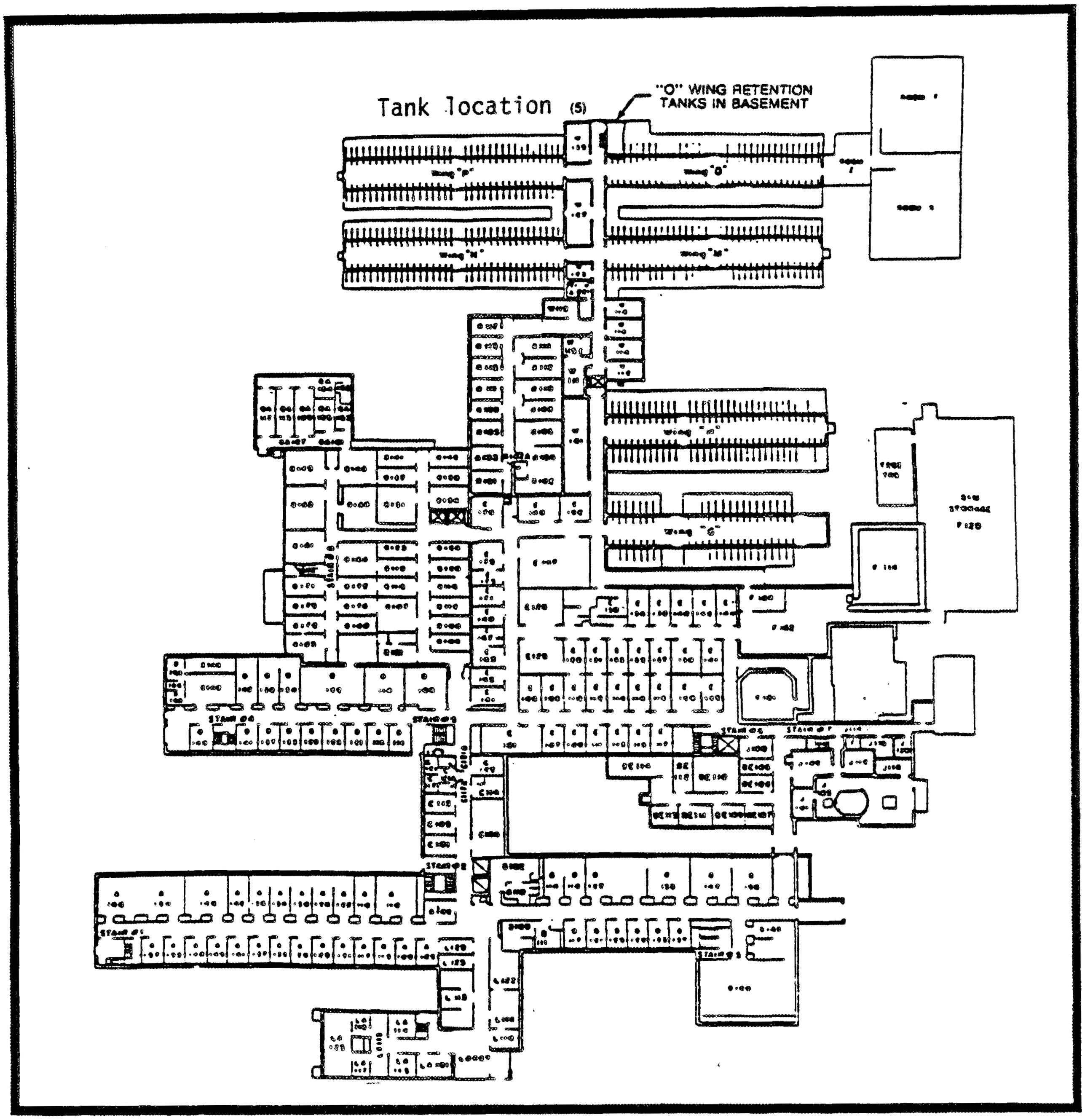


Figure 4.10d. Waste Retention Tanks in Building 202: Main Floor (Tank Location 5) (Request 500)

Environmental Problem: 10
Request Number: 500

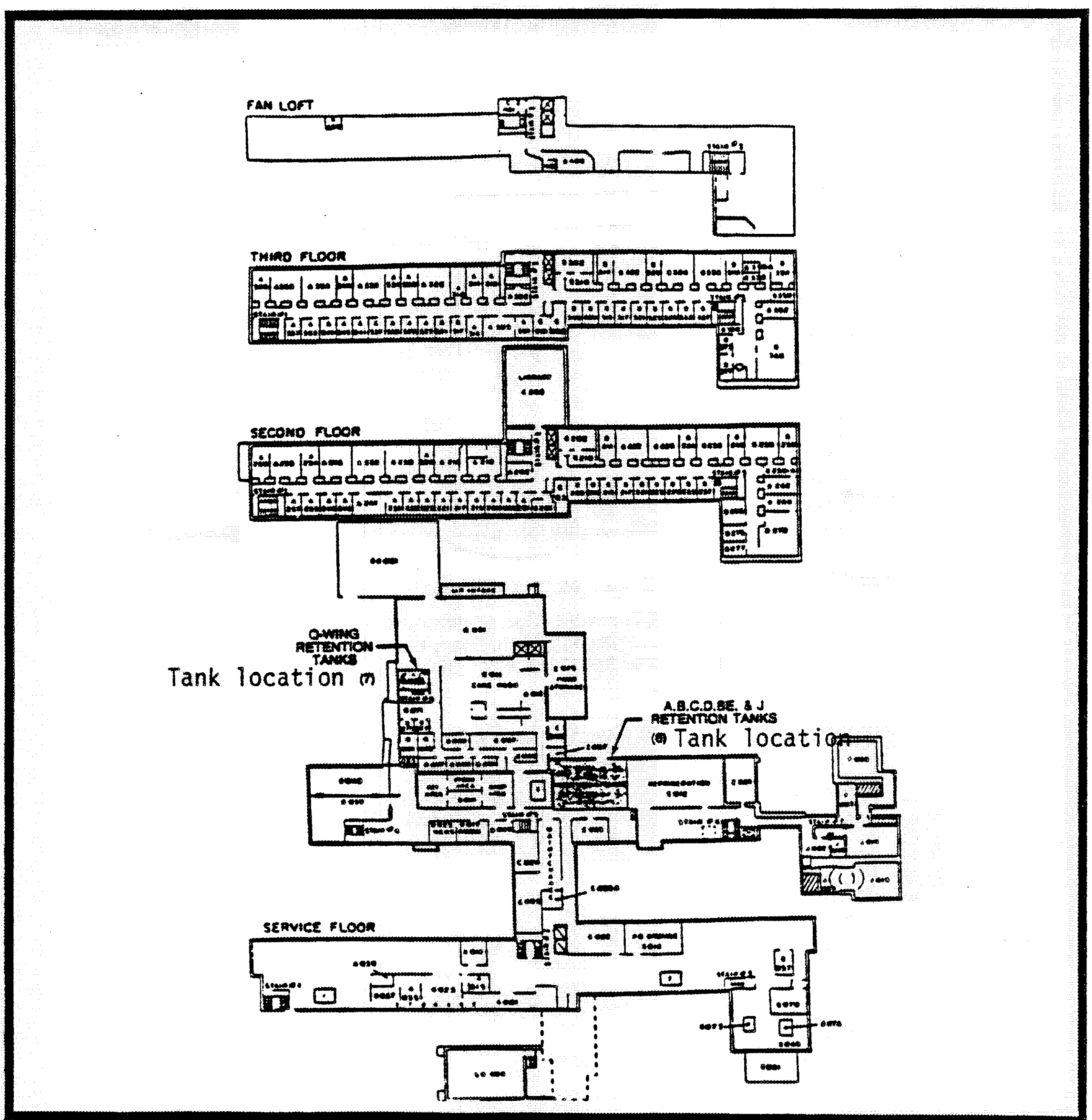
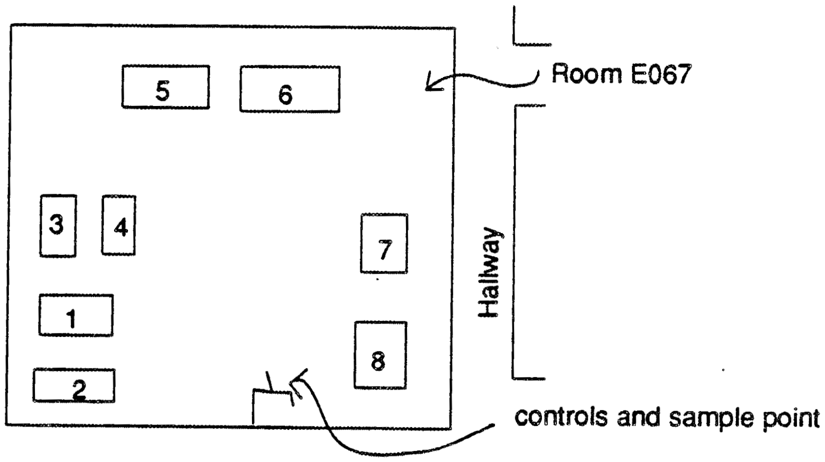


Figure 4.10e. Waste Retention Tanks in Building 202: Service Floor (Tank Locations 6 and 7) (Request 500)

Environmental Problem: 10
Request Number: 500



05NOV87 • ANL Tank 8 full; samples AR500182, -068 collected

• ANL Tanks 3-8 were filled at different times but were in sequence and, therefore, contained the same wastes; Tanks 1-2 pumped dry.

09NOV87 • ANL Tank 7 held 2000 out of 3000 gal. capacity; samples AR500411, -295 collected.

11NOV87 • ANL Tank 5 held 2500 out of 3000 gal. capacity; samples AR500648, -524 collected.

Figure 4.10f. Building 202 Retention Tanks on Service Floor in Room E067 (Tank Sampling Location 6) (Request 500)

Environmental Problem: 10
Request Number: 500

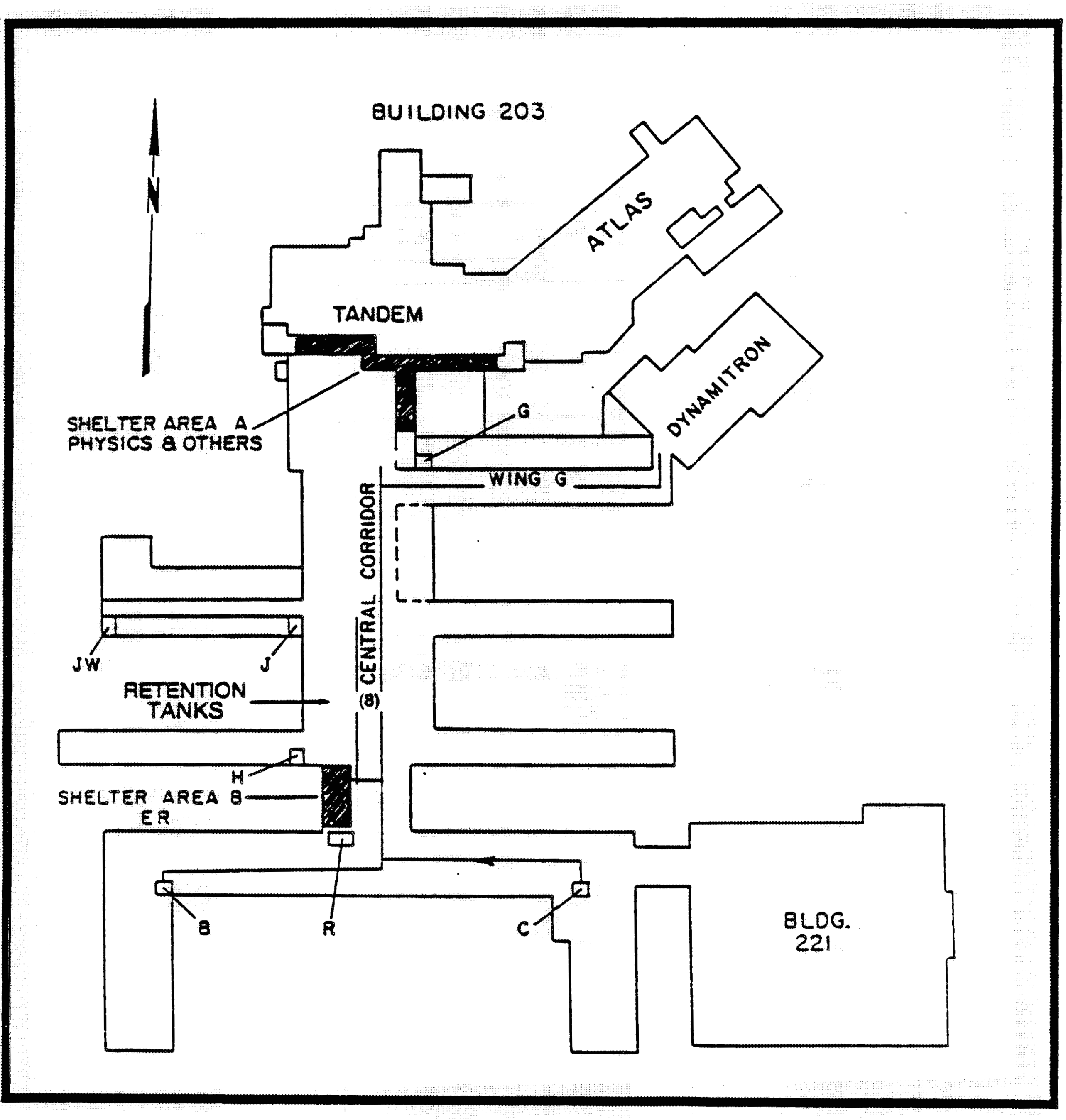
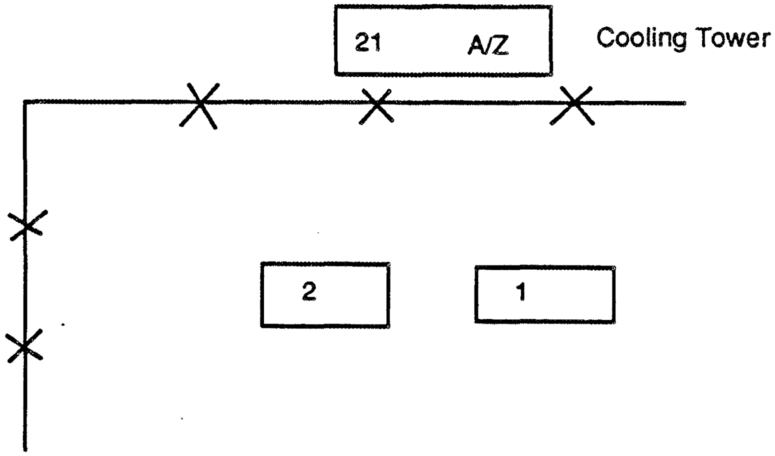


Figure 4.10g. Waste Retention Tanks in Building 203
(Tank Sampling Location 8) (Request 500)

Environmental Problem: 10
Request Number: 500



- 05NOV87: AR500206, -080, and -717 (QC Rinsate)
- 09NOV87: AR500433, -319
- 11NOV87: AR500660, -546

Figure 4.10h. Building 203 Retention Tanks Off Central Corridor (Tank Sampling Location 8) (Request 500)

Environmental Problem: 10
Request Number: 500

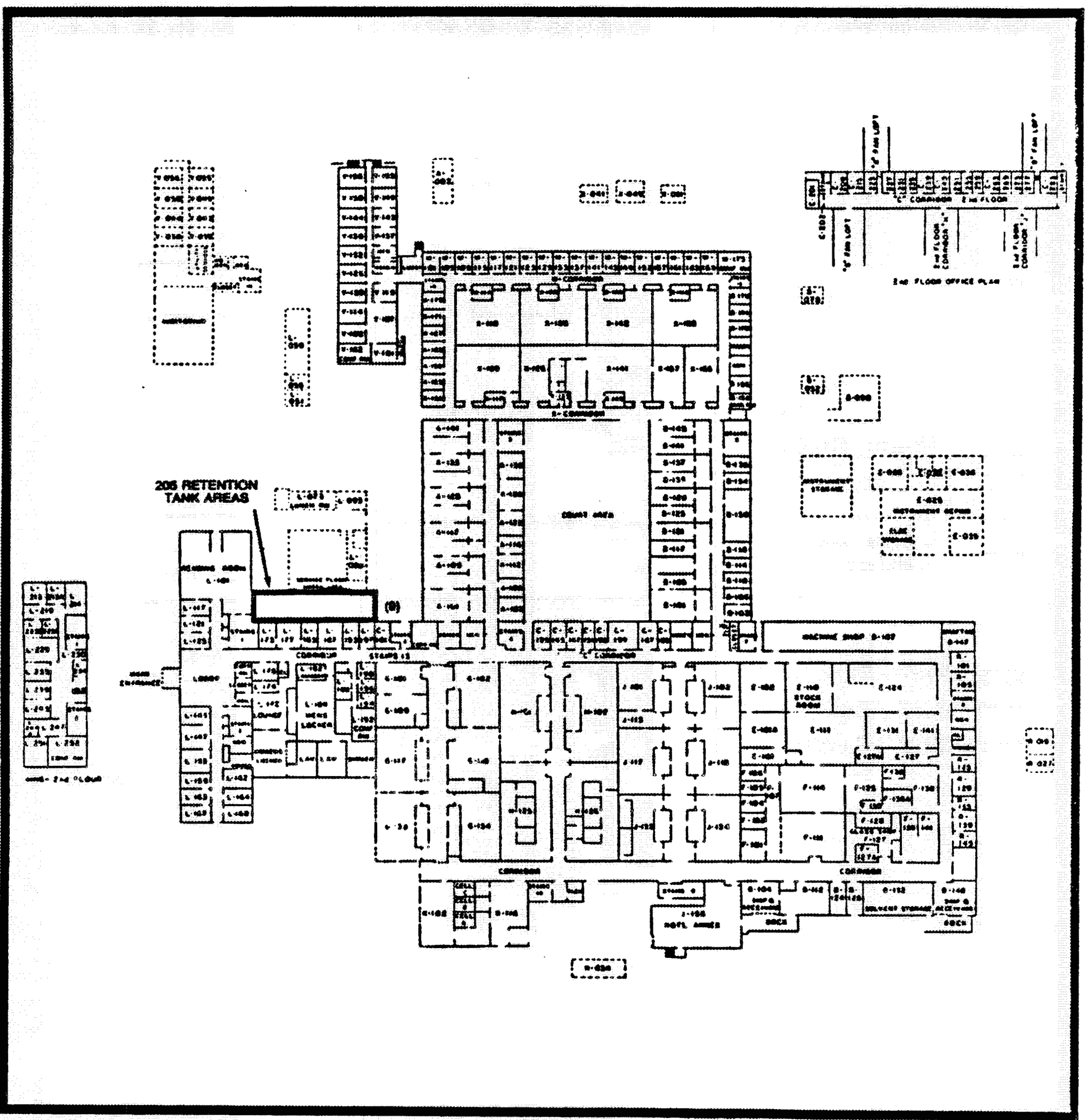
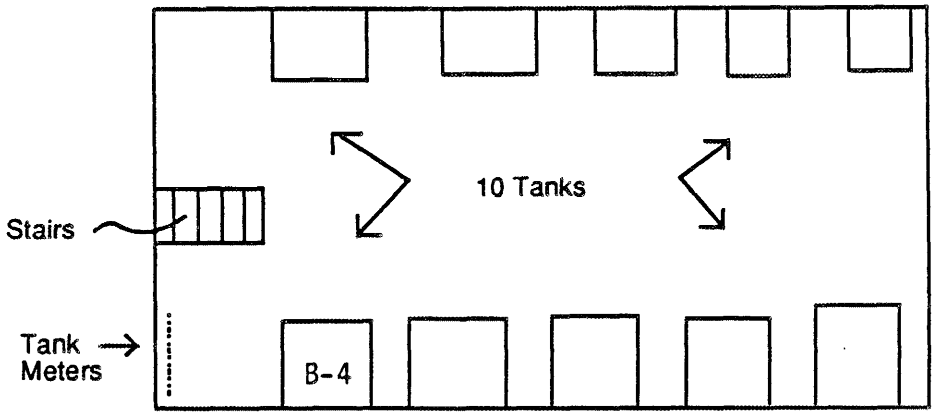


Figure 4.10i. Waste Retention Tanks in Building 205 (Tank Sampling Location 9) (Request 500)

Environmental Problem: 10
Request Number: 500



09NOV87 • Tank B-4 : AR500217, -091
11NOV87 • Tank B-4 : AR500444, -320
13NOV87 • Tank B-4 : AR500671, -557

Figure 4.10j. Building 205 Retention Tanks (Tank Sampling Location 9) (Request 500)

Environmental Problem: 10
Request Number: 500

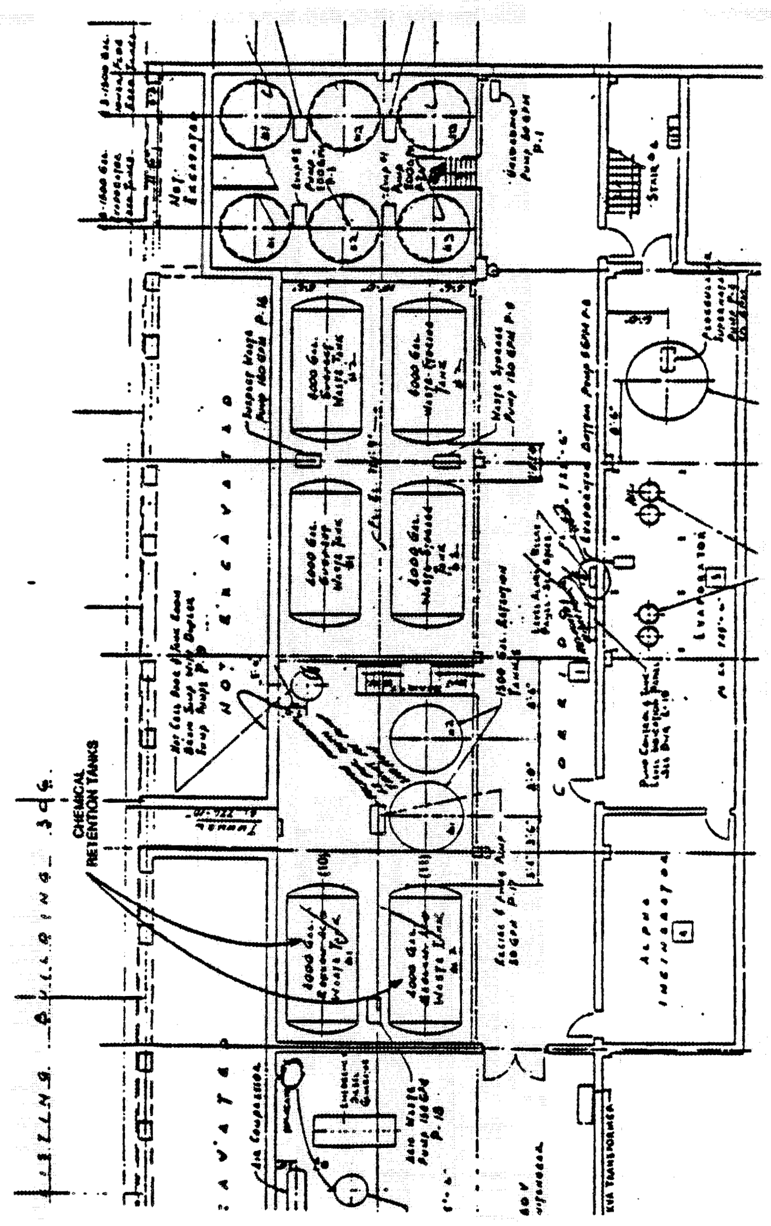


Figure 4.10k. Waste Retention Tanks in Building 306 (Tank Sampling Locations 10 and 11) (Request 500)

Environmental Problem: 10
Request Number: 500

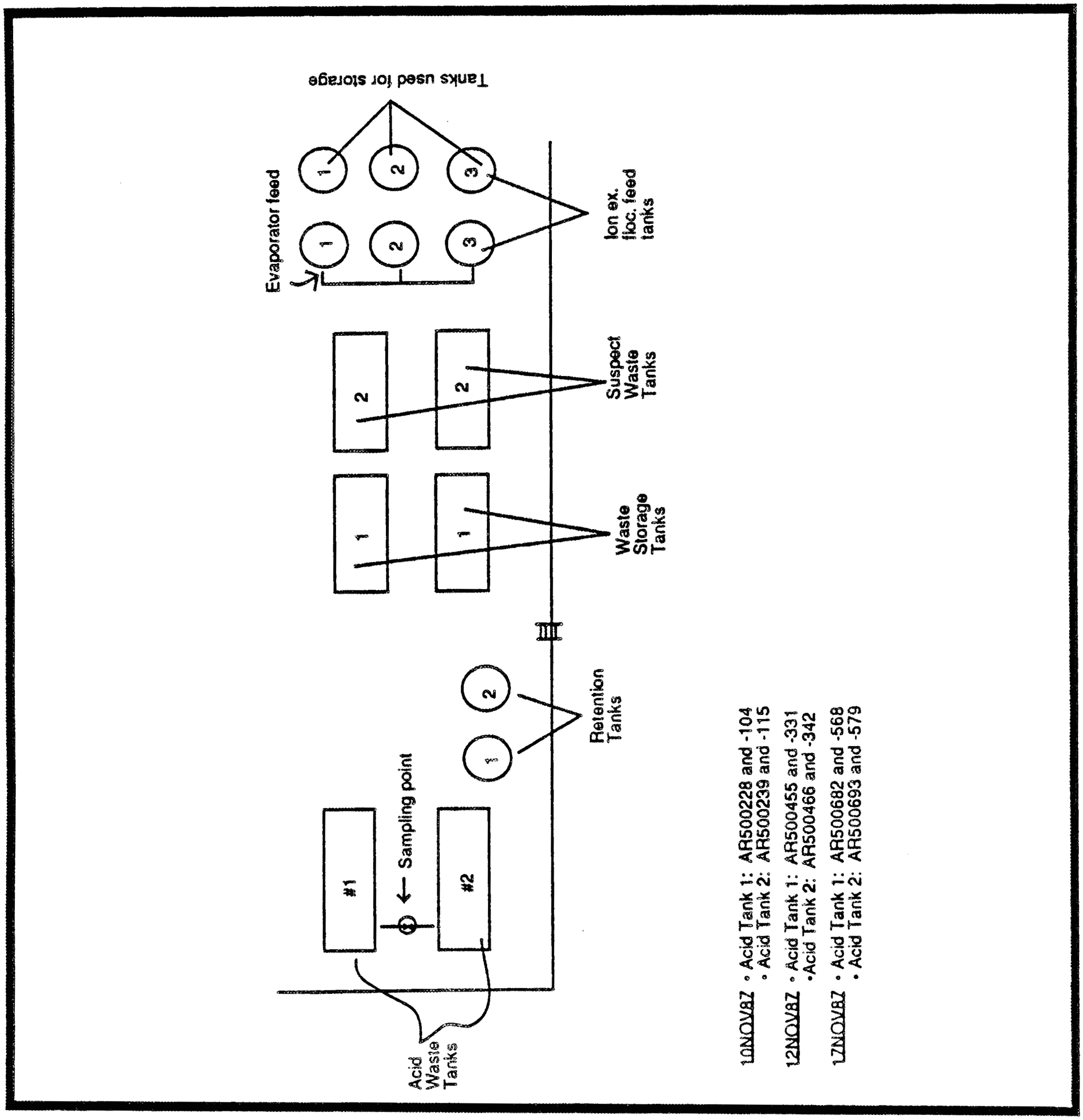
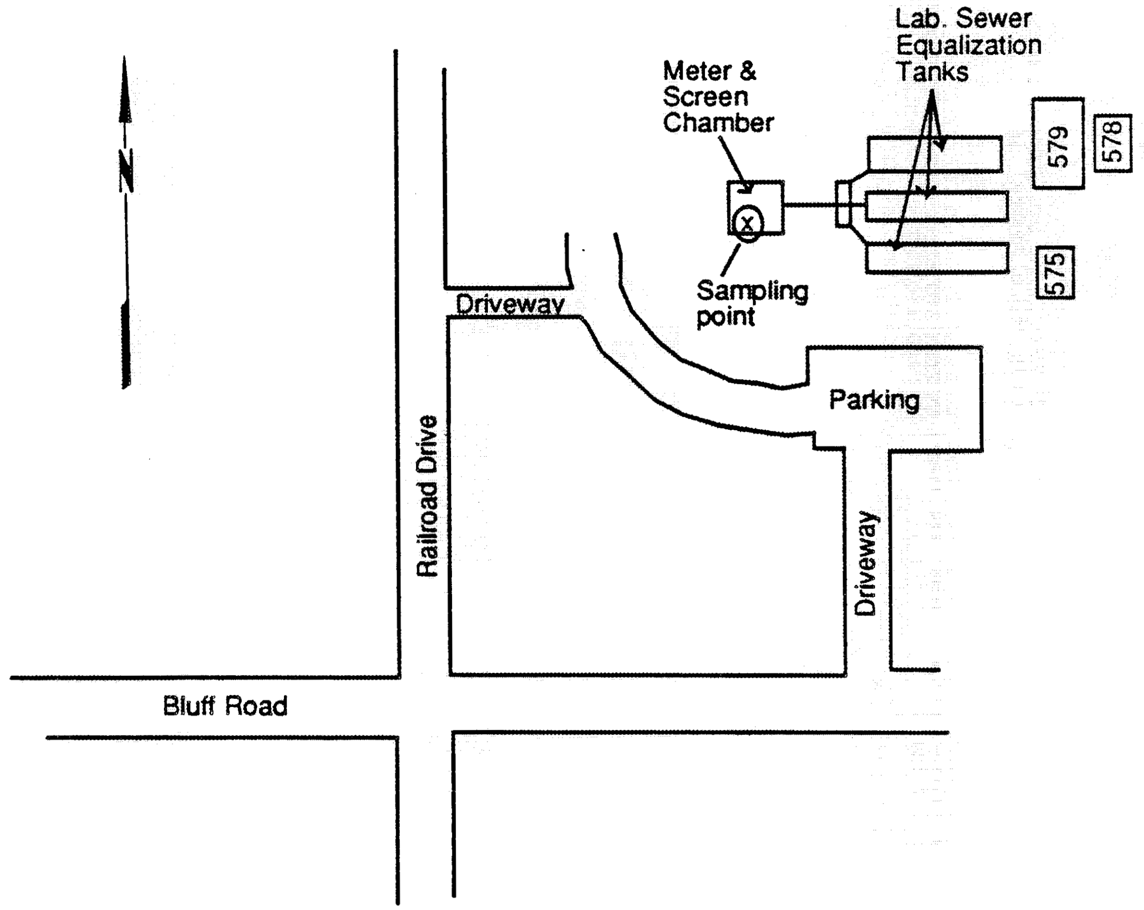


Figure 4.10l. Waste Retention Tanks in Building 306 (Tank Sampling Locations 10 and 11) (Request 500)

Environmental Problem: 10
Request Number: 500



09NOV87: AR500126
11NOV87: AR500706 (QC Field Preservative Blank); AR500353
13NOV87: AR500580

Figure 4.10m. Meter and Screen Chamber at the Laboratory Sewer Wastewater Treatment Plant (Request 500)

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TABLE 4.2.10 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 10

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR500	RET. TANKS	WASTEWATER	SUR WATER	1	1	QC FL	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR500	RET. TANKS	WASTEWATER	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
		MED TOTAL		2	2		0	2	2	2	0	0	0	0	0	0	1	1	1	1	1	1	0	0
AR500	RET. TANKS	WASTEWATER	SEALED CO	69	51	GRAB	13	27	27	27	0	0	0	0	0	0	12	24	27	27	51	51	0	0
		MED TOTAL		69	51		13	27	27	27	0	0	0	0	0	0	12	24	27	27	51	51	0	0
		EP TOTAL		71	53		13	29	29	29	0	0	0	0	0	0	13	25	28	28	52	52	0	0

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500706A / AR401024A / FIELD BLANK	AR500706A / AR500353F / FIELD BLANK	AR500706B / AR300044B / FIELD BLANK	AR500717F / AR307018G / RINSATE	AR500717F / AR400012G / RINSATE	AR500717G / AR308042G / RINSATE
BARIUM				2 U			21 B
CADMIUM			0.16 B			0.13 B	
IRON				31 B			39 BE
LEAD			1 B			0.7 U	
MAGNESIUM				37 B			10 U
MERCURY		0.03 B			0.03 B		
SILVER			0.6 B			0.14 U	
ZINC				20 B			3 UE

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500717E / ARG05 / RINSATE
HEPTACHLOR EPOXIDE		0.06 0.05

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500717E / DD28 / RINSATE
BIS(2-ETHYLHEXYL)PHTHALATE		2 JB
* HALOGENATED UNKNOWN		6 JB
* UNKNOWN		4 J
* UNKNOWN PHTHALATE		15 J

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500717A / ON13 / RINSATE
ACETONE		10 JB
METHYLENE CHLORIDE		2 JB
TOLUENE		19

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

FIELD MEASUREMENTS	SAMP NO: AR500013	AR500024	AR500046	AR500068	AR500080	AR500091
CONDUCTIVITY (MS/CM)	1.5	1.8	1.3	1.8	1.5	1.5
PH (UNITS)	8.4	7.8	6.1	7.8	8.1	7.7
RADIOACTIVITY (CPM)						
TEMPERATURE (DEG C)	20	23	23	28	27	23

FIELD MEASUREMENTS	SAMP NO: AR500104	AR500115	AR500126	AR500137	AR500148	AR500160
CONDUCTIVITY (MS/CM)	3.1	5.4	5.3	1.4	1.8	1.3
PH (UNITS)	7.2	8.3	4	8.3	7.6	6.1
RADIOACTIVITY (CPM)						
TEMPERATURE (DEG C)	22	22	16	20	23	20

FIELD MEASUREMENTS	SAMP NO: AR500182	AR500206	AR500217	AR500228	AR500239	AR500240
CONDUCTIVITY (MS/CM)	1.7	1.5	1.5	3.7	3.7	1.2
PH (UNITS)	8	7.6	7.6	8.6	8.6	8.1
RADIOACTIVITY (CPM)						
TEMPERATURE (DEG C)	25	25	23	21	21	20

FIELD MEASUREMENTS	SAMP NO: AR500251	AR500273	AR500295	AR500319	AR500320	AR500331
CONDUCTIVITY (MS/CM)	1.2	1.3	1.6	1.6	1.4	6.9
PH (UNITS)	7.5	6.1	7.8	8.1	7.8	9.5
RADIOACTIVITY (CPM)						
TEMPERATURE (DEG C)	22	23	20	28	23	23

FIELD MEASUREMENTS	SAMP NO: AR500342	AR500353	AR500364	AR500375	AR500397	AR500411
CONDUCTIVITY (MS/CM)	6.3	1.6	1.6	1.2	1.4	0.83
PH (UNITS)	8	8.1	7.5	8	6.2	8
RADIOACTIVITY (CPM)						
TEMPERATURE (DEG C)	23	17	22	21	20	20

FIELD MEASUREMENTS	SAMP NO: AR500433	AR500444	AR500455	AR500466	AR500477	AR500488
CONDUCTIVITY (MS/CM)	1.6	1.4	7.3	8.7	1.3	2.4
PH (UNITS)	7.4	7.2	9.8	5.6	8.2	8.8
RADIOACTIVITY (CPM)					50	50
TEMPERATURE (DEG C)	27	22	24	23	20	22

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

FIELD MEASUREMENTS	SAMP NO:	AR500502	AR500524	AR500546	AR500557	AR500568	AR500579
CONDUCTIVITY (MS/CM)		1.3	1.6	1.5	1.6	4.4	6.4
PH (UNITS)		6.1	7.5	8.2	8.1	6.1	5.3
RADIOACTIVITY (CPM)							
TEMPERATURE (DEG C)		23	29	27	22	24	25

FIELD MEASUREMENTS	SAMP NO:	AR500580	AR500591	AR500604	AR500626	AR500648	AR500660
CONDUCTIVITY (MS/CM)		0.33	1.3	2.5	1.4	1.8	1.5
PH (UNITS)		8	8.4	8.5	6.2	7.6	8.2
RADIOACTIVITY (CPM)			50	50			
TEMPERATURE (DEG C)		18	21	23	20	29	27

FIELD MEASUREMENTS	SAMP NO:	AR500671	AR500682	AR500693			
CONDUCTIVITY (MS/CM)		1.6	5.6	5.8			
PH (UNITS)		7.9	7	7.1			
RADIOACTIVITY (CPM)							
TEMPERATURE (DEG C)		22	21	23			

ANIONS AND CYANIDE (UG/L)	SAMP NO:	AR500013H	AR500024H	AR500046H	AR500068H	AR500080H	AR500091H
	SDG NO:	AR401013I	AR401013I	AR411015G	AR307018I	AR307018I	AR401013I
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
CYANIDE		2 U	3	2 U	2	3	3

ANIONS AND CYANIDE (UG/L)	SAMP NO:	AR500104H	AR500115H	AR500126H	AR500240H	AR500251H	AR500273H
	SDG NO:	AR401013I	AR401013I	AR401013I	AR302013C	AR500251H	AR411015G
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
CYANIDE		13	21	10	2 U	2 U	2 U

ANIONS AND CYANIDE (UG/L)	SAMP NO:	AR500295H	AR500319H	AR500320H	AR500331H	AR500342H	AR500353H
	SDG NO:	AR401013I	AR401013I	AR302013C	AR302013C	AR302013C	AR307018I
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
CYANIDE		3	2	7	2 U	2 U	9

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

ANIONS AND CYANIDE (UG/L)	SAMP NO:	AR500477H	AR500488H	AR500502H	AR500524H	AR500546H	AR500557H
	SDG NO:	AR411015G	AR411015G	AR411015G	AR307018I	AR302013C	AR411015G
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
CYANIDE		2 U	2 U	2 U	2 U	5	2 U

ANIONS AND CYANIDE (UG/L)	SAMP NO:	AR500568H	AR500579H	AR500580H			
	SDG NO:	AR411015G	AR411015G	AR411015G			
	TYPE:	GRAB	GRAB	GRAB			
CYANIDE		2 U	2 U	8			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR500013F	AR500013F	AR500013F	AR500013G	AR500013G	AR500024F
	SDG NO:	AR307018G	AR308042F	AR400012G	AR300044K	AR308042G	AR307018G
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM						436	
ANTIMONY			3.3 U				
ARSENIC				8.3 B			
BARIUM						89 B	
BERYLLIUM						0.3 U	
CADMIUM				3.9 B			
CALCIUM						21500	
CHROMIUM						100 *	
COBALT						3 U	
COPPER						291	
IRON						4080 E	
LEAD				58			
MAGNESIUM						9720	
MANGANESE						48	
MERCURY		5					1.5
NICKEL						101	
POTASSIUM					3300 B		
SELENIUM				1.3 U			
SILVER				0.5 B			
SODIUM						236000 E	
THALLIUM				0.8 U			
VANADIUM						4.8 B	
ZINC						474 E	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500024F / AR308042F / GRAB	AR500024F / AR400012G / GRAB	AR500024G / AR300044K / GRAB	AR500024G / AR308042G / GRAB	AR500046F / AR403015G / GRAB	AR500046F / AR415019F / GRAB
ALUMINUM					310		
ANTIMONY		7.3 B					4.8 B
ARSENIC			3 B			0.8 B	
BARIUM					27 B		
BERYLLIUM					0.31 B		
CADMIUM			14			2 B	
CALCIUM					16600		
CHROMIUM					29 *		
COBALT					9.7 B		
COPPER					282		
IRON					5250 E		
LEAD			95			1.2 B	
MAGNESIUM					9100		
MANGANESE					115		
MERCURY							
NICKEL					44		
POTASSIUM				14000			
SELENIUM			1.5 B			1.3 U	
SILVER			0.14 U			2 B	
SODIUM					298000 E		
THALLIUM			0.8 U			0.8 U	
VANADIUM					7.4 B		
ZINC					1700 E		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500046F / AR500046F / GRAB	AR500046G / AR300066K / GRAB	AR500046G / AR500046G / GRAB	AR500068F / AR307018G / GRAB	AR500068F / AR308042F / GRAB	AR500068F / AR400012G / GRAB
ALUMINUM				326			
ANTIMONY						3.3 U	
ARSENIC							1.2 B
BARIUM				35 BE			
BERYLLIUM				1.4 B			
CADMIUM							0.1 B
CALCIUM				21500 E			
CHROMIUM				35			
COBALT				11 B			
COPPER				738			
IRON				4680			
LEAD							11
MAGNESIUM				10900 E			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500046F / AR500046F / GRAB	AR500046G / AR300066K / GRAB	AR500046G / AR500046G / GRAB	AR500068F / AR307018G / GRAB	AR500068F / AR308042F / GRAB	AR500068F / AR400012G / GRAB
MANGANESE				62			
MERCURY		34			0.58		
NICKEL				31 B			
POTASSIUM			14000				
SELENIUM							1.3 U
SILVER							15
SODIUM				274000 E			
THALLIUM							0.55 U
VANADIUM				7.7 B			
ZINC				2880			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500068G / AR300044K / GRAB	AR500068G / AR308042G / GRAB	AR500080F / AR307018G / GRAB	AR500080F / AR308042F / GRAB	AR500080F / AR400012G / GRAB	AR500080G / AR300044K / GRAB
ALUMINUM			87 B				
ANTIMONY					3.3 U		
ARSENIC						0.7 B	
BARIUM			16 B				
BERYLLIUM			0.3 U				
CADMIUM						0.85 B	
CALCIUM			17900				
CHROMIUM			274 *				
COBALT			3 U				
COPPER			75				
IRON			2600 E				
LEAD						9	
MAGNESIUM			8050				
MANGANESE			44				
MERCURY				1.5			
NICKEL			146				
POTASSIUM		100 U					2500 B
SELENIUM						1.3 U	
SILVER						0.2 B	
SODIUM			267000 E				
THALLIUM						3 B	
VANADIUM			4 U				
ZINC			44 E				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500080G AR308042G GRAB	AR500091F AR307018G GRAB	AR500091F AR308042F GRAB	AR500091F AR400012G GRAB	AR500091G AR300044B GRAB	AR500091G AR300044K GRAB
ALUMINUM		60 U				330 NE	
ANTIMONY				10 B			
ARSENIC					2.5 B		
BARIUM		12 B				168 B	
BERYLLIUM		0.3 U				0.32 B	
CADMIUM					19		
CALCIUM		16800				23100	
CHROMIUM		6 U*				32	
COBALT		3 U				3 U	
COPPER		31				272	
IRON		1040 E				6660	
LEAD					146		
MAGNESIUM		10900				10200	
MANGANESE		17				79	
MERCURY			1.3				
NICKEL		7.5 B				178	
POTASSIUM							11000
SELENIUM					1.3 U		
SILVER					23		
SODIUM		254000 E				237000	
THALLIUM					0.8 U		
VANADIUM		5.6 B				7.3 B	
ZINC		24 E				166	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104F AR401013G GRAB	AR500104F AR401024A GRAB	AR500104F AR500353F GRAB	AR500104G AR300044B GRAB	AR500104G AR300044K GRAB	AR500115F AR401013G GRAB
ALUMINUM					26600 NE		
ANTIMONY		9.3 B					19 B
ARSENIC				6 B			
BARIUM					256		
BERYLLIUM					4.8 B		
CADMIUM				355			
CALCIUM					131000		
CHROMIUM					2260		
COBALT					14 B		
COPPER					13600		
IRON					42700		
LEAD				40000			
MAGNESIUM					33400		

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104F AR401013G GRAB	AR500104F AR401024A GRAB	AR500104F AR500353F GRAB	AR500104G AR300044B GRAB	AR500104G AR300044K GRAB	AR500115F AR401013G GRAB
MANGANESE					1530		
MERCURY			13				
NICKEL					404		
POTASSIUM						100000	
SELENIUM				1.3 U			
SILVER				1 B			
SODIUM					598000		
THALLIUM				0.8 U			
VANADIUM					25 B		
ZINC					486000		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500115F AR401024A GRAB	AR500115F AR500353F GRAB	AR500115G AR300044B GRAB	AR500115G AR300044K GRAB	AR500126F AR307018G GRAB	AR500126F AR308042F GRAB
ALUMINUM				364000 NE			
ANTIMONY							3.3 U
ARSENIC			12				
BARIUM				2580			
BERYLLIUM				38			
CADMIUM			1340				
CALCIUM				974000			
CHROMIUM				17600			
COBALT				136			
COPPER				165000			
IRON				393000			
LEAD			87800				
MAGNESIUM				167000			
MANGANESE				21800			
MERCURY		46				0.28	
NICKEL				2630			
POTASSIUM					470000		
SELENIUM			2 B				
SILVER			2 B				
SODIUM				1470000			
THALLIUM			0.8 U				
VANADIUM				107			
ZINC				5330000			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500126F / AR400012G / GRAB	AR500126G / AR300044K / GRAB	AR500126G / AR308042G / GRAB	AR500240F / AR401024A / GRAB	AR500240F / AR500240F / GRAB	AR500240F / AR500353F / GRAB
ALUMINUM				202			
ANTIMONY						3.3 U	
ARSENIC		0.66 U					0.9 B
BARIUM				72 B			
BERYLLIUM				0.47 B			
CADMIUM		0.85 B					1 B
CALCIUM				152000			
CHROMIUM				6.9 B*			
COBALT				3 U			
COPPER				26			
IRON				308 E			
LEAD		5					26
MAGNESIUM				99500			
MANGANESE				32			
MERCURY					1.2		
NICKEL				12 B			
POTASSIUM			5900				
SELENIUM		2.5 B					1.3 U
SILVER		2.5 B					4.2 B
SODIUM				255000 E			
THALLIUM		1 B					0.8 U
VANADIUM				9.6 B			
ZINC				26 E			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500240G / AR300044B / GRAB	AR500240G / AR300066K / GRAB	AR500251F / AR401024A / GRAB	AR500251F / AR500240F / GRAB	AR500251F / AR500353F / GRAB	AR500251G / AR300044B / GRAB
ALUMINUM		100 BNE					306 NE
ANTIMONY					6.7 B		
ARSENIC						0.66 U	
BARIUM		38 B					25 B
BERYLLIUM		0.33 B					0.41 B
CADMIUM						15	
CALCIUM		22900					17400
CHROMIUM		9.6 B					16
COBALT		3 U					7 B
COPPER		86					213
IRON		1540					5910
LEAD						79	
MAGNESIUM		8420					8310

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR500240G AR300044B GRAB	AR500240G AR300066K GRAB	AR500251F AR401024A GRAB	AR500251F AR500240F GRAB	AR500251F AR500353F GRAB	AR500251G AR300044B GRAB
MANGANESE		15					122
MERCURY				3.3			
NICKEL		17 B					52
POTASSIUM			2000 B				
SELENIUM						1.3 U	
SILVER						2 B	
SODIUM		194000					256000
THALLIUM						0.8 U	
VANADIUM		6.9 B					6.8 B
ZINC		61					1370

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR500251G AR300066K GRAB	AR500273F AR403015G GRAB	AR500273F AR415019F GRAB	AR500273F AR500046F GRAB	AR500273G AR300066K GRAB	AR500273G AR500046G GRAB
ALUMINUM							275
ANTIMONY				4 B			
ARSENIC			0.7 B				
BARIUM							25 BE
BERYLLIUM							1.1 B
CADMIUM			1.7 B				
CALCIUM							20700 E
CHROMIUM							22
COBALT							8.7 B
COPPER							527
IRON							2690
LEAD			1.6 B				
MAGNESIUM							10500 E
MANGANESE							47
MERCURY					36		
NICKEL							28 B
POTASSIUM		16000				13000	
SELENIUM			1.3 U				
SILVER			1 B				
SODIUM							270000 E
THALLIUM			0.8 U				
VANADIUM							7.9 B
ZINC							1770

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500295F AR307018G GRAB	AR500295F AR308042F GRAB	AR500295F AR400012G GRAB	AR500295G AR300044B GRAB	AR500295G AR300044K GRAB	AR500319F AR307018G GRAB
ALUMINUM					121 BNE		
ANTIMONY			3.3 U				
ARSENIC				2.6 B			
BARIUM					26 B		
BERYLLIUM					0.3 U		
CADMIUM				2.6 B			
CALCIUM					21700		
CHROMIUM					64		
COBALT					3 U		
COPPER					101		
IRON					2130		
LEAD				52			
MAGNESIUM					10300		
MANGANESE					21		
MERCURY		3.3					9.4
NICKEL					24 B		
POTASSIUM						3000 B	
SELENIUM				1.3 U			
SILVER				25			
SODIUM					247000		
THALLIUM				2 B			
VANADIUM					7.1 B		
ZINC					28		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500319F AR308042F GRAB	AR500319F AR400012G GRAB	AR500319G AR300044K GRAB	AR500319G AR308042G GRAB	AR500320F AR401024A GRAB	AR500320F AR500240F GRAB
ALUMINUM					406		
ANTIMONY		6.7 B					16 B
ARSENIC			0.66 U				
BARIUM					62 B		
BERYLLIUM					0.32 B		
CADMIUM			6.1				
CALCIUM					16100		
CHROMIUM					428 *		
COBALT					3 U		
COPPER					316		
IRON					9830 E		
LEAD			146				
MAGNESIUM					10100		

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500319F / AR308042F / GRAB	AR500319F / AR400012G / GRAB	AR500319G / AR300044K / GRAB	AR500319G / AR308042G / GRAB	AR500320F / AR401024A / GRAB	AR500320F / AR500240F / GRAB
MANGANESE					52		
MERCURY						1.2	
NICKEL					170		
POTASSIUM				3900 B			
SELENIUM			1.3 U				
SILVER			7.6 B				
SODIUM					238000 E		
THALLIUM			0.8 U				
VANADIUM					4.6 B		
ZINC					302 E		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500320F / AR500353F / GRAB	AR500320G / AR300044B / GRAB	AR500320G / AR300066K / GRAB	AR500331F / AR401013G / GRAB	AR500331F / AR403015G / GRAB	AR500331F / AR806090F / GRAB
ALUMINUM			545 NE				
ANTIMONY					26 B		
ARSENIC		1 B				8 B	
BARIUM			427				
BERYLLIUM			0.48 B				
CADMIUM		45				17	
CALCIUM			24700				
CHROMIUM			66				
COBALT			4.4 B				
COPPER			985				
IRON			6420				
LEAD		426				3250	
MAGNESIUM			10700				
MANGANESE			70				
MERCURY							8.4
NICKEL			129				
POTASSIUM				22000			
SELENIUM		1.3 U				3 B	
SILVER		24				1 B	
SODIUM			254000				
THALLIUM		0.8 U				0.8 U	
VANADIUM			10 B				
ZINC			1450				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500331G / AR300044B / GRAB	AR500331G / AR300066K / GRAB	AR500342F / AR401013G / GRAB	AR500342F / AR403015G / GRAB	AR500342F / AR806090F / GRAB	AR500342G / AR300044B / GRAB
ALUMINUM		3960 NE					1650 NE
ANTIMONY				6.2 B			
ARSENIC					1.1 B		
BARIUM		44 B					18 B
BERYLLIUM		1.4 B					0.61 B
CADMIUM					5.8		
CALCIUM		24400					32400
CHROMIUM		457					145
COBALT		4.6 B					3 U
COPPER		1610					1110
IRON		5520					2270
LEAD					855		
MAGNESIUM		11000					17200
MANGANESE		508					107
MERCURY						15	
NICKEL		379					305
POTASSIUM			42000				
SELENIUM					2 B		
SILVER					2 B		
SODIUM		1270000					1020000
THALLIUM					0.8 U		
VANADIUM		6.4 B					14 B
ZINC		43400					12500

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500342G / AR300066K / GRAB	AR500353F / AR401024A / GRAB	AR500353F / AR500240F / GRAB	AR500353F / AR500353F / GRAB	AR500353G / AR300044B / GRAB	AR500353G / AR300066K / GRAB
ALUMINUM						134 BNE	
ANTIMONY				3.3 U			
ARSENIC					1 B		
BARIUM						33 B	
BERYLLIUM						0.41 B	
CADMIUM					0.15 B		
CALCIUM						59900	
CHROMIUM						6 U	
COBALT						3 U	
COPPER						20 B	
IRON						122	
LEAD					13		
MAGNESIUM						23300	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR500342G	AR500353F	AR500353F	AR500353F	AR500353G	AR500353G
	SDG NO:	AR300066K	AR401024A	AR500240F	AR500353F	AR300044B	AR300066K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
MANGANESE						22	
MERCURY			0.16 B				
NICKEL						13 B	
POTASSIUM		320000					3200 B
SELENIUM					1.3 U		
SILVER					0.5 B		
SODIUM						187000	
THALLIUM					0.8 U		
VANADIUM						15 B	
ZINC						16 B	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR500477F	AR500477F	AR500477F	AR500477G	AR500477G	AR500488F
	SDG NO:	AR403015G	AR415019F	AR500046F	AR300066K	AR500046G	AR403015G
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM						156 B	
ANTIMONY			3.3 U				
ARSENIC		0.9 B					1.4 B
BARIUM						58 BE	
BERYLLIUM						1.2 B	
CADMIUM		1.7 B					15
CALCIUM						23600 E	
CHROMIUM						26	
COBALT						3 U	
COPPER						92	
IRON						1860	
LEAD		39					168
MAGNESIUM						11500 E	
MANGANESE						25	
MERCURY				0.46			
NICKEL						48	
POTASSIUM					3000 B		
SELENIUM		1.3 U					1.3 U
SILVER		4 B					6 B
SODIUM						276000 E	
THALLIUM		0.8 U					0.8 U
VANADIUM						6.9 B	
ZINC						199	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 — DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500488F / AR415019F / GRAB	AR500488F / AR500046F / GRAB	AR500488G / AR300066K / GRAB	AR500488G / AR500046G / GRAB	AR500502F / AR403015G / GRAB	AR500502F / AR415019F / GRAB
ALUMINUM					413		
ANTIMONY		4.8 B					4.3 B
ARSENIC						5 B	
BARIUM					32 BE		
BERYLLIUM					1.4 B		
CADMIUM						1.9 B	
CALCIUM					22000 E		
CHROMIUM					34		
COBALT					16 B		
COPPER					646		
IRON					5630		
LEAD						2.4 B	
MAGNESIUM					11900 E		
MANGANESE					122		
MERCURY			11				
NICKEL					45		
POTASSIUM				18000			
SELENIUM						1.3 U	
SILVER						2 B	
SODIUM					376000 E		
THALLIUM						0.8 U	
VANADIUM					8.5 B		
ZINC					2450		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500502F / AR500046F / GRAB	AR500502G / AR300066K / GRAB	AR500502G / AR500046G / GRAB	AR500524F / AR401024A / GRAB	AR500524F / AR500240F / GRAB	AR500524F / AR500353F / GRAB
ALUMINUM				246			
ANTIMONY						3.3 U	
ARSENIC							0.66 U
BARIUM				26 BE			
BERYLLIUM				1.4 B			
CADMIUM							0.8 B
CALCIUM				21400 E			
CHROMIUM				24			
COBALT				11 B			
COPPER				513			
IRON				2330			
LEAD							12
MAGNESIUM				10900 E			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500502F / AR500046F / GRAB	AR500502G / AR300066K / GRAB	AR500502G / AR500046G / GRAB	AR500524F / AR401024A / GRAB	AR500524F / AR500240F / GRAB	AR500524F / AR500353F / GRAB
MANGANESE				61			
MERCURY		34			0.21		
NICKEL				28 B			
POTASSIUM			19000				
SELENIUM							1.3 U
SILVER							2 B
SODIUM				278000 E			
THALLIUM							0.8 U
VANADIUM				7.5 B			
ZINC				2080			

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500524G / AR300044B / GRAB	AR500524G / AR300066K / GRAB	AR500546F / AR401024A / GRAB	AR500546F / AR500240F / GRAB	AR500546F / AR500353F / GRAB	AR500546G / AR300044B / GRAB
ALUMINUM		60 UNE					371 NE
ANTIMONY					8.3 B		
ARSENIC						0.66 U	
BARIUM		14 B					56 B
BERYLLIUM		0.3 U					0.4 B
CADMIUM						16	
CALCIUM		20100					15700
CHROMIUM		6 U					430
COBALT		3 U					3 U
COPPER		21 B					304
IRON		1320					7530
LEAD						144	
MAGNESIUM		7590					10100
MANGANESE		22					43
MERCURY				13			
NICKEL		22 B					176
POTASSIUM			2900 B				
SELENIUM						1.5 B	
SILVER						13	
SODIUM		201000					223000
THALLIUM						0.8 U	
VANADIUM		6.1 B					8.4 B
ZINC		6.6 B					251

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR500546G AR300066K GRAB	AR500557F AR403015G GRAB	AR500557F AR415019F GRAB	AR500557F AR500046F GRAB	AR500557G AR300066K GRAB	AR500557G AR500046G GRAB
ALUMINUM							171 B
ANTIMONY				8.2 B			
ARSENIC			1.7 B				
BARIUM							103 BE
BERYLLIUM							1.5 B
CADMIUM			9.5				
CALCIUM							24700 E
CHROMIUM							23
COBALT							3.3 B
COPPER							299
IRON							2930
LEAD			103				
MAGNESIUM							11400 E
MANGANESE							54
MERCURY					0.28		
NICKEL							73
POTASSIUM		4200 B				18000	
SELENIUM			1.3 U				
SILVER			5 B				
SODIUM							304000 E
THALLIUM			0.8 U				
VANADIUM							7.5 B
ZINC							827

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR500568F AR403015G GRAB	AR500568F AR415019F GRAB	AR500568F AR500046F GRAB	AR500568G AR300066K GRAB	AR500568G AR500046G GRAB	AR500579F AR403015G GRAB
ALUMINUM						405	
ANTIMONY			5 B				
ARSENIC		4.5 B					8.5 B
BARIUM						11 BE	
BERYLLIUM						1.8 B	
CADMIUM		5.9					30
CALCIUM						52500 E	
CHROMIUM						3280	
COBALT						3 U	
COPPER						890	
IRON						1120	
LEAD		22					2340
MAGNESIUM						22900 E	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500568F AR403015G GRAB	AR500568F AR415019F GRAB	AR500568F AR500046F GRAB	AR500568G AR300066K GRAB	AR500568G AR500046G GRAB	AR500579F AR403015G GRAB
MANGANESE						81	
MERCURY				1.1			
NICKEL						121	
POTASSIUM					42000		
SELENIUM		1.3 U					1.3 U
SILVER		1 B					3 B
SODIUM						874000 E	
THALLIUM		0.8 U					0.8 U
VANADIUM						12 B	
ZINC						2270	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500579F AR415019F GRAB	AR500579F AR500046F GRAB	AR500579G AR300066K GRAB	AR500579G AR500046G GRAB	AR500580F AR403015G GRAB	AR500580F AR415019F GRAB
ALUMINUM					4990		
ANTIMONY		11 B					3.3 U
ARSENIC						1 B	
BARIUM					39 BE		
BERYLLIUM					2.8 B		
CADMIUM						0.29 B	
CALCIUM					35600 E		
CHROMIUM					8520		
COBALT					16 B		
COPPER					11800		
IRON					9960		
LEAD						9	
MAGNESIUM					16300 E		
MANGANESE					292		
MERCURY			63				
NICKEL					812		
POTASSIUM				180000			
SELENIUM						1.3 U	
SILVER						7 B	
SODIUM					1310000 E		
THALLIUM						0.8 U	
VANADIUM					16 B		
ZINC					26800		

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR500580F	AR500580G	AR500580G			
	SDG NO:	AR500046F	AR300066K	AR500046G			
	TYPE:	GRAB	GRAB	GRAB			
ALUMINUM				104 B			
ANTIMONY							
ARSENIC							
BARIUM				157 BE			
BERYLLIUM				3 B			
CADMIUM							
CALCIUM				331000 E			
CHROMIUM				6 U			
COBALT				3 U			
COPPER				27			
IRON				382			
LEAD							
MAGNESIUM				134000 E			
MANGANESE				31			
MERCURY		0.15 B					
NICKEL				11 B			
POTASSIUM			11000				
SELENIUM							
SILVER							
SODIUM				522000 E			
THALLIUM							
VANADIUM				4 U			
ZINC				30			

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO:	AR500013E	AR500024E	AR500046E	AR500068E	AR500080E	AR500091E
	SDG NO:	ARG02	ARG02	ARG05	ARG04	ARG05	ARG02
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALDRIN		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ALPHA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
DELTA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDOSULFAN I		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDRIN		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
ENDRIN KETONE		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
GAMMA-BHC (LINDANE)		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR		0.06 U	0.06 J	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR EPOXIDE		0.06 U	0.06 U	0.08 J	0.06 U	0.08 J	0.06 U
4,4'-DDD		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 J
4,4'-DDT		0.25 J	0.11 J	0.11 U	0.11 U	0.11 U	0.2 J

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104E ARG04 GRAB	AR500126E ARG02 GRAB	AR500240E ARG04 GRAB	AR500251E ARG04 GRAB	AR500273E ARG05 GRAB	AR500295E ARG02 GRAB
ALDRIN		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.2 J
ALPHA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.08 J
DELTA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDOSULFAN I		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDRIN		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
ENDRIN KETONE		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 J
GAMMA-BHC (LINDANE)		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.17 J
HEPTACHLOR		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR EPOXIDE		0.06 U	0.06 U	0.06 U	0.06 U	0.12 J	0.06 U
4,4'-DDD		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.18 J
4,4'-DDT		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500319E ARG02 GRAB	AR500320E ARG04 GRAB	AR500331E ARG05 GRAB	AR500342E ARG05 GRAB	AR500353E ARG04 GRAB	AR500477E ARG05 GRAB
ALDRIN		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ALPHA-BHC		0.06 J	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
DELTA-BHC		0.06 U	0.06 U	0.06 U	0.07 J	0.06 U	0.06 U
ENDOSULFAN I		0.1 J	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDRIN		0.29 J	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
ENDRIN KETONE		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
GAMMA-BHC (LINDANE)		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR EPOXIDE		0.06 U	0.06 U	0.06 U	0.08 J	0.06 U	0.06 U
4,4'-DDD		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
4,4'-DDT		0.11 J	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500488E ARG05 GRAB	AR500502E ARG05 GRAB	AR500557E ARG05 GRAB	AR500568E ARG05 GRAB	AR500579E ARG05 GRAB	AR500580E ARG05 GRAB
ALDRIN		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ALPHA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
DELTA-BHC		0.06 U	0.06 U	0.06 U	0.06 U	0.08 J	0.06 U
ENDOSULFAN I		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
ENDRIN		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
ENDRIN KETONE		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
GAMMA-BHC (LINDANE)		0.06 U	0.06 U	0.06 U	0.06 U	0.06 U	0.06 U
HEPTACHLOR		0.06 U	0.06 U	0.06 U	0.06 U	0.26 J	0.06 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO:	AR500488E	AR500502E	AR500557E	AR500568E	AR500579E	AR500580E
	SDG NO:	ARG05	ARG05	ARG05	ARG05	ARG05	ARG05
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
HEPTACHLOR EPOXIDE		0.06 U	0.06 J	0.08 J	0.06 U	0.11 J	0.06 U
4,4'-DDD		0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
4,4'-DDT		0.11 U	0.11 U	0.11 U	0.11 U	0.11 J	0.11 U

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500013E	AR500024E	AR500046E	AR500068E	AR500080E	AR500091E
	SDG NO:	DD21B	DD21B	DD29	DD28	DD28	DD21B
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
BENZO(A)ANTHRACENE		11 U	11 U	11 U	11 U	11 U	11 U
BENZOIC ACID		56 U	56 U	56 U	56 U	56 U	56 U
BENZYL ALCOHOL		11 U	11 U	11 U	11 U	11 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE		15 B	4 JB	14 B	2 JB	2 JB	48 B
BUTYLBENZYLPHTHALATE		10 J	11 U	11 U	11 U	11 U	2 J
DI-N-BUTYLPHTHALATE		24 B	2 JB	11 U	11 U	0.7 J	1 JB
DI-N-OCTYL PHTHALATE		11 U	11 U	11 U	11 U	11 U	1 J
DIETHYLPHTHALATE		11 U	2 JB	11 U	11 U	11 U	1 JB
DIMETHYLPHTHALATE		11 U	11 U	11 U	11 U	11 U	11 U
FLUORANTHENE		11 U	11 U	11 U	11 U	11 U	11 U
NAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
PHENANTHRENE		11 U	11 U	11 U	11 U	11 U	11 U
PHENOL		11 U	4 J	11 U	43	11 U	11 U
PYRENE		11 U	11 U	11 U	11 U	11 U	11 U
2-CHLORONAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
2-METHYLNAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
2-METHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
2,4-DIMETHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
4-METHYLPHENOL		11 U	5 J	11 U	11 U	11 U	11 U
* ALKYL BENZENE(14.78)							
* ALKYL BENZENE(14.88)							
* ALKYL PHENOL(23.65)							
* ALKYL(C4)BENZENE(14.78)							
* BENZENE DERIVATIVE(11.90)							
* BENZOPHENONE(24.01)							
* BENZOPHENONE(24.04)							
* BENZOPHENONE(24.05)							
* BENZOPHENONE(24.06)							
* BENZOPHENONE(24.11)							
* BIPHENYL,PENTACHLORO-(30.70)							
* CAFFEINE(27.11)		22 J					
* CAFFEINE(27.12)			39 J				
* CAFFEINE(27.15)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* CAFFEINE(27.16)							
* CAFFEINE(27.17)							
* CAFFEINE(27.18)				87 J			
* CAFFEINE(27.22)							
* DIIODOMETHANE(9.59)							
* HALOGENATED UNKNOWN						18 JB	
* HALOGENATED UNKNOWN(26.95)							
* HALOGENATED UNKNOWN(26.98)							
* HALOGENATED UNKNOWN(26.99)							
* ISOQUINOLINE(17.35)							
* ISOQUINOLINE(17.39)							
* METHYLHEXANONE(8.14)							
* SULFUR(29.81)							
* SULFUR(29.89)							
* SULFUR, MOL.(29.80)			10 J				
* UNDECANE(14.48)							
* UNKNOWN					2000 J	14 J	
* UNKNOWN ACID ESTER(33.69)							
* UNKNOWN ACID(16.05)							
* UNKNOWN HYDROCARBON(8.07)							
* UNKNOWN HYDROCARBON(8.08)							
* UNKNOWN HYDROCARBON(8.10)				5 JB			
* UNKNOWN HYDROCARBON(8.14)							
* UNKNOWN HYDROCARBON(8.16)							
* UNKNOWN HYDROCARBON(13.68)							
* UNKNOWN HYDROCARBON(14.46)							
* UNKNOWN HYDROCARBON(14.48)							
* UNKNOWN HYDROCARBON(15.66)							
* UNKNOWN HYDROCARBON(15.94)							
* UNKNOWN HYDROCARBON(16.43)							
* UNKNOWN HYDROCARBON(19.87)							
* UNKNOWN HYDROCARBON(20.25)							
* UNKNOWN HYDROCARBON(21.47)							
* UNKNOWN HYDROCARBON(24.25)							
* UNKNOWN HYDROCARBON(25.00)							
* UNKNOWN HYDROCARBON(25.01)							
* UNKNOWN HYDROCARBON(25.09)							
* UNKNOWN HYDROCARBON(25.12)							
* UNKNOWN HYDROCARBON(26.43)							
* UNKNOWN HYDROCARBON(26.56)							
* UNKNOWN HYDROCARBON(26.57)							
* UNKNOWN HYDROCARBON(27.53)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* UNKNOWN HYDROCARBON(27.76)							
* UNKNOWN HYDROCARBON(29.02)							
* UNKNOWN HYDROCARBON(30.09)							
* UNKNOWN PHTHALATE						8 J	
* UNKNOWN PHTHALATE(35.06)							
* UNKNOWN PHTHALATE(35.07)							
* UNKNOWN PHTHALATE(35.08)							
* UNKNOWN PHTHALATE(35.09)							
* UNKNOWN(8.03)							
* UNKNOWN(8.05)							
* UNKNOWN(8.08)		29 J	21 J				
* UNKNOWN(8.10)							24 J
* UNKNOWN(8.12)							
* UNKNOWN(8.14)							
* UNKNOWN(8.33)				14 J			
* UNKNOWN(8.60)							
* UNKNOWN(8.92)				46 J			
* UNKNOWN(8.95)							
* UNKNOWN(9.01)							
* UNKNOWN(9.09)							
* UNKNOWN(9.53)							
* UNKNOWN(9.55)							
* UNKNOWN(9.57)		130 J	10 J				
* UNKNOWN(9.60)							
* UNKNOWN(9.61)							
* UNKNOWN(9.69)							
* UNKNOWN(9.85)							
* UNKNOWN(9.94)							
* UNKNOWN(10.12)		73 J					
* UNKNOWN(10.13)							
* UNKNOWN(10.21)							
* UNKNOWN(10.44)		120 J					
* UNKNOWN(10.53)							
* UNKNOWN(11.53)							
* UNKNOWN(11.66)				35 J			
* UNKNOWN(11.89)							
* UNKNOWN(12.19)		38 J					
* UNKNOWN(12.60)							
* UNKNOWN(12.79)							
* UNKNOWN(12.89)							
* UNKNOWN(12.96)							
* UNKNOWN(13.03)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 — LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* UNKNOWN(13.61)							
* UNKNOWN(13.93)							
* UNKNOWN(14.23)							
* UNKNOWN(14.45)							
* UNKNOWN(14.54)							
* UNKNOWN(14.76)							
* UNKNOWN(14.80)							
* UNKNOWN(14.86)							
* UNKNOWN(14.95)							
* UNKNOWN(14.96)							
* UNKNOWN(14.98)			5 J				
* UNKNOWN(14.99)							
* UNKNOWN(15.01)							
* UNKNOWN(15.03)							
* UNKNOWN(15.08)							
* UNKNOWN(15.14)							
* UNKNOWN(15.20)							
* UNKNOWN(15.33)							
* UNKNOWN(15.34)				6 J			
* UNKNOWN(15.42)							
* UNKNOWN(15.44)							
* UNKNOWN(15.74)							
* UNKNOWN(16.02)							
* UNKNOWN(16.03)							
* UNKNOWN(16.33)							
* UNKNOWN(16.35)							
* UNKNOWN(16.36)							
* UNKNOWN(16.39)							
* UNKNOWN(16.45)							
* UNKNOWN(16.47)							
* UNKNOWN(16.49)							
* UNKNOWN(16.50)							
* UNKNOWN(16.59)							
* UNKNOWN(16.70)							
* UNKNOWN(16.83)							
* UNKNOWN(16.95)							
* UNKNOWN(16.97)							
* UNKNOWN(17.07)							
* UNKNOWN(17.14)							
* UNKNOWN(17.23)							
* UNKNOWN(17.49)							
* UNKNOWN(17.57)			6 J				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500013E	AR500024E	AR500046E	AR500068E	AR500080E	AR500091E
	SDG NO:	DD21B	DD21B	DD29	DD28	DD28	DD21B
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(17.58)							
* UNKNOWN(17.59)							
* UNKNOWN(17.61)							
* UNKNOWN(17.71)							
* UNKNOWN(17.84)							
* UNKNOWN(17.95)							
* UNKNOWN(18.14)							
* UNKNOWN(18.30)							
* UNKNOWN(18.34)							
* UNKNOWN(18.38)							
* UNKNOWN(18.42)							
* UNKNOWN(18.51)							
* UNKNOWN(18.57)							
* UNKNOWN(18.73)							
* UNKNOWN(18.82)							
* UNKNOWN(19.13)							
* UNKNOWN(19.21)							
* UNKNOWN(19.24)							
* UNKNOWN(19.45)							
* UNKNOWN(19.46)							
* UNKNOWN(19.47)							
* UNKNOWN(19.48)							
* UNKNOWN(19.49)							
* UNKNOWN(19.59)							
* UNKNOWN(19.61)							
* UNKNOWN(19.76)				19 J			
* UNKNOWN(19.81)							
* UNKNOWN(19.82)				4 JB			
* UNKNOWN(19.83)							
* UNKNOWN(19.84)							
* UNKNOWN(19.85)							
* UNKNOWN(19.87)							
* UNKNOWN(20.24)							
* UNKNOWN(20.30)							
* UNKNOWN(20.34)							
* UNKNOWN(20.35)			8 J				
* UNKNOWN(20.36)							
* UNKNOWN(20.37)							
* UNKNOWN(20.52)							
* UNKNOWN(21.26)				12 J			
* UNKNOWN(21.28)							
* UNKNOWN(21.52)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* UNKNOWN(21.92)							
* UNKNOWN(21.94)							
* UNKNOWN(22.01)			14 J				
* UNKNOWN(22.02)							
* UNKNOWN(22.64)							
* UNKNOWN(22.78)							
* UNKNOWN(22.81)							
* UNKNOWN(22.86)			17 J				
* UNKNOWN(22.92)							
* UNKNOWN(22.96)							
* UNKNOWN(23.13)							
* UNKNOWN(23.19)							
* UNKNOWN(23.50)							
* UNKNOWN(23.62)							
* UNKNOWN(23.65)							
* UNKNOWN(23.68)			8 J				
* UNKNOWN(23.70)							
* UNKNOWN(23.88)							
* UNKNOWN(24.09)		29 J					
* UNKNOWN(24.10)							
* UNKNOWN(24.24)			46 J				
* UNKNOWN(24.25)				31 J			
* UNKNOWN(24.26)							
* UNKNOWN(24.29)							
* UNKNOWN(24.31)							
* UNKNOWN(24.49)				6 J			
* UNKNOWN(24.67)							
* UNKNOWN(25.09)							
* UNKNOWN(25.12)		12 J					
* UNKNOWN(25.24)		15 J					
* UNKNOWN(25.36)		12 J					
* UNKNOWN(25.43)							
* UNKNOWN(25.48)							
* UNKNOWN(25.54)		10 J					
* UNKNOWN(25.78)		16 J					
* UNKNOWN(25.87)							
* UNKNOWN(26.66)							
* UNKNOWN(26.67)							
* UNKNOWN(26.74)							
* UNKNOWN(26.87)							
* UNKNOWN(26.97)							14 J
* UNKNOWN(26.99)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* UNKNOWN(27.06)							
* UNKNOWN(27.29)							
* UNKNOWN(27.31)							
* UNKNOWN(27.32)							
* UNKNOWN(27.33)							
* UNKNOWN(27.35)							
* UNKNOWN(27.38)							
* UNKNOWN(27.39)							
* UNKNOWN(27.51)							
* UNKNOWN(27.82)				6 J			
* UNKNOWN(27.85)							
* UNKNOWN(27.86)							
* UNKNOWN(28.08)				6 J			
* UNKNOWN(28.09)							
* UNKNOWN(28.26)				4 J			
* UNKNOWN(28.28)							
* UNKNOWN(28.31)							
* UNKNOWN(28.32)							
* UNKNOWN(28.40)							
* UNKNOWN(28.50)				3 J			
* UNKNOWN(28.51)			5 J				
* UNKNOWN(28.53)							
* UNKNOWN(28.56)							
* UNKNOWN(28.70)		32 J					
* UNKNOWN(28.84)		20 J					
* UNKNOWN(28.99)		17 J					
* UNKNOWN(29.06)							
* UNKNOWN(29.23)		20 J					
* UNKNOWN(29.33)							
* UNKNOWN(29.34)			7 J				6 J
* UNKNOWN(29.37)		11 J					
* UNKNOWN(30.08)			6 J				
* UNKNOWN(30.09)							6 J
* UNKNOWN(30.17)							
* UNKNOWN(30.27)							
* UNKNOWN(30.57)				5 J			
* UNKNOWN(30.75)							
* UNKNOWN(30.77)							
* UNKNOWN(30.82)							
* UNKNOWN(30.87)							
* UNKNOWN(30.93)			7 J				
* UNKNOWN(30.99)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500013E DD21B GRAB	AR500024E DD21B GRAB	AR500046E DD29 GRAB	AR500068E DD28 GRAB	AR500080E DD28 GRAB	AR500091E DD21B GRAB
* UNKNOWN(31.02)							
* UNKNOWN(31.04)							
* UNKNOWN(31.27)				5 J			
* UNKNOWN(31.29)							
* UNKNOWN(32.28)							
* UNKNOWN(32.29)			7 J				
* UNKNOWN(33.80)							
* UNKNOWN(33.81)				34 J			
* UNKNOWN(33.82)			29 J				
* UNKNOWN(33.83)							34 J
* UNKNOWN(33.84)							
* UNKNOWN(33.85)							
* UNKNOWN(33.86)		690 J					
* UNKNOWN(33.91)							
* UNKNOWN(33.98)							
* UNKNOWN(34.07)							
* UNKNOWN(35.07)							
* UNKNOWN(35.11)							
* UNKNOWN(35.13)							
* UNKNOWN(35.18)				46 J			
* UNKNOWN(35.19)							
* UNKNOWN(35.62)							
* UNKNOWN(37.57)							
* UNKNOWN(37.58)				15 J			
* UNKNOWN(37.59)			40 J				
* UNKNOWN(37.63)							
* UNKNOWN(37.93)							
* UNKNOWN(39.21)							
* UNKNOWN(41.44)							
* UNKNOWN(41.48)			12 J				
* UNKNOWN(41.49)							
* UNKNOWN(41.50)							9 J
* UNKNOWN(44.59)							
* UNKNOWN(44.61)			20 J				9 J
* UNKNOWN(44.62)							
* UNKNOWN(51.84)							
* UNKNOWN(54.13)							
* XYLENE(8.43)							
* XYLENE(9.13)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
BENZO(A)ANTHRACENE		11 U	5 J	11 U	11 U	11 U	11 U
BENZOIC ACID		56 U	250 J	56 U	56 U	56 U	56 U
BENZYL ALCOHOL		11 U	55 U	11 U	11 U	11 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE		6 JB	310 B	8 JB	1 JB	1 JB	2 JB
BUTYLBENZYLPHTHALATE		11 U	25 J	11 U	11 U	11 U	11 U
DI-N-BUTYLPHTHALATE		3 J	180	2 JB	11 U	11 U	11 U
DI-N-OCTYL PHTHALATE		11 U	10 J	11 U	11 U	11 U	11 U
DIETHYLPHTHALATE		3 JB	55 U	1 JB	11 U	11 U	11 U
DIMETHYLPHTHALATE		11 U	55 U	11 U	11 U	11 U	11 U
FLUORANTHENE		11 U	15 J	11 U	11 U	11 U	11 U
NAPHTHALENE		30	50 J	11 U	11 U	11 U	11 U
PHENANTHRENE		11 U	15 J	11 U	11 U	11 U	11 U
PHENOL		110	130	11 U	11 U	7 J	11 U
PYRENE		11 U	15 J	11 U	11 U	11 U	11 U
2-CHLORONAPHTHALENE		1 J	10 J	11 U	11 U	11 U	11 U
2-METHYLNAPHTHALENE		11 U	10 J	11 U	11 U	11 U	11 U
2-METHYLPHENOL		13	55 U	11 U	11 U	11 U	11 U
2,4-DIMETHYLPHENOL		11 U	55 U	11 U	11 U	2 J	11 U
4-METHYLPHENOL		12	55 U	11 U	11 U	8 J	11 U
* ALKYL BENZENE(14.78)			500 J				
* ALKYL BENZENE(14.88)			400 J				
* ALKYL PHENOL(23.65)			150 J				
* ALKYL(C4)BENZENE(14.78)		43 J					
* BENZENE DERIVATIVE(11.90)							
* BENZOPHENONE(24.01)							
* BENZOPHENONE(24.04)							
* BENZOPHENONE(24.05)						4 J	
* BENZOPHENONE(24.06)		81 J	280 J				
* BENZOPHENONE(24.11)							
* BIPHENYL,PENTACHLORO-(30.70)							
* CAFFEINE(27.11)							
* CAFFEINE(27.12)					11 J		
* CAFFEINE(27.15)							
* CAFFEINE(27.16)						24 J	
* CAFFEINE(27.17)							
* CAFFEINE(27.18)							
* CAFFEINE(27.22)							200 J
* DIIODOMETHANE(9.59)							
* HALOGENATED UNKNOWN							
* HALOGENATED UNKNOWN(26.95)							
* HALOGENATED UNKNOWN(26.98)					10 JB		
* HALOGENATED UNKNOWN(26.99)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* ISOQUINOLINE(17.35)		42 J					
* ISOQUINOLINE(17.39)							
* METHYLHEXANONE(8.14)						23 JB	
* SULFUR(29.81)							
* SULFUR(29.89)							
* SULFUR, MOL.(29.80)							
* UNDECANE(14.48)							
* UNKNOWN							
* UNKNOWN ACID ESTER(33.69)							
* UNKNOWN ACID(16.05)							
* UNKNOWN HYDROCARBON(8.07)							
* UNKNOWN HYDROCARBON(8.08)							5 JB
* UNKNOWN HYDROCARBON(8.10)					15 JB		
* UNKNOWN HYDROCARBON(8.14)							
* UNKNOWN HYDROCARBON(8.16)							
* UNKNOWN HYDROCARBON(13.68)							
* UNKNOWN HYDROCARBON(14.46)			130 J				
* UNKNOWN HYDROCARBON(14.48)							
* UNKNOWN HYDROCARBON(15.66)							
* UNKNOWN HYDROCARBON(15.94)							
* UNKNOWN HYDROCARBON(16.43)							
* UNKNOWN HYDROCARBON(19.87)							
* UNKNOWN HYDROCARBON(20.25)			120 J				
* UNKNOWN HYDROCARBON(21.47)			120 J				
* UNKNOWN HYDROCARBON(24.25)			190 J				
* UNKNOWN HYDROCARBON(25.00)							
* UNKNOWN HYDROCARBON(25.01)			180 J				
* UNKNOWN HYDROCARBON(25.09)							
* UNKNOWN HYDROCARBON(25.12)			280 J				
* UNKNOWN HYDROCARBON(26.43)			120 J				
* UNKNOWN HYDROCARBON(26.56)							
* UNKNOWN HYDROCARBON(26.57)			150 J				
* UNKNOWN HYDROCARBON(27.53)							
* UNKNOWN HYDROCARBON(27.76)							
* UNKNOWN HYDROCARBON(29.02)							
* UNKNOWN HYDROCARBON(30.09)							
* UNKNOWN PHTHALATE							
* UNKNOWN PHTHALATE(35.06)							
* UNKNOWN PHTHALATE(35.07)							
* UNKNOWN PHTHALATE(35.08)							
* UNKNOWN PHTHALATE(35.09)							
* UNKNOWN(8.03)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES — DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500104E	AR500115E	AR500126E	AR500240E	AR500251E	AR500273E
	SDG NO:	DD24	DD24	DD21B	DD24	DD25	DD29
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(8.05)							
* UNKNOWN(8.08)							
* UNKNOWN(8.10)				15 J			
* UNKNOWN(8.12)							
* UNKNOWN(8.14)							
* UNKNOWN(8.33)							
* UNKNOWN(8.60)							
* UNKNOWN(8.92)							
* UNKNOWN(8.95)							
* UNKNOWN(9.01)							
* UNKNOWN(9.09)							
* UNKNOWN(9.53)							
* UNKNOWN(9.55)							
* UNKNOWN(9.57)							
* UNKNOWN(9.60)						8 J	
* UNKNOWN(9.61)							
* UNKNOWN(9.69)			1600 J				
* UNKNOWN(9.85)		1100 J					
* UNKNOWN(9.94)							
* UNKNOWN(10.12)							
* UNKNOWN(10.13)							
* UNKNOWN(10.21)							
* UNKNOWN(10.44)							
* UNKNOWN(10.53)							
* UNKNOWN(11.53)							
* UNKNOWN(11.66)							
* UNKNOWN(11.89)							
* UNKNOWN(12.19)							
* UNKNOWN(12.60)							
* UNKNOWN(12.79)		63 J					
* UNKNOWN(12.89)		85 J					
* UNKNOWN(12.96)							
* UNKNOWN(13.03)							
* UNKNOWN(13.61)							
* UNKNOWN(13.93)							
* UNKNOWN(14.23)					6 J		
* UNKNOWN(14.45)						5 J	
* UNKNOWN(14.54)							
* UNKNOWN(14.76)							
* UNKNOWN(14.80)							
* UNKNOWN(14.86)							
* UNKNOWN(14.95)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* UNKNOWN(14.96)			180 J				
* UNKNOWN(14.98)							
* UNKNOWN(14.99)						8 J	
* UNKNOWN(15.01)							
* UNKNOWN(15.03)							
* UNKNOWN(15.08)							
* UNKNOWN(15.14)							4 J
* UNKNOWN(15.20)							
* UNKNOWN(15.33)							
* UNKNOWN(15.34)							9 J
* UNKNOWN(15.42)							
* UNKNOWN(15.44)							
* UNKNOWN(15.74)							
* UNKNOWN(16.02)							
* UNKNOWN(16.03)							
* UNKNOWN(16.33)							
* UNKNOWN(16.35)						8 J	
* UNKNOWN(16.36)							
* UNKNOWN(16.39)		46 J					
* UNKNOWN(16.45)							
* UNKNOWN(16.47)							
* UNKNOWN(16.49)		54 J					
* UNKNOWN(16.50)							
* UNKNOWN(16.59)							
* UNKNOWN(16.70)							
* UNKNOWN(16.83)							
* UNKNOWN(16.95)							
* UNKNOWN(16.97)							
* UNKNOWN(17.07)							
* UNKNOWN(17.14)							
* UNKNOWN(17.23)							
* UNKNOWN(17.49)							
* UNKNOWN(17.57)							
* UNKNOWN(17.58)							
* UNKNOWN(17.59)						8 J	
* UNKNOWN(17.61)							
* UNKNOWN(17.71)		32 J					
* UNKNOWN(17.84)							
* UNKNOWN(17.95)		94 J					
* UNKNOWN(18.14)							
* UNKNOWN(18.30)		84 J					
* UNKNOWN(18.34)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* UNKNOWN(18.38)							
* UNKNOWN(18.42)		27 J					
* UNKNOWN(18.51)							5 J
* UNKNOWN(18.57)			190 J				
* UNKNOWN(18.73)							
* UNKNOWN(18.82)		27 J					
* UNKNOWN(19.13)							
* UNKNOWN(19.21)							
* UNKNOWN(19.24)							
* UNKNOWN(19.45)							
* UNKNOWN(19.46)							4 JB
* UNKNOWN(19.47)							
* UNKNOWN(19.48)							
* UNKNOWN(19.49)							
* UNKNOWN(19.59)						4 J	
* UNKNOWN(19.61)							
* UNKNOWN(19.76)							
* UNKNOWN(19.81)							
* UNKNOWN(19.82)							5 JB
* UNKNOWN(19.83)							
* UNKNOWN(19.84)							
* UNKNOWN(19.85)							
* UNKNOWN(19.87)						8 J	
* UNKNOWN(20.24)							
* UNKNOWN(20.30)							
* UNKNOWN(20.34)							
* UNKNOWN(20.35)							
* UNKNOWN(20.36)							
* UNKNOWN(20.37)						8 J	
* UNKNOWN(20.52)							
* UNKNOWN(21.26)							
* UNKNOWN(21.28)							
* UNKNOWN(21.52)							
* UNKNOWN(21.92)			160 J				
* UNKNOWN(21.94)		23 J					
* UNKNOWN(22.01)							
* UNKNOWN(22.02)							
* UNKNOWN(22.64)						5 J	
* UNKNOWN(22.78)							
* UNKNOWN(22.81)							
* UNKNOWN(22.86)							3 J
* UNKNOWN(22.92)						14 J	

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* UNKNOWN(22.96)							
* UNKNOWN(23.13)							
* UNKNOWN(23.19)							
* UNKNOWN(23.50)			190 J				
* UNKNOWN(23.62)							4 J
* UNKNOWN(23.65)							
* UNKNOWN(23.68)							
* UNKNOWN(23.70)						9 J	
* UNKNOWN(23.88)							
* UNKNOWN(24.09)							
* UNKNOWN(24.10)							
* UNKNOWN(24.24)							
* UNKNOWN(24.25)							
* UNKNOWN(24.26)							17 J
* UNKNOWN(24.29)						30 J	
* UNKNOWN(24.31)							
* UNKNOWN(24.49)							
* UNKNOWN(24.67)							
* UNKNOWN(25.09)		21 J					
* UNKNOWN(25.12)							
* UNKNOWN(25.24)							
* UNKNOWN(25.36)							
* UNKNOWN(25.43)							
* UNKNOWN(25.48)							
* UNKNOWN(25.54)							
* UNKNOWN(25.78)							
* UNKNOWN(25.87)							
* UNKNOWN(26.66)							
* UNKNOWN(26.67)							
* UNKNOWN(26.74)							3 J
* UNKNOWN(26.87)						6 J	
* UNKNOWN(26.97)							
* UNKNOWN(26.99)						5 JB	
* UNKNOWN(27.06)							
* UNKNOWN(27.29)							
* UNKNOWN(27.31)							
* UNKNOWN(27.32)			140 J				
* UNKNOWN(27.33)		60 J					
* UNKNOWN(27.35)							
* UNKNOWN(27.38)							
* UNKNOWN(27.39)							
* UNKNOWN(27.51)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* UNKNOWN(27.82)							
* UNKNOWN(27.85)							
* UNKNOWN(27.86)							
* UNKNOWN(28.08)							
* UNKNOWN(28.09)							
* UNKNOWN(28.26)							
* UNKNOWN(28.28)							
* UNKNOWN(28.31)							26 J
* UNKNOWN(28.32)							
* UNKNOWN(28.40)							
* UNKNOWN(28.50)							
* UNKNOWN(28.51)							
* UNKNOWN(28.53)							7 J
* UNKNOWN(28.56)							
* UNKNOWN(28.70)							
* UNKNOWN(28.84)							
* UNKNOWN(28.99)							
* UNKNOWN(29.06)			170 J				
* UNKNOWN(29.23)							
* UNKNOWN(29.33)							
* UNKNOWN(29.34)				12 J			
* UNKNOWN(29.37)							
* UNKNOWN(30.08)				22 J			
* UNKNOWN(30.09)							
* UNKNOWN(30.17)							
* UNKNOWN(30.27)							
* UNKNOWN(30.57)							7 J
* UNKNOWN(30.75)							
* UNKNOWN(30.77)							7 J
* UNKNOWN(30.82)							
* UNKNOWN(30.87)							
* UNKNOWN(30.93)							
* UNKNOWN(30.99)							
* UNKNOWN(31.02)		45 J					
* UNKNOWN(31.04)			420 J				
* UNKNOWN(31.27)							
* UNKNOWN(31.29)							7 J
* UNKNOWN(32.28)							
* UNKNOWN(32.29)							
* UNKNOWN(33.80)							
* UNKNOWN(33.81)							
* UNKNOWN(33.82)				20 J			34 J

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104E DD24 GRAB	AR500115E DD24 GRAB	AR500126E DD21B GRAB	AR500240E DD24 GRAB	AR500251E DD25 GRAB	AR500273E DD29 GRAB
* UNKNOWN(33.83)					75 J		
* UNKNOWN(33.84)							
* UNKNOWN(33.85)							
* UNKNOWN(33.86)		260 J				37 J	
* UNKNOWN(33.91)							
* UNKNOWN(33.98)							
* UNKNOWN(34.07)							
* UNKNOWN(35.07)							6 JB
* UNKNOWN(35.11)							
* UNKNOWN(35.13)							5 J
* UNKNOWN(35.18)							
* UNKNOWN(35.19)							
* UNKNOWN(35.62)							
* UNKNOWN(37.57)							32 J
* UNKNOWN(37.58)							
* UNKNOWN(37.59)							
* UNKNOWN(37.63)						30 J	
* UNKNOWN(37.93)							
* UNKNOWN(39.21)				10 J			
* UNKNOWN(41.44)							
* UNKNOWN(41.48)							
* UNKNOWN(41.49)				70 J			
* UNKNOWN(41.50)							
* UNKNOWN(44.59)							
* UNKNOWN(44.61)							
* UNKNOWN(44.62)				120 J			
* UNKNOWN(51.84)							
* UNKNOWN(54.13)							
* XYLENE(8.43)							
* XYLENE(9.13)							

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
BENZO(A)ANTHRACENE		11 U	11 U	11 U	11 U	11 U	11 U
BENZOIC ACID		56 U	56 U	56 U	130	30 J	56 U
BENZYL ALCOHOL		11 U	11 U	8 J	11 U	11 U	11 U
BIS(2-ETHYLHEXYL)PHTHALATE		2 JB	2 JB	47 B	7 JB	8 JB	1 JB
BUTYLBENZYLPHTHALATE		11 U	11 U	32	11 U	11 U	11 U
DI-N-BUTYLPHTHALATE		2 JB	0.7 JB	380 E	6 JB	7 JB	2 J

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
DI-N-OCTYL PHTHALATE		11 U	11 U	2 J	11 U	11 U	11 U
DIETHYLPHTHALATE		1 JB	0.9 JB	11 U	11 U	1 J	11 U
DIMETHYLPHTHALATE		11 U	11 U	11 U	11 U	11 U	11 U
FLUORANTHENE		11 U	11 U	11 U	11 U	11 U	11 U
NAPHTHALENE		11 U	11 U	11 U	85	53	11 U
PHENANTHRENE		11 U	11 U	11 U	11 U	11 U	11 U
PHENOL		10 J	11 U	11 U	150	330	11 U
PYRENE		11 U	11 U	11 U	11 U	11 U	11 U
2-CHLORONAPHTHALENE		11 U	11 U	11 U	2 J	11 U	11 U
2-METHYLNAPHTHALENE		11 U	11 U	11 U	11 U	3 J	11 U
2-METHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
2,4-DIMETHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
4-METHYLPHENOL		11 U	11 U	14	11 U	19	11 U
* ALKYL BENZENE(14.78)							
* ALKYL BENZENE(14.88)							
* ALKYL PHENOL(23.65)							
* ALKYL(C4)BENZENE(14.78)							
* BENZENE DERIVATIVE(11.90)							
* BENZOPHENONE(24.01)							
* BENZOPHENONE(24.04)							
* BENZOPHENONE(24.05)							
* BENZOPHENONE(24.06)							
* BENZOPHENONE(24.11)						72 J	
* BIPHENYL,PENTACHLORO-(30.70)			7 J				
* CAFFEINE(27.11)							
* CAFFEINE(27.12)		18 J					
* CAFFEINE(27.15)							
* CAFFEINE(27.16)							
* CAFFEINE(27.17)							
* CAFFEINE(27.18)							
* CAFFEINE(27.22)							
* DIIODOMETHANE(9.59)							
* HALOGENATED UNKNOWN							
* HALOGENATED UNKNOWN(26.95)							
* HALOGENATED UNKNOWN(26.98)							
* HALOGENATED UNKNOWN(26.99)							
* ISOQUINOLINE(17.35)							
* ISOQUINOLINE(17.39)							
* METHYLHEXANONE(8.14)							
* SULFUR(29.81)							
* SULFUR(29.89)							
* SULFUR, MOL.(29.80)		14 J					

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
* UNDECANE(14.48)						8 J	
* UNKNOWN							
* UNKNOWN ACID ESTER(33.69)							
* UNKNOWN ACID(16.05)							
* UNKNOWN HYDROCARBON(8.07)							
* UNKNOWN HYDROCARBON(8.08)							
* UNKNOWN HYDROCARBON(8.10)							
* UNKNOWN HYDROCARBON(8.14)							
* UNKNOWN HYDROCARBON(8.16)							
* UNKNOWN HYDROCARBON(13.68)							
* UNKNOWN HYDROCARBON(14.46)							
* UNKNOWN HYDROCARBON(14.48)							
* UNKNOWN HYDROCARBON(15.66)							
* UNKNOWN HYDROCARBON(15.94)							
* UNKNOWN HYDROCARBON(16.43)							
* UNKNOWN HYDROCARBON(19.87)							
* UNKNOWN HYDROCARBON(20.25)							
* UNKNOWN HYDROCARBON(21.47)							
* UNKNOWN HYDROCARBON(24.25)							
* UNKNOWN HYDROCARBON(25.00)							
* UNKNOWN HYDROCARBON(25.01)							
* UNKNOWN HYDROCARBON(25.09)							
* UNKNOWN HYDROCARBON(25.12)							
* UNKNOWN HYDROCARBON(26.43)							
* UNKNOWN HYDROCARBON(26.56)							
* UNKNOWN HYDROCARBON(26.57)							
* UNKNOWN HYDROCARBON(27.53)							
* UNKNOWN HYDROCARBON(27.76)							
* UNKNOWN HYDROCARBON(29.02)							
* UNKNOWN HYDROCARBON(30.09)							
* UNKNOWN PHTHALATE							
* UNKNOWN PHTHALATE(35.06)							
* UNKNOWN PHTHALATE(35.07)							
* UNKNOWN PHTHALATE(35.08)							
* UNKNOWN PHTHALATE(35.09)							
* UNKNOWN(8.03)							
* UNKNOWN(8.05)							
* UNKNOWN(8.08)							
* UNKNOWN(8.10)		32 J					
* UNKNOWN(8.12)			17 J				
* UNKNOWN(8.14)							27 JB
* UNKNOWN(8.33)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500295E	AR500319E	AR500320E	AR500331E	AR500342E	AR500353E
	SDG NO:	DD21B	DD21B	DD25	DD29	DD29	DD25
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(8.60)							
* UNKNOWN(8.92)							
* UNKNOWN(8.95)		13 J					
* UNKNOWN(9.01)							
* UNKNOWN(9.09)					67 J		
* UNKNOWN(9.53)							
* UNKNOWN(9.55)							
* UNKNOWN(9.57)							
* UNKNOWN(9.60)							
* UNKNOWN(9.61)							
* UNKNOWN(9.69)							
* UNKNOWN(9.85)							
* UNKNOWN(9.94)					1500 J		
* UNKNOWN(10.12)							
* UNKNOWN(10.13)							
* UNKNOWN(10.21)						1200 J	
* UNKNOWN(10.44)							
* UNKNOWN(10.53)						110 J	
* UNKNOWN(11.53)							
* UNKNOWN(11.66)							
* UNKNOWN(11.89)		15 J					
* UNKNOWN(12.19)							
* UNKNOWN(12.60)							
* UNKNOWN(12.79)							
* UNKNOWN(12.89)							
* UNKNOWN(12.96)						21 J	
* UNKNOWN(13.03)					420 J		
* UNKNOWN(13.61)							
* UNKNOWN(13.93)					81 J		
* UNKNOWN(14.23)							
* UNKNOWN(14.45)							
* UNKNOWN(14.54)							
* UNKNOWN(14.76)							
* UNKNOWN(14.80)						5 J	
* UNKNOWN(14.86)							
* UNKNOWN(14.95)							
* UNKNOWN(14.96)							
* UNKNOWN(14.98)							
* UNKNOWN(14.99)							
* UNKNOWN(15.01)					100 J		
* UNKNOWN(15.03)							
* UNKNOWN(15.08)						7 J	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
* UNKNOWN(15.14)							
* UNKNOWN(15.20)							
* UNKNOWN(15.33)							
* UNKNOWN(15.34)							
* UNKNOWN(15.42)							
* UNKNOWN(15.44)						28 J	
* UNKNOWN(15.74)							
* UNKNOWN(16.02)							
* UNKNOWN(16.03)		11 J					
* UNKNOWN(16.33)					140 J		
* UNKNOWN(16.35)							
* UNKNOWN(16.36)							
* UNKNOWN(16.39)							
* UNKNOWN(16.45)					88 J		
* UNKNOWN(16.47)						47 J	
* UNKNOWN(16.49)							
* UNKNOWN(16.50)							
* UNKNOWN(16.59)					87 J		
* UNKNOWN(16.70)							
* UNKNOWN(16.83)					81 J		
* UNKNOWN(16.95)						8 J	
* UNKNOWN(16.97)							
* UNKNOWN(17.07)						12 J	
* UNKNOWN(17.14)				910 J			
* UNKNOWN(17.23)							
* UNKNOWN(17.49)		6 J					
* UNKNOWN(17.57)							
* UNKNOWN(17.58)							
* UNKNOWN(17.59)							
* UNKNOWN(17.61)							
* UNKNOWN(17.71)							
* UNKNOWN(17.84)					71 J		
* UNKNOWN(17.95)							
* UNKNOWN(18.14)					480 J		
* UNKNOWN(18.30)							
* UNKNOWN(18.34)							
* UNKNOWN(18.38)					68 J		
* UNKNOWN(18.42)							
* UNKNOWN(18.51)							
* UNKNOWN(18.57)							
* UNKNOWN(18.73)					510 J		
* UNKNOWN(18.82)					85 J		

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
* UNKNOWN(19.13)							
* UNKNOWN(19.21)					48 J		
* UNKNOWN(19.24)							
* UNKNOWN(19.45)							
* UNKNOWN(19.46)							
* UNKNOWN(19.47)							
* UNKNOWN(19.48)							
* UNKNOWN(19.49)							11 J
* UNKNOWN(19.59)							
* UNKNOWN(19.61)							
* UNKNOWN(19.76)							
* UNKNOWN(19.81)							
* UNKNOWN(19.82)							
* UNKNOWN(19.83)							
* UNKNOWN(19.84)							
* UNKNOWN(19.85)							13 J
* UNKNOWN(19.87)							
* UNKNOWN(20.24)					130 J		
* UNKNOWN(20.30)							
* UNKNOWN(20.34)						11 J	
* UNKNOWN(20.35)							
* UNKNOWN(20.36)					44 J		
* UNKNOWN(20.37)							
* UNKNOWN(20.52)							
* UNKNOWN(21.26)							
* UNKNOWN(21.28)							
* UNKNOWN(21.52)		6 J					
* UNKNOWN(21.92)							
* UNKNOWN(21.94)							
* UNKNOWN(22.01)							
* UNKNOWN(22.02)						11 J	
* UNKNOWN(22.64)							
* UNKNOWN(22.78)							
* UNKNOWN(22.81)							
* UNKNOWN(22.86)							
* UNKNOWN(22.92)		26 J					
* UNKNOWN(22.96)							
* UNKNOWN(23.13)						88 J	
* UNKNOWN(23.19)							
* UNKNOWN(23.50)							
* UNKNOWN(23.62)							
* UNKNOWN(23.65)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
* UNKNOWN(23.68)							
* UNKNOWN(23.70)							
* UNKNOWN(23.88)							
* UNKNOWN(24.09)							
* UNKNOWN(24.10)					120 J		
* UNKNOWN(24.24)							
* UNKNOWN(24.25)							
* UNKNOWN(24.26)							
* UNKNOWN(24.29)							
* UNKNOWN(24.31)						46 J	
* UNKNOWN(24.49)							
* UNKNOWN(24.67)							
* UNKNOWN(25.09)							
* UNKNOWN(25.12)							
* UNKNOWN(25.24)							
* UNKNOWN(25.36)							
* UNKNOWN(25.43)							
* UNKNOWN(25.48)						8 J	
* UNKNOWN(25.54)							
* UNKNOWN(25.78)							
* UNKNOWN(25.87)		40 J					
* UNKNOWN(26.66)							
* UNKNOWN(26.67)							
* UNKNOWN(26.74)							
* UNKNOWN(26.87)							
* UNKNOWN(26.97)							
* UNKNOWN(26.99)							
* UNKNOWN(27.06)							11 J
* UNKNOWN(27.29)							
* UNKNOWN(27.31)							
* UNKNOWN(27.32)							
* UNKNOWN(27.33)							
* UNKNOWN(27.35)						24 J	
* UNKNOWN(27.38)							
* UNKNOWN(27.39)					150 J		
* UNKNOWN(27.51)							
* UNKNOWN(27.82)							
* UNKNOWN(27.85)							
* UNKNOWN(27.86)							
* UNKNOWN(28.08)							
* UNKNOWN(28.09)							
* UNKNOWN(28.26)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES — DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500295E	AR500319E	AR500320E	AR500331E	AR500342E	AR500353E
	SDG NO:	DD21B	DD21B	DD25	DD29	DD29	DD25
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(28.28)							
* UNKNOWN(28.31)		22 J					
* UNKNOWN(28.32)							
* UNKNOWN(28.40)						15 J	
* UNKNOWN(28.50)							
* UNKNOWN(28.51)							
* UNKNOWN(28.53)							
* UNKNOWN(28.56)							
* UNKNOWN(28.70)							
* UNKNOWN(28.84)							
* UNKNOWN(28.99)							
* UNKNOWN(29.06)							
* UNKNOWN(29.23)							
* UNKNOWN(29.33)							
* UNKNOWN(29.34)							
* UNKNOWN(29.37)							
* UNKNOWN(30.08)							
* UNKNOWN(30.09)							
* UNKNOWN(30.17)							
* UNKNOWN(30.27)							
* UNKNOWN(30.57)							
* UNKNOWN(30.75)		29 J					
* UNKNOWN(30.77)							
* UNKNOWN(30.82)						18 J	
* UNKNOWN(30.87)							
* UNKNOWN(30.93)							
* UNKNOWN(30.99)							
* UNKNOWN(31.02)							
* UNKNOWN(31.04)							
* UNKNOWN(31.27)							
* UNKNOWN(31.29)							
* UNKNOWN(32.28)							
* UNKNOWN(32.29)							
* UNKNOWN(33.80)							
* UNKNOWN(33.81)							
* UNKNOWN(33.82)							
* UNKNOWN(33.83)							
* UNKNOWN(33.84)							
* UNKNOWN(33.85)							9 J
* UNKNOWN(33.86)						89 J	
* UNKNOWN(33.91)					89 J		
* UNKNOWN(33.98)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500295E DD21B GRAB	AR500319E DD21B GRAB	AR500320E DD25 GRAB	AR500331E DD29 GRAB	AR500342E DD29 GRAB	AR500353E DD25 GRAB
* UNKNOWN(34.07)				2800 J			
* UNKNOWN(35.07)							
* UNKNOWN(35.11)							5 J
* UNKNOWN(35.13)							
* UNKNOWN(35.18)							
* UNKNOWN(35.19)							
* UNKNOWN(35.62)							
* UNKNOWN(37.57)							
* UNKNOWN(37.58)							
* UNKNOWN(37.59)							
* UNKNOWN(37.63)							
* UNKNOWN(37.93)							
* UNKNOWN(39.21)							
* UNKNOWN(41.44)							
* UNKNOWN(41.48)							
* UNKNOWN(41.49)		14 J					
* UNKNOWN(41.50)							
* UNKNOWN(44.59)		17 J					
* UNKNOWN(44.61)							
* UNKNOWN(44.62)							
* UNKNOWN(51.84)			35 J				
* UNKNOWN(54.13)			12 J				
* XYLENE(8.43)							
* XYLENE(9.13)							

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
BENZO(A)ANTHRACENE		11 U	11 U	11 U	11 U	11 U	11 U
BENZOIC ACID		56 U	11 U	56 U	56 U	56 U	56 U
BENZYL ALCOHOL		11 U	11 U	11 U	11 U	11 U	8 J
BIS(2-ETHYLHEXYL)PHTHALATE		2 JB	2 J	3 J	6 JB	1 JB	28
BUTYLBENZYLPHTHALATE		11 U	11 U	11 U	11 U	11 U	14
DI-N-BUTYLPHTHALATE		11 U	11 U	0.8 J	0.9 J	0.6 J	210
DI-N-OCTYL PHTHALATE		11 U	11 U	11 U	11 U	11 U	11 U
DIETHYLPHTHALATE		11 U	11 U	11 U	57 B	21 B	11 U
DIMETHYLPHTHALATE		11 U	11 U	11 U	2 J	11 U	11 U
FLUORANTHENE		11 U	11 U	11 U	11 U	11 U	11 U
NAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
PHENANTHRENE		11 U	11 U	11 U	11 U	11 U	11 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
PHENOL		11 U	11 U	11 U	170	11 U	11 U
PYRENE		11 U	11 U	11 U	11 U	11 U	11 U
2-CHLORONAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
2-METHYLNAPHTHALENE		11 U	11 U	11 U	11 U	11 U	11 U
2-METHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
2,4-DIMETHYLPHENOL		11 U	11 U	11 U	2 J	11 U	11 U
4-METHYLPHENOL		11 U	11 U	11 U	11 U	11 U	11 U
* ALKYL BENZENE(14.78)							
* ALKYL BENZENE(14.88)							
* ALKYL PHENOL(23.65)							
* ALKYL(C4)BENZENE(14.78)							
* BENZENE DERIVATIVE(11.90)					13 J		
* BENZOPHENONE(24.01)				3 J			
* BENZOPHENONE(24.04)							
* BENZOPHENONE(24.05)							
* BENZOPHENONE(24.06)							
* BENZOPHENONE(24.11)							
* BIPHENYL,PENTACHLORO-(30.70)							
* CAFFEINE(27.11)							
* CAFFEINE(27.12)							
* CAFFEINE(27.15)					31 J		
* CAFFEINE(27.16)							
* CAFFEINE(27.17)			82 J				
* CAFFEINE(27.18)							
* CAFFEINE(27.22)				190 J			
* DIIODOMETHANE(9.59)		15 J					
* HALOGENATED UNKNOWN							
* HALOGENATED UNKNOWN(26.95)		3 J					
* HALOGENATED UNKNOWN(26.98)					3 JB		
* HALOGENATED UNKNOWN(26.99)						6 JB	
* ISOQUINOLINE(17.35)							
* ISOQUINOLINE(17.39)							
* METHYLHEXANONE(8.14)							
* SULFUR(29.81)					5 J		
* SULFUR(29.89)							
* SULFUR, MOL.(29.80)							
* UNDECANE(14.48)							
* UNKNOWN							
* UNKNOWN ACID ESTER(33.69)					18 J		
* UNKNOWN ACID(16.05)					8 J		
* UNKNOWN HYDROCARBON(8.07)							
* UNKNOWN HYDROCARBON(8.08)		6 JB					

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN HYDROCARBON(8.10)							
* UNKNOWN HYDROCARBON(8.14)						29 JB	
* UNKNOWN HYDROCARBON(8.16)					29 JB		
* UNKNOWN HYDROCARBON(13.68)							
* UNKNOWN HYDROCARBON(14.46)							
* UNKNOWN HYDROCARBON(14.48)							
* UNKNOWN HYDROCARBON(15.66)							
* UNKNOWN HYDROCARBON(15.94)							
* UNKNOWN HYDROCARBON(16.43)							
* UNKNOWN HYDROCARBON(19.87)					3 J		
* UNKNOWN HYDROCARBON(20.25)							
* UNKNOWN HYDROCARBON(21.47)							
* UNKNOWN HYDROCARBON(24.25)							
* UNKNOWN HYDROCARBON(25.00)							
* UNKNOWN HYDROCARBON(25.01)							
* UNKNOWN HYDROCARBON(25.09)							
* UNKNOWN HYDROCARBON(25.12)							
* UNKNOWN HYDROCARBON(26.43)							
* UNKNOWN HYDROCARBON(26.56)							
* UNKNOWN HYDROCARBON(26.57)							
* UNKNOWN HYDROCARBON(27.53)							
* UNKNOWN HYDROCARBON(27.76)							
* UNKNOWN HYDROCARBON(29.02)			18 J				
* UNKNOWN HYDROCARBON(30.09)				6 J			
* UNKNOWN PHTHALATE							
* UNKNOWN PHTHALATE(35.06)		17 JB					
* UNKNOWN PHTHALATE(35.07)							
* UNKNOWN PHTHALATE(35.08)						7 J	
* UNKNOWN PHTHALATE(35.09)					9 J		
* UNKNOWN(8.03)				16 JB			10 JB
* UNKNOWN(8.05)							
* UNKNOWN(8.08)							
* UNKNOWN(8.10)							
* UNKNOWN(8.12)							
* UNKNOWN(8.14)							
* UNKNOWN(8.33)							
* UNKNOWN(8.60)			17 J				
* UNKNOWN(8.92)			54 J				
* UNKNOWN(8.95)							
* UNKNOWN(9.01)					10 J		
* UNKNOWN(9.09)							
* UNKNOWN(9.53)							24 J

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR500477E	AR500488E	AR500502E	AR500524E	AR500546E	AR500557E
	SDG NO:	DD29	DD30	DD30	DD26	DD26	DD30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(9.55)			12 J				
* UNKNOWN(9.57)							
* UNKNOWN(9.60)							
* UNKNOWN(9.61)							
* UNKNOWN(9.69)							
* UNKNOWN(9.85)							
* UNKNOWN(9.94)							
* UNKNOWN(10.12)							
* UNKNOWN(10.13)							
* UNKNOWN(10.21)							
* UNKNOWN(10.44)							
* UNKNOWN(10.53)							
* UNKNOWN(11.53)			12 J				
* UNKNOWN(11.66)							
* UNKNOWN(11.89)							
* UNKNOWN(12.19)							
* UNKNOWN(12.60)							
* UNKNOWN(12.79)							
* UNKNOWN(12.89)							
* UNKNOWN(12.96)							
* UNKNOWN(13.03)							
* UNKNOWN(13.61)				5 J			
* UNKNOWN(13.93)							
* UNKNOWN(14.23)							
* UNKNOWN(14.45)							
* UNKNOWN(14.54)							
* UNKNOWN(14.76)							
* UNKNOWN(14.80)							
* UNKNOWN(14.86)							
* UNKNOWN(14.95)			59 J				
* UNKNOWN(14.96)							
* UNKNOWN(14.98)							
* UNKNOWN(14.99)							
* UNKNOWN(15.01)							
* UNKNOWN(15.03)							
* UNKNOWN(15.08)							
* UNKNOWN(15.14)							
* UNKNOWN(15.20)							
* UNKNOWN(15.33)				7 J			
* UNKNOWN(15.34)							
* UNKNOWN(15.42)							
* UNKNOWN(15.44)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN(15.74)							
* UNKNOWN(16.02)			9 J				
* UNKNOWN(16.03)							
* UNKNOWN(16.33)							
* UNKNOWN(16.35)							
* UNKNOWN(16.36)			63 J				
* UNKNOWN(16.39)							
* UNKNOWN(16.45)							
* UNKNOWN(16.47)							
* UNKNOWN(16.49)							
* UNKNOWN(16.50)							
* UNKNOWN(16.59)							
* UNKNOWN(16.70)							87 J
* UNKNOWN(16.83)							
* UNKNOWN(16.95)							
* UNKNOWN(16.97)							
* UNKNOWN(17.07)							
* UNKNOWN(17.14)							
* UNKNOWN(17.23)							
* UNKNOWN(17.49)							
* UNKNOWN(17.57)							
* UNKNOWN(17.58)					17 J		
* UNKNOWN(17.59)							
* UNKNOWN(17.61)			9 J				
* UNKNOWN(17.71)							
* UNKNOWN(17.84)							
* UNKNOWN(17.95)							
* UNKNOWN(18.14)							
* UNKNOWN(18.30)							
* UNKNOWN(18.34)		120 J					
* UNKNOWN(18.38)							
* UNKNOWN(18.42)							
* UNKNOWN(18.51)							
* UNKNOWN(18.57)							
* UNKNOWN(18.73)							
* UNKNOWN(18.82)							
* UNKNOWN(19.13)							13 J
* UNKNOWN(19.21)							
* UNKNOWN(19.24)							
* UNKNOWN(19.45)				18 JB			
* UNKNOWN(19.46)							
* UNKNOWN(19.47)		6 JB					16 JB

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 — DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN(19.48)							
* UNKNOWN(19.49)						5 J	
* UNKNOWN(19.59)							
* UNKNOWN(19.61)					5 J		
* UNKNOWN(19.76)							
* UNKNOWN(19.81)				20 JB			
* UNKNOWN(19.82)							
* UNKNOWN(19.83)		6 JB				5 J	13 JB
* UNKNOWN(19.84)							
* UNKNOWN(19.85)							
* UNKNOWN(19.87)							
* UNKNOWN(20.24)							
* UNKNOWN(20.30)							
* UNKNOWN(20.34)							
* UNKNOWN(20.35)							
* UNKNOWN(20.36)							
* UNKNOWN(20.37)							
* UNKNOWN(20.52)					5 J		
* UNKNOWN(21.26)							
* UNKNOWN(21.28)			30 J				
* UNKNOWN(21.52)							
* UNKNOWN(21.92)							
* UNKNOWN(21.94)							
* UNKNOWN(22.01)							
* UNKNOWN(22.02)							
* UNKNOWN(22.64)							
* UNKNOWN(22.78)							
* UNKNOWN(22.81)							
* UNKNOWN(22.86)			7 J				
* UNKNOWN(22.92)							
* UNKNOWN(22.96)			7 J				
* UNKNOWN(23.13)							
* UNKNOWN(23.19)							
* UNKNOWN(23.50)							
* UNKNOWN(23.62)							
* UNKNOWN(23.65)				6 J			
* UNKNOWN(23.68)							
* UNKNOWN(23.70)							
* UNKNOWN(23.88)					4 J		
* UNKNOWN(24.09)							
* UNKNOWN(24.10)							
* UNKNOWN(24.24)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN(24.25)				18 J			
* UNKNOWN(24.26)							
* UNKNOWN(24.29)							
* UNKNOWN(24.31)							
* UNKNOWN(24.49)							
* UNKNOWN(24.67)				4 J			
* UNKNOWN(25.09)							
* UNKNOWN(25.12)							
* UNKNOWN(25.24)							
* UNKNOWN(25.36)							
* UNKNOWN(25.43)							
* UNKNOWN(25.48)							
* UNKNOWN(25.54)							
* UNKNOWN(25.78)							
* UNKNOWN(25.87)							
* UNKNOWN(26.66)							
* UNKNOWN(26.67)			10 J				
* UNKNOWN(26.74)				3 J			
* UNKNOWN(26.87)							
* UNKNOWN(26.97)							
* UNKNOWN(26.99)							
* UNKNOWN(27.06)							
* UNKNOWN(27.29)		2 J					
* UNKNOWN(27.31)							
* UNKNOWN(27.32)				3 J			
* UNKNOWN(27.33)							
* UNKNOWN(27.35)							
* UNKNOWN(27.38)			8 J				
* UNKNOWN(27.39)							
* UNKNOWN(27.51)							6 J
* UNKNOWN(27.82)							
* UNKNOWN(27.85)							
* UNKNOWN(27.86)							
* UNKNOWN(28.08)							
* UNKNOWN(28.09)			8 J				
* UNKNOWN(28.26)							
* UNKNOWN(28.28)				5 J			
* UNKNOWN(28.31)							
* UNKNOWN(28.32)							6 J
* UNKNOWN(28.40)							
* UNKNOWN(28.50)							
* UNKNOWN(28.51)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN(28.53)							
* UNKNOWN(28.56)			7 J				
* UNKNOWN(28.70)							
* UNKNOWN(28.84)							
* UNKNOWN(28.99)							
* UNKNOWN(29.06)							
* UNKNOWN(29.23)							
* UNKNOWN(29.33)				5 J			
* UNKNOWN(29.34)							
* UNKNOWN(29.37)							
* UNKNOWN(30.08)		3 J					
* UNKNOWN(30.09)							
* UNKNOWN(30.17)					4 J		
* UNKNOWN(30.27)							
* UNKNOWN(30.57)							
* UNKNOWN(30.75)							
* UNKNOWN(30.77)							
* UNKNOWN(30.82)							
* UNKNOWN(30.87)							
* UNKNOWN(30.93)							
* UNKNOWN(30.99)							
* UNKNOWN(31.02)							18 J
* UNKNOWN(31.04)							
* UNKNOWN(31.27)							
* UNKNOWN(31.29)							
* UNKNOWN(32.28)			18 J				
* UNKNOWN(32.29)							
* UNKNOWN(33.80)				27 J			
* UNKNOWN(33.81)							
* UNKNOWN(33.82)		14 J	46 J				
* UNKNOWN(33.83)							
* UNKNOWN(33.84)							
* UNKNOWN(33.85)							
* UNKNOWN(33.86)							
* UNKNOWN(33.91)							
* UNKNOWN(33.98)							2400 J
* UNKNOWN(34.07)							
* UNKNOWN(35.07)							
* UNKNOWN(35.11)							
* UNKNOWN(35.13)							
* UNKNOWN(35.18)							
* UNKNOWN(35.19)				110 J			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500477E DD29 GRAB	AR500488E DD30 GRAB	AR500502E DD30 GRAB	AR500524E DD26 GRAB	AR500546E DD26 GRAB	AR500557E DD30 GRAB
* UNKNOWN(35.62)							21 J
* UNKNOWN(37.57)				15 J			
* UNKNOWN(37.58)							
* UNKNOWN(37.59)							
* UNKNOWN(37.63)							
* UNKNOWN(37.93)				10 J			
* UNKNOWN(39.21)							
* UNKNOWN(41.44)				11 J			
* UNKNOWN(41.48)							
* UNKNOWN(41.49)							
* UNKNOWN(41.50)							
* UNKNOWN(44.59)							
* UNKNOWN(44.61)							
* UNKNOWN(44.62)							
* UNKNOWN(51.84)							
* UNKNOWN(54.13)							
* XYLENE(8.43)					54 J		
* XYLENE(9.13)					33 J		

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500568E DD30 GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB			
BENZO(A)ANTHRACENE		11 U	11 U	11 U			
BENZOIC ACID		56 U	56 U	56 U			
BENZYL ALCOHOL		11 U	11 U	11 U			
BIS(2-ETHYLHEXYL)PHTHALATE		2 J	10 J	3 J			
BUTYLBENZYLPHTHALATE		11 U	2 J	11 U			
DI-N-BUTYLPHTHALATE		4 J	9 J	0.7 J			
DI-N-OCTYL PHTHALATE		11 U	11 U	11 U			
DIETHYLPHTHALATE		11 U	11 U	11 U			
DIMETHYLPHTHALATE		11 U	11 U	11 U			
FLUORANTHENE		11 U	11 U	11 U			
NAPHTHALENE		6 J	64	11 U			
PHENANTHRENE		11 U	1 J	11 U			
PHENOL		5 J	180	11 U			
PYRENE		11 U	11 U	11 U			
2-CHLORONAPHTHALENE		11 U	11 U	11 U			
2-METHYLNAPHTHALENE		11 U	5 J	11 U			
2-METHYLPHENOL		11 U	11 U	11 U			
2,4-DIMETHYLPHENOL		11 U	11 U	11 U			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500568E DD30 GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB			
4-METHYLPHENOL		11 U	11 U	11 U			
* ALKYL BENZENE(14.78)							
* ALKYL BENZENE(14.88)							
* ALKYL PHENOL(23.65)							
* ALKYL(C4)BENZENE(14.78)							
* BENZENE DERIVATIVE(11.90)							
* BENZOPHENONE(24.01)							
* BENZOPHENONE(24.04)		59 J					
* BENZOPHENONE(24.05)							
* BENZOPHENONE(24.06)							
* BENZOPHENONE(24.11)							
* BIPHENYL,PENTACHLORO-(30.70)							
* CAFFEINE(27.11)				4 J			
* CAFFEINE(27.12)							
* CAFFEINE(27.15)							
* CAFFEINE(27.16)							
* CAFFEINE(27.17)							
* CAFFEINE(27.18)							
* CAFFEINE(27.22)							
* DIIODOMETHANE(9.59)							
* HALOGENATED UNKNOWN							
* HALOGENATED UNKNOWN(26.95)							
* HALOGENATED UNKNOWN(26.98)							
* HALOGENATED UNKNOWN(26.99)							
* ISOQUINOLINE(17.35)							
* ISOQUINOLINE(17.39)		110 J					
* METHYLHEXANONE(8.14)							
* SULFUR(29.81)							
* SULFUR(29.89)		77 J					
* SULFUR, MOL.(29.80)							
* UNDECANE(14.48)							
* UNKNOWN							
* UNKNOWN ACID ESTER(33.69)							
* UNKNOWN ACID(16.05)							
* UNKNOWN HYDROCARBON(8.07)				17 JB			
* UNKNOWN HYDROCARBON(8.08)							
* UNKNOWN HYDROCARBON(8.10)							
* UNKNOWN HYDROCARBON(8.14)							
* UNKNOWN HYDROCARBON(8.16)							
* UNKNOWN HYDROCARBON(13.68)			50 J				
* UNKNOWN HYDROCARBON(14.46)							
* UNKNOWN HYDROCARBON(14.48)			14 J				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR500568E SDG NO: DD30 TYPE: GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB
* UNKNOWN HYDROCARBON(15.66)		20 J	
* UNKNOWN HYDROCARBON(15.94)		4 J	
* UNKNOWN HYDROCARBON(16.43)	12 J		
* UNKNOWN HYDROCARBON(19.87)			
* UNKNOWN HYDROCARBON(20.25)			
* UNKNOWN HYDROCARBON(21.47)			
* UNKNOWN HYDROCARBON(24.25)			
* UNKNOWN HYDROCARBON(25.00)		87 J	
* UNKNOWN HYDROCARBON(25.01)			
* UNKNOWN HYDROCARBON(25.09)		64 J	
* UNKNOWN HYDROCARBON(25.12)			
* UNKNOWN HYDROCARBON(26.43)			
* UNKNOWN HYDROCARBON(26.56)		70 J	
* UNKNOWN HYDROCARBON(26.57)			
* UNKNOWN HYDROCARBON(27.53)		61 J	
* UNKNOWN HYDROCARBON(27.76)		68 J	
* UNKNOWN HYDROCARBON(29.02)			
* UNKNOWN HYDROCARBON(30.09)			
* UNKNOWN PHTHALATE			
* UNKNOWN PHTHALATE(35.06)			
* UNKNOWN PHTHALATE(35.07)			9 JB
* UNKNOWN PHTHALATE(35.08)			
* UNKNOWN PHTHALATE(35.09)			
* UNKNOWN(8.03)			
* UNKNOWN(8.05)	31 JB		
* UNKNOWN(8.08)			
* UNKNOWN(8.10)			
* UNKNOWN(8.12)			
* UNKNOWN(8.14)			
* UNKNOWN(8.33)			
* UNKNOWN(8.60)			
* UNKNOWN(8.92)			
* UNKNOWN(8.95)			
* UNKNOWN(9.01)			
* UNKNOWN(9.09)			
* UNKNOWN(9.53)			
* UNKNOWN(9.55)			
* UNKNOWN(9.57)			
* UNKNOWN(9.60)			
* UNKNOWN(9.61)	180 J		
* UNKNOWN(9.69)			
* UNKNOWN(9.85)			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500568E DD30 GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB			
* UNKNOWN(9.94)							
* UNKNOWN(10.12)							
* UNKNOWN(10.13)			1100 J				
* UNKNOWN(10.21)							
* UNKNOWN(10.44)							
* UNKNOWN(10.53)							
* UNKNOWN(11.53)							
* UNKNOWN(11.66)							
* UNKNOWN(11.89)							
* UNKNOWN(12.19)							
* UNKNOWN(12.60)				93 J			
* UNKNOWN(12.79)							
* UNKNOWN(12.89)							
* UNKNOWN(12.96)							
* UNKNOWN(13.03)							
* UNKNOWN(13.61)							
* UNKNOWN(13.93)							
* UNKNOWN(14.23)							
* UNKNOWN(14.45)							
* UNKNOWN(14.54)		16 J					
* UNKNOWN(14.76)		60 J					
* UNKNOWN(14.80)							
* UNKNOWN(14.86)		49 J					
* UNKNOWN(14.95)							
* UNKNOWN(14.96)							
* UNKNOWN(14.98)							
* UNKNOWN(14.99)							
* UNKNOWN(15.01)							
* UNKNOWN(15.03)				5 J			
* UNKNOWN(15.08)							
* UNKNOWN(15.14)							
* UNKNOWN(15.20)		320 J					
* UNKNOWN(15.33)							
* UNKNOWN(15.34)							
* UNKNOWN(15.42)			4 J				
* UNKNOWN(15.44)							
* UNKNOWN(15.74)			13 J				
* UNKNOWN(16.02)							
* UNKNOWN(16.03)							
* UNKNOWN(16.33)		54 J					
* UNKNOWN(16.35)							
* UNKNOWN(16.36)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500568E DD30 GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB
* UNKNOWN(16.39)				
* UNKNOWN(16.45)				
* UNKNOWN(16.47)				
* UNKNOWN(16.49)				
* UNKNOWN(16.50)			41 J	
* UNKNOWN(16.59)				
* UNKNOWN(16.70)				
* UNKNOWN(16.83)				
* UNKNOWN(16.95)				
* UNKNOWN(16.97)		13 J		
* UNKNOWN(17.07)				
* UNKNOWN(17.14)				
* UNKNOWN(17.23)				7 J
* UNKNOWN(17.49)				
* UNKNOWN(17.57)				
* UNKNOWN(17.58)				
* UNKNOWN(17.59)				
* UNKNOWN(17.61)				
* UNKNOWN(17.71)				
* UNKNOWN(17.84)				
* UNKNOWN(17.95)				
* UNKNOWN(18.14)				
* UNKNOWN(18.30)				
* UNKNOWN(18.34)				
* UNKNOWN(18.38)				
* UNKNOWN(18.42)				
* UNKNOWN(18.51)				
* UNKNOWN(18.57)				
* UNKNOWN(18.73)				
* UNKNOWN(18.82)				
* UNKNOWN(19.13)				
* UNKNOWN(19.21)				
* UNKNOWN(19.24)			15 J	
* UNKNOWN(19.45)				
* UNKNOWN(19.46)				
* UNKNOWN(19.47)				
* UNKNOWN(19.48)				12 JB
* UNKNOWN(19.49)				
* UNKNOWN(19.59)				
* UNKNOWN(19.61)				
* UNKNOWN(19.76)				
* UNKNOWN(19.81)				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR500568E SDG NO: DD30 TYPE: GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB
* UNKNOWN(19.82)	13 JB		
* UNKNOWN(19.83)			
* UNKNOWN(19.84)			13 JB
* UNKNOWN(19.85)			
* UNKNOWN(19.87)			
* UNKNOWN(20.24)			
* UNKNOWN(20.30)	19 J		
* UNKNOWN(20.34)			
* UNKNOWN(20.35)			
* UNKNOWN(20.36)			
* UNKNOWN(20.37)			
* UNKNOWN(20.52)			
* UNKNOWN(21.26)			
* UNKNOWN(21.28)			
* UNKNOWN(21.52)			
* UNKNOWN(21.92)			
* UNKNOWN(21.94)			
* UNKNOWN(22.01)			
* UNKNOWN(22.02)			
* UNKNOWN(22.64)			
* UNKNOWN(22.78)		7 J	
* UNKNOWN(22.81)	12 J		
* UNKNOWN(22.86)			
* UNKNOWN(22.92)			
* UNKNOWN(22.96)			
* UNKNOWN(23.13)			
* UNKNOWN(23.19)		89 J	
* UNKNOWN(23.50)			
* UNKNOWN(23.62)			
* UNKNOWN(23.65)			
* UNKNOWN(23.68)			
* UNKNOWN(23.70)			
* UNKNOWN(23.88)			
* UNKNOWN(24.09)			
* UNKNOWN(24.10)			
* UNKNOWN(24.24)			
* UNKNOWN(24.25)			
* UNKNOWN(24.26)	15 J		
* UNKNOWN(24.29)			
* UNKNOWN(24.31)			
* UNKNOWN(24.49)			
* UNKNOWN(24.67)			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR500568E SDG NO: DD30 TYPE: GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB
* UNKNOWN(25.09)			
* UNKNOWN(25.12)			
* UNKNOWN(25.24)			
* UNKNOWN(25.36)			
* UNKNOWN(25.43)	13 J		
* UNKNOWN(25.48)			
* UNKNOWN(25.54)			
* UNKNOWN(25.78)			
* UNKNOWN(25.87)			
* UNKNOWN(26.66)		110 J	
* UNKNOWN(26.67)			
* UNKNOWN(26.74)			
* UNKNOWN(26.87)			
* UNKNOWN(26.97)			
* UNKNOWN(26.99)			
* UNKNOWN(27.06)			
* UNKNOWN(27.29)			
* UNKNOWN(27.31)	35 J		
* UNKNOWN(27.32)			
* UNKNOWN(27.33)			
* UNKNOWN(27.35)			
* UNKNOWN(27.38)			
* UNKNOWN(27.39)			
* UNKNOWN(27.51)			
* UNKNOWN(27.82)			
* UNKNOWN(27.85)		81 J	
* UNKNOWN(27.86)			4 J
* UNKNOWN(28.08)			
* UNKNOWN(28.09)			
* UNKNOWN(28.26)			
* UNKNOWN(28.28)			
* UNKNOWN(28.31)			
* UNKNOWN(28.32)			
* UNKNOWN(28.40)			
* UNKNOWN(28.50)			3 J
* UNKNOWN(28.51)			
* UNKNOWN(28.53)			
* UNKNOWN(28.56)			
* UNKNOWN(28.70)			
* UNKNOWN(28.84)			
* UNKNOWN(28.99)			
* UNKNOWN(29.06)			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR500568E SDG NO: DD30 TYPE: GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB
* UNKNOWN(29.23)			
* UNKNOWN(29.33)			
* UNKNOWN(29.34)			
* UNKNOWN(29.37)			
* UNKNOWN(30.08)			
* UNKNOWN(30.09)			
* UNKNOWN(30.17)			
* UNKNOWN(30.27)			7 J
* UNKNOWN(30.57)			
* UNKNOWN(30.75)			
* UNKNOWN(30.77)			
* UNKNOWN(30.82)			
* UNKNOWN(30.87)		39 J	
* UNKNOWN(30.93)			
* UNKNOWN(30.99)	34 J		
* UNKNOWN(31.02)			
* UNKNOWN(31.04)			
* UNKNOWN(31.27)			
* UNKNOWN(31.29)			
* UNKNOWN(32.28)			
* UNKNOWN(32.29)			
* UNKNOWN(33.80)			
* UNKNOWN(33.81)			
* UNKNOWN(33.82)			
* UNKNOWN(33.83)			
* UNKNOWN(33.84)	210 J		
* UNKNOWN(33.85)		89 J	
* UNKNOWN(33.86)			
* UNKNOWN(33.91)			
* UNKNOWN(33.98)			
* UNKNOWN(34.07)			
* UNKNOWN(35.07)			
* UNKNOWN(35.11)			
* UNKNOWN(35.13)			
* UNKNOWN(35.18)			
* UNKNOWN(35.19)			
* UNKNOWN(35.62)			
* UNKNOWN(37.57)			
* UNKNOWN(37.58)			
* UNKNOWN(37.59)			
* UNKNOWN(37.63)			
* UNKNOWN(37.93)			

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500568E DD30 GRAB	AR500579E DD30 GRAB	AR500580E DD30 GRAB			
* UNKNOWN(39.21)							
* UNKNOWN(41.44)							
* UNKNOWN(41.48)							
* UNKNOWN(41.49)							
* UNKNOWN(41.50)							
* UNKNOWN(44.59)							
* UNKNOWN(44.61)							
* UNKNOWN(44.62)							
* UNKNOWN(51.84)							
* UNKNOWN(54.13)							
* XYLENE(8.43)							
* XYLENE(9.13)							

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013A GN14 GRAB	AR500024A ON14 GRAB	AR500046A GN30 GRAB	AR500068A ON13 GRAB	AR500080A ON13 GRAB	AR500091A GN14 GRAB
ACETONE		4500 BE	2400 BE	7500 BE	170 B	4 JB	530 BE
BENZENE		5 U	110	4 J	2 U	5 U	5 U
BROMODICHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE		5 U	2 J	5 U	1 JB	0.9 JB	5 U
CARBON TETRACHLORIDE		5 U	5 U	5 U	2 J	5 U	5 U
CHLOROFORM		14	41	10	310 E	5 U	9
DIBROMOCHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	5 U	6	5 U	5 U
METHYLENE CHLORIDE		1600 BE	450 BE	810 BE	48 B	3 JB	140 B
TETRACHLOROETHENE		5 U	5 U	5 U	5 U	5 U	5 U
TOLUENE		21	12 B	5 U	14 U	8 U	5 U
TRICHLOROETHENE		130	5 U	5 U	5 U	140 U	5 U
VINYL ACETATE		10 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)		5 U	5 U	5 U	35	5 U	5 U
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE		2 J	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		140	5 U	5 U	5 U	7	5 U
2-BUTANONE		10 U	27	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE		10 U	23	8 J	10 U	10 U	10 U
* ACETIC ACID, METHYL ACI(9.68)							
* ACETIC ACID, METHYL EST(9.79)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500013A	AR500024A	AR500046A	AR500068A	AR500080A	AR500091A
	SDG NO:	GN14	ON14	GN30	ON13	ON13	GN14
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* ACETIC ACID,METHYL ESTE(9.80)					14 J		
* BUTANOL(15.55)							
* BUTANOL(15.69)							
* BUTANOL(15.70)							
* DIMETHYL HEXANE(25.16)							
* DIMETHYLHEXANE(24.67)							
* DIMETHYLHEXANE(25.15)							
* DIMETHYLHEXANE(25.17)							
* DIMETHYLHEXANE(25.25)							
* ETHANOL(5.38)							
* ETHANOL(5.52)							
* ETHANOL(5.57)					240 J		
* ETHANOL(5.67)							
* ETHANOL(5.80)							
* ETHYL ETHER							
* ETHYL ETHER(12.13)							
* ETHYL ETHER(12.15)							
* ETHYL ETHER(12.22)							
* FURAN, TETRAHYDO(11.20)		31 J					
* FURAN, TETRAHYDRO(11.03)							
* FURAN, TETRAHYDRO(11.16)							
* FURAN, TETRAHYDRO(11.29)							
* FURAN, TETRAHYDRO(11.30)			18 J				
* FURAN, TETRAHYDRO(11.31)							
* FURAN, TETRAHYDRO-(11.15)							
* FURAN, TETRAHYDRO-(11.16)				7 J			
* FURAN, TETRAHYDRO-(11.18)							
* FURAN, TETRAHYDRO-(11.20)							
* FURAN, TETRAHYDRO-(11.30)							
* FURAN, TETRAHYDRO-(11.31)							
* FURAN, TETRHYDRO-(11.19)							
* FURAN,TETRAHYDRO-(11.17)							
* METHYL DIOXOLANE(13.94)							
* METHYLDIOXOLANE(13.93)							
* PYRIDINE(18.55)							
* TETRAHYDROFURAN							
* UNKNOWN							
* UNKNOWN(4.14)							
* UNKNOWN(4.17)							
* UNKNOWN(4.72)							
* UNKNOWN(4.80)							
* UNKNOWN(4.81)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013A GN14 GRAB	AR500024A ON14 GRAB	AR500046A GN30 GRAB	AR500068A ON13 GRAB	AR500080A ON13 GRAB	AR500091A GN14 GRAB
* UNKNOWN(4.86)							
* UNKNOWN(4.87)							
* UNKNOWN(4.91)					350 J		
* UNKNOWN(4.95)							
* UNKNOWN(4.98)							
* UNKNOWN(5.05)							
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							
* UNKNOWN(9.99)							
* UNKNOWN(11.57)							
* UNKNOWN(12.20)			24 J				
* UNKNOWN(13.66)							
* UNKNOWN(13.69)							
* UNKNOWN(13.70)							
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)			6 J				
* UNKNOWN(14.69)							
* UNKNOWN(14.70)					7 J		
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)							
* UNKNOWN(23.19)							
* UNKNOWN(24.67)							
* UNKNOWN(24.70)							
* UNKNOWN(24.71)							
* UNKNOWN(24.73)							
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							
* UNKNOWN(31.46)							
* UNKNOWN(37.56)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500013A GN14 GRAB	AR500024A ON14 GRAB	AR500046A GN30 GRAB	AR500068A ON13 GRAB	AR500080A ON13 GRAB	AR500091A GN14 GRAB
* UNKNOWN(55.48)							
* 2-PROPANOL							
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							
* 2-PROPANOL(8.98)		22 J					
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104A GN15 GRAB	AR500115A GN15 GRAB	AR500126A ON15 GRAB	AR500137A ON14 GRAB	AR500148A ON14 GRAB	AR500160A GN30 GRAB
ACETONE		570 BE	820 BE	1200 BE	2600 BE	2400 BE	6100 BE
BENZENE		5 U	5 U	5 U	5 U	130	3 J
BROMODICHLOROMETHANE		5 U	5 U	2 J	5 U	5 U	5 U
CARBON DISULFIDE		3 J	3 J	5 U	1 J	1 J	5 U
CARBON TETRACHLORIDE		3 J	5 J	5 U	5 U	5 U	5 U
CHLOROFORM		140	140	3 J	11	35	13
DIBROMOCHLOROMETHANE		5 U	5 U	3 J	5 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	5 U	3 J	5 U	5 U
METHYLENE CHLORIDE		90 B	96 B	500 BE	1500 BE	330 BE	750 BE
TETRACHLOROETHENE		310 E	170	5 U	5 U	2 J	5 U
TOLUENE		14 B	14 B	5 B	18 B	16 B	5 U
TRICHLOROETHENE		17 U	12 U	2 J	110	3 U	5 U
VINYL ACETATE		10 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)		5 U	5 U	5 U	10	5 U	5 U
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	3 J	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE		5 U	5 U	5 U	1 J	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 J	5 J	5 U	97	5 U	5 U
2-BUTANONE		10 U	10 U	10 U	17	24	10 U
4-METHYL-2-PENTANONE		23	24	10 U	10 U	23	10 J
* ACETIC ACID, METHYL ACI(9.68)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500104A SDG NO: GN15 TYPE: GRAB	AR500115A GN15 GRAB	AR500126A ON15 GRAB	AR500137A ON14 GRAB	AR500148A ON14 GRAB	AR500160A GN30 GRAB
* ACETIC ACID, METHYL EST(9.79)						
* ACETIC ACID,METHYL ESTE(9.80)						
* BUTANOL(15.55)						
* BUTANOL(15.69)						
* BUTANOL(15.70)						
* DIMETHYL HEXANE(25.16)						
* DIMETHYLHEXANE(24.67)						
* DIMETHYLHEXANE(25.15)						
* DIMETHYLHEXANE(25.17)						
* DIMETHYLHEXANE(25.25)						
* ETHANOL(5.38)						
* ETHANOL(5.52)						
* ETHANOL(5.57)						
* ETHANOL(5.67)						
* ETHANOL(5.80)						
* ETHYL ETHER			19 J			
* ETHYL ETHER(12.13)						
* ETHYL ETHER(12.15)						
* ETHYL ETHER(12.22)						
* FURAN, TETRAHYDO(11.20)						
* FURAN, TETRAHYDRO(11.03)						
* FURAN, TETRAHYDRO(11.16)						
* FURAN, TETRAHYDRO(11.29)				50 J		
* FURAN, TETRAHYDRO(11.30)					25 J	
* FURAN, TETRAHYDRO(11.31)						
* FURAN, TETRAHYDRO-(11.15)						
* FURAN, TETRAHYDRO-(11.16)						
* FURAN, TETRAHYDRO-(11.18)						
* FURAN, TETRAHYDRO-(11.20)						
* FURAN, TETRAHYDRO-(11.30)						
* FURAN, TETRAHYDRO-(11.31)						
* FURAN, TETRHYDRO-(11.19)						
* FURAN,TETRAHYDRO-(11.17)						6 J
* METHYL DIOXOLANE(13.94)						
* METHYLDIOXOLANE(13.93)						
* PYRIDINE(18.55)						
* TETRAHYDROFURAN						
* UNKNOWN						
* UNKNOWN(4.14)		3 J				
* UNKNOWN(4.17)	11 J					
* UNKNOWN(4.72)						
* UNKNOWN(4.80)						

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500104A GN15 GRAB	AR500115A GN15 GRAB	AR500126A ON15 GRAB	AR500137A ON14 GRAB	AR500148A ON14 GRAB	AR500160A GN30 GRAB
* UNKNOWN(4.81)							
* UNKNOWN(4.86)							
* UNKNOWN(4.87)		860 J					
* UNKNOWN(4.91)							
* UNKNOWN(4.95)							
* UNKNOWN(4.98)			380 J				
* UNKNOWN(5.05)							
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)						9 J	
* UNKNOWN(9.58)		20 J	4 J				
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							
* UNKNOWN(9.99)							
* UNKNOWN(11.57)					9 J		
* UNKNOWN(12.20)						15 J	
* UNKNOWN(13.66)		10 J					
* UNKNOWN(13.69)			4 J				
* UNKNOWN(13.70)							
* UNKNOWN(14.46)		8 J					
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							
* UNKNOWN(14.69)							
* UNKNOWN(14.70)							
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)			10 J				
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)							
* UNKNOWN(23.19)							
* UNKNOWN(24.67)		31 J					
* UNKNOWN(24.70)			16 J				
* UNKNOWN(24.71)							
* UNKNOWN(24.73)							
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							
* UNKNOWN(31.46)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500104A	AR500115A	AR500126A	AR500137A	AR500148A	AR500160A
	SDG NO:	GN15	GN15	ON15	ON14	ON14	GN30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(37.56)							
* UNKNOWN(55.48)							
* 2-PROPANOL				14 J			
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)		8 J					
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500182A	AR500206A	AR500217A	AR500228A	AR500239A	AR500240A
	SDG NO:	ON13	ON13	ON14	GN15	GN17	ON19
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		230 BE	6 JB	250 BE	490 BE	420 BE	2700 BE
BENZENE		2 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE		3 JB	5 U	5 U	2 J	3 J	5 U
CARBON TETRACHLORIDE		5 U	5 U	2 J	2 J	5 U	5 U
CHLOROFORM		260 E	5 U	9	110	130	3 J
DIBROMOCHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE		4 J	5 U	5 U	5 U	5 U	2 JB
METHYLENE CHLORIDE		38 B	3 JB	120 B	69 B	83 B	88 B
TETRACHLOROETHENE		5 U	5 U	5 U	400 E	360 E	5 U
TOLUENE		14	7	2 JB	9 B	17	8 B
TRICHLOROETHENE		5 U	180 U	5 U	16 U	18	9
VINYL ACETATE		10 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)		23	5 U	5 U	5 U	5 U	5 U
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	1 J	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 U	9	5 U	5 J	6	9
2-BUTANONE		10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE		10 U	10 U	10 U	22	22	10 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500182A ON13 GRAB	AR500206A ON13 GRAB	AR500217A ON14 GRAB	AR500228A GN15 GRAB	AR500239A GN17 GRAB	AR500240A ON19 GRAB
* ACETIC ACID, METHYL ACI(9.68)							
* ACETIC ACID, METHYL EST(9.79)							
* ACETIC ACID,METHYL ESTE(9.80)							
* BUTANOL(15.55)						5 J	
* BUTANOL(15.69)							
* BUTANOL(15.70)							
* DIMETHYL HEXANE(25.16)							
* DIMETHYLHEXANE(24.67)						73 J	
* DIMETHYLHEXANE(25.15)							
* DIMETHYLHEXANE(25.17)							
* DIMETHYLHEXANE(25.25)							
* ETHANOL(5.38)						47 J	
* ETHANOL(5.52)		91 J					
* ETHANOL(5.57)							
* ETHANOL(5.67)							
* ETHANOL(5.80)							
* ETHYL ETHER							
* ETHYL ETHER(12.13)							
* ETHYL ETHER(12.15)							
* ETHYL ETHER(12.22)							
* FURAN, TETRAHYDO(11.20)							
* FURAN, TETRAHYDRO(11.03)							
* FURAN, TETRAHYDRO(11.16)							
* FURAN, TETRAHYDRO(11.29)							
* FURAN, TETRAHYDRO(11.30)							19 J
* FURAN, TETRAHYDRO(11.31)							
* FURAN, TETRAHYDRO-(11.15)							
* FURAN, TETRAHYDRO-(11.16)							
* FURAN, TETRAHYDRO-(11.18)							
* FURAN, TETRAHYDRO-(11.20)							
* FURAN, TETRAHYDRO-(11.30)							
* FURAN, TETRAHYDRO-(11.31)							
* FURAN, TETRHYDRO-(11.19)							
* FURAN,TETRAHYDRO-(11.17)							
* METHYL DIOXOLANE(13.94)							
* METHYLDIOXOLANE(13.93)							
* PYRIDINE(18.55)							
* TETRAHYDROFURAN							
* UNKNOWN							
* UNKNOWN(4.14)					320 J		
* UNKNOWN(4.17)							
* UNKNOWN(4.72)						100 J	

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500182A ON13 GRAB	AR500206A ON13 GRAB	AR500217A ON14 GRAB	AR500228A GN15 GRAB	AR500239A GN17 GRAB	AR500240A ON19 GRAB
* UNKNOWN(4.80)							
* UNKNOWN(4.81)					500 J		
* UNKNOWN(4.86)		260 J					
* UNKNOWN(4.87)							
* UNKNOWN(4.91)							
* UNKNOWN(4.95)							
* UNKNOWN(4.98)							
* UNKNOWN(5.05)							
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							
* UNKNOWN(9.99)							
* UNKNOWN(11.57)							
* UNKNOWN(12.20)							
* UNKNOWN(13.66)						6 J	
* UNKNOWN(13.69)							
* UNKNOWN(13.70)					7 J		
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							
* UNKNOWN(14.69)							
* UNKNOWN(14.70)							
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)							
* UNKNOWN(23.19)							
* UNKNOWN(24.67)							
* UNKNOWN(24.70)							
* UNKNOWN(24.71)					24 J		
* UNKNOWN(24.73)							
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500182A	AR500206A	AR500217A	AR500228A	AR500239A	AR500240A
	SDG NO:	ON13	ON13	ON14	GN15	GN17	ON19
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(31.46)							
* UNKNOWN(37.56)							
* UNKNOWN(55.48)							
* 2-PROPANOL							
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							21 J
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500251A	AR500273A	AR500295A	AR500319A	AR500320A	AR500331A
	SDG NO:	GN19	GN30	ON15	ON14	GN19	ON21
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		5600 BE	7700 BE	1300 BE	4 JB	360 BE	1600 BE
BENZENE		58	6	5 U	5 U	5 U	2 J
BROMODICHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE		5 U	5 U	5 U	5 U	5 U	3 J
CARBON TETRACHLORIDE		5 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM		25	7	130	5 U	7	120
DIBROMOCHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	1 J	5 U	5 U	3 J
METHYLENE CHLORIDE		260 BE	720 BE	11 B	2 JB	19 B	230 BE
TETRACHLOROETHENE		5 U	5 U	5 U	5 U	5 U	860 E
TOLUENE		11	5 U	14 B	9 B	5 U	38 B
TRICHLOROETHENE		5 U	5 U	5 U	200 E	5 U	54
VINYL ACETATE		10 U	10 U	10 U	10 U	10 U	6 J
XYLENE (TOTAL)		7	5 U	10	5 U	5 U	19
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	2 J
1,1,1-TRICHLOROETHANE		5 U	2 J	5 U	5 U	5 U	3 J
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 U	5 U	5 U	8	5 U	7
2-BUTANONE		10 U	10 U	10 U	10 U	10 U	60

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500251A GN19 GRAB	AR500273A GN30 GRAB	AR500295A ON15 GRAB	AR500319A ON14 GRAB	AR500320A GN19 GRAB	AR500331A ON21 GRAB
4-METHYL-2-PENTANONE		15	12	10 U	10 U	10 U	74
* ACETIC ACID, METHYL ACI(9.68)							
* ACETIC ACID, METHYL EST(9.79)							
* ACETIC ACID,METHYL ESTE(9.80)							
* BUTANOL(15.55)							
* BUTANOL(15.69)							
* BUTANOL(15.70)							
* DIMETHYL HEXANE(25.16)							
* DIMETHYLHEXANE(24.67)							
* DIMETHYLHEXANE(25.15)							
* DIMETHYLHEXANE(25.17)							99 J
* DIMETHYLHEXANE(25.25)							
* ETHANOL(5.38)							
* ETHANOL(5.52)							
* ETHANOL(5.57)							63 J
* ETHANOL(5.67)							
* ETHANOL(5.80)							
* ETHYL ETHER							
* ETHYL ETHER(12.13)		8 J					
* ETHYL ETHER(12.15)							
* ETHYL ETHER(12.22)							
* FURAN, TETRAHYDO(11.20)							
* FURAN, TETRAHYDRO(11.03)							
* FURAN, TETRAHYDRO(11.16)							
* FURAN, TETRAHYDRO(11.29)							
* FURAN, TETRAHYDRO(11.30)							
* FURAN, TETRAHYDRO(11.31)							
* FURAN, TETRAHYDRO-(11.15)						5 J	
* FURAN, TETRAHYDRO-(11.16)							
* FURAN, TETRAHYDRO-(11.18)		5 J					
* FURAN, TETRAHYDRO-(11.20)			7 J				
* FURAN, TETRAHYDRO-(11.30)							
* FURAN, TETRAHYDRO-(11.31)							
* FURAN, TETRHYDRO-(11.19)							
* FURAN,TETRAHYDRO-(11.17)							
* METHYL DIOXOLANE(13.94)							
* METHYLDIOXOLANE(13.93)							
* PYRIDINE(18.55)							
* TETRAHYDROFURAN				4 J			
* UNKNOWN							
* UNKNOWN(4.14)							
* UNKNOWN(4.17)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500251A SDG NO: GN19 TYPE: GRAB	AR500273A GN30 GRAB	AR500295A ON15 GRAB	AR500319A ON14 GRAB	AR500320A GN19 GRAB	AR500331A ON21 GRAB
* UNKNOWN(4.72)						
* UNKNOWN(4.80)						
* UNKNOWN(4.81)						
* UNKNOWN(4.86)						
* UNKNOWN(4.87)						
* UNKNOWN(4.91)						
* UNKNOWN(4.95)						
* UNKNOWN(4.98)						
* UNKNOWN(5.05)						300 J
* UNKNOWN(5.44)						
* UNKNOWN(6.08)						
* UNKNOWN(7.84)						
* UNKNOWN(7.93)						
* UNKNOWN(9.16)						
* UNKNOWN(9.58)						
* UNKNOWN(9.80)						30 J
* UNKNOWN(9.84)						
* UNKNOWN(9.99)						
* UNKNOWN(11.57)						
* UNKNOWN(12.20)						
* UNKNOWN(13.66)						
* UNKNOWN(13.69)						
* UNKNOWN(13.70)						
* UNKNOWN(14.46)						
* UNKNOWN(14.50)						
* UNKNOWN(14.68)						
* UNKNOWN(14.69)						
* UNKNOWN(14.70)						
* UNKNOWN(15.65)						68 J
* UNKNOWN(15.70)						
* UNKNOWN(15.74)						
* UNKNOWN(18.53)						
* UNKNOWN(19.01)						
* UNKNOWN(19.03)						
* UNKNOWN(19.13)						13 J
* UNKNOWN(19.16)						
* UNKNOWN(23.19)						
* UNKNOWN(24.67)						
* UNKNOWN(24.70)						
* UNKNOWN(24.71)						
* UNKNOWN(24.73)						
* UNKNOWN(25.39)						

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500251A SDG NO: GN19 TYPE: GRAB	AR500273A GN30 GRAB	AR500295A ON15 GRAB	AR500319A ON14 GRAB	AR500320A GN19 GRAB	AR500331A ON21 GRAB
* UNKNOWN(31.44)						6 J
* UNKNOWN(31.46)						
* UNKNOWN(37.56)						
* UNKNOWN(55.48)						
* 2-PROPANOL			11 J			
* 2-PROPANOL(8.78)						
* 2-PROPANOL(8.79)						
* 2-PROPANOL(8.82)						
* 2-PROPANOL(8.91)	50 J					
* 2-PROPANOL(8.92)						
* 2-PROPANOL(8.94)						
* 2-PROPANOL(8.97)						
* 2-PROPANOL(8.98)						
* 2-PROPANOL(8.99)						
* 2-PROPANOL(9.06)						
* 2-PROPANONE(8.23)						

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500342A SDG NO: ON23 TYPE: GRAB	AR500353A GN19 GRAB	AR500364A GN19 GRAB	AR500375A GN19 GRAB	AR500397A GN30 GRAB	AR500411A ON15 GRAB
ACETONE	5600 BE	8 JB	6000 BE	6000 BE	8700 BE	810 BE
BENZENE	13 U	5 U	5 U	82	53	5 U
BROMODICHLOROMETHANE	13 U	2 J	5 U	5 U	5 U	5 U
CARBON DISULFIDE	3 J	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE	13 U	5 U	5 U	5 U	5 U	5 U
CHLOROFORM	140	2 J	3 J	25	17	120
DIBROMOCHLOROMETHANE	13 U	3 J	5 U	5 U	5 U	5 U
ETHYLBENZENE	7 J	5 U	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE	190 B	6 B	150 B	220 BE	1100 BE	8 B
TETRACHLOROETHENE	380 E	5 U	5 U	5 U	5 U	5 U
TOLUENE	13 B	3 J	5 U	15	7	11 B
TRICHLOROETHENE	21	5 U	13 U	5 U	5 U	5 U
VINYL ACETATE	25 U	10 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)	13 U	6	5 U	5 U	5 U	9
1,1-DICHLOROETHANE	13 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE	13 U	5	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE	13 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE	13 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE	13 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)	13 U	5 U	13	5 U	5 U	5 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500342A SDG NO: DN23 TYPE: GRAB	AR500353A GN19 GRAB	AR500364A GN19 GRAB	AR500375A GN19 GRAB	AR500397A GN30 GRAB	AR500411A DN15 GRAB
2-BUTANONE	83	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE	65	10 U	10 U	17	11	10 U
* ACETIC ACID, METHYL ACI(9.68)						
* ACETIC ACID, METHYL EST(9.79)	120 J					
* ACETIC ACID,METHYL ESTE(9.80)						
* BUTANOL(15.55)						
* BUTANOL(15.69)	280 J					
* BUTANOL(15.70)						
* DIMETHYL HEXANE(25.16)						
* DIMETHYLHEXANE(24.67)						
* DIMETHYLHEXANE(25.15)						
* DIMETHYLHEXANE(25.17)						
* DIMETHYLHEXANE(25.25)	14 J					
* ETHANOL(5.38)						
* ETHANOL(5.52)						
* ETHANOL(5.57)						
* ETHANOL(5.67)						
* ETHANOL(5.80)	380 J					
* ETHYL ETHER						
* ETHYL ETHER(12.13)						
* ETHYL ETHER(12.15)				9 J		
* ETHYL ETHER(12.22)						
* FURAN, TETRAHYDO(11.20)						
* FURAN, TETRAHYDRO(11.03)						
* FURAN, TETRAHYDRO(11.16)						
* FURAN, TETRAHYDRO(11.29)						
* FURAN, TETRAHYDRO(11.30)						
* FURAN, TETRAHYDRO(11.31)						
* FURAN, TETRAHYDRO-(11.15)						
* FURAN, TETRAHYDRO-(11.16)						
* FURAN, TETRAHYDRO-(11.18)						
* FURAN, TETRAHYDRO-(11.20)						
* FURAN, TETRAHYDRO-(11.30)						
* FURAN, TETRAHYDRO-(11.31)	5 J					
* FURAN, TETRHYDRO-(11.19)				6 J		
* FURAN,TETRAHYDRO-(11.17)					7 J	
* METHYL DIOXOLANE(13.94)						
* METHYLDIOXOLANE(13.93)	10 J					
* PYRIDINE(18.55)	20 J					
* TETRAHYDROFURAN						
* UNKNOWN						13 J
* UNKNOWN(4.14)						

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500342A	AR500353A	AR500364A	AR500375A	AR500397A	AR500411A
	SDG NO:	ON23	GN19	GN19	GN19	GN30	ON15
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(4.17)							
* UNKNOWN(4.72)							
* UNKNOWN(4.80)							
* UNKNOWN(4.81)							
* UNKNOWN(4.86)							
* UNKNOWN(4.87)							
* UNKNOWN(4.91)							
* UNKNOWN(4.95)							
* UNKNOWN(4.98)							
* UNKNOWN(5.05)		570 J					
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							
* UNKNOWN(9.99)							
* UNKNOWN(11.57)							
* UNKNOWN(12.20)							
* UNKNOWN(13.66)							
* UNKNOWN(13.69)							
* UNKNOWN(13.70)							
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							
* UNKNOWN(14.69)		76 J					
* UNKNOWN(14.70)							
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)		190 J					
* UNKNOWN(23.19)							
* UNKNOWN(24.67)							
* UNKNOWN(24.70)							
* UNKNOWN(24.71)							
* UNKNOWN(24.73)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500342A ON23 GRAB	AR500353A GN19 GRAB	AR500364A GN19 GRAB	AR500375A GN19 GRAB	AR500397A GN30 GRAB	AR500411A ON15 GRAB
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							
* UNKNOWN(31.46)		41 J					
* UNKNOWN(37.56)							
* UNKNOWN(55.48)							
* 2-PROPANOL							13 J
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)					50 J		
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)						10 J	
* 2-PROPANONE(8.23)					9 J		

VOLATILE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500433A ON14 GRAB	AR500444A GN19 GRAB	AR500455A ON23 GRAB	AR500466A ON23 GRAB	AR500477A ON30 GRAB	AR500488A ON30 GRAB
ACETONE		3 JB	360 BE	1900 BE	2700 BE	416 BE	389 BE
BENZENE		5 U	5 U	3 J	2 J	5 U	15
BROMODICHLOROMETHANE		5 U	5 U	13 U	13 U	5 U	5 U
CARBON DISULFIDE		5 U	5 U	4 J	13 U	5 U	5 U
CARBON TETRACHLORIDE		5 U	5 U	13 U	13 U	18	5 U
CHLOROFORM		5 U	5 U	120	140	145	14
DIBROMOCHLOROMETHANE		5 U	5 U	13 U	13 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	6 J	13 U	15	5 U
METHYLENE CHLORIDE		2 JB	450 BE	230 BE	370 BE	63	316 E
TETRACHLOROETHENE		5 U	5 U	1400 E	530 E	5 U	6
TOLUENE		10 B	110 U	48 B	24 B	5 U	5 U
TRICHLOROETHENE		200 E	5 U	68	66 U	12	5 U
VINYL ACETATE		10 U	10 U	15 J	25 U	5 U	5 U
XYLENE (TOTAL)		5 U	5 U	36	30	5 U	5 U
1,1-DICHLOROETHANE		5 U	5 U	13 U	13 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	13 U	13 U	136	5 U
1,1,2-TRICHLOROETHANE		5 U	5 U	13 U	13 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	13 U	13 U	5 U	5 U
1,2-DICHLOROETHANE		5 U	5 U	13 U	13 U	15	5 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L) SAMP NO: / SDG NO: / TYPE:	AR500433A ON14 GRAB	AR500444A GN19 GRAB	AR500455A ON23 GRAB	AR500466A ON23 GRAB	AR500477A ON30 GRAB	AR500488A ON30 GRAB
1,2-DICHLOROETHENE (TOTAL)	8	5 U	7 J	6 J	5 U	6 U
2-BUTANONE	10 U	10 U	120	71	10 U	10 U
4-METHYL-2-PENTANONE	10 U	10 U	110	100	178	10 U
* ACETIC ACID, METHYL ACI(9.68)						
* ACETIC ACID, METHYL EST(9.79)						
* ACETIC ACID,METHYL ESTE(9.80)				15 J		
* BUTANOL(15.55)						
* BUTANOL(15.69)			65 J			
* BUTANOL(15.70)				35 J		
* DIMETHYL HEXANE(25.16)				44 J		
* DIMETHYLHEXANE(24.67)						
* DIMETHYLHEXANE(25.15)			38 J			
* DIMETHYLHEXANE(25.17)						
* DIMETHYLHEXANE(25.25)						
* ETHANOL(5.38)						
* ETHANOL(5.52)						
* ETHANOL(5.57)			130 J			
* ETHANOL(5.67)				600 J		
* ETHANOL(5.80)						
* ETHYL ETHER						
* ETHYL ETHER(12.13)						
* ETHYL ETHER(12.15)						
* ETHYL ETHER(12.22)				61 J		
* FURAN, TETRAHYDO(11.20)						
* FURAN, TETRAHYDRO(11.03)						
* FURAN, TETRAHYDRO(11.16)						
* FURAN, TETRAHYDRO(11.29)						
* FURAN, TETRAHYDRO(11.30)						
* FURAN, TETRAHYDRO(11.31)					153 J	
* FURAN, TETRAHYDRO-(11.15)						
* FURAN, TETRAHYDRO-(11.16)						
* FURAN, TETRAHYDRO-(11.18)						
* FURAN, TETRAHYDRO-(11.20)						
* FURAN, TETRAHYDRO-(11.30)						
* FURAN, TETRAHYDRO-(11.31)						
* FURAN, TETRHYDRO-(11.19)						
* FURAN,TETRAHYDRO-(11.17)						
* METHYL DIOXOLANE(13.94)				22 J		
* METHYLDIOXOLANE(13.93)						
* PYRIDINE(18.55)						
* TETRAHYDROFURAN						
* UNKNOWN						

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR500433A ON14 GRAB	AR500444A GN19 GRAB	AR500455A ON23 GRAB	AR500466A ON23 GRAB	AR500477A ON30 GRAB	AR500488A ON30 GRAB
* UNKNOWN(4.14)							
* UNKNOWN(4.17)							
* UNKNOWN(4.72)							
* UNKNOWN(4.80)							
* UNKNOWN(4.81)							
* UNKNOWN(4.86)				160 J			
* UNKNOWN(4.87)							
* UNKNOWN(4.91)							
* UNKNOWN(4.95)							
* UNKNOWN(4.98)							
* UNKNOWN(5.05)					1900 J		
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)				72 J			
* UNKNOWN(9.99)					19 J		
* UNKNOWN(11.57)							
* UNKNOWN(12.20)							
* UNKNOWN(13.66)							
* UNKNOWN(13.69)							
* UNKNOWN(13.70)							
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							
* UNKNOWN(14.69)							
* UNKNOWN(14.70)					13 J		
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)					43 J		
* UNKNOWN(19.16)							
* UNKNOWN(23.19)						28 J	
* UNKNOWN(24.67)							
* UNKNOWN(24.70)							
* UNKNOWN(24.71)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500433A	AR500444A	AR500455A	AR500466A	AR500477A	AR500488A
	SDG NO:	ON14	GN19	ON23	ON23	ON30	ON30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(24.73)						81 J	
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							
* UNKNOWN(31.46)							
* UNKNOWN(37.56)						47 J	
* UNKNOWN(55.48)						27 J	
* 2-PROPANOL							
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							48 J
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)					18 J		
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500502A	AR500524A	AR500546A	AR500557A	AR500568A	AR500579A
	SDG NO:	OD01	GN20	GN20	ON30	ON30	ON30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		293 B	2200 BE	260 BE	320 BE	302 BE	2840 BE
BENZENE		5 U	5 U	5 U	5 U	5 U	5 U
BROMODICHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE		5 U	5 U	5 U	5 U	11	5 U
CHLOROFORM		5 U	640 E	5 U	5 U	122	51
DIBROMOCHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE		5 U	19	5 U	5 U	5 U	5 U
METHYLENE CHLORIDE		400	42 B	10 B	13	17	37
TETRACHLOROETHENE		5 U	5 U	5 U	5 U	28	44
TOLUENE		5 U	15	7	8	5 U	5 U
TRICHLOROETHENE		5 U	5 U	210 E	5 U	5 U	5 U
VINYL ACETATE		10 U	10 U	10 U	5 U	17	5 U
XYLENE (TOTAL)		5 U	260 E	8	5 U	5 U	14
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	21
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES — DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500502A	AR500524A	AR500546A	AR500557A	AR500568A	AR500579A
	SDG NO:	OD01	GN20	GN20	ON30	ON30	ON30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
1,2-DICHLOROETHANE		5 U	5 U	5 U	5 U	10 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 U	5 U	7	8	5 U	5 U
2-BUTANONE		10 U	10 U	10 U	12	14	69
4-METHYL-2-PENTANONE		11	10 U	10 U	10 U	11	332
* ACETIC ACID, METHYL ACI(9.68)							
* ACETIC ACID, METHYL EST(9.79)							
* ACETIC ACID,METHYL ESTE(9.80)							
* BUTANOL(15.55)							
* BUTANOL(15.69)							
* BUTANOL(15.70)							
* DIMETHYL HEXANE(25.16)							
* DIMETHYLHEXANE(24.67)							
* DIMETHYLHEXANE(25.15)							
* DIMETHYLHEXANE(25.17)							
* DIMETHYLHEXANE(25.25)							
* ETHANOL(5.38)							
* ETHANOL(5.52)							
* ETHANOL(5.57)							
* ETHANOL(5.67)							
* ETHANOL(5.80)							
* ETHYL ETHER							
* ETHYL ETHER(12.13)							
* ETHYL ETHER(12.15)							
* ETHYL ETHER(12.22)							
* FURAN, TETRAHYDO(11.20)							
* FURAN, TETRAHYDRO(11.03)							
* FURAN, TETRAHYDRO(11.16)							
* FURAN, TETRAHYDRO(11.29)							
* FURAN, TETRAHYDRO(11.30)							
* FURAN, TETRAHYDRO(11.31)							
* FURAN, TETRAHYDRO-(11.15)							
* FURAN, TETRAHYDRO-(11.16)		10 J					
* FURAN, TETRAHYDRO-(11.18)							
* FURAN, TETRAHYDRO-(11.20)							
* FURAN, TETRAHYDRO-(11.30)							
* FURAN, TETRAHYDRO-(11.31)							24 J
* FURAN, TETRHYDRO-(11.19)							
* FURAN,TETRAHYDRO-(11.17)							
* METHYL DIOXOLANE(13.94)							
* METHYLDIOXOLANE(13.93)							
* PYRIDINE(18.55)							
* TETRAHYDROFURAN							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500502A	AR500524A	AR500546A	AR500557A	AR500568A	AR500579A
	SDG NO:	OD01	GN20	GN20	ON30	ON30	ON30
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN							
* UNKNOWN(4.14)							
* UNKNOWN(4.17)							
* UNKNOWN(4.72)							
* UNKNOWN(4.80)							
* UNKNOWN(4.81)			32 J				
* UNKNOWN(4.86)						247 J	
* UNKNOWN(4.87)							
* UNKNOWN(4.91)							
* UNKNOWN(4.95)							1250 J
* UNKNOWN(4.98)							
* UNKNOWN(5.05)							
* UNKNOWN(5.44)							
* UNKNOWN(6.08)							1500 J
* UNKNOWN(7.84)						80 J	
* UNKNOWN(7.93)							1520 J
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							354 J
* UNKNOWN(9.99)							
* UNKNOWN(11.57)							
* UNKNOWN(12.20)							
* UNKNOWN(13.66)							
* UNKNOWN(13.69)							
* UNKNOWN(13.70)							
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							210 J
* UNKNOWN(14.69)							
* UNKNOWN(14.70)							
* UNKNOWN(15.65)							
* UNKNOWN(15.70)							
* UNKNOWN(15.74)							780 J
* UNKNOWN(18.53)							23 J
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)							190 J
* UNKNOWN(23.19)							
* UNKNOWN(24.67)							
* UNKNOWN(24.70)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500502A / OD01 / GRAB	AR500524A / GN20 / GRAB	AR500546A / GN20 / GRAB	AR500557A / ON30 / GRAB	AR500568A / ON30 / GRAB	AR500579A / ON30 / GRAB
* UNKNOWN(24.71)							
* UNKNOWN(24.73)							
* UNKNOWN(25.39)							29 J
* UNKNOWN(31.44)							
* UNKNOWN(31.46)							
* UNKNOWN(37.56)							
* UNKNOWN(55.48)							
* 2-PROPANOL							
* 2-PROPANOL(8.78)							
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)					20 J		
* 2-PROPANOL(8.97)							
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500580A / ON30 / GRAB	AR500591A / ON30 / GRAB	AR500604A / OD01 / GRAB	AR500626A / OD01 / GRAB	AR500648A / GN20 / GRAB	AR500660A / GN20 / GRAB
ACETONE		83 B	402 BE	4600 BE	297 B	1800 BE	41 B
BENZENE		5 U	5 U	16	7	5 U	5 U
BROMODICHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON DISULFIDE		5 U	5 U	5 U	5 U	5 U	5 U
CARBON TETRACHLORIDE		5 U	5 U.	5 U	5 U	5 U	5 U
CHLOROFORM		5 U	134	15	16	680 E	5 U
DIBROMOCHLOROMETHANE		5 U	5 U	5 U	5 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	5 U	5 U	27	5 U
METHYLENE CHLORIDE		16	50	330 BE	664 E	38 B	10 B
TETRACHLOROETHENE		5 U	5 U	8	5 U	5 U	5 U
TOLUENE		5 U	5 U	4 J	5 U	19	11
TRICHLOROETHENE		5 U	5 U	5 U	5 U	5 U	220 E
VINYL ACETATE		5 U	5 U	10 U	10 U	10 U	10 U
XYLENE (TOTAL)		5 U	5 U	5 U	5 U	270 E	8
1,1-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR500580A	AR500591A	AR500604A	AR500626A	AR500648A	AR500660A
	SDG NO:	ON30	ON30	GD01	OD01	GN20	GN20
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHANE		5 U	5 U	5 U	5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 U	5 U	5 U	5 U	5 U	8
2-BUTANONE		10 U	10 U	10 U	10 U	10 U	10 U
4-METHYL-2-PENTANONE		10 U	10 U	10 U	10	10 U	10 U
* ACETIC ACID, METHYL ACI(9.68)						6 J	
* ACETIC ACID, METHYL EST(9.79)							
* ACETIC ACID,METHYL ESTE(9.80)							
* BUTANOL(15.55)							
* BUTANOL(15.69)							
* BUTANOL(15.70)							
* DIMETHYL HEXANE(25.16)							
* DIMETHYLHEXANE(24.67)							
* DIMETHYLHEXANE(25.15)							
* DIMETHYLHEXANE(25.17)							
* DIMETHYLHEXANE(25.25)							
* ETHANOL(5.38)							
* ETHANOL(5.52)							
* ETHANOL(5.57)							
* ETHANOL(5.67)							
* ETHANOL(5.80)							
* ETHYL ETHER							
* ETHYL ETHER(12.13)							
* ETHYL ETHER(12.15)							
* ETHYL ETHER(12.22)							
* FURAN, TETRAHYDO(11.20)							
* FURAN, TETRAHYDRO(11.03)							
* FURAN, TETRAHYDRO(11.16)					11 J		
* FURAN, TETRAHYDRO(11.29)							
* FURAN, TETRAHYDRO(11.30)							
* FURAN, TETRAHYDRO(11.31)							
* FURAN, TETRAHYDRO-(11.15)							
* FURAN, TETRAHYDRO-(11.16)							
* FURAN, TETRAHYDRO-(11.18)							
* FURAN, TETRAHYDRO-(11.20)							
* FURAN, TETRAHYDRO-(11.30)			158 J				
* FURAN, TETRAHYDRO-(11.31)							
* FURAN, TETRHYDRO-(11.19)							
* FURAN,TETRAHYDRO-(11.17)							
* METHYL DIOXOLANE(13.94)							
* METHYLDIOXOLANE(13.93)							
* PYRIDINE(18.55)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500580A / ON30 / GRAB	AR500591A / ON30 / GRAB	AR500604A / GD01 / GRAB	AR500626A / OD01 / GRAB	AR500648A / GN20 / GRAB	AR500660A / GN20 / GRAB
* TETRAHYDROFURAN							
* UNKNOWN							
* UNKNOWN(4.14)							
* UNKNOWN(4.17)							
* UNKNOWN(4.72)							
* UNKNOWN(4.80)							
* UNKNOWN(4.81)						34 J	
* UNKNOWN(4.86)							
* UNKNOWN(4.87)							
* UNKNOWN(4.91)		139 J					
* UNKNOWN(4.95)							
* UNKNOWN(4.98)							
* UNKNOWN(5.05)							
* UNKNOWN(5.44)		81 J					
* UNKNOWN(6.08)							
* UNKNOWN(7.84)							
* UNKNOWN(7.93)							
* UNKNOWN(9.16)							
* UNKNOWN(9.58)							
* UNKNOWN(9.80)							
* UNKNOWN(9.84)							
* UNKNOWN(9.99)							
* UNKNOWN(11.57)							
* UNKNOWN(12.20)							
* UNKNOWN(13.66)							
* UNKNOWN(13.69)							
* UNKNOWN(13.70)							
* UNKNOWN(14.46)							
* UNKNOWN(14.50)							
* UNKNOWN(14.68)							
* UNKNOWN(14.69)							
* UNKNOWN(14.70)		13 J					
* UNKNOWN(15.65)							
* UNKNOWN(15.70)		48 J					
* UNKNOWN(15.74)							
* UNKNOWN(18.53)							
* UNKNOWN(19.01)							
* UNKNOWN(19.03)							
* UNKNOWN(19.13)							
* UNKNOWN(19.16)							
* UNKNOWN(23.19)							
* UNKNOWN(24.67)							

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500580A ON30 GRAB	AR500591A ON30 GRAB	AR500604A GD01 GRAB	AR500626A OD01 GRAB	AR500648A GN20 GRAB	AR500660A GN20 GRAB
* UNKNOWN(24.70)							
* UNKNOWN(24.71)							
* UNKNOWN(24.73)							
* UNKNOWN(25.39)							
* UNKNOWN(31.44)							
* UNKNOWN(31.46)							
* UNKNOWN(37.56)							
* UNKNOWN(55.48)							
* 2-PROPANOL							
* 2-PROPANOL(8.78)				31 J			
* 2-PROPANOL(8.79)							
* 2-PROPANOL(8.82)							
* 2-PROPANOL(8.91)							
* 2-PROPANOL(8.92)							
* 2-PROPANOL(8.94)							
* 2-PROPANOL(8.97)							
* 2-PROPANOL(8.98)							
* 2-PROPANOL(8.99)							
* 2-PROPANOL(9.06)							
* 2-PROPANONE(8.23)							

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500671A GD01 GRAB	AR500682A GD01 GRAB	AR500693A OD01 GRAB
ACETONE		3000 BE	730 BE	1420 B
BENZENE		5 U	5 U	5 U
BROMODICHLOROMETHANE		5 U	5 U	5 U
CARBON DISULFIDE		5 U	4 J	5 U
CARBON TETRACHLORIDE		5 U	5 U	5 U
CHLOROFORM		9 U	100	89
DIBROMOCHLOROMETHANE		5 U	5 U	5 U
ETHYLBENZENE		5 U	5 U	5 U
METHYLENE CHLORIDE		19 B	83 B	71
TETRACHLOROETHENE		5 U	620 E	611 E
TOLUENE		10	20	16
TRICHLOROETHENE		5 U	27	26 U
VINYL ACETATE		10 U	10 U	10 U
XYLENE (TOTAL)		5 U	5 U	12
1,1-DICHLOROETHANE		5 U	5 U	5 U
1,1,1-TRICHLOROETHANE		5 U	4 J	5 U

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

DRAFT DO NOT CITE

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500671A / GD01 / GRAB	AR500682A / GD01 / GRAB	AR500693A / OD01 / GRAB
1,1,2-TRICHLOROETHANE		5 U	5 U	5 U
1,1,2,2-TETRACHLOROETHANE		5 U	5 U	9
1,2-DICHLOROETHANE		5 U	5 U	5 U
1,2-DICHLOROETHENE (TOTAL)		5 U	4 J	5 U
2-BUTANONE		10 U	10 U	53
4-METHYL-2-PENTANONE		10 U	36	54
* ACETIC ACID, METHYL ACI(9.68)				
* ACETIC ACID, METHYL EST(9.79)				
* ACETIC ACID,METHYL ESTE(9.80)				
* BUTANOL(15.55)				
* BUTANOL(15.69)				
* BUTANOL(15.70)				
* DIMETHYL HEXANE(25.16)				
* DIMETHYLHEXANE(24.67)				
* DIMETHYLHEXANE(25.15)				
* DIMETHYLHEXANE(25.17)				
* DIMETHYLHEXANE(25.25)				
* ETHANOL(5.38)				
* ETHANOL(5.52)				
* ETHANOL(5.57)				
* ETHANOL(5.67)				
* ETHANOL(5.80)				
* ETHYL ETHER				
* ETHYL ETHER(12.13)				
* ETHYL ETHER(12.15)				
* ETHYL ETHER(12.22)				
* FURAN, TETRAHYDO(11.20)				
* FURAN, TETRAHYDRO(11.03)		4 J		
* FURAN, TETRAHYDRO(11.16)				
* FURAN, TETRAHYDRO(11.29)				
* FURAN, TETRAHYDRO(11.30)				
* FURAN, TETRAHYDRO(11.31)				
* FURAN, TETRAHYDRO-(11.15)				
* FURAN, TETRAHYDRO-(11.16)				
* FURAN, TETRAHYDRO-(11.18)				
* FURAN, TETRAHYDRO-(11.20)				
* FURAN, TETRAHYDRO-(11.30)				
* FURAN, TETRAHYDRO-(11.31)				
* FURAN, TETRHYDRO-(11.19)				
* FURAN,TETRAHYDRO-(11.17)				
* METHYL DIOXOLANE(13.94)				
* METHYLDIOXOLANE(13.93)				

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: AR500671A SDG NO: GD01 TYPE: GRAB	AR500682A GD01 GRAB	AR500693A OD01 GRAB			
* PYRIDINE(18.55)						
* TETRAHYDROFURAN						
* UNKNOWN						
* UNKNOWN(4.14)						
* UNKNOWN(4.17)						
* UNKNOWN(4.72)						
* UNKNOWN(4.80)		230 JE				
* UNKNOWN(4.81)			590 J			
* UNKNOWN(4.86)						
* UNKNOWN(4.87)						
* UNKNOWN(4.91)						
* UNKNOWN(4.95)						
* UNKNOWN(4.98)						
* UNKNOWN(5.05)						
* UNKNOWN(5.44)						
* UNKNOWN(6.08)						
* UNKNOWN(7.84)						
* UNKNOWN(7.93)						
* UNKNOWN(9.16)						
* UNKNOWN(9.58)						
* UNKNOWN(9.80)						
* UNKNOWN(9.84)						
* UNKNOWN(9.99)						
* UNKNOWN(11.57)						
* UNKNOWN(12.20)						
* UNKNOWN(13.66)						
* UNKNOWN(13.69)						
* UNKNOWN(13.70)						
* UNKNOWN(14.46)						
* UNKNOWN(14.50)			8 J			
* UNKNOWN(14.68)						
* UNKNOWN(14.69)						
* UNKNOWN(14.70)						
* UNKNOWN(15.65)						
* UNKNOWN(15.70)						
* UNKNOWN(15.74)						
* UNKNOWN(18.53)						
* UNKNOWN(19.01)						
* UNKNOWN(19.03)			8 J			
* UNKNOWN(19.13)						
* UNKNOWN(19.16)						
* UNKNOWN(23.19)						

TABLE 4.3.10 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 10 DRAFT DO NOT CITE
LABORATORY SEWER WASTEWATER TREATMENT FACILITIES

S&A REQUEST: 500
LOCATION: LABORATORY SEWER WASTEWATER TREATMENT FACILITIES
MEDIUM: SEALED CONTAINER

VOLATILE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR500671A / GD01 / GRAB	AR500682A / GD01 / GRAB	AR500693A / OD01 / GRAB
* UNKNOWN(24.67)				
* UNKNOWN(24.70)				
* UNKNOWN(24.71)				
* UNKNOWN(24.73)				
* UNKNOWN(25.39)				
* UNKNOWN(31.44)				
* UNKNOWN(31.46)				
* UNKNOWN(37.56)				
* UNKNOWN(55.48)				
* 2-PROPANOL				
* 2-PROPANOL(8.78)				
* 2-PROPANOL(8.79)		14 J		
* 2-PROPANOL(8.82)				
* 2-PROPANOL(8.91)				
* 2-PROPANOL(8.92)				
* 2-PROPANOL(8.94)				
* 2-PROPANOL(8.97)				
* 2-PROPANOL(8.98)				
* 2-PROPANOL(8.99)				
* 2-PROPANOL(9.06)				
* 2-PROPANONE(8.23)				

4.16 Environmental Problem 11: Building 575 Sewer Sludge Drying Beds

Request Number: 501.

Requester: D. Worley.

Finding and Basis: Low-level radioactive waste at the sewer sludge drying beds (Facility 575) may be contaminated with hazardous wastes. The individual research laboratories and their supporting shops may be using the laboratory sewer for the disposal of hazardous chemical wastes (see Environmental Problem 10). Because primary settling and chlorination is the extent of treatment for the laboratory sewer, soluble wastes may be discharged to Sawmill Creek. Those contaminants which are less soluble are collected in the bottom of three 70,000-gal. retention basins. The accumulated solids or sludge are periodically removed from the basins and collected in the drying beds.

4.16.1 Sampling and Analysis Objectives

Statement: Samples of sludge were collected from the Facility 575 drying beds to determine if hazardous wastes and radionuclides listed in Sect. 4.16.2.2 were present at minimum detection levels, making the sludge a mixed waste.

Supporting Information: It is probable that the sludge in the drying beds is a mixed waste because both low-level radioactive and hazardous chemical wastes were discharged to the laboratory sewer wastewater system. No monitoring of the potentially hazardous contaminants is done prior to discharging the contents of the retention tanks to the sewer system. Even though wastes are to be segregated and managed at a facility dedicated to that purpose (Building 306), the wastes are not adequately identified to promote segregation.

4.16.2 Sampling and Analytical Design

4.16.2.1 Sampling Design

Request 501: Sewer Sludge Drying Beds - Sludge (Fig. 4.11). Three random grab samples were to be collected from each drying bed. Each 20 x 30 ft bed was divided into a 6 x 10-segment grid and 3 segments were selected at random. The samples were collected to the depth of the sludge at the center of the segment (Sampling Method: Reference E5.3.1).

The Sampling Team arrived at the sampling site 11NOV87 at 1315. The temperature was 40^{o}F under clear skies and winds were 0-5 mph. The distribution of constituents in the drying beds was considered homogeneous. Two to 5 in. of sludge had accumulated in each of the drying beds since they were cleaned in 1986 (as indicated by the operator). Both beds had dead weeds inside. The media was dark, rich, and humus-like. It was moist without being muddy and had a manure-like odor. Samples AR501070 (QC rinsate), -014 (grid 11), -025 (grid 19), and -036 (grid 39) were collected from Bed 1 between 1313 and 1330. Samples AR501047 (grid 14), -058 (grid 40), and -069 (grid 51) were collected from Bed 2 between 1330 and 1340.

4.16.2.2 Analytical Design

Request 501: Parameters analyzed for Request 501 included volatiles, semivolatiles, PCBs, ICP-metals, AA-mercury, TCLP-metals, TCLP-pesticides, TCLP-semivolatiles, cyanide, gross alpha, gross beta, and gamma scan. For TCLP procedures, the normal analysis should be run; if any parameters exceeded the RCRA TCLP levels, the TCLP analysis should be run.

4.16.3 Field and Analytical Data

Field Data: *No specific field measurements were requested for this problem.*

Field Data Evaluation: Not applicable.

Analytical Data:

<u>Anions and cyanide</u>. Because the cyanide concentration for the sludge in Request 501 was below 250 mg/kg, it is not reported in Table 4.3.11.

<u>Metals</u>. Analytical results for metals in sediment are presented in Table 4.3.11. Of the 22 metals detected, arsenic and selenium were below either the CRDL or the IDL in all six samples. Of the remaining metals detected, antimony ranged from 12 to 27 mg/kg, barium from 222 to 574 mg/kg, beryllium from 2 to 9.8 mg/kg, cadmium from 23 to 69 mg/kg, chromium from 609 to 1560 mg/kg, cobalt from 11 to 17 mg/kg, copper from 1440 to 6090 mg/kg, lead from 404 to 1120 mg/kg, mercury from 159 to 307 mg/kg, nickel from 97 to 201 mg/kg, silver from 163 to 276 mg/kg, and zinc from 2920 to 6310 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, sodium, and vanadium.

TCLP-metals analyses were to be performed if concentrations were 20 times the RCRA EPA toxicity limits. The following metals exceeded the required concentrations: cadmium, chromium, lead, mercury, and silver. TCLP analyses were not performed.

<u>PCBs and other extractables</u>. Aroclors 1248, 1254, and 1260 were indicated in all six samples, but concentrations were estimated because they were all below the quantitation limit. Estimates were as high as 390 mg/kg.

<u>Extractable organics</u>. No target compounds were detected in these samples. Estimated concentrations of unknown compounds ranging from 12 to 30 ppm occurred in six samples. Several other unknowns in several of the other samples had estimated concentrations ranging from 1 to 10 ppm.

<u>Volatile organics</u>. There were six compounds detected in three of the samples, seven in another, and eight in the remaining sample. Acetone and methylene chloride were

detected in all samples. Sample AR501014 also contained xylene and carbon disulfide. The only volatile organic compound that was determined to be present with a measured concentration in excess of 0.12 mg/kg was xylene (total) at 0.059 mg/kg. Methylene chloride was present in all samples in estimated concentrations exceeding 4 mg/kg, but the values given for methylene chloride all exceeded the calibration range of the instrument. Methylene chloride was also detected in the blank.

Radiochemistry. Contamination was present in samples from both sludge drying beds. In Bed 1, gross alpha and gross beta activity averaged 56,000 and 80,333 pCi/kg, respectively. Other average radionuclide quantities were cobalt-60, 5,933 pCi/kg; cesium-134, 278 pCi/kg; cesium-137, 23,666 pCi/kg; europium-152, 1,143 pCi/kg; europium-155, 1,333 pCi/kg; potassium-40, 4,773 pCi/kg, and antimony-125, 540 pCi/kg.

Average gross alpha and gross beta activities for samples from Bed 2 were 143,333 and 95,333 pCi/kg, respectively. Other average activities in pCi/kg were cobalt-60, 10,200; cesium-134, 290; cesium-137, 35,333; europium-152, 2,333; europium-155, 2,733; potassium-40, 8,300; and antimony-125, 3,000.

Rinsate sample AR501070 contained 6.9 pCi/L of cobalt-60.

Analytical Data Evaluation:

Anions and cyanide. The calibrated instrument verification and the calibration blanks were in compliance; these and other quality control measures taken (see Environmental Problem 2) make the results reliable.

Metals. The following metals of interest were detected above the CRDL samples for Request 501: antimony, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc.

PCBs and other extractables. No aroclors were present in sufficient quantities to be confirmed by GC/MS.

Extractable organics. No target compounds were detected in these samples. Estimated concentrations of unknown compounds were from 12 to 30 ppm in some cases. All concentrations were below quantitation limits.

Volatile organics. Acetone and methylene chloride were detected in all samples. Sample AR501014 also contained xylene and carbon disulfide. The only volatile organic compound that was determined to be present with a measured concentration in excess of 0.12 mg/kg was xylene at 0.059 mg/kg. Methylene chloride was present in all samples and in the blank. Estimated concentrations of methylene chloride exceeded the calibration range of the instrument.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.16.4 Limitations and Qualifications

Data Quality Level: Both the sampling design and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data:

Analytical Data:

Anions and cyanide. The data quality level for cyanide in this request is Quality Level I.

Metals. Analytical results were Quality Level I except for the following metals at Level II: aluminum, antimony, arsenic, calcium, manganese, selenium, silver, and sodium. TCLP analyses were not performed.

PCBs and other extractables. All results are Quality Level III because: (1) the surrogate standard was not observed within the specified retention time window, or (2) the quantitation was derived from data generated on a capilliary column. Although quantitation is expected to be less reliable on a capilliary column, identification of multicomponent species, such as the PCBs, may be enhanced.

Extractable organics. Data were of Quality Level II for identified TICs and Quality Level III for unknown TICs.

Volatile organics. Most of the data in this set were Quality Level III because they were obtained when the appropriate internal standard did not meet criteria. However, the high values for methylene chloride must still be considered real. Toluene in AR501070 was Quality Level II. Ethyl benzene was found in the method blank at levels below the quantitation limits.

Radiochemistry. The data quality level for radiochemistry is I.

Environmental Problem: 11
Request Number: 501

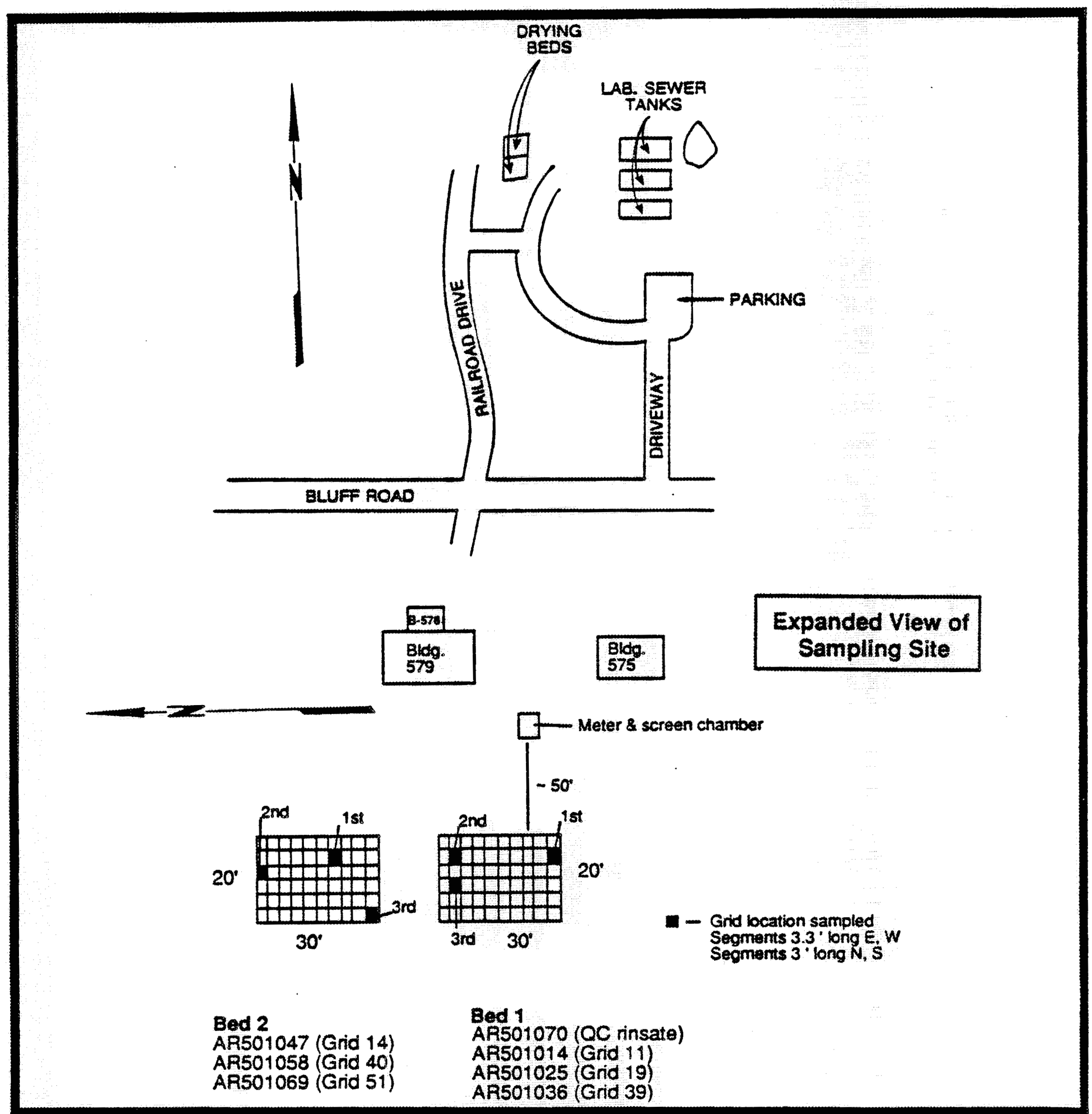

Figure 4.11. Sewer Sludge Drying Beds (Request 501)

TABLE 4.2.11 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 11

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR501	DRYING BED	SLUDGE	SEDIMENT	6	6	GRAB	0	6	6	6	0	0	0	0	0	0	6	6	6	6	5	5	6	6
			MED TOTAL	6	6		0	6	6	6	0	0	0	0	0	0	6	6	6	6	5	5	6	6
AR501	DRYING BED	SLUDGE	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
			MED TOTAL	1	1		0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
			EP TOTAL	7	7		0	7	7	7	0	0	0	0	0	0	6	6	7	7	6	6	7	7

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 DRAFT DO NOT CITE
BUILDING 575 SEWER SLUDGE DRYING BEDS

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501014E AR406030M GRAB	AR501014E AR501014K GRAB	AR501014F AR501014F GRAB	AR501025E AR406030M GRAB	AR501025E AR501014K GRAB	AR501025F AR501014F GRAB
ALUMINUM		10700			9220		
ANTIMONY		12 N			12 UN		
ARSENIC		12 UN			14 UN		
BARIUM		222 E			319 E		
BERYLLIUM		2			9.8		
CADMIUM		23			40		
CALCIUM		125000			92300		
CHROMIUM		609			765		
COBALT		8.6 B			12		
COPPER		1740			1440		
IRON		39700 E			37200 E		
LEAD		404			664		
MAGNESIUM		49900			14100		
MANGANESE		743 N*			426 N*		
MERCURY				159			214
NICKEL		97			125		
POTASSIUM			1300			1000 B	
SELENIUM		12 UN			14 UN		
SILVER		192 N			216 N		
SODIUM		827 B			1250		
VANADIUM		21			29		
ZINC		4220			3640		

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501036E AR406030M GRAB	AR501036E AR501014K GRAB	AR501036F AR501014F GRAB	AR501047E AR406030M GRAB	AR501047E AR501014K GRAB	AR501047F AR501014F GRAB
ALUMINUM		9350			14700		
ANTIMONY		16 N			27 N		
ARSENIC		11 UN			25 BN		
BARIUM		267 E			475 E		
BERYLLIUM		3.1			3.6		
CADMIUM		37			69		
CALCIUM		85700			78300		
CHROMIUM		827			1390		
COBALT		11			17		
COPPER		2190			3940		
IRON		32500 E			54300 E		
LEAD		490			935		
MAGNESIUM		36100			20800		
MANGANESE		246 N*			299 N*		

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 DRAFT DO NOT CITE
BUILDING 575 SEWER SLUDGE DRYING BEDS

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501036E AR406030M GRAB	AR501036E AR501014K GRAB	AR501036F AR501014F GRAB	AR501047E AR406030M GRAB	AR501047E AR501014K GRAB	AR501047F AR501014F GRAB
MERCURY				182			258
NICKEL		105			183		
POTASSIUM			970			1200 B	
SELENIUM		11 UN			26 BN		
SILVER		163 N			275 N		
SODIUM		558 B			681 B		
VANADIUM		24			42		
ZINC		2920			5370		

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501058E AR406030M GRAB	AR501058E AR501014K GRAB	AR501058F AR501014F GRAB	AR501069E AR406030M GRAB	AR501069E AR501014K GRAB	AR501069F AR501014F GRAB
ALUMINUM		16700			17200		
ANTIMONY		16 BN			14 UN		
ARSENIC		17 UN			17 UN		
BARIUM		567 E			574 E		
BERYLLIUM		4.2			3.8		
CADMIUM		64			67		
CALCIUM		55700			61500		
CHROMIUM		1470			1560		
COBALT		11 B			17		
COPPER		6090			5540		
IRON		58800 E			59700 E		
LEAD		1120			1100		
MAGNESIUM		20700			10000		
MANGANESE		245 N*			283 N*		
MERCURY				318			307
NICKEL		179			201		
POTASSIUM			1400 B			1400 B	
SELENIUM		18 BN			29 BN		
SILVER		274 N			276 N		
SODIUM		405 B			534 B		
VANADIUM		45			45		
ZINC		6310			7460		

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 DRAFT DO NOT CITE
BUILDING 575 SEWER SLUDGE DRYING BEDS

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SEDIMENT

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501014B ARG06 GRAB	AR501025B ARG06 GRAB	AR501036B ARG06 GRAB	AR501047B ARG06 GRAB	AR501058B ARG06 GRAB	AR501069B ARG06 GRAB
AROCLOR-1248		200000 JD	320000 JD	390000 JD	260000 JD	430000 JD	480000 JD
AROCLOR-1254		91000 JD	130000 JD	180000 JD	130000 JD	120000 JD	140000 JD
AROCLOR-1260		23000 JD	30000 JD	36000 JD	32000 JD	35000 JD	37000 JD

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR501014B CD25 GRAB	AR501025B CD26 GRAB	AR501036B CD26 GRAB	AR501047B CD26 GRAB	AR501058B CD26 GRAB	AR501069B CD26 GRAB
* BIPHENYL, PENTACHLORO-(29.62)				1000 J			
* PHTHALIC ANHYDRIDE(18.17)			3100 J				
* UNKNOWN HYDROCARBON(26.02)			1300 J				
* UNKNOWN PHTHALATE(34.78)			2000 J				
* UNKNOWN(7.58)			510 J				
* UNKNOWN(7.79)				520 J			
* UNKNOWN(8.02)				570 J			
* UNKNOWN(13.84)		160 J					260 J
* UNKNOWN(15.82)		210 J					340 J
* UNKNOWN(16.70)				360 J			
* UNKNOWN(18.35)		260 J		440 J		570 J	410 J
* UNKNOWN(19.20)							260 J
* UNKNOWN(21.20)			800 J			1700 J	
* UNKNOWN(21.38)				340 J			
* UNKNOWN(22.69)				700 J			
* UNKNOWN(23.84)		360 J					580 J
* UNKNOWN(24.55)		640 J		650 J		610 J	1000 J
* UNKNOWN(25.05)						610 J	
* UNKNOWN(25.07)		400 J		3300 J			650 J
* UNKNOWN(25.08)			1300 J				
* UNKNOWN(26.02)				630 J		770 J	
* UNKNOWN(26.03)		690 J					1100 J
* UNKNOWN(26.99)						560 J	
* UNKNOWN(27.23)		1300 J		7100 J	2500 J		2100 J
* UNKNOWN(27.24)			4000 J			2100 J	
* UNKNOWN(27.62)						570 J	
* UNKNOWN(27.97)				640 J			
* UNKNOWN(27.98)		370 J					600 J
* UNKNOWN(28.57)						730 J	
* UNKNOWN(29.20)		710 J			2600 J		1100 J
* UNKNOWN(29.21)			4600 J	6300 J		1300 J	
* UNKNOWN(30.20)				4800 J			
* UNKNOWN(30.21)			2200 J				

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 DRAFT DO NOT CITE
BUILDING 575 SEWER SLUDGE DRYING BEDS

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR501014B	AR501025B	AR501036B	AR501047B	AR501058B	AR501069B
	SDG NO:	CD25	CD26	CD26	CD26	CD26	CD26
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(31.01)				21000 J		4500 J	
* UNKNOWN(31.02)			5800 J		3400 J		
* UNKNOWN(31.12)				3800 J			
* UNKNOWN(31.53)						3500 J	
* UNKNOWN(31.61)		1500 J					2400 J
* UNKNOWN(31.72)		1700 J					2800 J
* UNKNOWN(32.68)				9800 J			
* UNKNOWN(32.70)			2100 J				
* UNKNOWN(33.62)		1500 J					2300 J
* UNKNOWN(34.20)		2600 J					4200 J
* UNKNOWN(35.80)						2800 J	
* UNKNOWN(37.90)		14000 J		30000 J		29000 J	23000 J
* UNKNOWN(37.91)			12000 J		18000 J		
* UNKNOWN(38.76)						4900 J	
* UNKNOWN(39.48)						5600 J	
* UNKNOWN(42.00)						5300 J	
* UNKNOWN(43.14)					2800 J		
* UNKNOWN(45.14)						4800 J	
* UNKNOWN(48.18)						5100 J	
* UNKNOWN(48.30)		2200 J					3600 J
* UNKNOWN(49.52)		2200 J					3500 J

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR501014A	AR501014A	AR501025A	AR501036A	AR501047A	AR501069A
	SDG NO:	GN20	GN22	GN22	GN22	GN22	GN22
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		17 B	95 B	62 B	140 B	46 B	52 B
CARBON DISULFIDE		9	9 U	11 U	10 U	11 U	12 U
CHLOROFORM		7 U	9 U	10 J	10 U	11 U	12 U
METHYLENE CHLORIDE		4100 BE	5300 BE	5800 BE	5900 BE	5800 BE	7300 BE
XYLENE (TOTAL)		59	95	11 U	10 U	11 U	12 U

RADIOCHEMISTRY (PCI/KGD)	SAMP NO:	AR501014G	AR501025G	AR501036G	AR501047G	AR501058G	AR501069G
	SDG NO:	LLL7671	LLL7671	LLL7671	LLL7671	LLL7671	LLL7671
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
CO-60		6900	5400	5500	8600	12000	10000
CS-134		73		760	410	350	200
CS-137		11000	26000	34000	41000	35000	30000
EU-152		730	1100	1600	1900	2500	2600

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 BUILDING 575 SEWER SLUDGE DRYING BEDS

DRAFT DO NOT CITE

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SEDIMENT

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE:	AR501014G / LLL7671 / GRAB	AR501025G / LLL7671 / GRAB	AR501036G / LLL7671 / GRAB	AR501047G / LLL7671 / GRAB	AR501058G / LLL7671 / GRAB	AR501069G / LLL7671 / GRAB
EU-155		1400	2600		4700	4800	
GROSS ALPHA		58000		110000	99000	170000	150000
GROSS BETA		75000	80000	86000	84000	110000	92000
K-40		3900	4900	5400	12000	6400	6500
SB-125		840	780		1600	2400	5200

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR501070F / AR401024A / RINSATE	AR501070G / AR300044B / RINSATE
BARIUM			2.1 B
IRON			32 B
MAGNESIUM			30 B
MERCURY		0.03 B	
NICKEL			7.3 B

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR501070E / DD26 / RINSATE
BIS(2-ETHYLHEXYL)PHTHALATE		1 JB
DI-N-BUTYLPHTHALATE		0.6 J
DIETHYLPHTHALATE		14 B
* CYCLOHEXYL BENZENE(18.89)		75 J
* UNKNOWN HYDROCARBON(8.14)		11 JB
* UNKNOWN PHTHALATE(35.09)		8 J
* UNKNOWN(8.95)		180 J
* UNKNOWN(9.13)		12 J
* UNKNOWN(17.14)		5 J
* UNKNOWN(17.20)		3 J
* UNKNOWN(19.49)		6 J
* UNKNOWN(19.85)		8 J
* UNKNOWN(19.97)		5 J

TABLE 4.3.11 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 11 BUILDING 575 SEWER SLUDGE DRYING BEDS

DRAFT DO NOT CITE

S&A REQUEST: 501
LOCATION: SEWER SLUDGE DRYING BEDS
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR501070E SDG NO: DD26 TYPE: RINSATE
* UNKNOWN(22.37)	5 J
* UNKNOWN(25.06)	3 J
* UNKNOWN(27.86)	4 J
* UNKNOWN(27.94)	12 J

VOLATILE ORGANICS (UG/L)	SAMP NO: AR501070A SDG NO: 0N19 TYPE: RINSATE
ACETONE	12 B
ETHYLBENZENE	3 JB
METHYLENE CHLORIDE	4 JB
TOLUENE	6 B

RADIOCHEMISTRY (PCI/L)	SAMP NO: AR501070I SDG NO: LLL7670 TYPE: RINSATE
CO-60	6.9
GROSS ALPHA	0
GROSS BETA	0

4.17 Environmental Problem 12: Sludge and Water Discharges From Building 145

Request Numbers: 502 and 503.

Requester: D. Worley.

Finding and Basis: Sludge generated at Building 145 from scrubbing flue gas from coal combustion may be hazardous and may be disposed of in the 800 Area landfill, which may contaminate the groundwater. Coal combustion flue-gas scrubber water is being drawn from a lined impoundment adjacent to Building 145 to scrub contaminants from the flue gas (Building 145) and is recycled back into the impoundment. Although the impoundment is lined to prevent undesired discharges, the soils around the pond are saturated due to leakage from the impoundment. It is expected that the scrubber water is highly contaminated with heavy metals due to the removal of particulates from the flue gas. The same water, with whatever makeup water is necessary to replace the leakage, has been in use for at least the last 5 years. The sludge in the impoundment has never been removed and probably is the major source of contamination for the impoundment water.

4.17.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if potentially hazardous constituents listed in Sect. 4.17.2.2 are present at minimum detection levels in the sludge and water column of the flue-gas scrubber water impoundment adjacent to Building 145.

Supporting Information: Because the water was used to scrub coal combustion flue gas, heavy metal contamination was very likely. Also, sulfate contamination should have been high from the coal combustion. pH adjustment was often necessary to control the acidity before the water was used for scrubbing. This further supports the position that the water was contaminated. The impoundment had never been cleaned, and discharge of its contents was not intended. However, leakage from the pond seemed to be substantial. Because there was no plan to clean the impoundment, no analytical information existed for its contents.

4.17.2 Sampling and Analytical Design

4.17.2.1 Sampling Design

Request 502: Impoundment Adjacent to Building 145 - Sludge (Fig. 4.12a). Three samples of sludge were to be collected at random from the 30 x 30 ft flue gas scrubber impoundment (Sampling Method: References E.5.3.1 or E.5.3.2).

The Sampling Team arrived at the site east of Building 145 on 06NOV87. The temperature was 42^{o}F and winds were calm. The sampling media was composed of a silty base approximately 1-in. thick. The distribution of contaminants in the sludge was thought to be homogeneous. The silt for samples AR502015, -026, and -037 was dark gray to black and had a relatively low viscosity. The area surrounding the pond was marshy for a distance of approximately 10 ft. Sample AR502015 (grid 16) was collected with a stainless steel tube/scoop to the depth of the sludge/sediment at 1354; AR502026 (grid 40) at 1403; and AR502037 (grid 45) at 1407.

Request 503: Impoundment Adjacent to Building 145 - Water (Figs. 4.12b). Three grab water samples were to be collected (Sampling Method: Reference E.4.2.4) at the same time and location as the sludge samples identified in Request 502.

The distribution of contaminants was considered homogeneous. The pond was approximately 4-ft deep and filled to within 10 in. of the top with clear water. No oil film was visible. The pond was divided into a 6 x 10-segment grid and 3 segments selected at random as described in Request 502. All samples were clear. A 10 ft perimeter around the pond was saturated and relatively void of vegetation. QC rinsate sample AR503049 was collected at 1333; AR503016 at 1339 from grid 16; AR503027 at 1342 from grid 40; and AR503038 at 1345 from grid 45.

4.17.2.2 Analytical Design

Request 502: The field parameter measured for Request 502 was pH. Parameters analyzed included TCLP-metals, ICP-metals, and sulfate. (For TCLP procedures, the normal analysis was to be run. If any parameters exceeded RCRA TCLP levels, the TCLP analysis should have been run.)

Request 503: Field parameters measured for Request 503 included pH and specific conductivity. Parameters analyzed included PCBs, ICP-metals, and sulfate.

4.17.3 Field and Analytical Data

Field Data:

Request 502: *The pH readings of the sludge are shown in Table 4.3.12. The sediment samples ranged from a pH of 7.6 to 8.2.*

Request 503: *The pH readings of the water samples are shown in Table 4.3.12. The water samples were also measured for specific conductivity and temperature (which was not requested in the ANL Sampling and Analysis Plan). The water samples all showed a pH of 10. The specific conductivity readings were all 8 mS/cm.*

Field Data Evaluation:

Request 502: Because the instrument was calibrated prior to taking the readings, the data are reliable.

Request 503: Because the instrument was calibrated prior to taking the readings, the data are reliable.

Analytical Data:

Request 502:

<u>Anions and cyanide</u>. The sulfate concentrations from the impoundment are given in Table 4.3.12. In the sludge (Request 502) the concentrations ranged from 50,000 to 70,000 mg/kg.

<u>Metals</u>. Analytical results for metals in sediment are presented in Table 4.3.12. Of the 18 metals detected, silver and sodium were below either the CRDL or the IDL in all three samples. Two metals were above the CRDL in one sample: cobalt at 73 mg/kg and lead at 229 mg/kg. Of the remaining metals detected, barium ranged from 2230 to 2290 mg/kg, beryllium from 5.6 to 7 mg/kg, cadmium from 13 to 64 mg/kg, chromium from 687 to 718 mg/kg, copper from 1220 to 1460 mg/kg, nickel from 163 to 273 mg/kg, and zinc from 1780 to 3220 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

For Request 502, TCLP-metals analyses were to be performed if concentrations were twenty times the RCRA EPA toxicity limits. Although barium, cadmium, chromium, and lead exceeded the required concentrations, no TCLP analyses were run.

<u>PCBs and other extractables</u>. No pesticides or PCBs were detected.

Request 503:

<u>Anions and cyanide</u>. The sulfate concentrations from the impoundment are given in Table 4.3.12. In the water phase, the concentrations ranged from 5000 to 5300 mg/L.

<u>Metals</u>. Analytical results for metals in surface water are presented in Table 4.3.12. Of the 15 metals detected, the following 9 were below either the CRDL or the IDL in all three samples: barium, beryllium, cadmium, copper, magnesium, manganese, nickel, silver,

and vanadium. Of the remaining metals detected, zinc ranged between 28 and 44 µg/L. Other metals detected were aluminum, calcium, iron, potassium, and sodium.

PCBs and other extractables. No pesticides or PCBs were detected.

Analytical Data Evaluation:

Request 502:

Anions and cyanide. The instrument was calibrated and the calibration verified with quality control solutions. Duplicates were in conformance and all spikes were in compliance. The minimum detection limit was less than 5 mg/L.

Metals. Seven metals of interest--barium, beryllium, cadmium, chromium, copper, nickel, and zinc--were detected above the CRDL in the samples for Request 502.

Request 503:

Anions and cyanide. The instrument was calibrated and the calibration verified with quality control solutions. Duplicates were in conformance and all spikes were in compliance. The minimum detection limit was less than 5 mg/L.

Metals. One metal of interest, zinc, was detected above the CRDL in the samples for Request 503.

4.17.4 Limitations and Qualifications

Data Quality Level:

Request 502: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level I.

Request 503: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level I.

Field Data: There were no apparent limitations or qualifications for field data.

Analytical Data:

Request 502:

Anions and cyanide. The data quality level for sulfate is Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. No pesticides or PCBs were detected and no quality judgments were made.

Request 503:

Anions and cyanide. The data quality level for sulfate is Quality Level I.

Metals. Analytical results were Quality Level I except for iron, sodium, and zinc at Quality Level II.

PCBs and other extractables. No pesticides or PCBs were detected and no quality judgments were made.

Environmental Problem: 12
Request Number: 502

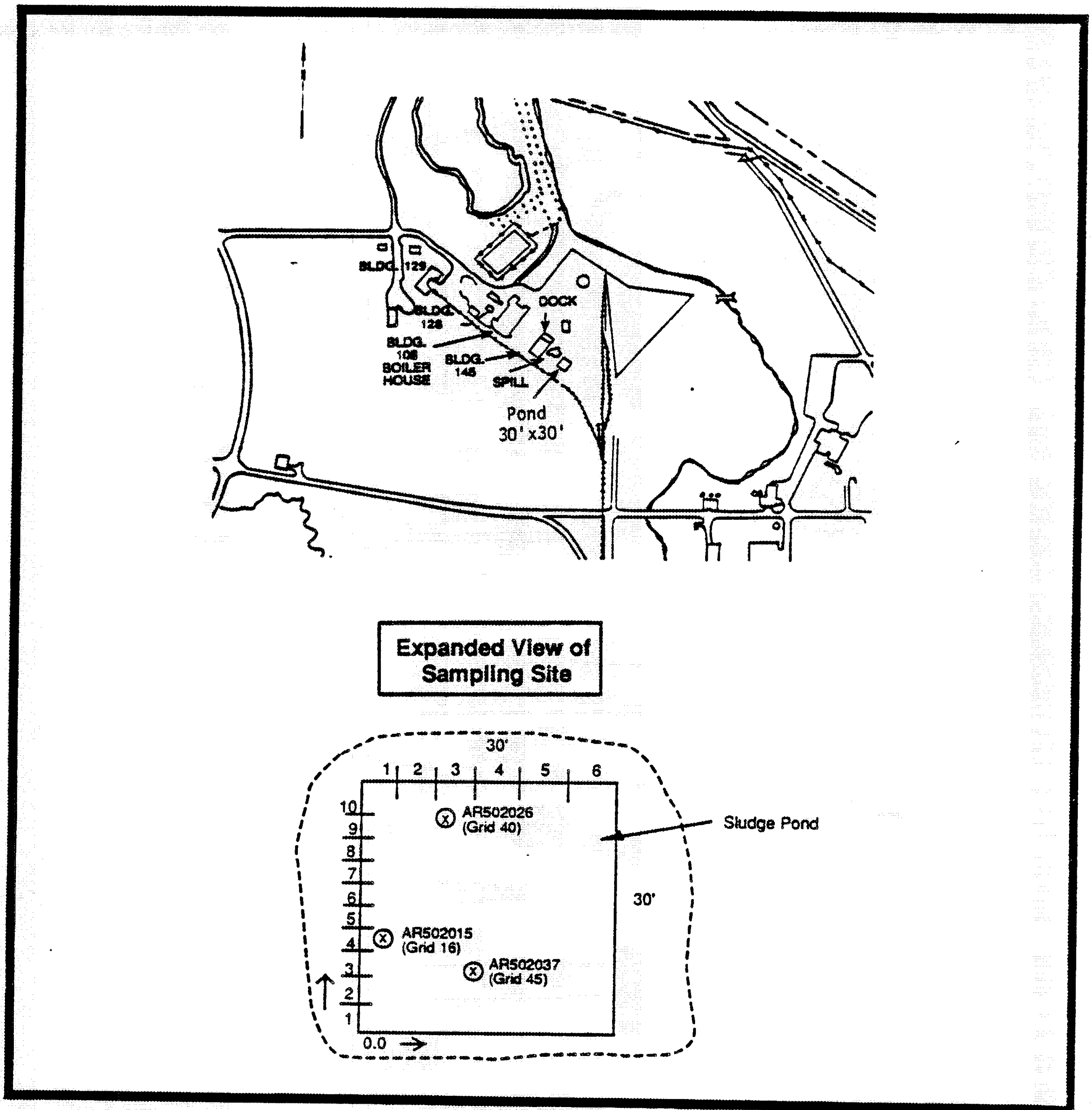

Figure 4.12a. Flue Gas Scrubber Water Basin Adjacent to Building 145 (Request 502)

Environmental Problem: 12
Request Number: 503

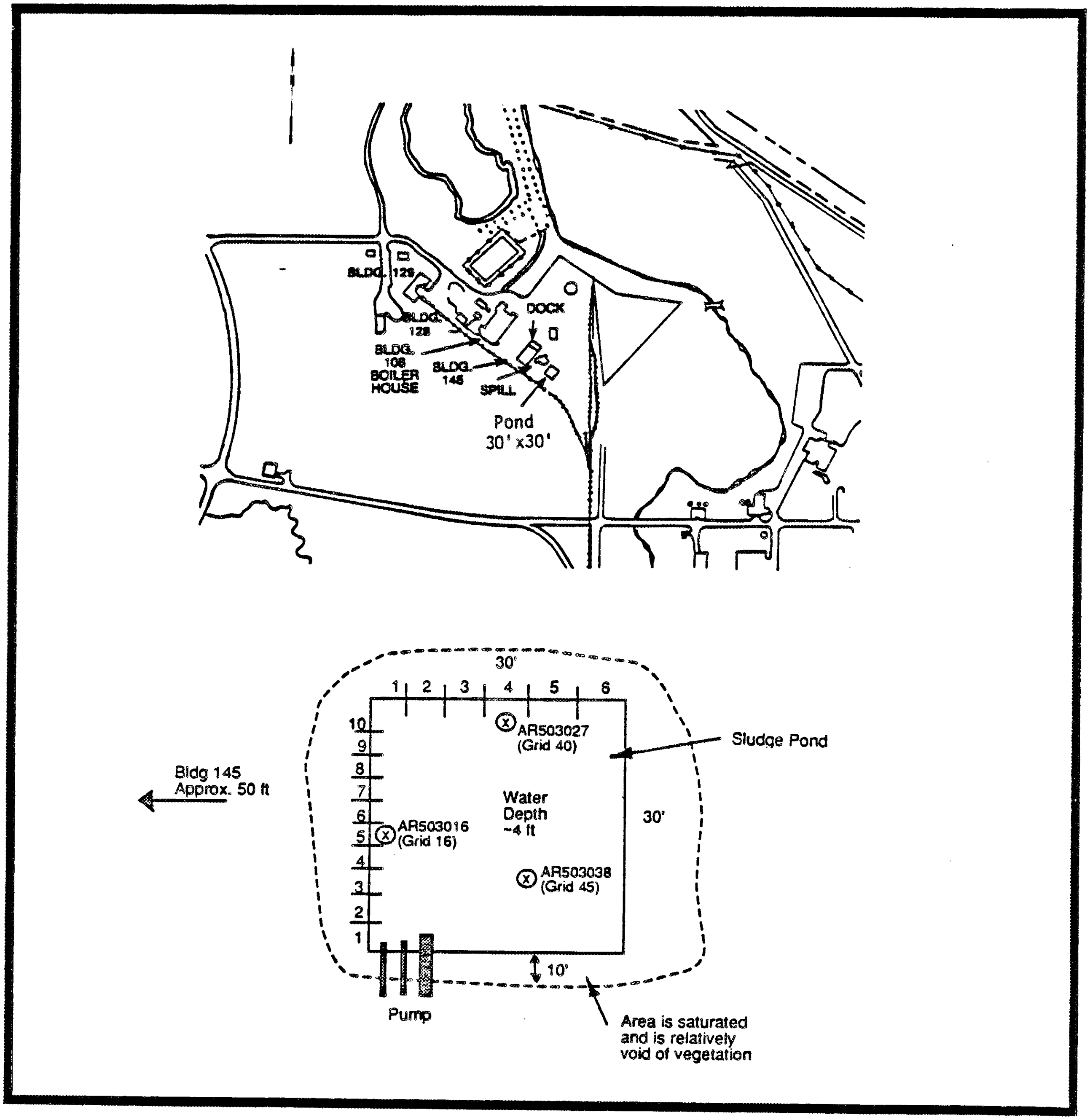

Figure 4.12b. Flue Gas Scrubber Water Basin Adjacent to Building 145 (Request 503)

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TABLE 4.2.12 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 12

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR502	B145 FLUE	DISCHARGES	SEDIMENT	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
		MED TOTAL		3	3		3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR503	B145 FLUE	DISCHARGES	SUR WATER	3	3	GRAB	3	3	3	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0
AR503	B145 FLUE	DISCHARGES	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0
		MED TOTAL		4	4		3	4	4	4	0	0	0	0	0	0	0	4	0	0	0	0	0	0
		EP TOTAL		7	7		6	7	7	7	0	0	0	0	0	0	0	4	0	0	0	0	0	0

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TABLE 4.3.12 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 12
SLUDGE AND WATER DISCHARGES FROM BUILDING 145

S&A REQUEST: 502
LOCATION: UNLINED IMPOUNDMENT ADJACENT TO BUILDING 145
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR502015	AR502026	AR502037			
PH (UNITS)		7.6	8.2	7.8			

ANIONS AND CYANIDE (MG/KG)							
	SAMP NO:	AR502015A	AR502026A	AR502037A			
	SDG NO:	AR502015A	AR502015A	AR502015A			
	TYPE:	GRAB	GRAB	GRAB			
SULFATE		70000	50000	60000			

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR502015B	AR502015B	AR502026B	AR502026B	AR502037B	AR502037B
	SDG NO:	AR302013E	AR302013K	AR302013E	AR302013K	AR302013E	AR302013K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		42700 E		37900 E		46200 E	
BARIUM		2250		2290		2230	
BERYLLIUM		7		5.7		6.2	
CADMIUM		13		64		14	
CALCIUM		31400		21400		12200	
CHROMIUM		687 N*		718 N*		692 N*	
COBALT		37 B		73		34 B	
COPPER		1400		1460		1220	
IRON		187000 *E		967000 *E		196000 *E	
LEAD		159 B		229		140 B	
MAGNESIUM		9400		6670		6410	
MANGANESE		994 E		5090 E		978 E	
NICKEL		163		273		193	
POTASSIUM			6600		4400 B		5000 B
SILVER		7.1 U		7.7 B		7.3 U	
SODIUM		4230 B		4670 B		4030 B	
VANADIUM		126		155		100	
ZINC		2830 N*E		1780 N*E		3220 N*E	

TABLE 4.3.12 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 12
SLUDGE AND WATER DISCHARGES FROM BUILDING 145

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S&A REQUEST: 503
LOCATION: UNLINED IMPOUNDMENT ADJACENT TO BUILDING 145
MEDIUM: SURFACE WATER

FIELD MEASUREMENTS	SAMP NO: AR503016	AR503027	AR503038			
CONDUCTIVITY (MS/CM)	8	8	8			
PH (UNITS)	10	10	10			
TEMPERATURE (DEG C)	9.3	8.4	7.9			

ANIONS AND CYANIDE (UG/L)	SAMP NO: AR503016B SDG NO: AR503016B TYPE: GRAB	AR503027B AR503016B GRAB	AR503038B AR503016B GRAB	AR503049B AR503016B RINSATE		
SULFATE	5300000	5000000	5100000	5000 U		

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR503016C SDG NO: AR300044K TYPE: GRAB	AR503016C AR308042G GRAB	AR503027C AR300044K GRAB	AR503027C AR308042G GRAB	AR503038C AR300044K GRAB	AR503038C AR308042G GRAB
ALUMINUM		260		280		303
BARIUM		45 B		46 B		48 B
BERYLLIUM		0.32 B		0.33 B		0.34 B
CADMIUM		2.9 B		2.8 B		2.3 B
CALCIUM		46300		47200		49600
COPPER		14 B		19 B		16 B
IRON		132 E		166 E		266 E
MAGNESIUM		2110 B		2180 B		2470 B
MANGANESE		8.2 B		8.8 B		12 B
NICKEL		8.2 B		9.1 B		6 U
POTASSIUM	4300 B		2400000		2200000	
SILVER		6.4 B*		6 U*		6 U*
SODIUM		1110000 E		1100000 E		1050000 E
VANADIUM		4 U		4.2 B		4.2 B
ZINC		28 E		30 E		44 E

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR503049C SDG NO: AR300044K TYPE: RINSATE	AR503049C AR308042G RINSATE				
ALUMINUM		60 U				
BARIUM		2.6 B				
BERYLLIUM		0.3 U				
CADMIUM		2 U				
CALCIUM		200 U				
COPPER		10 U				
IRON		44 BE				

DRAFT DO NOT CITE

TABLE 4.3.12 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 12
SLUDGE AND WATER DISCHARGES FROM BUILDING 145

S&A REQUEST: 503
LOCATION: UNLINED IMPOUNDMENT ADJACENT TO BUILDING 145
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR503049C SDG NO: AR300044K TYPE: RINSATE	AR503049C AR308042G RINSATE				
MAGNESIUM		21 B				
MANGANESE		5 U				
NICKEL		6 U				
POTASSIUM	100 U					
SILVER		6 UX				
SODIUM		200 UE				
VANADIUM		4 U				
ZINC		8.8 BE				

4.18 Environmental Problem 13: Seepage from the Flue Gas Scrubber Water Impoundment

Request Number: 504.

Requester: D. Worley.

Finding and Basis: Contaminated flue gas scrubber water from Building 145 is leaking from a lined surface impoundment into the adjacent soils, thereby potentially contaminating the soils and underlying groundwater with heavy metals, sulfates, acidic water, and organics (see Environmental Problem 12).

4.18.1 Sampling and Analysis Objectives

Statement: Samples were collected to identify the contaminants that were leaking via the water from the Building 145 impoundment into the adjacent soils which, in turn, may have been contaminating groundwater above background levels. Samples were collected at two depths to provide an indication of the downward migration. The analytical results of the soil samples were compared with the results of water and sludge samples taken from the impoundment and with a background soil sample to evaluate similarities in constituents and their concentrations.

Supporting Information: The impoundment was lined to prevent undesired discharges; however, the soils around the pond were saturated due to leakage from the impoundment.

4.18.2 Sampling and Analytical Design

4.18.2.1 Sampling Design

Request 504: The Gas Scrubber Water Impoundment Seepage - Soil (Fig. 4.17). Three cores were to be collected (Sampling Method: References E5.1, E5.2.3, and E5.2.2) from outside the impoundment in the area that had been saturated by seepage from the impoundment.

The Sampling Team arrived on site 11NOV87 at approximately 1355. The weather was clear and sunny and the temperature was 55°F. Because the objective of the sampling was to identify soil contamination and the potential movement of material toward the underlying groundwater, at least two samples from each core were to be analyzed. The location of the sample sites was as shown in Fig. 4.13 within 5 to 6 ft of the edge of the impoundment. Each selected site was divided into 60-segment grids and 3 segments were selected at random from each site. The extent of the seepage determined the number of cores required to provide an adequate data base, but a minimum of three cores was mandatory. The mobile drill rig was positioned according to the grid arrangement. The digging permit (number 174-1987) specified the presence of ANL personnel during drilling; T. Secor (ANL) and R.B. Young (IBT) were present. A radiation scan (gamma) of the area indicated 20-40 cpm. The hydrogen ion concentration (pH) of the flue gas scrubber water was 10.6. The ground surface around the impoundment was dry and consisted of coal residue and sand. All soil pH measurements were noted as "soil pH in water." The first sample was collected from the 0- to 2-ft section of the core. Subsequent samples were collected at the interface of any soil type change. If the soil remained the same, a sample was collected from the bottom 2-ft section (5 to 7 ft). When compositing a core, a vertical "slice" was taken of the core representing equal representation of the core segment. QC rinsate sample AR504073 was collected at 1355. Sample AR504017 was collected at 1400 from 0.0 to 2.0 ft of grid 52; coal dust and particles in the top 6-in. graded into sand fill. Sample AR504040 was collected at 1425 from 5.0 to 7.0 ft of grid 52. Sample AR504028 was collected at 1450 from 0.0 to 2.0 ft of grid 55; the sample was all sand with no color or texture change in the depth profile. AR504051 was collected at 1500 from grid 55 at 5.0 to 7.0 ft. Sample AR504039 was collected at 1520 from grid 57 at 0.0 to 2.0 ft. Sample AR504062 was collected at 1530 from grid 57 at 5.0 to 7.0 ft.

4.18.2.2 Analytical Design

Request 504: The field parameter measured for Request 504 was pH. Parameters analyzed included ICP-metals, sulfate, and TCLP-metals. (For TCLP procedures, the normal analysis was run; if any parameters exceeded RCRA TCLP levels, the TCLP analysis was to be run.)

4.18.3 Field and Analytical Data

Field Data: *The pH of the cores are shown in Table 4.3.13. The pH ranged from 7.4 to 8.9. The pH of the flue gas scrubber water was 10.6. Three of the samples (AR504017, -039, and -040) were from the 0-2 ft zone. The remaining three samples represent the subsoil readings.*

Field Data Evaluation: Because the instrument was calibrated prior to taking the readings, the data are reliable. The only sample evidencing the effect of the high pH of the flue gas scrubber water is the sample reading pH 8.9. Values between pH 7.2 and 8.3 under natural conditions reflect calcareous soils.

Analytical Data:

Anions and cyanide. The concentration of sulfate from soils around the impoundment is shown in Table 4.3.13. The soil samples from the 0-2 ft depth (AR504017, -039, and -040) show concentrations ranging from 40 to 650 mg/kg; the deeper samples (5-7 ft) range from 48 to 990 mg/kg. The pairs to be compared based on "top and bottom" are 600 and 990, 40 to 48, and 650 to 320.

Metals. Analytical results for metals in soil are presented in Table 4.3.13. Of the 19 metals detected, the following 5 were below either the CRDL or the IDL in all six samples: arsenic, barium, cobalt, lead, and sodium. Of the remaining metals detected, beryllium ranged from 0.73 to 0.93 mg/kg, cadmium from 1 to 1.5 mg/kg, chromium from 3.5 to 5.5 mg/kg, copper from 8.6 to 14 mg/kg, nickel from 7.8 to 12 mg/kg, silver from 0.89 to 1.7 mg/kg, and zinc from 37 to 81 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

TCLP-metals analyses were to be performed if concentrations were twenty times the RCRA EPA toxicity limits. No metals exceeded the concentration limits.

Analytical Data Evaluation:

Anions and cyanide. The instrument was calibrated and the calibration verified with quality control solutions. Duplicates were in conformance and all spikes were in compliance. The MDL was less than 5 mg/L.

Metals. Seven metals of interest--beryllium, cadmium, chromium, copper, nickel, silver, and zinc--were detected above the CRDL in samples for this request.

4.18.4 Limitations and Qualifications

Data Quality Level: The sampling design is rated Quality Level I. The field sampling is rated Quality Level II. The overall analytical rating is Quality Level I.

Field Data: The sampling is rated Quality Level II. The depth of the subsoil was not recorded, and the field note did not clarify whether the subsoil samples were taken because of uniformity (5-7 ft), except for one sample, or because interface changed as requested by the plan.

Analytical Data:

Anions and cyanide. The data quality level for sulfate is Quality Level I.

Metals. Analytical results were Quality Level I except for the following metals at Quality Level II: aluminum, antimony, arsenic, calcium, manganese, selenium, silver, and sodium.

Environmental Problem: 13
Request Number: 504

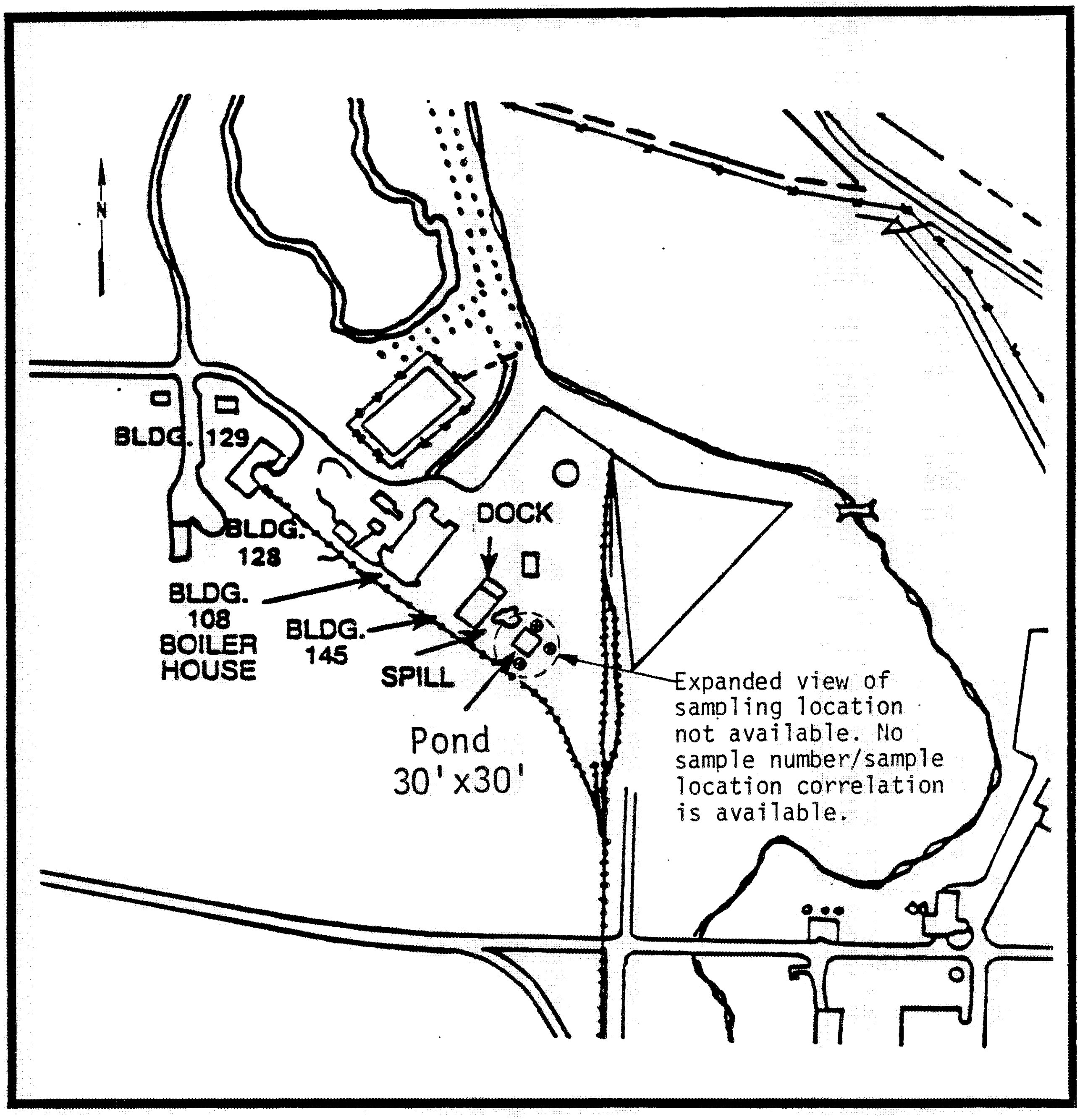

Figure 4.13. Seepage of Contaminated Liquid from the Flue Gas Scrubber Water Impoundment (Request 504)

TABLE 4.2.13 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 13

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR504	B148 FLUE	SEEPAGE	SOIL	6	6	GRAB	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	6	6		6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR504	B148 FLUE	SEEPAGE	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	1	1		0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EP TOTAL	7	7		6	7	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4.3.13 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 13 SEEPAGE FROM THE FLUE GAS SCRUBBER WATER IMPOUNDMENT

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S&A REQUEST: 504
LOCATION: FLUE GAS SCRUBBER WATER IMPOUNDMENT SEEPAGE
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR504017	AR504028	AR504039	AR504040	AR504051	AR504062
PH (UNITS)		7.7	8.3	8.9	7.4	8.3	7.6

ANIONS AND CYANIDE (MG/KG)							
	SAMP NO:	AR504017A	AR504028A	AR504039A	AR504040A	AR504051A	AR504062A
	SDG NO:	AR504017A	AR504017A	AR504017A	AR504017A	AR504017A	AR504017A
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
SULFATE		600	990	40	650	320	48

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR504017B	AR504017B	AR504028B	AR504028B	AR504039B	AR504039B
	SDG NO:	AR406030M	AR501014K	AR406030M	AR501014K	AR406030M	AR501014K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		2670		2920		2890	
ARSENIC		13 BN		9.8 BN		8.3 UN	
BARIUM		18 BE		15 BE		13 BE	
BERYLLIUM		0.93		0.74 B		0.73	
CADMIUM		1.5		1.2		1.1	
CALCIUM		103000		111000		119000	
CHROMIUM		5.5		3.5		3.5	
COBALT		4.5 B		4 B		3.4 B	
COPPER		14		12		8.6	
IRON		10900 E		10000 E		9590 E	
LEAD		12 B		7.5 U		6.9 U	
MAGNESIUM		60900		65500		99900	
MANGANESE		600 N*		574 N*		530 N*	
NICKEL		12		9		7.8	
POTASSIUM			1400		1400		1200
SILVER		1.5 BN		0.89 UN		0.94 BN	
SODIUM		653 B		447 B		489 B	
VANADIUM		7.8		6.4 B		7	
ZINC		82		65		37	

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR504040B	AR504040B	AR504051B	AR504051B	AR504062B	AR504062B
	SDG NO:	AR406030M	AR501014K	AR406030M	AR501014K	AR406030M	AR501014K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		3060		3580		3330	
ARSENIC		10 UN		9.6 UN		10 BN	
BARIUM		16 BE		18 BE		14 BE	
BERYLLIUM		0.8 B		0.79 B		0.8 B	
CADMIUM		1.1		1.1		1.4	

TABLE 4.3.13 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 13 SEEPAGE FROM THE FLUE GAS SCRUBBER WATER IMPOUNDMENT

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S&A REQUEST: 504
LOCATION: FLUE GAS SCRUBBER WATER IMPOUNDMENT SEEPAGE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR504040B AR406030M GRAB	AR504040B AR501014K GRAB	AR504051B AR406030M GRAB	AR504051B AR501014K GRAB	AR504062B AR406030M GRAB	AR504062B AR501014K GRAB
CALCIUM		121000		119000		125000	
CHROMIUM		3.8		4.3		4.6	
COBALT		3.7 B		3.4 B		4 B	
COPPER		11		9.9		9.5	
IRON		11000 E		10600 E		10800 E	
LEAD		8.6 U		8 U		8.1 U	
MAGNESIUM		71900		70500		73200	
MANGANESE		299 N*		288 N*		307 N*	
NICKEL		9.1		9.2		9.5	
POTASSIUM			1300		1400		1200
SILVER		1.3 BN		1.7 N		4 N	
SODIUM		665 B		563 B		498 B	
VANADIUM		7.1 B		7.1 B		7.9 B	
ZINC		48		40		49	

S&A REQUEST: 504
LOCATION: FLUE GAS SCRUBBER WATER IMPOUNDMENT SEEPAGE
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: SDG NO: TYPE:	AR504073B AR300044B RINSATE	AR504073B AR300066K RINSATE				
ALUMINUM		130 BNE					
BARIUM		6 B					
CADMIUM		2.1 B					
CALCIUM		589 B					
IRON		230					
MAGNESIUM		315 B					
MANGANESE		15 B					
POTASSIUM			100				
ZINC		16 B					

4.19 Environmental Problem 14: The 317 Area "Shoot and Burn" Pile

Request Number: 505.

Requester: D. Worley.

Finding and Basis: Reactive waste residues and solvents at the "shoot and burn" pile in the Facility 317 area, including organics, inorganics, PCBs, and cyanide, may have contaminated the soil and/or groundwater. Reactive wastes stored in individual containers were brought to the Facility 317 area and placed along the eastern edge of a sand pile. A security marksman used a nearby picnic table for a shooting stand and fired a bullet into the reactive waste, thus exposing the reactive waste to moist air. The reactive waste would burn or explode, leaving the combustion residues in the sand pile. This practice occurred for numerous years at this location; however, it was discontinued about two years ago pending the issuance of an EPA RCRA permit.

4.19.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if any hazardous materials listed in Sect. 4.19.2.2 were present at minimum detection levels in the area around the "shoot and burn" pile in the Facility 317 area.

Supporting Information: Reactive wastes are those wastes which react violently in the presence of water or air below ambient temperatures. There is a fire and explosion hazard associated with these wastes. Examples of reactive wastes are: Na metal, NaK, benzene diazonium chloride, butylperoxide, norbornadiene and butyllithium, and tetranitromethane isoamyl nitrite. Reactive wastes may also contain cyanic compounds. No controls were maintained to prevent discharges from the reactive waste site, which was exposed to the environment. PCBs may have been the medium in which reactive waste was stored. The resulting discharge could have contaminated the surrounding soils and groundwater.

4.19.2 Sampling and Analytical Design

4.19.2.1 Sampling Design

Request 505: Eastern Edge of the "Shoot and Burn" Pile at Facility 317 - Soil (Fig. 4.14). Two surface soil samples were to be collected (Sampling Method: Reference E5.1) under the sand at the eastern edge of the "shoot and burn" pile at Facility 317. An area approximately 10 x 25 ft was divided into a 50-segment grid and two segments were selected for sampling.

The Sampling Team arrived at the sampling location 06NOV87 at 0945. Skies were partly cloudy, temperatures were 35-40^{o}F, and winds were 0-5 mph. The team spoke to Tom Levee concerning the shoot and burn pile and its location in general. It was assumed that the destruction of chemicals occurred only on the eastern edge of the pile facing the "shooters bench." The area was screened with a gamma meter (100 to 300 cpm). Shots had been fired from the east to the southeast into an approximately 625 ft^2 pile of sand. Previous sampling by Larry Boeing had left 1 ft steel rods in the pile and adjacent ground at 2-ft intervals. Vegetation appeared to be normal. A few spots of oil (approximately 1 ft^2) were observed in the area. Sample AR505018 was collected at 1020 from a depth of 0.0 to 3.0 in. at grid 17; the sample was buff colored and sandy with clay matrix and pebbles. Sample AR505029 was collected at 1040 from a depth of 0.0 to 3.0 in. at grid 42; the sample was buff-gray, sandy soil with clay matrix and pebbles and collected from the base of the sand (8-10 in.). Miscellaneous trash (bottle caps and wire) was found in the hole dug for sample AR505029.

4.19.2.2 Analytical Design

Request 505: The field parameter measured for Request 505 was pH. The parameters analyzed included volatiles, semivolatiles, PCBs, ICP-metals, AA-mercury, and cyanide.

4.19.3 Field and Analytical Data

Field Data: *The requested pH readings from the pile are shown in Table 4.3.14. The pH readings of the 0-3 in. depth samples were 8.1 and 8.2.*

Field Data Evaluation: Because the instrument was calibrated prior to taking the measurements, the values are reliable. The pH readings represent a soil-water pH.

Analytical Data:

Anions and cyanide. The cyanide concentration in the soil was below the level for characterization as a hazardous waste (250 mg/kg).

Metals. Analytical results for metals in soil are presented in Table 4.3.14. Of the 20 metals detected, the following 4 were below the CRDL in both samples: barium, cobalt, lead, and sodium. Of the remaining metals detected, arsenic was 44 mg/kg, beryllium was 1.0 mg/kg, cadmium ranged from 1.6 to 2.1 mg/kg, chromium from 5.3 to 8.2 mg/kg, copper from 11 to 15 mg/kg, mercury from 0.19 to 1.8 mg/kg, nickel from 7.1 to 15 mg/kg, silver was 1.6 mg/kg, and zinc from 37 to 49 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

PCBs and other extractables. There was some 4,4'-DDD indicated in one of the samples, and some 4,4'-DDE and 4,4'-DDT indicated in both samples. All concentrations were estimated because the concentrations were below quantitation limits. No estimated concentration exceeded 200 ppm.

Extractable organics. No target compounds were detected in these samples. All unknowns were in estimated concentrations of less than 10 ppm, and most were less than 1 ppm.

Volatile organics. Acetone and methylene chloride were detected in each of the two soil samples collected for Environmental Problem 14. There were four additional *compounds detected in each of these two samples, but they were always in concentrations estimated at less than 0.010 mg/kg. Acetone and methylene chloride were both detected in the laboratory blank associated with these samples. Acetone levels in the samples were 0.012 and 0.013 mg/kg. Methylene chloride concentrations exceeded the calibration range and were estimated as 0.26 and 0.40 mg/kg. No tentatively identified volatile organic compounds were detected.*

Analytical Data Evaluation:

Anions and cyanide. The calibrated instrument verification and the calibration blanks were in compliance. These and other quality control measures (see Environmental Problem 2) make the results reliable.

Metals. The following nine metals of interest were detected above the CRDL in the samples for Request 505: arsenic, beryllium, cadmium, chromium, copper, mercury, nickel, silver, and zinc.

PCBs and other extractables. These samples appeared to contain some DDD, DDE, and DDT, but not in quantities high enough to be confirmed by GC/MS.

Extractable organics. No target compounds were detected in these samples. All unknowns were in estimated concentrations of less than 10 ppm, and all concentrations were below quantitation limits.

Volatile organics. Acetone was present in concentrations of 0.012 and 0.013 mg/kg in these samples, and methylene chloride was present in concentrations beyond the calibration range but estimated at 0.26 and 0.40 mg/kg. These compounds were both detected in the laboratory blank associated with these samples. No tentatively identified volatile organic compounds were detected.

4.19.4 Limitations and Qualifications

Data Quality Level: The sampling scheme and the field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: No limitations or qualifications are apparent.

Analytical Data:

Anions and cyanide. The data Quality Level is I based on the cutoff of cyanide concentration at 250 mg/kg.

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. All results are Quality Level III. Data for single component pesticides are not usable because the surrogate standard was not found at the expected retention time in the chromatograms.

Extractable organics. All data are of Quality Level II for identified TICs and Quality Level III for unknown TICs.

Volatile organics. Data quality for methylene chloride was Quality Level II because the levels observed for both samples exceeded the calibration range for the mass spectrometer detector.

Environmental Problem: 14
Request Number: 505

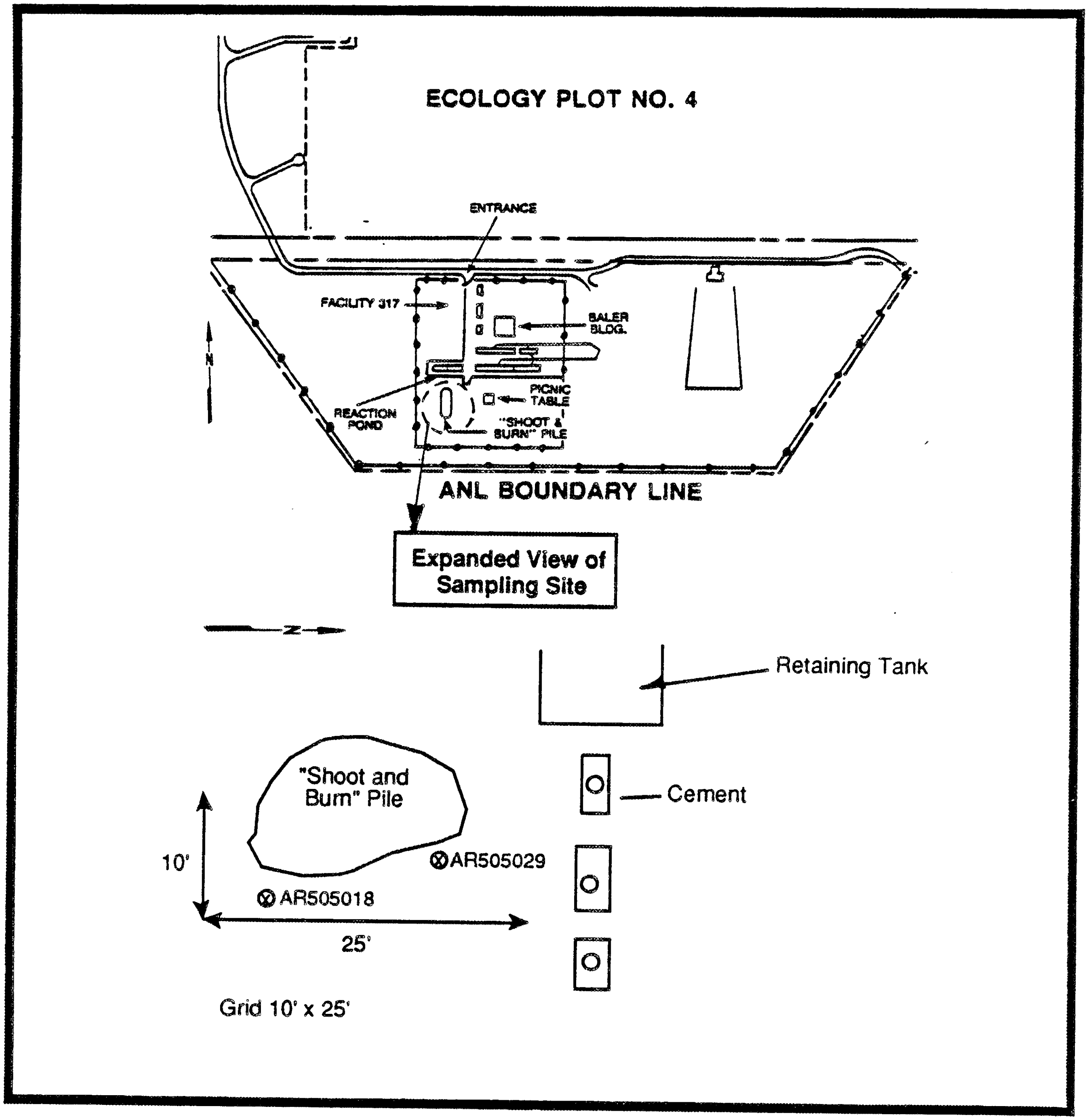

Figure 4.14. "Shoot and Burn" Pile at Facility 317 (Request 505)

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TABLE 4.2.14 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 14

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR505	317 AREA	BURN PILE	SOIL	2	2	GRAB	0	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	0	0
		MED TOTAL		2	2		0	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	0	0
		EP TOTAL		2	2		0	2	2	2	0	0	0	0	0	0	2	2	2	2	2	2	0	0

TABLE 4.3.14 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 14 DRAFT DO NOT CITE
THE 317 AREA "SHOOT AND BURN" PILE

S&A REQUEST: 505
LOCATION: EASTERN EDGE OF THE "SHOOT AND BURN" PILE AT FACILITY 317
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR505018	AR505029				
PH (UNITS)		8.1	8.2				

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR505018D	AR505018E	AR505018E	AR505029D	AR505029E	AR505029E
	SDG NO:	AR310013C	AR302013E	AR302013K	AR310013C	AR302013E	AR302013K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM			5930 E			2930 E	
ARSENIC			17 BN			44 N	
BARIUM			30 B			17 B	
BERYLLIUM			0.99			1	
CADMIUM			1.6			2.1	
CALCIUM			111000			158000	
CHROMIUM			8.2 N*			5.3 N*	
COBALT			5.8 B			2.4 B	
COPPER			16			11	
IRON			15400 *E			9040 *E	
LEAD			22 B			20 B	
MAGNESIUM			60700			89200	
MANGANESE			533 E			252 E	
MERCURY		0.19			1.8		
NICKEL			15			7.1	
POTASSIUM				1500			920
SILVER			1.3 B			1.6	
SODIUM			368 B			318 B	
VANADIUM			13			5.7 B	
ZINC			50 N*E			37 N*E	

PCBS & OTHER EXTRACTABLES (UG/KG)							
	SAMP NO:	AR505018B	AR505029B				
	SDG NO:	ARG01	ARG01				
	TYPE:	GRAB	GRAB				
4,4'-DDD		18 U	30 J				
4,4'-DDE		18 J	73 J				
4,4'-DDT		18 J	200 J				

EXTRACTABLE ORGANICS (UG/KG)							
	SAMP NO:	AR505018B	AR505029B				
	SDG NO:	CD22	CD22				
	TYPE:	GRAB	GRAB				
BIS(2-ETHYLHEXYL)PHTHALATE		370 U	49 J				
DIETHYLPHTHALATE		39 J	370 U				

TABLE 4.3.14 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 14 THE 317 AREA "SHOOT AND BURN" PILE

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S&A REQUEST: 505
LOCATION: EASTERN EDGE OF THE "SHOOT AND BURN" PILE AT FACILITY 317
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: SDG NO: TYPE:	AR505018B CD22 GRAB	AR505029B CD22 GRAB
* UNKNOWN(7.66)		140 J	
* UNKNOWN(9.32)		520 J	530 J
* UNKNOWN(10.27)			170 J
* UNKNOWN(10.28)		130 J	
* UNKNOWN(11.24)		69 J	
* UNKNOWN(11.31)		120 J	
* UNKNOWN(11.83)		120 J	
* UNKNOWN(12.78)		68 J	
* UNKNOWN(15.17)			170 J
* UNKNOWN(15.18)		560 J	
* UNKNOWN(18.48)		280 J	810 J
* UNKNOWN(19.43)			230 J
* UNKNOWN(19.45)		98 J	
* UNKNOWN(21.42)		140 J	800 J
* UNKNOWN(22.24)		320 J	600 J
* UNKNOWN(22.60)			150 J
* UNKNOWN(24.05)		140 J	830 J
* UNKNOWN(24.82)		420 J	980 J
* UNKNOWN(26.33)			510 J
* UNKNOWN(27.09)		320 J	840 J
* UNKNOWN(27.42)		96 J	440 J
* UNKNOWN(28.37)			370 J
* UNKNOWN(29.12)		180 J	
* UNKNOWN(29.13)			620 J
* UNKNOWN(29.26)			210 J
* UNKNOWN(30.25)		270 J	810 J
* UNKNOWN(31.94)			580 J
* UNKNOWN(32.86)			1100 J
* UNKNOWN(33.21)		5700 J	
* UNKNOWN(33.22)			7600 J
* UNKNOWN(39.31)		1100 J	

VOLATILE ORGANICS (UG/KG)	SAMP NO: SDG NO: TYPE:	AR505018A GN16 GRAB	AR505029A GN16 GRAB
ACETONE		12 B	13 B
METHYLENE CHLORIDE		260 BE	400 BE

4.20 Environmental Problem 15: Lead Storage Yard

Request Number: 506.

Requester: D. Worley.

Finding and Basis: There is a potential for lead contamination of surface soils between Buildings 378 and 382. An area between Buildings 378 and 382 has been used for the last twenty years to store lead shielding and other lead recoverable materials. Currently in this area there are three partially filled skids of lead rolls (sheet metal), lead sheets, and seven drums of lead wool. The area is open to the environment. One drum does not have a lid and rainwater is entering the drum. This area has been used more actively than is reflected by current activities. Because of the accumulation of lead in this area and the exposure to the environment (acid rain), it is likely that lead has accumulated in the soils.

4.20.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of lead at the lead storage yard located between Buildings 378 and 382.

Supporting Information: Because lead had been stored in various portions of the yard for the last twenty years, the potential for lead contamination existed over the entire area. The storage yard was covered with weeds and there were no indications of areas of extensive contamination.

4.20.2 Sampling and Analytical Design

4.20.2.1 Sampling Design

Request 506: Lead Storage Yard Between Buildings 378 and 382 - Soil (Fig. 4.15). Because the entire yard had been used to store lead materials, more extensive sampling was needed to determine the presence of contamination. Collection of surface (0- to

3-in.) samples in accordance with E5.1 was considered adequate because lead should have been relatively immobile in ANL soils.

The Sampling Team arrived at the sampling site on 06NOV87 at 1310. Skies were cloudy, with a temperature of 40°F and winds at 0-5 mph. The team obtained the key to the yard from JoAnn Day (Building 362). The 140 x 60 ft yard was divided into a 10 x 20, 200-segment grid and 9 segments selected at random. Flags were placed at sample locations. The yard was covered with colored gravel. There was scattered, weedy vegetation that appeared unstressed. Miscellaneous pieces of lead of various shapes and sizes were in the yard. The area was scanned with a gamma meter (50-100 cpm). All equipment was decontaminated prior to use. Sample AR506019, collected at 1335 from grid 5, was ash-gray in color and had a sandy consistency. Sample AR506020, collected at 1344 from grid 44, was ash-gray and sandy. It contained pebble-sized gravel and the top 1 in. of gravel was lichen-covered and oil stained. Sample AR506031, collected at 1350 from grid 77, was ash gray with a graveled surface and lichen-covered soil. Sample AR506042 was collected at 1356 from grid 83. It was ash-gray, lichen-covered sandy gravel. Sample AR506053, collected at 1403 from grid 86, was ash-colored sandy gravel with a clay matrix. Sample AR506064, collected at 1407 from grid 95, was ash-gray colored sandy gravel with a clay matrix. The ground was lichen covered at segment 95. Sample AR506075, collected at 1411 from grid 112, was a gray-brown, sandy sample from a lichen-covered, gravel surface. The ground was damp at grid 112. Sample AR506086, collected at 1417 from grid 166, was ash-gray sandy gravel with a clay matrix. The surface was lichen covered. Sample AR506097, collected at 1421 from grid 189, was ash-gray sandy gravel with a clay matrix. The surface was lichen-covered with flakes of blue paint.

4.20.2.2 Analytical Design

Request 506: The field parameter measured for Request 506 was pH. The parameter analyzed was AA-metals (lead).

4.20.3 Field and Analytical Data

Field Data: *The pH readings of the surface soils (0-3 in.) were all above 8 and ranged from 8 to 8.7.*

Field Data Evaluation: Because the instruments were calibrated, the soil-water pH readings are reliable.

Analytical Data:

Metals. Analytical results for lead in soil are presented in Table 4.3.15. Nine samples were analyzed for AA-lead. Lead was detected in all nine samples and concentrations ranged from 114 to 46,100 mg/kg.

Analytical Data Evaluation:

Metals. Lead was detected in all nine samples and ranged from 114 to 46,100 mg/kg.

4.20.4 Limitations and Qualifications

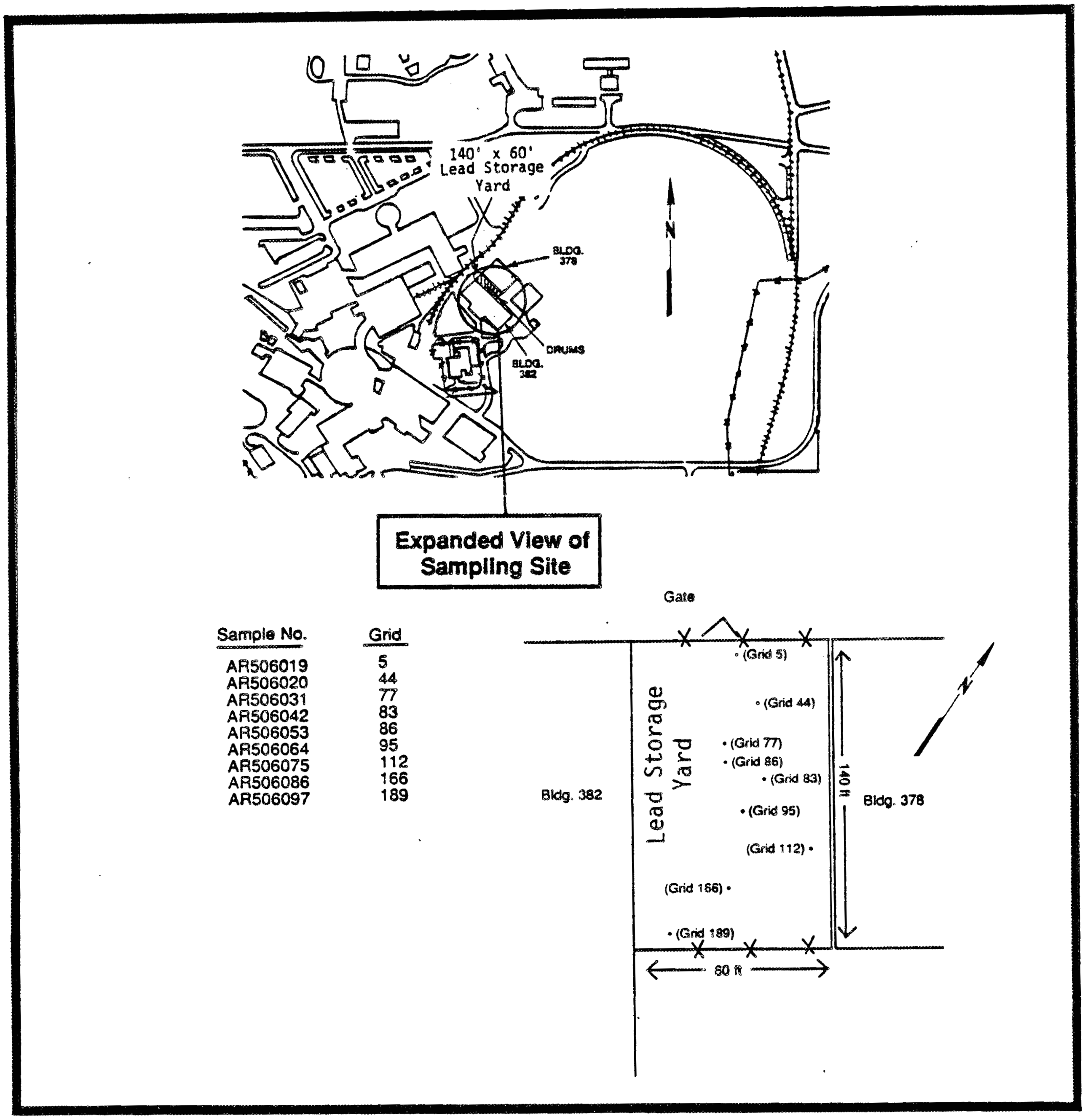
Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level I.

Field Data:

Analytical Data:

Metals. The analytical data Quality Level is I.

Environmental Problem: 15
Request Number: 506



Sample No.	Grid
AR506019	5
AR506020	44
AR506031	77
AR506042	83
AR506053	86
AR506064	95
AR506075	112
AR506086	166
AR506097	189

Figure 4.15. Lead Storage Yard Located Between Building 378 and 382 (Request 506)

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TABLE 4.2.15 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 15

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL
AR506	B. 378/382	LEAD	SOIL	9	9	GRAB	0	0	9	9	0	0	0	0
			MED TOTAL	9	9		0	0	9	9	0	0	0	0
			EP TOTAL	9	9		0	0	9	9	0	0	0	0

REQUEST NUMBER	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR506	0	0	0	0	0	0	0	0	0	0
MED TOTAL	0	0	0	0	0	0	0	0	0	0
EP TOTAL	0	0	0	0	0	0	0	0	0	0

TABLE 4.3.15 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 15 DRAFT DO NOT CITE
LEAD STORAGE YARD

S&A REQUEST: 506
LOCATION: LEAD STORAGE YARD BETWEEN BUILDINGS 378 AND 382
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR506019	AR506020	AR506031	AR506042	AR506053	AR506064
PH (UNITS)		8	8.4	8	8.5	8.2	8.7

FIELD MEASUREMENTS	SAMP NO:	AR506075	AR506086	AR506097			
PH (UNITS)		8.2	8.2	8.4			

METALS, INCLUDING CR+6 (MG/KG)		AR506019A	AR506020A	AR506031A	AR506042A	AR506053A	AR506064A
	SDG NO:	AR506019A	AR506019A	AR506019A	AR506019A	AR506019A	AR506019A
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
LEAD		239	114	46100	265	4620	29100

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR506075A	AR506086A	AR506097A			
	SDG NO:	AR506019A	AR506019A	AR506019A			
	TYPE:	GRAB	GRAB	GRAB			
LEAD		9180	1070	1090			

4.21 Environmental Problem 16: Coal Pile Yard

Request Numbers: 507 and 508.

Requester: D. Worley.

Findings and Basis: Organic and inorganic hazardous wastes and PCBs may be discharged into the sanitary sewer wastewater treatment facility from the coal pile yard located near Building 108. Coal silts and liquids discharging from the active coal pile may be hazardous. Heavy metals and organic compounds found naturally in the coal are being leached by rainwater, collected in a newly constructed sump, transferred to an impoundment, and eventually pumped into the sanitary sewer system.

4.21.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if contaminants listed in Sect. 4.21.2.2 were present in liquid samples from the coal pile surface water collection sumps at minimum detection levels.

Supporting Information: The surface water in the collection sumps had an oil sheen and heavy staining from dissolved iron leading to the sumps. There were two primary collection sumps to collect runoff which emptied into a common secondary sump. The surface water was gravity fed into a holding sump and then pumped to a surface impoundment which was used for other wastes from the boiler house and the water treatment facility. This mixture of waste waters was eventually pumped into the sanitary sewer system as necessary. Waste oils, which may have contained PCBs and other organic solvents, were once used to prevent the coal pile from freezing. Metals were present in the coal.

4.21.2 Sampling and Analytical Design

4.21.2.1 Sampling Design

Request 507: Coal Pile Surface Water Collection Sump Located Near Building 108 - Silt (Fig. 4.16a). One grab sample of coal silt was to be collected (Sampling Method: Reference E5.1) from each of the three coal pile surface water collection sumps using a stainless steel spoon or scoop. Because the material in the three sumps had a common source, it was considered one population. Each of the three sumps was divided into a 20-segment grid and one grid segment selected at random for sampling. Sump 1 was a 5 x 4 grid and sumps 2 and 3 were 4 x 5 grids.

The Sampling Team arrived at the site on 06NOV87 at 0930. The temperature was 40^{o}F and winds were calm. The site was ENE of Buildings 108, 145, and 146 and north of the coal storage pile. Each sump measured approximately 8 x 8 ft. Sump 1 surface water was greenish-brown in color with streaks of oil on its surface. Sump 2 surface water was slightly darker, but it also had streaks of oil on its surface. Sump 3 surface water was reddish-brown with oil and foam streaks. Sample AR507010 was collected at 1100 from grid 18 in Sump 1. The sediment was dark brown with yellow residues and had the consistency of soft clay. Sample AR507021 was collected at 1110 from grid 12 in Sump 2. The sediment was dark black with yellow streaks and had the consistency of soft clay. Sample AR507032 was collected at 1120 from grid 17 in Sump 3. The sediment was dark brown to black with yellow residue and had the consistency of slurry.

Request 508: Collection Sumps Located Near Building 108 - Water (Fig. 4.16b). One grab water sample was to be collected (Sampling Method: Reference E4.2.4) from each of the collection sumps just before and in the same location as the sediment samples for Request 507.

The Sampling Team arrived at the sampling location 06NOV87 at 0930. pH measurements were made at each sample location. Sump 1 had a dark greenish-brown tint and an oily iridescent film on its surface. Sump 2 had a dark brown color and an oily film on its surface. Sump 3 had a dark red color and an oily film on its surface. Sample AR508011, collected from Sump 1 at 1000, was relatively clear. Sample AR508022, collected from Sump 2 at 1010, was also relatively clear. Sample AR508033, collected from Sump 3 at 1020, had a yellow tint. All samples seemed slightly more viscous than water.

4.21.2.2 Analytical Design

Request 507: The parameter measured for Request 507 included pH. The parameters analyzed included volatiles, semivolatiles, PCBs, ICP-metals, TCLP-metals, and TCLP-semivolatiles. The identification and quantification of long-chain hydrocarbons was also requested. For TCLP procedures, the normal analysis should be run. If any parameters exceeded RCRA TCLP levels, TCLP analyses should also be run.

Request 508: The parameter measured for Request 508 included pH. The parameters analyzed included volatiles, semivolatiles, and PCBs. The identification and quantification of long-chain hydrocarbons was also requested.

4.21.3 Field and Analytical Data

Field Data:

Request 507: *The pH readings of the coal pile runoff are shown in Table 4.3.16. The pH readings of the silty particles are slightly higher than the pH readings of the water. The particle pH ranged from 5.4 to 5.8.*

Request 508: The pH readings of the coal pile runoff are shown in Table 4.3.16. The pH readings of the silty particles are slightly higher than the pH readings of the water. The water pH ranges from 2.5 to 5.5. Although not requested, conductivity and temperature readings are shown in the table for the water samples. The conductivity varied inversely with the pH.

Field Data Evaluation:

Request 507: Because the instrument was calibrated prior to taking the readings, the results are reliable.

Request 508: Because the instrument was calibrated prior to taking the readings, the results are reliable. The sample showing the lowest pH reading of 2.5 was described as having a yellow tint.

Analytical Data:

Request 507:

Metals. Analytical results for metals in sediment are presented in Table 4.3.16. Of the 18 metals detected, arsenic and cobalt were below either the CRDL or the IDL in all three samples. Of the remaining metals detected, barium ranged from 50 to 68 mg/kg, beryllium from 2 to 2.3 mg/kg, cadmium from 3.1 to 4.8 mg/kg, chromium from 9 to 14 mg/kg, copper from 53 to 63 mg/kg, lead was 66 mg/kg, nickel ranged from 21 to 29 mg/kg, and zinc from 153 to 343 mg/kg.

TCLP-metals analyses were to be performed if concentrations were 20 times the RCRA EPA toxicity limits. No metals exceeded the concentration limits.

Extractable organics. Naphthalene, 2-methylnaphthalene, phenanthrene, fluoranthene, and pyrene were all identified in concentrations between 1 and 5 ppm in sample AR507010. Molecular sulfur was tentatively identified with an estimated concentration of 1.9 ppm in the same sample. Samples AR507010, AR507032, and AR507021 had unknowns with estimated concentrations of 9.8, 37, and 29 ppm respectively. All other compounds identified in these samples were in measured or estimated concentrations of less than 2 ppm and most were less than 1 ppm.

Volatile organics. There were 13 compounds detected in two of the samples and 14 compounds detected in the remaining sample. All measured or estimated concentrations were less than 0.025 mg/kg. Xylene was measured in concentrations of 0.019 mg/kg or less. Methylene chloride concentrations were measured or estimated at concentrations of 0.011 mg/kg or less in the samples and also in the blank. Acetone was also detected in the associated blank, and was estimated in concentrations of 0.018 to 0.023 mg/kg in the samples.

Long-chain hydrocarbons. The ANL Sampling and Analysis Plan requested that all long-chain hydrocarbons be identified and quantified. Based upon a review of the extractable organics and volatile organics data, there were three instances of tentatively identified hydrocarbons in these samples. In sample AR507010 (Request 507) there was one tentatively identified hydrocarbon (retention time = 20.77 min) with an estimated concentration of 0.470 mg/kg and another (retention time = 24.58 min) with an estimated concentration of 2.1 mg/kg. No tentatively identified hydrocarbons were indicated for the other sediment samples (AR507021 or AR507032).

Request 508:

PCBs and other extractables. In sample AR508033, aldrin and heptachlor epoxide were detected below the quantitation limit in concentrations estimated at 0.06 µg/L. No other compounds in this classification were detected in these samples.

Extractable organics. Bis(2-ethylhexyl)phthalate was the only compound identified above the quantitation limit and was present at 0.035 µg/L. Di-N-buthylphthalate was present in all samples and in one of the blanks. No other identified compound was present in estimated concentrations exceeding 0.011 µg/L. One unknown TIC was present at the estimated concentration of 0.28 µg/L; all other TICs had estimated concentrations less than 0.10 µg/L.

Volatile organics. There were six volatile organic compounds identified in two samples and five such compounds identified in the remaining sample. No measured or estimated *concentration exceeded 0.012 mg/L. Methylene chloride and acetone were identified in the samples and in the associated method blank.*

Long-chain hydrocarbons. In the samples for Request 508, there was one tentatively identified hydrocarbon (retention time = 30.09 min) with an estimated concentration of 0.007 mg/L in sample AR508033, but no tentatively identified hydrocarbons were indicated in the other samples (AR508011 or AR508022). A tentatively identified hydrocarbon (same retention time as the one in sample AR508033) was also indicated in the rinsate, with an estimated concentration there of 0.005 mg/L.

Analytical Data Evaluation:

Request 507:

Metals. Eight metals of interest were detected above the CRDL in the samples for Request 507: barium, beryllium, cadmium, chromium, copper, lead, nickel, and zinc.

Extractable organics. Naphthalene, 2-methylnaphthalene, phenanthrene, fluoranthene, and pyrene were all identified in concentrations less than 5 ppm in sample AR507010. Molecular sulfur was tentatively identified in the same sample. Samples AR507010, AR507032, and AR507021 had unknowns with estimated concentrations of 9.8 or greater, but none of these could be quantified. All other compounds identified in these samples were in measured or estimated concentrations of less than 2 ppm and most were less than 1 ppm.

Volatile organics. All measured or estimated concentrations were less than 0.025 mg/kg. Acetone and methylene chloride were detected in the samples and in the associated blank.

Request 508:

PCBs and other extractables. Aldrin and heptachlor were indicated, but not confirmed by GC/MS.

Extractable organics. No compound was identified in measurable concentrations except bis(2-ethylhexyl)phthalate.

Volatile organics. No measured or estimated concentration exceeded 0.012 mg/L. Acetone and methylene chloride were identified in the samples and in the associated method blank.

4.21.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data:

Request 507: There were no limitations or qualifications of the data.

Request 508: There were no limitations or qualifications of the data.

Analytical Data:

Request 507:

Metals. Analytical results were Quality Level I except for sodium at Quality Level II and antimony at Quality Level III.

Extractable organics. Although data quality was generally of Quality Level III due to low concentrations, sample AR507010 provided the exception. Data for that sample were of Quality Level II except for anthracene, benzo(a)anthracene, and chrysene which were of Quality Level III because concentrations were below the quantitation limit. The phenanthrene datum in sample AR507021 was also of Quality Level II.

Volatile organics. Data quality for all target volatile compounds detected at levels above their quantitation limits was either Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. Detected, but unidentified, TIC volatile compounds were Quality Level III.

Request 508:

PCBs and other extractables. The results for aldrin and heptachlor epoxide are suspect because the surrogate retention time did not meet criteria. In like manner, the data for all single component pesticides in all samples for this environmental problem are unusable because the surrogate standard was not found at the expected retention time.

Extractable organics. The data quality level for the extractable organics is III due to mass spectral uncertainties for TICs and concentrations below quantitation limit for identified compounds.

Volatile organics. Data quality for all target volatile compounds detected at levels above their quantitation limits was either Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. Detected, but unidentified, TIC volatile compounds were Quality Level III.

Environmental Problem: 16
Request Number: 507

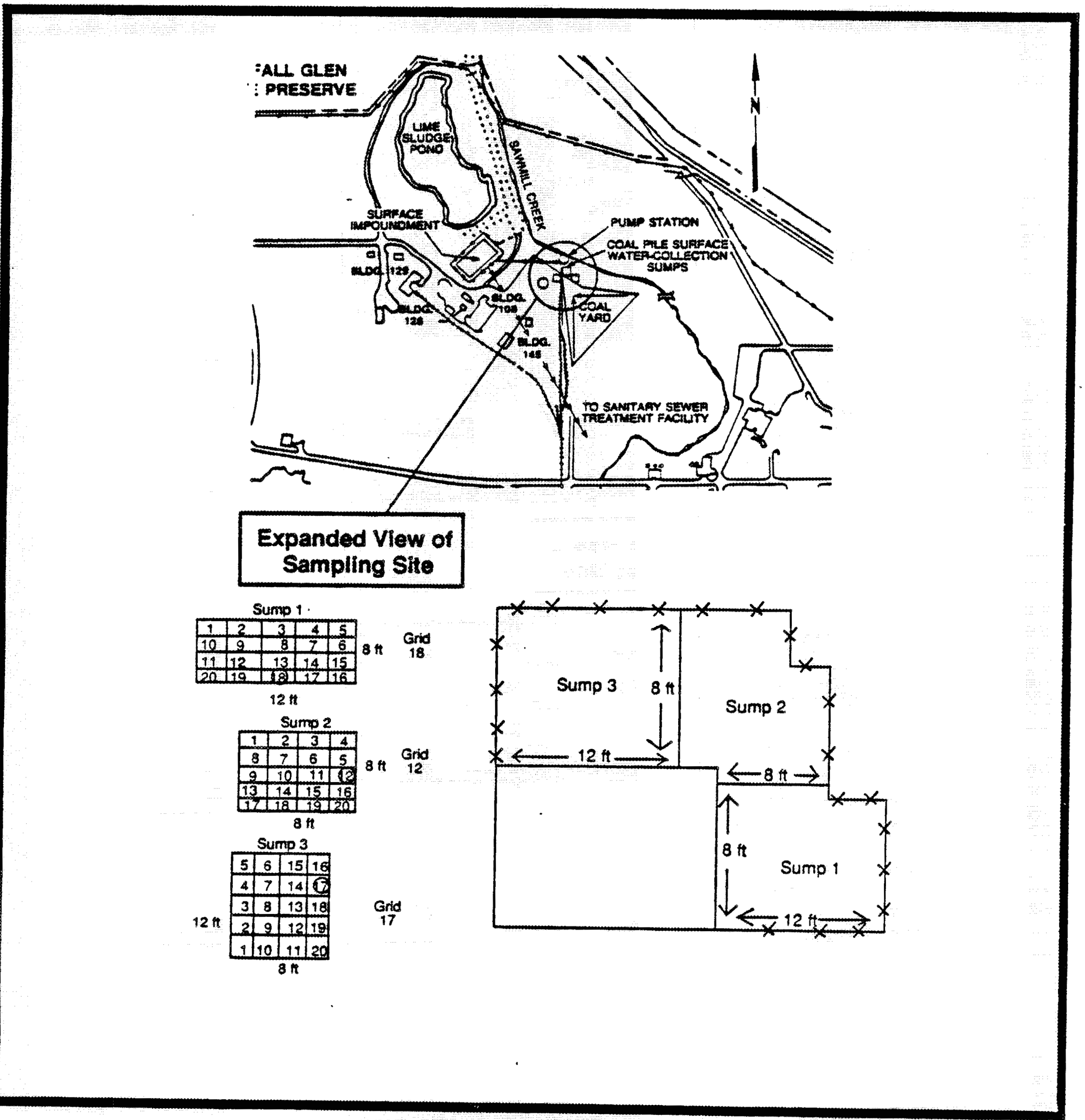

Figure 4.16a. Coal Pile Surface Water Collection Sumps (Request 507)

Environmental Problem: 16
Request Number: 508

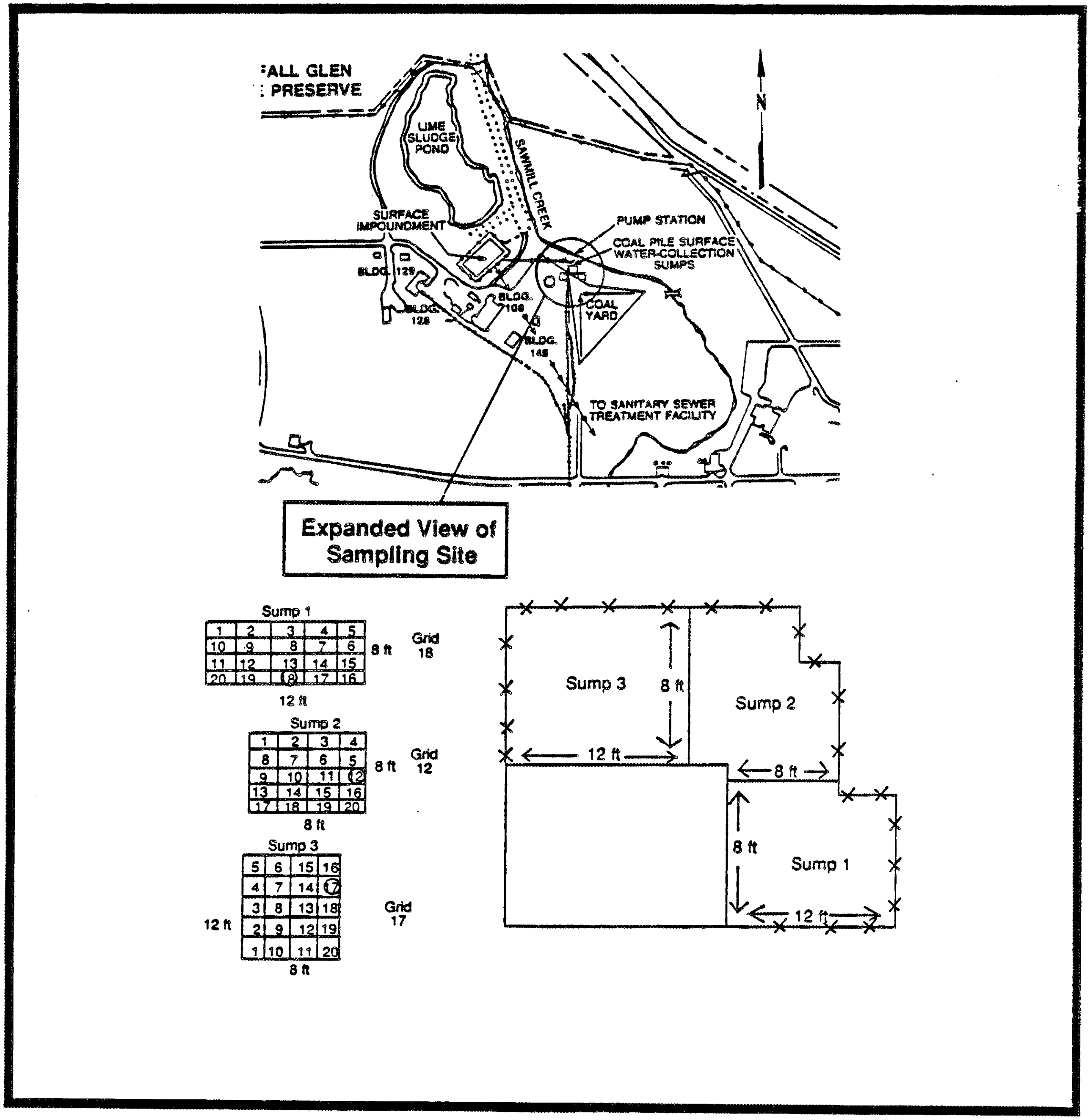

Figure 4.16b. Coal Pile Surface Water Collection Sumps (Request 508)

TABLE 4.2.16 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 16

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR507	BLDG 108	SILT	SEDIMENT	3	3	GRAB	0	0	3	3	0	0	0	0	0	0	0	3	3	3	3	3	0	0
			MED TOTAL	3	3		0	0	3	3	0	0	0	0	0	0	0	3	3	3	3	3	0	0
AR508	BLDG 108	SILT	SUR WATER	1	1	QC RN	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0
			MED TOTAL	1	1		0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0
AR508	BLDG 108	SILT	UNSEAL CO	3	3	GRAB	0	0	0	0	0	0	0	0	0	0	1	3	3	3	3	3	0	0
			MED TOTAL	3	3		0	0	0	0	0	0	0	0	0	0	1	3	3	3	3	3	0	0
			EP TOTAL	7	7		0	0	3	3	0	0	0	0	0	0	1	7	7	7	7	7	0	0

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TABLE 4.3.16 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 16
COAL PILE YARD

S&A REQUEST: 507
LOCATION: COAL PILE SURFACE WATER COLLECTION SUMP LOCATED NEAR BUILDING 108
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO: AR507010	AR507021	AR507032			
PH (UNITS)	5.4	5.8	5.6			

METALS, INCLUDING CR+6 (MG/KG)	AR507010C	AR507010C	AR507021C	AR507021C	AR507032C	AR507032C
SAMP NO:	AR507010C	AR507010C	AR507021C	AR507021C	AR507032C	AR507032C
SDG NO:	AR507010C	AR507010K	AR507010C	AR507010K	AR507010C	AR507010K
TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM	5240		6260		8720	
ARSENIC	26 B		16 U		37 B	
BARIUM	50		60		68	
BERYLLIUM	2.2		2.3		2	
CADMIUM	3.1		4.8		4.4	
CALCIUM	4320		6110		8740	
CHROMIUM	10		9		14	
COBALT	8.9 B		8 B		9.6 B	
COPPER	53		63		55	
IRON	43100		78600		59800	
LEAD	44 B		57 B		66	
MAGNESIUM	2130		1910		5380	
MANGANESE	75		68		119	
NICKEL	24		21		30	
POTASSIUM		1100 B		1500		1300
SODIUM	777 B		1760		2210	
VANADIUM	26		30		39	
ZINC	153		160		343	

EXTRACTABLE ORGANICS (UG/KG)	AR507010B	AR507021B	AR507032B			
SAMP NO:	AR507010B	AR507021B	AR507032B			
SDG NO:	CD22	CD22	CD22			
TYPE:	GRAB	GRAB	GRAB			
ACENAPHTHENE	1200	140 J	700 U			
ANTHRACENE	350 J	57 J	700 U			
BENZO(A)ANTHRACENE	500 J	670 U	700 U			
BENZO(A)PYRENE	660	670 U	700 U			
BENZO(B)FLUORANTHENE	570	670 U	700 U			
BENZO(K)FLUORANTHENE	590	670 U	700 U			
BIS(2-ETHYLHEXYL)PHTHALATE	840	420 J	700 U			
CHRYSENE	560 J	670 U	700 U			
DI-N-BUTYLPHTHALATE	33 J	65 J	35 J			
DIBENZOFURAN	1000	170 J	64 J			
DIETHYLPHTHALATE	64 J	110 J	700 U			
FLUORANTHENE	2100	220 J	96 J			
FLUORENE	990	120 J	700 U			

TABLE 4.3.16 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 16 COAL PILE YARD

DRAFT DO NOT CITE

S&A REQUEST: 507
LOCATION: COAL PILE SURFACE WATER COLLECTION SUMP LOCATED NEAR BUILDING 108
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR507010B / CD22 / GRAB	AR507021B / CD22 / GRAB	AR507032B / CD22 / GRAB
NAPHTHALENE		2100	340 J	140 J
PHENANTHRENE		4500	710	280 J
PYRENE		2700	390 J	160 J
2-METHYLNAPHTHALENE		1300	460 J	170 J
* DIMETHYLNAPHTHALENE(19.86)		410 J	290 J	130 J
* DIMETHYLNAPHTHALENE(20.10)				120 J
* DIMETHYLNAPHTHALENE(20.12)			440 J	
* DIMETHYLNAPHTHALENE(20.18)		470 J		
* SULFUR(29.24)				490 J
* SULFUR(29.30)		1900 J		
* TRIMETHYLNAPHTHALENE(22.24)			240 J	
* UNKNOWN HYDROCARBON(20.77)		470 J		
* UNKNOWN HYDROCARBON(24.58)		2100 J		
* UNKNOWN(7.70)		300 J		
* UNKNOWN(9.34)				970 J
* UNKNOWN(9.35)		840 J	1300 J	
* UNKNOWN(10.27)			660 J	
* UNKNOWN(10.29)				580 J
* UNKNOWN(11.25)				140 J
* UNKNOWN(11.33)				200 J
* UNKNOWN(12.79)			230 J	
* UNKNOWN(15.16)				630 J
* UNKNOWN(15.17)		690 J		
* UNKNOWN(16.01)		290 J	210 J	150 J
* UNKNOWN(18.17)		700 J	290 J	120 J
* UNKNOWN(18.47)			230 J	340 J
* UNKNOWN(19.31)			230 J	
* UNKNOWN(19.32)		320 J		
* UNKNOWN(19.67)		360 J		
* UNKNOWN(19.70)				310 J
* UNKNOWN(19.71)			540 J	
* UNKNOWN(19.73)		550 J		
* UNKNOWN(20.77)			350 J	170 J
* UNKNOWN(21.21)				120 J
* UNKNOWN(21.39)				430 J
* UNKNOWN(21.40)		920 J	820 J	
* UNKNOWN(22.24)				130 J
* UNKNOWN(22.51)		370 J		
* UNKNOWN(22.96)				220 J
* UNKNOWN(23.77)			780 J	
* UNKNOWN(24.45)				200 J
* UNKNOWN(24.47)			530 J	

TABLE 4.3.16 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 16 COAL PILE YARD

DRAFT DO NOT CITE

S&A REQUEST: 507
LOCATION: COAL PILE SURFACE WATER COLLECTION SUMP LOCATED NEAR BUILDING 108
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR507010B SDG NO: CD22 TYPE: GRAB	AR507021B CD22 GRAB	AR507032B CD22 GRAB			
* UNKNOWN(24.48)	700 J					
* UNKNOWN(24.55)			590 J			
* UNKNOWN(24.57)		1800 J				
* UNKNOWN(25.10)		430 J				
* UNKNOWN(25.11)	610 J					
* UNKNOWN(25.39)	490 J					
* UNKNOWN(27.25)		350 J				
* UNKNOWN(27.68)	590 J					
* UNKNOWN(29.26)		970 J				
* UNKNOWN(33.20)	9800 J	29000 J	37000 J			

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR507010A SDG NO: ON20 TYPE: GRAB	AR507021A ON20 GRAB	AR507032A ON20 GRAB			
ACETONE	18 B	23 B	22 B			
ETHYLBENZENE	8	11	9 J			
METHYLENE CHLORIDE	8 JB	11 B	9 JB			
TETRACHLOROETHENE	8 U	3 J	10 U			
TOLUENE	3 JB	3 JB	3 JB			
XYLENE (TOTAL)	14	18	19			
* UNKNOWN(6.11)		4 J	5 J			
* UNKNOWN(6.21)	4 J					
* UNKNOWN(9.10)			2 J			
* UNKNOWN(9.15)	2 J	2 J				
* UNKNOWN(17.99)			5 J			
* UNKNOWN(18.00)	2 J					
* UNKNOWN(18.04)		3 J				
* UNKNOWN(19.76)	7 J	7 J	8 J			
* UNKNOWN(22.55)		4 J	4 J			
* UNKNOWN(22.56)	4 J					

TABLE 4.3.16 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 16 COAL PILE YARD

DRAFT DO NOT CITE

S&A REQUEST: 508
LOCATION: COLLECTION SUMPS LOCATED NEAR BUILDING 108
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR508044E SDG NO: DD22 TYPE: RINSATE					
BIS(2-ETHYLHEXYL)PHTHALATE	2 J					
DI-N-BUTYLPHTHALATE	0.7 J					
DIETHYLPHTHALATE	1 J					
* UNKNOWN HYDROCARBON(30.09)	5 J					
* UNKNOWN(8.09)	9 JB					

VOLATILE ORGANICS (UG/L)	SAMP NO: AR508044A SDG NO: GN13 TYPE: RINSATE					
ACETONE	12 B					
METHYLENE CHLORIDE	3 JB					
TOLUENE	16					

S&A REQUEST: 508
LOCATION: COLLECTION SUMPS LOCATED NEAR BUILDING 108
MEDIUM: UNSEALED CONTAINER

FIELD MEASUREMENTS	SAMP NO: AR508011	AR508022	AR508033			
CONDUCTIVITY (MS/CM)	1.7	0.67	2.5			
PH (UNITS)	4.6	5.5	2.5			
TEMPERATURE (DEG C)	7.7	5	7.1			

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: AR508011E SDG NO: ARG02 TYPE: GRAB	AR508022E ARG02 GRAB	AR508033E ARG02 GRAB			
ALDRIN	0.06 U	0.06 U	0.06 J			
HEPTACHLOR EPOXIDE	0.06 U	0.06 U	0.06 J			

TABLE 4.3.16 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 16 DRAFT DO NOT CITE
COAL PILE YARD

S&A REQUEST: 508
LOCATION: COLLECTION SUMPS LOCATED NEAR BUILDING 108
MEDIUM: UNSEALED CONTAINER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR508011E DD21B GRAB	AR508022E DD21B GRAB	AR508033E DD22 GRAB			
ACENAPHTHENE		11 U	2 J	3 J			
BIS(2-ETHYLHEXYL)PHTHALATE		2 JB	35 B	2 J			
DI-N-BUTYLPHTHALATE		0.7 JB	0.9 JB	1 J			
DI-N-OCTYL PHTHALATE		11 U	2 J	11 U			
DIBENZOFURAN		11 U	1 J	11 U			
DIETHYLPHTHALATE		11 U	11 U	1 J			
NAPHTHALENE		11 U	2 J	11 U			
2,4-DIMETHYLPHENOL		11 U	2 J	11 U			
* UNKNOWN HYDROCARBON(30.09)				7 J			
* UNKNOWN(8.00)			280 J				
* UNKNOWN(8.10)		25 J					
* UNKNOWN(8.11)				14 JB			
* UNKNOWN(8.12)			32 J				
* UNKNOWN(9.07)			54 J				
* UNKNOWN(9.57)			8 J				
* UNKNOWN(10.15)				16 J			
* UNKNOWN(20.14)			5 J				
* UNKNOWN(21.98)			9 J				

VOLATILE ORGANICS (UG/L)	SAMP NO: SDG NO: TYPE:	AR508011A ON13 GRAB	AR508022A GN13 GRAB	AR508033A GN13 GRAB			
ACETONE		7 JB	10 U	12 B			
METHYLENE CHLORIDE		3 JB	3 JB	3 JB			
TOLUENE		9	10	12			

4.22 Environmental Problem 17: The ENE 319 Landfill and Reference Soil Samples for ANL

NOTE: Environmental Problem 17a, Request 802, has been incorporated into Environmental Problem 17 text and data tables for reporting purposes.

Request Numbers: 800, 801, and 802.

Requester: B. Levitan.

Finding and Basis: The ENE 319 Landfill received wastes from 1948 to the mid 1950s. The waste was primarily construction debris, piping, ductwork, and wood. Because the operation was loosely controlled, it is possible that some radioactive or hazardous wastes may have been disposed of in the landfill. Rainwater infiltration through the fill has a potential to leach contaminants into the soil, groundwater, and nearby stream. Stream sediments may act as a sink by adsorbing contaminants. Additional soil samples were collected to provide a basis for evaluating such soil contamination in ANL soils.

4.22.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if contaminants listed in Sect. 4.22.2.2 were present in stream sediments in Area B above the levels determined by sampling at Area A. Samples were also collected to determine if contaminants listed in Sect. 4.22.2.2 (Request 801) were present in soil samples above the concentrations sampled in Request 802. Soil samples were collected to provide soil concentrations for comparison to ANL soil samples collected for Requests 800 and 801.

Supporting Information: Mercury concentrations in surface water collected in 1984 at the site boundary downgradient of the ENE 319 Landfill exceeded the 1986 U.S. EPA water quality criteria. Contaminant concentrations of organics, pesticides, PCBs, CLP-metals, cyanide, plutonium, tritium, strontium-90, and cesium-137 in soil were to be analyzed as a control for all ANL soil samples.

4.22.2 Sampling and Analytical Design

4.22.2.1 Sampling Design

Request 800: Stream Near the ENE 319 Landfill - Sediment (Fig. 4.17a). Six grab sediment samples were to be collected (Sampling Method: Reference E5.3) from the stream at the base of the ENE 319 Landfill.

The Sampling Team arrived at the sampling site 06NOV87. The stream was divided into two areas (A & B). Area A represented a control site for this sample, 50 ft upstream of the visible landfill mound. Area B was downgradient 50 ft of the landfill mound. Areas A and B were considered homogeneous, but not with respect to each other. Each sample area was restricted to approximately 100 m^2 so that analyses would reflect upgradient and downgradient contaminants, and not a concentration gradient. Each area was divided into a 2 x 30-segment grid. Three segments were selected at random in each area. One grab sample was collected to sediment depth from each selected segment.

The team decided to sample Area B first. At 1440, skies were overcast and the temperature was approximately 50^{o}F. The stream bed was full of oak leaves. Sample AR800049 was collected at 1440 from grid 8 of Area B at a sample depth of 2-3 in. There was strong resistance to the posthole digger because of coarse, rocky, sandy material. Water was very clear, with a visible film on the stream surface. Sample AR800050 was collected at 1500 from grid 26 of Area B at a sample depth of 0-2 in. The soil was much finer and darker and there were lots of fallen leaves. The team noted that the sampling site was in an extremely forested area (deciduous). Sample AR800061 was collected at 1510 from grid 49 of Area B at a sample depth of 0-2 in. The sampling site was very rocky and the sample was difficult to obtain. The material was very coarse and darker in color than sample AR800049, but lighter in color than AR800050.

The team arrived at Area A at 1640. The temperature was 46°F and winds were 0-3 mph. The sampling site for all of Request 800 was in a forested area. Sample AR800016 was collected at 1650 from grid 10 of Area A at a sample depth of 0 to 2 in. The sample was sandy, coarse, and dark brown--similar to the downstream water. The stream was slow moving and clear, but full of leaves and very rocky. There was no film on the water. Sample AR800027 was collected at 1705 from grid 40 in Area A at a sample depth of 0-1 in. The sample was very coarse, sandy sediment slightly lighter in color than sample AR800016. The water was clear and a light rain began during sampling. Sample AR800038 was collected at 1710 from grid 43 in Area A at a depth of 0-2 in. There was slightly more decaying vegetation than previous samples.

Request 801: South Base of ENE 319 Landfill - Soil (Fig. 4.17b). Six grab samples of soil were to be collected (Sampling Method: Reference E5.2.3) along depth gradients from three bore holes near the south end of the ENE 319 Landfill. The holes were located near the mound boundary, west of the stream floodplain.

The Sampling Team arrived at the sampling site on 16NOV87 at 1015. Skies were cloudy and raining, the temperature was 40-45°F, and winds were 0-5 mph. The area of interest was less than 100 m^2 and considered homogeneous. The area of interest had been divided into a 60-segment grid by the Team Leader on 13NOV87 and three segments chosen at 20-segment intervals. Landfill was evident--barrels and piping were visible on the surface. The area was rad scanned prior to sampling. Readings of 20 to 120 cpm were observed. No stressed vegetation was noted in the area. The ANL Sampling and Analysis Plan requested that the boreholes be augered to a maximum depth of 21 ft; the Team was to collect composite soil samples at intervals of 1-11 and 11-21 ft. Because the Team was unable to access the area with the auger truck, posthole diggers were used and samples were selected and composited from 1-3 ft only. Sample AR801017 was collected at 1045 from grid 4 from 1.0 to 3.0 ft. Sample AR801028 was collected from grid 24 at 1045. Sample AR801039 was collected from grid 44 at 1100. For all three collected samples, rich, dark-brown humus was evident for 0-4 in.; light-brown clay for 4 in. to 1-1/2 ft; and light brown clay with rock for 1.5-3.0 ft. Because of the limited depth of sampling, samples AR801040, -051, and -062 were not collected.

Request 802: Background for ANL - Soil (Fig. 4.17c). Nine grab soil samples were to be collected (Sampling Method: Reference E5.2.3) from three boreholes to a depth of 5 ft, north of the ENE 319 Landfill.

The Sampling Team arrived at the sampling site 09NOV87 at 1020. Skies were partly cloudy, the temperature was 40°F, and winds were calm. The specific location was 200 ft from the road, 470 ft from the ENE 319 Landfill underneath the power line. A 60 x 100 ft area was selected and divided into 60 segments. Three segments were selected at random. The area was considered homogeneous with respect to historical perturbations (farming, etc.). There was dense grass in the area. Surface soil to about 4 in. was very dark; it then changed to a light yellow-brown (possibly clay). At 1.5 ft, a "pan" was observed. This copper-colored layer was about 1/4-in. thick and could be broken easily by hand. Beneath the "pan," the soil color remained yellow-brown to a depth of 5 ft. The soil was moist, but not wet. QC rinsate sample AR802109 was collected at 1030. AR802018 (from 0.0 to 3.0 in.), AR802041 (from 3.0 to 12.0 in.), and AR802074 (from 1.0 to 5.0 ft) were collected from grid 15. AR802029 (from 0.0 to 3.0 in.), AR802052 (from 3.0 to 12.0 in.), and AR802085 (from 1.0 to 5.0 ft) were collected from grid 16. AR802030 (from 0.0 to 3.0 in.), AR802063 (from 3.0 to 12 in.), and AR802096 (from 1.0 to 5.0 ft) were collected from grid 38.

4.22.2.2 Analytical Design

Request 800: The field parameter measured for Request 800 included pH. Parameters analyzed included volatiles, semivolatiles, PCBs, and CLP-metals.

Request 801: The field parameter measured for Request 801 included pH. Parameters analyzed included volatiles, semivolatiles, PCBs,and CLP-metals.

Request 802: The field parameter measured for Request 802 included pH. Parameters analyzed included volatiles, semivolatiles, hydrocarbons by GC, pesticides, PCBs, pyridine, CLP-metals, cyanide, plutonium, tritium oxide, strontium-90, and cesium-137.

4.22.3 Field and Analytical Data

Field Data:

Request 800: *The requested pH readings for the landfill area, including the stream, are given in Table 4.3.17. The sediment pH of the samples from upstream (AR800049 to-061) and downstream (AR800016 to -038) of the landfill range between 7.6 to 8.2. The soil samples collected all gave pH readings of 7.6.*

Request 801: *The requested pH readings for the landfill area, including the stream, are given in Table 4.3.17. The soil samples collected all gave pH readings of 7.6.*

Request 802: *No field data were recorded for this request.*

Field Data Evaluation:

Request 800: Because the instrument was calibrated prior to taking the readings, the results are reliable. The soil samples were taken from 1 to 3 ft and not from 1 to 11 ft as requested in the plan. The samples from 11 to 21 ft were not collected due to inability to access the area with the auger truck; the collected samples were obtained with a posthole digger.

Request 801: Because the instrument was calibrated prior to taking the readings, the results are reliable. The samples from 11 to 21 ft were not collected due to inability to access the area with the auger truck; the collected samples were obtained with a posthole digger.

Request 802: Although a pH reading was requested, no field data were recorded.

Analytical Data:

Request 800:

Metals. Analytical results for metals in sediment are presented in Table 4.3.17. Of the 20 metals detected, the following 2 were below either the CRDL or the IDL in all six samples: silver and sodium. Of the remaining metals detected, arsenic ranged from 7.7 to 16 mg/kg, barium from 40 to 72 mg/kg, beryllium from 0.84 to 1.1 mg/kg, cadmium from 1.7 to 2.6 mg/kg, chromium from 24 to 363 mg/kg, cobalt from 11 to 13 mg/kg, copper from 20 to 60 mg/kg, lead from 13 to 53 mg/kg, mercury was 0.08 mg/kg, nickel from 21 to 34 mg/kg, and zinc from 103 to 122 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

Extractable organics. A few target compounds were identified in measured or estimated concentrations of less than 1 ppm in some of these samples. Unknowns in concentrations ranging from 7 to 30 ppm were found in six samples, along with unknowns in lower estimated concentrations (usually less than 1 ppm except in sample AR800050 where estimated concentrations were between 1 and 9 ppm for about half of the unknown compounds detected).

Volatile organics. From six to eight volatile compounds were detected in each of these six samples. Methylene chloride was detected in the blank and in all samples, with measured concentrations of up to 0.110 mg/kg and estimated concentrations (calibration range exceeded) up to 0.078 mg/kg. Acetone was also detected in the blank, and in the samples in measured concentrations of up to 0.035 mg/kg and in estimated concentrations of up to 0.011 mg/kg. Concentrations of all other volatile organic compounds detected were always estimated at less than 0.010 mg/kg.

Request 801:

Metals. Analytical results for metals in soil are presented in Table 4.3.17. Of the 20 metals detected, only sodium was below the CRDL in all three samples. Of the *remaining metals detected, arsenic ranged from 11 to 17 mg/kg, barium from 105 to 356 mg/kg, beryllium from 1.1 to 1.2 mg/kg, cadmium from 2.2 to 16 mg/kg, chromium from 14 to 28 mg/kg, cobalt from 12 to 13 mg/kg, copper from 26 to 433 mg/kg, lead from 25 to 347 mg/kg, mercury from 0.1 to 1.7 mg/kg, nickel from 27 to 58 mg/kg, silver from 2.6 to 8.4 mg/kg, and zinc from 74 to 758 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.*

PCBs and other extractables. Aroclor 1248 was indicated in one sample and aroclor 1254 was indicated in two samples. Both were below the quantitation limits, and both were estimated at less than 1 ppm.

Extractable organics. A few target compounds were identified in measured or estimated concentrations of less than 1 ppm in some of these samples. Unknowns in concentrations ranging from 7 to 30 ppm were found in six samples, along with unknowns in lower estimated concentrations (usually less than 1 ppm).

Volatile organics. There were six volatile organic compounds identified in two samples and ten compounds identified in the remaining sample. Acetone was present in all samples (concentrations always less than 0.040 mg/kg) and in the blank. Concentrations of methylene chloride exceeded the calibration range in all samples (estimated concentrations ranged from 0.203 to 1.8 mg/kg). Methylene chloride was also present in the blank. There was some 1,1,1-trichloroethane (concentration measured at 0.039 mg/kg) and some 4-methyl-2-pentanone (concentration measured at 0.036 mg/kg) in sample AR801017. All other measured or estimated concentrations of volatile organic compounds were less than 0.010 mg/kg in these samples. No tentatively identified compounds were indicated.

Request 802:

Anions and cyanide. Request 802 of this problem is a soil sample designed to provide control information for other soil systems. The analysis revealed that the concentration *of cyanide was less than 250 mg/kg which is the level that would require remedial action.*

Metals. Analytical results for metals in soil are presented in Table 4.3.17. Of the 20 metals detected, the following 2 were below either the CRDL or the IDL in all nine samples: silver and sodium. Of the remaining metals detected, arsenic ranged from 4.9 to 12 mg/kg, barium from 72 and 125 mg/kg, beryllium from 0.96 to 1.1 mg/kg, cadmium from 1.1 to 3.6 mg/kg, chromium from 13 to 26 mg/kg, cobalt from 9.7 to 15 mg/kg, copper from 9.5 to 31 mg/kg, lead from 23 to 39 mg/kg, mercury from 0.5 to 0.8 mg/kg, nickel from 12 to 30 mg/kg, and zinc from 61 to 90 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

PCBs and other extractables. Heptachlor was indicated in estimated concentrations of 10-12 µg/kg. These concentrations were, however, below quantitation limits.

Extractable organics. No target compounds were identified. Unknowns with estimated concentrations in the 20-25 ppm range occurred in three samples. Occasional other unknowns were detected in estimated concentrations between 1 and 10 ppm.

Volatile organics. There were six volatile organic compounds detected in eight of the samples, and seven such compounds detected in the other two of these background soil samples. Acetone was detected in these background samples and in the blank (sample concentrations always less than 0.025 mg/kg). Methylene chloride was also detected in the samples in concentrations beyond the calibration range but estimated to be always less than 1.5 mg/kg. Methylene chloride was also detected in the method blank. Toluene and benzene were detected in small amounts in these samples, but always in estimated concentrations of less than 0.010 mg/kg. All other measured or estimated concentrations were less than 0.010 mg/kg. No tentatively identified compounds were indicated.

Pyridine. The pyridine concentrations were not reported due to uncertainties in the results.

Radiochemistry. *For Grid 15, at the 0-3 in. depth, cesium-137 (660 pCi/kg), potassium-40 (20,000 pCi/kg), and total strontium (600 pCi/kg) were detected. At 3-12 in., tritium (4,000 pCi/kg), cesium-137 (290 pCi/kg), potassium-40, (17,000 pCi/kg), plutonium-238 (7.3 pCi/kg), and plutonium-239 (5.7 pCi/kg) were detected. At the 1-5 ft depth, cesium-137 (35 pCi/kg), tritium (11,000 pCi/kg), potassium-40 (18,000 pCi/kg), and total strontium (1,400 pCi/kg) were detected.*

For Grid 16, at the 0-3 in. depth, cesium-137 (460 pCi/kg), tritium (2,000 pCi/kg), plutonium-238 (15 pCi/kg), and plutonium-239 (13 pCi/kg) were found. At 3-12 in., cesium-137 (270 pCi/kg), tritium (10,000 pCi/kg), potassium-40, (20,000 pCi/kg), plutonium-238 (0.3 pCi/kg), and total strontium (1,000 pCi/kg) were detected. At 1-5 ft, cesium-137 (73 pCi/kg), tritium (4,000 pCi/kg), potassium-40 (21,000 pCi/kg), and plutonium-238 (0.3 pCi/kg) were detected.

For Grid 38, at the 0-3 in. depth, cesium-137 (680 pCi/kg), tritium (22,000 pCi/kg), potassium-40 (18,000 pCi/kg), and plutonium-239 (7.8 pCi/kg) were detected. Radionuclides detected in the 3-12 in. depth were cesium-137 (250 pCi/kg), tritium (5,000 pCi/kg), potassium-40 (18,000 pCi/kg), plutonium-239 (3 pCi/kg), and total strontium (600 pCi/kg). At 1-5 ft., cesium-137 (140 pCi/kg), tritium (2,000 pCi/kg), potassium-40 (22,000 pCi/kg), plutonium-238 (0.9 pCi/kg), plutonium-239 (1.1 pCi/kg), and total strontium (1,700 pCi/kg) were found.

Rinsate sample AR802109 contained plutonium-238 (0.003 pCi/L) and total strontium (1.9 pCi/L).

Analytical Data Evaluation:

Request 800:

Metals. Eleven metals of interest--arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc--were detected above the CRDL in the samples for Request 800.

Extractable organics. Target compounds identified had measured or estimated concentrations of less than 1 ppm. Unknowns were estimated in concentrations 30 ppm or less.

Volatile organics. Methylene chloride was detected in the blank and in all samples, with measured concentrations of up to 0.110 mg/kg and estimated concentrations (calibration range exceeded) up to 0.078 mg/kg. Acetone was also detected in the blank, and in measured or estimated concentrations of up to 0.035 mg/kg. Concentrations of all other volatile organic compounds detected were always estimated at less than 0.010 mg/kg.

Request 801:

Metals. Twelve metals of interest--arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc--were detected above the CRDL in the samples for Request 801.

Extractable organics. Target compounds identified had measured or estimated concentrations of less than 1 ppm. Unknowns were estimated in concentrations 30 ppm or less.

Volatile organics. Acetone was present in all samples (concentrations always less than 0.040 mg/kg) and in the blank. Concentrations of methylene chloride exceeded the calibration range in all samples (estimated concentrations ranged from 0.203 to 1.8 mg/kg). Methylene chloride was also present in the blank. There was some 1,1,1-trichloroethane (concentration measured at 0.039 mg/kg) and some 4-methyl-2-pentanone (concentration measured at 0.036 mg/kg) in sample AR801017. All other measured or estimated concentrations of volatile organic compounds were less than 0.010 mg/kg in these samples.

Request 802:

Anions and cyanide. The verification of calibration, calibration blanks, and other quality control measures were in compliance and the results are reliable.

Metals. Eleven metals of interest--arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc--were detected above the CRDL in the samples for Request 802.

PCBs and other extractables. Heptachlor was indicated in concentrations of 10-12 µg/L in samples for Request 802. However, this was not confirmed with GC/MS.

Extractable organics. No target compounds were identified. Occasional unknowns were detected in concentrations estimated at 25 ppm or less.

Volatile organics. Acetone was detected in the samples and in the blank (sample concentrations always less than 0.025 mg/kg). Methylene chloride was also detected in the samples in concentrations beyond the calibration range but estimated to be always less than 1.5 mg/kg. Methylene chloride was also detected in the method blank. All other measured or estimated concentrations were less than 0.010 mg/kg.

Pyridine. Pyridine was initially analyzed directly by solvent extraction and gas chromatography; the results were inconclusive. The spectra from the volatiles and semivolatiles were then inspected for characteristics expected for pyridine; these comparisons showed no TICs whose characteristics matched those of pyridine.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the intitial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.22.4 Limitations and Qualifications

Data Quality Level: The sampling plan is rated Quality Level II and the field sampling is rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: The sampling plan is rated Quality Level II because the area should have been scouted and accessibility determined prior to sampling.

Analytical Data:

Request 800:

Metals. Analytical results were Quality Level I except for aluminum, chromium, and zinc at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. The data for all single component pesticides in AR800016, AR800027, AR800038, AR800049, AR800050, and AR800061 should not be used because the surrogate standard was not found at the expected retention time.

Extractable organics. Data were of Quality Level III.

Volatile organics. Data quality for all target volatile compounds detected at levels above their quantitation limits was Quality Level II. Methylene chloride data were Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. Detected, but unidentified, TIC volatile compounds were Quality Level III.

Request 801:

Metals. Analytical results were Quality Level I except for sodium at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. The PCB results in AR801017 amd AR801029 are Quality Level II.

Extractable organics. Data were of Quality Level III except for the fluoranthene identified in sample AR801017 (Quality Level II).

Volatile organics. Data quality for target volatile compounds detected at levels above their quantitation limits was Quality Level II. Methylene chloride data were Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. Detected, but unidentified, TIC volatile compounds were Quality Level III.

Request 802:

Anions and cyanide. The data are Quality Level I.

Metals. Samples AR802018, -29, -30, -41, -52, -63, and -74 were Quality Level I except for aluminum, antimony, arsenic, calcium, manganese, selenium, silver, and sodium at Quality Level II. Samples AR802085 and -096 were Quality Level I except for aluminum and selenium at Quality Level II and antimony at Quality Level III. Sample AR802109 was Quality Level I except for aluminum at Quality Level II and silver at Quality Level III.

PCBs and other extractables. The results for heptachlor in AR802018, AR802029, AR802030, and AR802041 are suspect and should not be used because the surrogate retention time did not meet criteria. In like manner, the data for all single component pesticides in AR802018, AR802029, AR802030, and AR802041 should not be used because the surrogate standard was not found at the expected retention time.

Extractable organics. The data are of Quality Level III due to mass spectral uncertainties for tentatively identified compounds.

Volatile organics. Toluene in AR802109 and methylene chloride in AR802096 and AR802085 were Quality Level I. Data quality for all other target volatile compounds detected at levels above their quantitation limits was Quality Level II. Methylene chloride data were Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality III. Detected, but unidentified, TIC volatile compounds were Quality Level III.

Pyridine. The data quality level for this compound is III. A direct method which did not rely on volatile and semivolatile data should have been used.

Radiochemistry. All data are Quality Level I.

Environmental Problem: 17
Request Number: 800

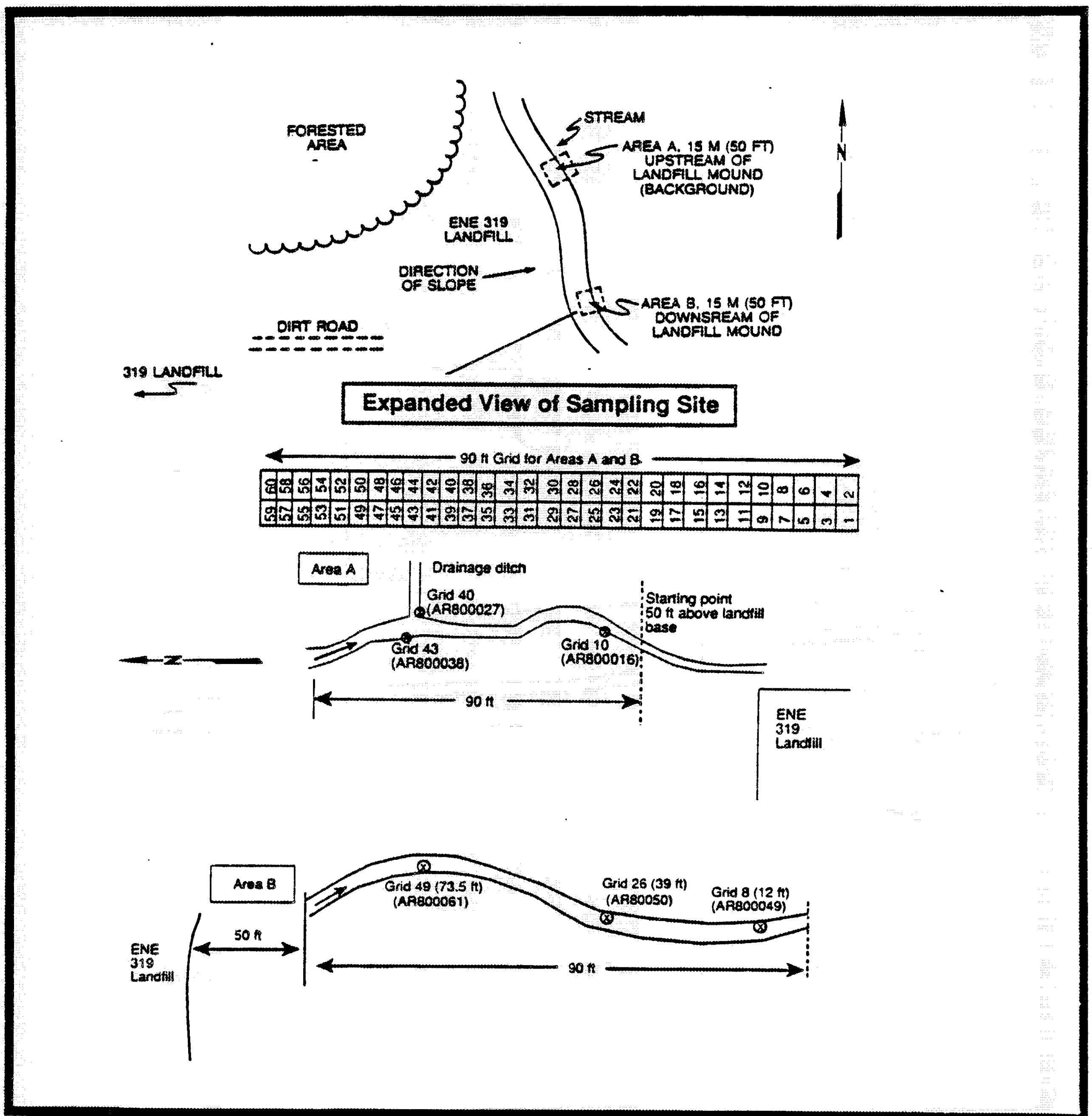

Figure 4.17a. Sediment Sampling Location Near the ENE 319 Landfill (Request 800)

Environmental Problem: 17
Request Number: 801

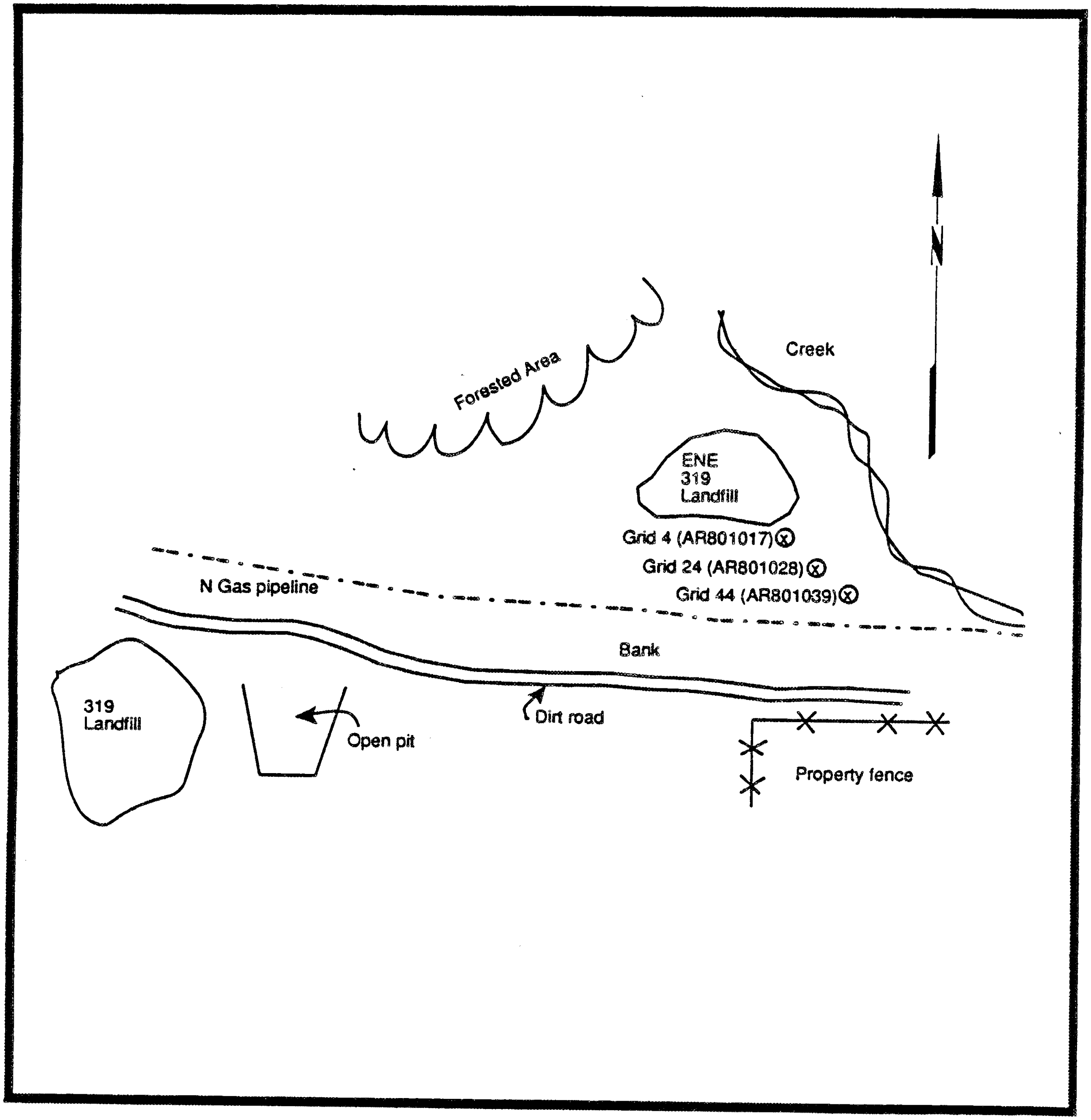

Figure 4.17b. Soil Sampling Location at the ENE 319 Landfill (Request 801)

Environmental Problem: 17
Request Number: 802

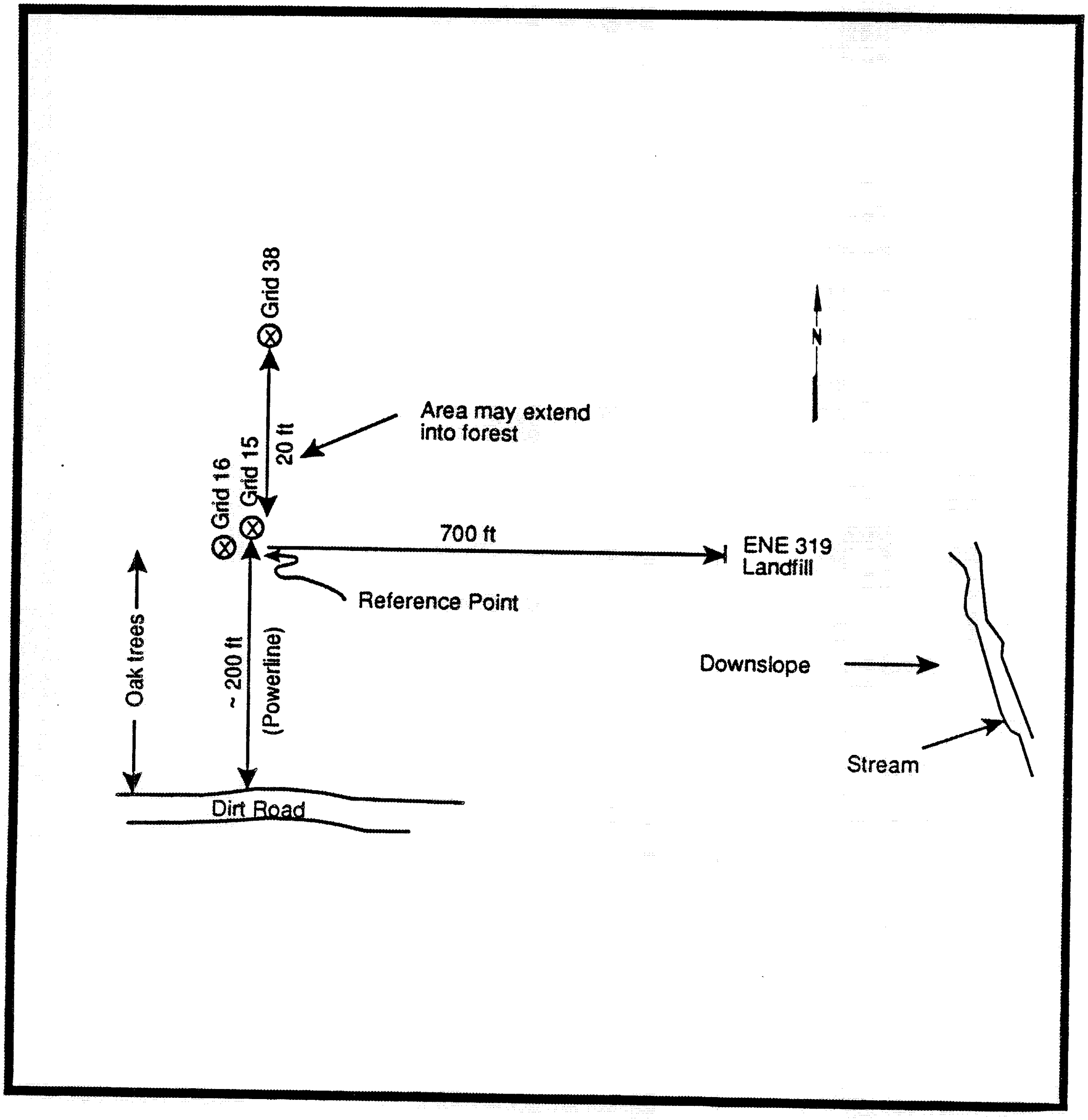

Figure 4.17c. Reference Soil Sample Site (Request 802)

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TABLE 4.2.17 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 17

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR801	319 LNDF-S	LANDFILL	SOIL	6	3	GRAB	0	0	3	3	0	0	0	0	0	0	2	3	3	3	3	3	0	0
AR802	319 LDF-NW	BACKGROUND	SOIL	9	9	BKGRN	0	9	9	9	0	0	0	10	0	0	4	9	9	9	9	9	8	8
		MED TOTAL		15	12		0	9	12	12	0	0	0	10	0	0	6	12	12	12	12	12	8	8
AR800	319 LANDF	STREAM	SEDIMENT	6	6	GRAB	0	0	6	6	0	0	0	0	0	0	0	6	6	6	6	6	0	0
		MED TOTAL		6	6		0	0	6	6	0	0	0	0	0	0	0	6	6	6	6	6	0	0
AR802	319 LDF-NW	BACKGROUND	SUR WATER	1	1	BKGRN	0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
		MED TOTAL		1	1		0	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1
		EP TOTAL		22	19		0	10	19	19	0	0	0	10	0	0	6	18	19	19	19	19	9	9

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 800
LOCATION: STREAM NEAR THE ENE 319 LANDFILL
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO: AR800016	AR800027	AR800038	AR800049	AR800050	AR800061
PH (UNITS)	8	8	7.9	8	7.6	8.2

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR800016C SDG NO: AR302013D TYPE: GRAB	AR800016C AR310013C GRAB	AR800016D AR302013E GRAB	AR800016D AR302013K GRAB	AR800027C AR302013D GRAB	AR800027C AR310013C GRAB
ALUMINUM			6470 E			
ARSENIC	16		10 UN		11	
BARIUM			64			
BERYLLIUM			1			
CADMIUM	2.2 B		2		1.7 B	
CALCIUM			70600			
CHROMIUM			24 N*			
COBALT			11			
COPPER			20			
IRON			19800 *E			
LEAD	15		18 B		24	
MAGNESIUM			39600			
MANGANESE			893 E			
MERCURY		0.03 B				0.04 B
NICKEL			21			
POTASSIUM				1400		
SILVER	1.1 U		1.3 B		1 U	
SODIUM			455 B			
VANADIUM			18			
ZINC			103 N*E			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR800027D SDG NO: AR302013E TYPE: GRAB	AR800027D AR302013K GRAB	AR800038C AR302013D GRAB	AR800038C AR310013C GRAB	AR800038D AR302013E GRAB	AR800038D AR302013K GRAB
ALUMINUM	6810 E				6560 E	
ARSENIC	11 UN		9.7		12 UN	
BARIUM	40				40 B	
BERYLLIUM	0.9 B				0.98 B	
CADMIUM	2.1		1.9 B		1.9	
CALCIUM	44400				64200	
CHROMIUM	59 N*				81 N*	
COBALT	11				10 B	
COPPER	26				46	
IRON	29800 *E				19200 *E	
LEAD	17 B		26		23 B	

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 800
LOCATION: STREAM NEAR THE ENE 319 LANDFILL
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800027D AR302013E GRAB	AR800027D AR302013K GRAB	AR800038C AR302013D GRAB	AR800038C AR310013C GRAB	AR800038D AR302013E GRAB	AR800038D AR302013K GRAB
MAGNESIUM		25600				35000	
MANGANESE		541 E				689 E	
MERCURY					0.08		
NICKEL		24				24	
POTASSIUM			1500				1200
SILVER		1.1 U		1 U		1.2 U	
SODIUM		438 B				516 B	
VANADIUM		17				16	
ZINC		133 N*E				257 N*E	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800049C AR302013D GRAB	AR800049C AR310013C GRAB	AR800049D AR302013E GRAB	AR800049D AR302013K GRAB	AR800050C AR310013C GRAB	AR800050C AR800050C GRAB
ALUMINUM				2410 E			
ARSENIC		7.7		10 UN			12
BARIUM				21 B			
BERYLLIUM				0.85			
CADMIUM		1.6 B		1.7			2.2 B
CALCIUM				113000			
CHROMIUM				49 N*			
COBALT				5.3 B			
COPPER				19			
IRON				15600 *E			
LEAD		13		11 B			53 N
MAGNESIUM				60000			
MANGANESE				643 E			
MERCURY			0.03 B			0.08	
NICKEL				13			
POTASSIUM					590 B		
SILVER		1 U		1.5 B			1.3 U
SODIUM				474 B			
VANADIUM				7.7 B			
ZINC				192 N*E			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800050D AR302013E GRAB	AR800050D AR302013K GRAB	AR800061C AR310013C GRAB	AR800061C AR800050C GRAB	AR800061D AR302013E GRAB	AR800061D AR302013K GRAB
ALUMINUM		9300 E				7480 E	

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 800
LOCATION: STREAM NEAR THE ENE 319 LANDFILL
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800050D AR302013E GRAB	AR800050D AR302013K GRAB	AR800061C AR310013C GRAB	AR800061C AR800050C GRAB	AR800061D AR302013E GRAB	AR800061D AR302013K GRAB
ARSENIC		12 UN			9.3	11 UN	
BARIUM		72				42	
BERYLLIUM		1.1				1.1	
CADMIUM		2.6			2.3 B	1.8	
CALCIUM		56500				98000	
CHROMIUM		363 N*				38 N*	
COBALT		13				11	
COPPER		60				24	
IRON		23300 *E				17300 *E	
LEAD		36 B			18 N	14 B	
MAGNESIUM		31000				56800	
MANGANESE		1060 E				885 E	
MERCURY				0.04 B			
NICKEL		34				21	
POTASSIUM			1700				2300
SILVER		1.7 B			1.1 U	1.6 B	
SODIUM		492 B				585 B	
VANADIUM		23				16	
ZINC						126 N*E	

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE:	AR800050D AR302013E GRAB					
ZINC		1460000					

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800016B CD22 GRAB	AR800027B CD22 GRAB	AR800038B CD22 GRAB	AR800049B CD22 GRAB	AR800050B CD23 GRAB	AR800061B CD23 GRAB
ANTHRACENE		400 U	400 U	4600 U	400 U	54 J	39 J
BENZO(B)FLUORANTHENE		110 J	400 U	4600 U	400 U	500 U	430 U
BENZO(K)FLUORANTHENE		110 J	400 U	4600 U	400 U	500 U	430 U
BIS(2-ETHYLHEXYL)PHTHALATE		66 J	400 U	4600 U	81 J	500 U	430 U
DI-N-BUTYLPHTHALATE		400 U	30 J	4600 U	400 U	500 U	430 U
DIETHYLPHTHALATE		24 J	27 J	4600 U	31 J	54 J	430 U
FLUORANTHENE		35 J	32 J	4600 U	400 U	360 J	68 J
PHENANTHRENE		400 U	29 J	4600 U	400 U	230 J	36 J
PYRENE		400 U	79 J	4600 U	400 U	210 J	54 J
* SULFUR(29.23)			580 J				

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 800
LOCATION: STREAM NEAR THE ENE 319 LANDFILL
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR800016B CD22 GRAB	AR800027B CD22 GRAB	AR800038B CD22 GRAB	AR800049B CD22 GRAB	AR800050B CD23 GRAB	AR800061B CD23 GRAB
* SULFUR(29.31)						3000 J	
* UNKNOWN(7.26)				22000 J			
* UNKNOWN(7.62)				630 J			
* UNKNOWN(8.03)				3500 J	320 J		
* UNKNOWN(8.04)			310 J				
* UNKNOWN(8.06)		230 J					
* UNKNOWN(8.40)				270 J			
* UNKNOWN(8.42)							47 J
* UNKNOWN(9.34)			470 J				
* UNKNOWN(9.36)		440 J					
* UNKNOWN(10.25)						170 J	
* UNKNOWN(10.29)			150 J				
* UNKNOWN(10.34)							68 J
* UNKNOWN(11.24)						90 J	
* UNKNOWN(11.26)							59 J
* UNKNOWN(11.31)						130 J	
* UNKNOWN(11.33)							100 J
* UNKNOWN(12.55)			84 J		40 J		55 J
* UNKNOWN(12.76)							170 J
* UNKNOWN(13.56)					59 J		
* UNKNOWN(15.16)		1300 J	690 J		510 J	1300 J	1200 J
* UNKNOWN(15.35)		680 J					
* UNKNOWN(15.50)							64 J
* UNKNOWN(16.27)							57 J
* UNKNOWN(18.45)					160 J		
* UNKNOWN(18.46)		750 J	240 J				450 J
* UNKNOWN(18.47)						1100 J	
* UNKNOWN(20.94)		440 J					
* UNKNOWN(21.39)					110 J		
* UNKNOWN(21.40)		460 J					
* UNKNOWN(21.41)			150 J			920 J	280 J
* UNKNOWN(23.95)		400 J					
* UNKNOWN(24.03)					75 J		
* UNKNOWN(24.04)		450 J	130 J			720 J	210 J
* UNKNOWN(25.86)					79 J		65 J
* UNKNOWN(26.29)		610 J					
* UNKNOWN(26.31)							160 J
* UNKNOWN(26.32)						470 J	
* UNKNOWN(28.01)							100 J
* UNKNOWN(28.32)		470 J					
* UNKNOWN(28.36)						340 J	91 J
* UNKNOWN(29.21)					100 J		

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 800
LOCATION: STREAM NEAR THE ENE 319 LANDFILL
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR800016B	AR800027B	AR800038B	AR800049B	AR800050B	AR800061B
	SDG NO:	CD22	CD22	CD22	CD22	CD23	CD23
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(29.22)		370 J		3500 J			
* UNKNOWN(29.23)							310 J
* UNKNOWN(30.19)		840 J					
* UNKNOWN(31.90)		630 J					
* UNKNOWN(31.92)						800 J	
* UNKNOWN(33.17)		8500 J		27000 J			
* UNKNOWN(33.19)			12000 J			8300 J	
* UNKNOWN(33.20)		8000 J			19000 J		
* UNKNOWN(33.49)						2400 J	
* UNKNOWN(34.90)						1400 J	
* UNKNOWN(35.70)						770 J	
* UNKNOWN(43.59)						3000 J	
* UNKNOWN(44.36)						1300 J	
* UNKNOWN(44.96)						1000 J	
* UNKNOWN(47.48)						2500 J	

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR800016A	AR800027A	AR800038A	AR800049A	AR800050A	AR800061A
	SDG NO:	ON16	ON16	ON16	ON16	ON16	ON16
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		11 JB	20 B	29 B	11 JB	35 B	10 JB
CARBON DISULFIDE		6 U	6 U	1 J	6 U	2 J	2 J
METHYLENE CHLORIDE		460 BE	270 BE	780 BE	22 B	770 BE	110 B
TOLUENE		6 U	6 U	7 U	6 U	2 JB	2 JB
* ACETIC ACID, METHYL EST(9.70)							3 J

S&A REQUEST: 801
LOCATION: SOUTH BASE OF ENE 319 LANDFILL
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR801017	AR801028	AR801039			
PH (UNITS)		7.6	7.6	7.6			

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 801
LOCATION: SOUTH BASE OF ENE 319 LANDFILL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR801017C / AR805022D / GRAB	AR801017C / AR806012D / GRAB	AR801017D / AR507010C / GRAB	AR801017D / AR507010K / GRAB	AR801028C / AR801028C / GRAB	AR801028C / AR805022D / GRAB
ALUMINUM				12400			
ARSENIC			17	10 U		13	
BARIUM				142			
BERYLLIUM				1.2			
CADMIUM			116 N	8.6		6.9	
CALCIUM				42300			
CHROMIUM				28			
COBALT				13			
COPPER				433			
IRON				29000			
LEAD			347	196		135	
MAGNESIUM				24500			
MANGANESE				1010			
MERCURY		1.7					0.29
NICKEL				58			
POTASSIUM					3400		
SILVER			8.4 N	5.2		2.6	
SODIUM				192 B			
VANADIUM				27			
ZINC				758			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR801028D / AR507010C / GRAB	AR801028D / AR507010K / GRAB	AR801039C / AR801028C / GRAB	AR801039C / AR805022D / GRAB	AR801039D / AR507010C / GRAB	AR801039D / AR507010K / GRAB
ALUMINUM		11300				11200	
ARSENIC		10 U		11		11 U	
BARIUM		356				105	
BERYLLIUM		1.1				1.2	
CADMIUM		4.6		3.2 B		2.2	
CALCIUM		62300				52000	
CHROMIUM		18				14	
COBALT		12				12	
COPPER		219				26	
IRON		27800				28600	
LEAD		91		25		21 B	
MAGNESIUM		37800				31600	
MANGANESE		872				1340	
MERCURY					0.1		
NICKEL		39				27	
POTASSIUM			2700				2100

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 801
LOCATION: SOUTH BASE OF ENE 319 LANDFILL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR801028D	AR801028D	AR801039C	AR801039C	AR801039D	AR801039D
	SDG NO:	AR507010C	AR507010K	AR801028C	AR805022D	AR507010C	AR507010K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
SILVER		4		1 U		1.7 B	
SODIUM		230 B				221 B	
VANADIUM		24				29	
ZINC		521				74	

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO:	AR801017B	AR801028B	AR801039B
	SDG NO:	ARG03	ARG03	ARG03
	TYPE:	GRAB	GRAB	GRAB
AROCLOR-1248		260 J	98 U	98 U
AROCLOR-1254		750 J	490 J	200 U

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR801017B	AR801028B	AR801039B
	SDG NO:	C106	C106	C106
	TYPE:	GRAB	GRAB	GRAB
ANTHRACENE		24 J	330 U	330 U
BENZO(A)ANTHRACENE		130 J	330 U	330 U
BENZO(A)PYRENE		97 J	330 U	330 U
BENZO(B)FLUORANTHENE		200 J	28 J	330 U
BENZO(G,H,I)PERYLENE		57 J	15 J	330 U
BENZO(K)FLUORANTHENE		220 J	330 U	330 U
BIS(2-ETHYLHEXYL)PHTHALATE		77 J	74 J	93 J
BUTYLBENZYLPHTHALATE		61 J	330 U	330 U
CHRYSENE		140 J	330 U	330 U
DI-N-BUTYLPHTHALATE		210 J	13 J	330 U
DI-N-OCTYL PHTHALATE		330 U	330 U	17 J
DIETHYLPHTHALATE		2100	100 J	330 U
FLUORANTHENE		360	21 J	330 U
INDENO(1,2,3-CD)PYRENE		57 J	15 J	330 U
PHENANTHRENE		110 J	330 U	330 U
PYRENE		240 J	17 J	330 U
* UNKNOWN(7.29)				3300 J
* UNKNOWN(7.43)			7300 J	
* UNKNOWN(7.45)		970 J		
* UNKNOWN(7.46)				1300 J
* UNKNOWN(7.62)			490 J	
* UNKNOWN(7.64)				190 J
* UNKNOWN(7.66)		140 J		
* UNKNOWN(7.85)			460 J	

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17
THE ENE 319 LANDFILL

S&A REQUEST: 801
LOCATION: SOUTH BASE OF ENE 319 LANDFILL
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: SDG NO: TYPE:	AR801017B C106 GRAB	AR801028B C106 GRAB	AR801039B C106 GRAB
* UNKNOWN(7.87)				160 J
* UNKNOWN(7.89)		120 J		
* UNKNOWN(10.12)		370 J		
* UNKNOWN(10.17)				490 J
* UNKNOWN(10.20)			690 J	
* UNKNOWN(11.14)				130 J
* UNKNOWN(11.31)		460 J		
* UNKNOWN(11.32)				170 J
* UNKNOWN(11.35)			410 J	
* UNKNOWN(12.20)			130 J	
* UNKNOWN(12.21)		54 J		
* UNKNOWN(12.66)			110 J	
* UNKNOWN(12.68)		100 J		
* UNKNOWN(13.31)				82 J
* UNKNOWN(24.42)		77 J		
* UNKNOWN(24.43)			76 J	
* UNKNOWN(24.86)				170 J
* UNKNOWN(27.10)		67 J		
* UNKNOWN(27.88)		120 J	79 J	
* UNKNOWN(27.89)				120 J
* UNKNOWN(28.40)		76 J		
* UNKNOWN(29.63)		66 J		
* UNKNOWN(31.24)		96 J		
* UNKNOWN(31.93)		96 J		
* UNKNOWN(32.13)		110 J		
* UNKNOWN(33.03)			150 J	
* UNKNOWN(33.04)		140 J		
* UNKNOWN(34.33)		180 J		
* UNKNOWN(35.08)		180 J		
* UNKNOWN(35.09)			190 J	210 J
* UNKNOWN(36.05)		140 J		
* UNKNOWN(37.89)			210 J	
* UNKNOWN(39.80)			190 J	
* UNKNOWN(42.00)				290 J
* UNKNOWN(42.38)				140 J
* UNKNOWN(47.06)		270 J		

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 801
LOCATION: SOUTH BASE OF ENE 319 LANDFILL
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR801017A SDG NO: OD01 TYPE: GRAB	AR801028A GN25 GRAB	AR801039A GN25 GRAB			
ACETONE	18 B	30 B	38 B			
ETHYLBENZENE	5	6 U	6 U			
METHYLENE CHLORIDE	203 E	1800 BE	1200 BE			
XYLENE (TOTAL)	9	6 U	6 U			
1,1,1-TRICHLOROETHANE	39	6 U	6 U			
4-METHYL-2-PENTANONE	36	12 U	12 U			

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR802018E SDG NO: AR501014F TYPE: BACKGROUND	AR802018E AR802018E BACKGROUND	AR802018F AR406030M BACKGROUND	AR802018F AR501014K BACKGROUND	AR802029E AR501014F BACKGROUND	AR802029E AR802018E BACKGROUND
ALUMINUM			10400			
ARSENIC		6.7 N	12 UN			8.6 N
BARIUM			106 E			
BERYLLIUM			0.58 B			
CADMIUM		2.3 B	1.9			2.3 B
CALCIUM			3000			
CHROMIUM			14			
COBALT			11			
COPPER			13			
IRON			14600 E			
LEAD		31	33 B			36
MAGNESIUM			2730			
MANGANESE			947 N*			
MERCURY	0.07 B				0.05	
NICKEL			15			
POTASSIUM				1600		
SILVER		1.2 U	1.6 BN			1.1 U
SODIUM			65 B			
VANADIUM			28			
ZINC			69			

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR802029F	AR802029F	AR802030E	AR802030E	AR802030F	AR802030F
	SDG NO:	AR406030M	AR501014K	AR501014F	AR802018E	AR406030M	AR501014K
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
ALUMINUM		11700				10400	
ARSENIC		12 UN			7.1 N	11 UN	
BARIUM		104 E				125 E	
BERYLLIUM		0.69 B				0.54 B	
CADMIUM		1.7			2.2 B	1.5	
CALCIUM		3920				2940	
CHROMIUM		15				13	
COBALT		10				8.6 B	
COPPER		16				13	
IRON		17900 E				14500 E	
LEAD		26 B			39	28 B	
MAGNESIUM		3610				2500	
MANGANESE		1030 N*				1020 N*	
MERCURY				0.08			
NICKEL		17				13	
POTASSIUM			1500				1600
SILVER		1.2 UN			1.2 U	1.1 UN	
SODIUM		63 B				52 B	
VANADIUM		30				27	
ZINC		75				90	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR802041E	AR802041E	AR802041F	AR802041F	AR802052E	AR802052E
	SDG NO:	AR310013C	AR501014F	AR406030M	AR501014K	AR310013C	AR501014F
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
ALUMINUM				11400			
ARSENIC		4.9 *		10 UN		5.5 *	
BARIUM				114 E			
BERYLLIUM				0.6 B			
CADMIUM		2.3 B**		1.1		2.3 B**	
CALCIUM				1900			
CHROMIUM				14			
COBALT				12			
COPPER				11			
IRON				15500 E			
LEAD		24 *		26 B		27 *	
MAGNESIUM				2620			
MANGANESE				1180 N*			
MERCURY			0.05 B				0.05 B
NICKEL				12			
POTASSIUM					1300		

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR802041E AR310013C BACKGROUND	AR802041E AR501014F BACKGROUND	AR802041F AR406030M BACKGROUND	AR802041F AR501014K BACKGROUND	AR802052E AR310013C BACKGROUND	AR802052E AR501014F BACKGROUND
SILVER		1.1 U		1 UN		1 U	
SODIUM				75 B			
VANADIUM				31			
ZINC				66			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR802052F AR406030M BACKGROUND	AR802052F AR501014K BACKGROUND	AR802063E AR501014F BACKGROUND	AR802063E AR802018E BACKGROUND	AR802063F AR406030M BACKGROUND	AR802063F AR501014K BACKGROUND
ALUMINUM		13100				11600	
ARSENIC		10 UN			5.8 N	10 UN	
BARIUM		98 E				106 E	
BERYLLIUM		0.68 B				0.49 B	
CADMIUM		1.7			4.3 B	1.2	
CALCIUM		3030				1940	
CHROMIUM		16				14	
COBALT		9.8				9.7	
COPPER		12				9.5	
IRON		17300 E				15800 E	
LEAD		20 B			29	27 B	
MAGNESIUM		3730				2560	
MANGANESE		778 N*				711 N*	
MERCURY				0.05 B			
NICKEL		16				13	
POTASSIUM			1400				1200
SILVER		1.4 BN			1.1 U	1.1 UN	
SODIUM		103 B				291 B	
VANADIUM		33				29	
ZINC		61				65	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR802074E AR501014F BACKGROUND	AR802074E AR802018E BACKGROUND	AR802074F AR406030M BACKGROUND	AR802074F AR501014K BACKGROUND	AR802085E AR501014F BACKGROUND	AR802085E AR802018E BACKGROUND
ALUMINUM				19000			
ARSENIC			12 N	10 UN			10 N
BARIUM				74 E			
BERYLLIUM				0.96			
CADMIUM			3.4 B	2.2			3.6 B
CALCIUM				1700			

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR802074E / AR501014F / BACKGROUND	AR802074E / AR802018E / BACKGROUND	AR802074F / AR406030M / BACKGROUND	AR802074F / AR501014K / BACKGROUND	AR802085E / AR501014F / BACKGROUND	AR802085E / AR802018E / BACKGROUND
CHROMIUM				21			
COBALT				13			
COPPER				27			
IRON				30700 E			
LEAD			25	15 B			23
MAGNESIUM				4290			
MANGANESE				643 N*			
MERCURY		0.08				0.08	
NICKEL				25			
POTASSIUM					2000		
SILVER			1 U	1 UN			0.99 U
SODIUM				78 B			
VANADIUM				40			
ZINC				76			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR802085F / AR802085F / BACKGROUND	AR802085F / AR802085K / BACKGROUND	AR802096E / AR501014F / BACKGROUND	AR802096E / AR802018E / BACKGROUND	AR802096F / AR802085F / BACKGROUND	AR802096F / AR802085K / BACKGROUND
ALUMINUM		21400				19000	
ARSENIC		9.8 U			12 N	10 U	
BARIUM		72 E				92 E	
BERYLLIUM		1.1				1.1	
CADMIUM		1.7			3 B	1.6	
CALCIUM		1600				1620	
CHROMIUM		26				23	
COBALT		12				15	
COPPER		31				26	
IRON		34800				31700	
LEAD		20 B			27	24 B	
MAGNESIUM		5180				4520	
MANGANESE		469				581	
MERCURY				0.05 B			
NICKEL		30				29	
POTASSIUM			3000				2400
SILVER		0.98 U			1 U	1 U	
SODIUM		145 B				129 B	
VANADIUM		48				42	
ZINC		82				83	

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO:	AR802018C	AR802029C	AR802030C	AR802041C	AR802052C	AR802063C
	SDG NO:	ARG01	ARG01	ARG01	ARG01	ARG01	ARG01
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
HEPTACHLOR		10 J	12 J	10 J	11 J	9.1 U	11 U

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO:	AR802074C	AR802085C	AR802096C			
	SDG NO:	ARG01	ARG01	ARG01			
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND			
HEPTACHLOR		10 U	10 U	9.1 U			

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR802018C	AR802029C	AR802030C	AR802041C	AR802052C	AR802063C
	SDG NO:	CD23	CD24	CD24	CD24	CD24	CD24
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
* MYREX(35.25)				330 J			
* UNKNOWN(7.58)					25000 J		
* UNKNOWN(7.59)							
* UNKNOWN(7.62)							20000 J
* UNKNOWN(7.70)						26000 J	
* UNKNOWN(7.75)							
* UNKNOWN(7.83)							
* UNKNOWN(7.85)							
* UNKNOWN(7.90)			56 J				
* UNKNOWN(7.95)			58 J	62 J			
* UNKNOWN(8.06)							
* UNKNOWN(8.09)							
* UNKNOWN(8.40)			75 J				
* UNKNOWN(9.18)				51 J			
* UNKNOWN(9.35)				800 J			
* UNKNOWN(9.36)			860 J				
* UNKNOWN(9.38)					540 J		
* UNKNOWN(9.40)							530 J
* UNKNOWN(9.42)						550 J	
* UNKNOWN(9.45)							
* UNKNOWN(9.49)						370 J	
* UNKNOWN(9.51)		430 J					
* UNKNOWN(9.52)			480 J	530 J	360 J		
* UNKNOWN(9.54)							260 J
* UNKNOWN(9.77)							
* UNKNOWN(10.28)							
* UNKNOWN(10.36)							
* UNKNOWN(10.66)		82 J	84 J	71 J			

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 DRAFT DO NOT CITE
THE ENE 319 LANDFILL

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: SDG NO: TYPE:	AR802018C CD23 BACKGROUND	AR802029C CD24 BACKGROUND	AR802030C CD24 BACKGROUND	AR802041C CD24 BACKGROUND	AR802052C CD24 BACKGROUND	AR802063C CD24 BACKGROUND
* UNKNOWN(11.14)							
* UNKNOWN(11.25)			110 J	110 J			
* UNKNOWN(11.32)			160 J	170 J			
* UNKNOWN(11.34)							
* UNKNOWN(11.44)			130 J				
* UNKNOWN(11.45)		75 J					
* UNKNOWN(11.50)							
* UNKNOWN(11.51)							
* UNKNOWN(11.78)						440 J	
* UNKNOWN(11.79)							
* UNKNOWN(11.80)			330 J		310 J		
* UNKNOWN(11.83)							440 J
* UNKNOWN(11.84)							
* UNKNOWN(11.87)							
* UNKNOWN(13.56)		39 J					
* UNKNOWN(14.13)		36 J					
* UNKNOWN(14.14)			79 J	80 J			
* UNKNOWN(14.86)		86 J					
* UNKNOWN(14.87)			130 J	68 J			
* UNKNOWN(15.46)			45 J				
* UNKNOWN(15.78)		32 J					
* UNKNOWN(15.80)				140 J			
* UNKNOWN(15.81)			63 J				
* UNKNOWN(19.22)		43 J	47 J				
* UNKNOWN(19.23)							
* UNKNOWN(21.19)		34 J					
* UNKNOWN(21.58)		30 J					
* UNKNOWN(22.98)			95 J				
* UNKNOWN(22.99)				120 J			
* UNKNOWN(23.84)		45 J					
* UNKNOWN(25.86)		53 J					
* UNKNOWN(26.19)			64 J				
* UNKNOWN(26.51)				63 J			
* UNKNOWN(26.81)							
* UNKNOWN(26.83)							
* UNKNOWN(26.85)							
* UNKNOWN(27.77)		51 J					
* UNKNOWN(27.89)			76 J				
* UNKNOWN(27.90)		94 J					
* UNKNOWN(28.02)		140 J	200 J	140 J			
* UNKNOWN(28.03)							
* UNKNOWN(28.59)							

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR802018C CD23 BACKGROUND	AR802029C CD24 BACKGROUND	AR802030C CD24 BACKGROUND	AR802041C CD24 BACKGROUND	AR802052C CD24 BACKGROUND	AR802063C CD24 BACKGROUND
* UNKNOWN(30.20)		270 J					
* UNKNOWN(30.22)			420 J				
* UNKNOWN(32.70)							
* UNKNOWN(33.07)							
* UNKNOWN(33.13)							
* UNKNOWN(33.21)							1600 J
* UNKNOWN(33.23)							
* UNKNOWN(33.24)							
* UNKNOWN(33.28)							
* UNKNOWN(33.68)							
* UNKNOWN(35.24)		330 J					
* UNKNOWN(37.47)		630 J					
* UNKNOWN(39.99)				440 J			

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR802074C CD24 BACKGROUND	AR802085C CD24 BACKGROUND	AR802096C CD24 BACKGROUND			
* MYREX(35.25)							
* UNKNOWN(7.58)							
* UNKNOWN(7.59)			8900 J				
* UNKNOWN(7.62)							
* UNKNOWN(7.70)							
* UNKNOWN(7.75)		410 J					
* UNKNOWN(7.83)				330 J			
* UNKNOWN(7.85)		360 J					
* UNKNOWN(7.90)							
* UNKNOWN(7.95)							
* UNKNOWN(8.06)				610 J			
* UNKNOWN(8.09)		560 J					
* UNKNOWN(8.40)							
* UNKNOWN(9.18)							
* UNKNOWN(9.35)							
* UNKNOWN(9.36)							
* UNKNOWN(9.38)							
* UNKNOWN(9.40)		1100 J					
* UNKNOWN(9.42)				1000 J			
* UNKNOWN(9.45)			590 J				
* UNKNOWN(9.49)							
* UNKNOWN(9.51)				450 J			
* UNKNOWN(9.52)							

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR802074C SDG NO: CD24 TYPE: BACKGROUND	AR802085C CD24 BACKGROUND	AR802096C CD24 BACKGROUND			
* UNKNOWN(9.54)	490 J	1600 J				
* UNKNOWN(9.77)			280 J			
* UNKNOWN(10.28)	200 J		180 J			
* UNKNOWN(10.36)		490 J				
* UNKNOWN(10.66)						
* UNKNOWN(11.14)		820 J				
* UNKNOWN(11.25)						
* UNKNOWN(11.32)						
* UNKNOWN(11.34)	180 J					
* UNKNOWN(11.44)						
* UNKNOWN(11.45)						
* UNKNOWN(11.50)			1400 J			
* UNKNOWN(11.51)		890 J				
* UNKNOWN(11.78)						
* UNKNOWN(11.79)			410 J			
* UNKNOWN(11.80)						
* UNKNOWN(11.83)						
* UNKNOWN(11.84)		600 J				
* UNKNOWN(11.87)	130 J					
* UNKNOWN(13.56)						
* UNKNOWN(14.13)						
* UNKNOWN(14.14)						
* UNKNOWN(14.86)						
* UNKNOWN(14.87)	120 J					
* UNKNOWN(15.46)						
* UNKNOWN(15.78)						
* UNKNOWN(15.80)						
* UNKNOWN(15.81)						
* UNKNOWN(19.22)						
* UNKNOWN(19.23)	100 J					
* UNKNOWN(21.19)						
* UNKNOWN(21.58)						
* UNKNOWN(22.98)						
* UNKNOWN(22.99)						
* UNKNOWN(23.84)						
* UNKNOWN(25.86)						
* UNKNOWN(26.19)						
* UNKNOWN(26.51)						
* UNKNOWN(26.81)	280 J					
* UNKNOWN(26.83)			340 J			
* UNKNOWN(26.85)		750 J				
* UNKNOWN(27.77)						

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR802074C	AR802085C	AR802096C			
	SDG NO:	CD24	CD24	CD24			
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND			
* UNKNOWN(27.89)							
* UNKNOWN(27.90)							
* UNKNOWN(28.02)							
* UNKNOWN(28.03)			210 J	210 J			
* UNKNOWN(28.59)			190 J				
* UNKNOWN(30.20)							
* UNKNOWN(30.22)							
* UNKNOWN(32.70)			11 J				
* UNKNOWN(33.07)			31 J				
* UNKNOWN(33.13)				30 J			
* UNKNOWN(33.21)							
* UNKNOWN(33.23)		1500 J					
* UNKNOWN(33.24)				1500 J			
* UNKNOWN(33.28)			1500 J				
* UNKNOWN(33.68)			16 J				
* UNKNOWN(35.24)							
* UNKNOWN(37.47)							
* UNKNOWN(39.99)							

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR802018A	AR802029A	AR802030A	AR802041A	AR802052A	AR802063A
	SDG NO:	GN17	GN17	ON17	ON17	ON17	ON17
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
ACETONE		16 B	20 B	5 JB	18 B	14 B	17 B
ETHYLBENZENE		7 U	7 U	8 U	7 U	7 U	7 U
METHYLENE CHLORIDE		1100 BE	710 BE	1500 BE	550 BE	980 BE	1100 BE
TOLUENE		7 U	7 U	8 U	7 U	2 JB	2 JB

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR802074A	AR802085A	AR802096A			
	SDG NO:	ON17	ON19	ON19			
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND			
ACETONE		11 JB	21 B	21 B			
ETHYLBENZENE		6 U	6 JB	6 JB			
METHYLENE CHLORIDE		360 BE	1200 BE	1200 BE			
TOLUENE		6 U	2 JB	2 JB			

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17 THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SOIL

RADIOCHEMISTRY (PCI/KGD)	SAMP NO:	AR802029H	AR802030H	AR802041H	AR802052G	AR802052H	AR802063G
	SDG NO:	LLL7672	LLL7672	LLL7672	LLL7672	LLL7672	LLL7672
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
CS-137		440	680	290		270	
H-3					10000		5000
K-40		15000	18000	17000		20000	
PU-238		15	0	7.3		0.3	
PU-239		13	7.8	5.7		0	
SR-TOT		0	0	0		1000	

RADIOCHEMISTRY (PCI/KGD)	SAMP NO:	AR802063H	AR802074G	AR802074H	AR802085G	AR802085H	AR802096G
	SDG NO:	LLL7672	LLL7672	LLL7672	LLL7672	LLL7672	LLL7672
	TYPE:	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND	BACKGROUND
CS-137		250		35		73	
H-3			11000		4000		2000
K-40		18000		18000		21000	
PU-238		0		0		0.3	
PU-239		3		0		0	
SR-TOT		600		1400		0	

RADIOCHEMISTRY (PCI/KGD)	SAMP NO:	AR802096H
	SDG NO:	LLL7672
	TYPE:	BACKGROUND
CS-137		140
H-3		
K-40		22000
PU-238		0.86
PU-239		1.1
SR-TOT		1700

TABLE 4.3.17 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 17
THE ENE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 802
LOCATION: BACKGROUND FOR ANL
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)			
SAMP NO:	AR802109H	AR802109H	AR802109I
SDG NO:	AR401024A	AR500353F	AR300044B
TYPE:	BACKGROUND	BACKGROUND	BACKGROUND
ALUMINUM			107 BNE
CADMIUM		0.4 B	
IRON			259
LEAD		265	
MAGNESIUM			34 B
MANGANESE			13 B
MERCURY	0.03 B		
NICKEL			10 B

EXTRACTABLE ORGANICS (UG/L)	
SAMP NO:	AR802109G
SDG NO:	DD24
TYPE:	BACKGROUND
BIS(2-ETHYLHEXYL)PHTHALATE	2 JB
DI-N-BUTYLPHTHALATE	0.7 J
DIETHYLPHTHALATE	0.9 JB
* HALOGENATED UNKNOWN(26.98)	10 JB
* UNKNOWN HYDROCARBON(8.12)	33 JB
* UNKNOWN(21.48)	4 J
* UNKNOWN(22.20)	14 J
* UNKNOWN(37.46)	22 J

VOLATILE ORGANICS (UG/L)	
SAMP NO:	AR802109A
SDG NO:	GN17
TYPE:	BACKGROUND
ACETONE	22 B
METHYLENE CHLORIDE	3 JB

RADIOCHEMISTRY (PCI/L)			
SAMP NO:	AR802109K	AR802109L	AR802109M
SDG NO:	LLL7669	LLL7669	LLL7669
TYPE:	BACKGROUND	BACKGROUND	BACKGROUND
H-3	0		
PU-238		0.003	
PU-239		0	
SR-TOT			1.9

4.23 Environmental Problem 18: 317 Area French Drain

Request Numbers: 803 and 804.

Requester: B. Levitan.

Finding and Basis: The 317 Area French drain was in operation for approximately 5 years in the mid 1950s. Employee interviews indicate that a solvent containing paraffin, naphthenes, aromatics, and olefins was poured into an 18-inch fill pipe. Based on disposal records for subsequent French drains at ANL, a variety of hazardous substances may have also been disposed of in the 317 Area drain. Liquid chemicals may have seeped directly into the surface drainage swale, contaminating surface waters and sediment. They may have also migrated into the soil and groundwater.

4.23.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if the contaminants listed in Sect. 4.23.2 were present in the soil and sediment in or near the area of the 317 Area French drain, as compared to background.

Supporting Information: There were no records as to the types or quantities of materials disposed of in the 317 Area French drain. Employee recollections indicated that a variety of chemicals, including hazardous organics, were probably disposed of in all ANL French drains. These may have included PCBs, metals (including mercury), and cyanide. The potential existed for suspect contaminants to move horizontally into a surface drainage swale and vertically into the soil profile. Sediments may have acted as a pollutant sink; the presence of contaminants above background would indicate a potential for chemical transport into surface water during periods of runoff.

4.23.2 Sampling and Analytical Design

4.23.2.1 Sampling Design

Request 803: 317 Area French Drain - Soil (Fig. 4.18a). Six grab soil samples were to be collected (Sampling Method: Reference E5.2.3) in the area of the 317 Area French drain.

The Sampling Team arrived at the sampling site 10NOV87 at 1145. Skies were overcast, the temperature was 42^{O}F, and winds were high. The French drain fill pipe was approximately 50 ft north of the control tower and drainage was approximately 65 ft southeast. The team divided the area beginning at the former fill pipe location and extending 3 m toward the fence into a 1 x 60-segment grid. A starting point near the site of the former fill pipe was selected from the 0-20 segment section of the grid; the subsequent two sample points equaled the previous point plus 20 segments. The team place the drill rig at hole one (grid 15) and adjusted it for sampling. The first attempt at drilling (AR803019) was only to 6 ft in grid 15 because of rocks. (AR803042 was not collected for this reason.) Activity was halted pending the decision of the Field Team Leader with respect to sample plan depth (0-10 ft and 10-20 ft composites). Activity resumed on 12NOV87 with a decision to auger 0-8 ft and 8-16 ft. These increments were dictated by drill rod lengths. Rock (gravel) was present to 3 ft, grading into soil. Hole two (grid 35) was to 16 ft (AR803020 and AR803053) and hole three (grid 55) was to 16 ft with water present at 7 ft (AR803031 and AR803064). At 12 ft, the trimmings were mainly water. A gamma scan of the area indicated 20 to 40 cpm. All soil pH measurements were noted as "soil pH in water."

Request 804: Drainage Swale Southeast of the 317 Area French Drain - Sediment (Fig. 4.18b). Three surface grab samples of sediment were to be collected (Sampling Method: Reference E5.3.1) in the drainage swale upstream from contributions of the adjacent ENE 319 Landfill. The samples were to be collected as close to the head of the swale as possible.

The Sampling Team arrived at the sampling location 05NOV87 at 1020. Winds were out of the NW at 10-15 mph and the temperature was approximately 40^{o}F. The area of interest was a reach of approximately 10 ft starting at the head of the drainage swale and extending down gradient. There may also have been a concentration gradient. Beginning 105 ft from the head of the stream, an area 10 ft further down the stream was divided into a 1 x 60-segment grid (from downstream [grid 1] to upstream) and 3 segments were selected at random. QC rinsate sample AR804043 was collected at 1053. Sample AR804010 was collected from grid 40 (6.6 ft upstream) at 1118 at a depth of 6 in. (the bottom 2 in. was slightly coarser). The material was dark brown in color and collected with a cup setter. AR804021 was collected from grid 43 (7.2 ft upstream) at 1132 at a depth of 6 in. The sample was collected with a post-hole digger because material would not stay in the cup setter. The material was approximately the same color as sample AR804010. AR804032 was collected from grid 49 (8.2 ft upstream) at 1131. The sample material at grid segments 43 and 49 was approximately the same color, but much more coarse and rocky than sample AR804010 collected at grid 40.

4.23.2.2 Analytical Design

Request 803: The field parameter measured for Request 803 included pH. Parameters analyzed included volatiles, semivolatiles, PCBs, CLP-metals, and cyanide.

Request 804: The field parameter measured for Request 804 included pH. Parameters analyzed included volatiles, semivolatiles, PCBs, CLP-metals, and cyanide.

4.23.3 Field and Analytical Data

Field Data:

Request 803: *The pH readings for Environmental Problem 18 are given in Table 4.3.18. The pH of the soil samples (AR803020 to -064) range from 7.2 to 8.1.*

Request 804: *The pH readings for Environmental Problem 18 are given in Table 4.3.18. The sediment samples (Request 804) show a pH range of 7.4 to 7.5.*

Field Data Evaluation:

Request 803: Because the instrument was calibrated prior to the readings, the data are reliable. Samples from two holes were obtained for the soil samples; at the third hole, rock was encountered at 6 ft and samples were not taken. The greatest depth of the soil samples was 16 ft, as compared to 20 ft as originally requested.

Request 804: Because the instrument was calibrated prior to the readings, the data are reliable.

Analytical Data:

Request 803:

<u>Anions and cyanide</u>. The soil samples from the 317 Area French Drain showed concentrations below 250 mg/kg.

<u>Metals</u>. Analytical results for metals in soil are presented in Table 4.3.18. Of the 19 metals detected, the following 2 were below either the CRDL or the IDL in all five samples: silver and sodium. Of the remaining metals detected, arsenic ranged from 7.5 to 15 mg.kg, barium from 39 to 62 mg/kg, beryllium from 1.4 to 1.7 mg/kg, cadmium from 0.5 to 1.5 mg/kg, chromium from 14 to 20 mg/kg, cobalt from 8.9 to 12 mg/kg, copper from 22 to 27 mg/kg, lead from 15 to 41 mg/kg, mercury from 0.06 to 0.12 mg/kg, nickel from 21 to 32 mg/kg, and zinc from 63 to 81 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, and vanadium.

<u>PCBs and other extractables</u>. Aroclor 1248 was indicated in two samples. Aroclor 1254 was indicated in three samples. Aroclor 1260 was indicated in two samples.

Concentrations were all below quantitation limits, but all were estimated at less than 1 ppm.

Extractable organics. Naphthalene was found in concentrations of 6.3 mg/kg in sample AR803031 and 3.7 mg/kg in sample AR803064. Other target compounds were detected in measured or estimated concentrations of less than 1 ppm.

Volatile organics. The number of compounds detected in individual samples (of five samples) ranged from 7 to 12. Acetone and methylene chloride were detected in all samples and in the associated blank. Methylene chloride was beyond the calibration range in three samples, and was estimated as high as 3.2 mg/kg in sample AR803053. The highest measured value of methylene chloride was 0.189 mg/kg in sample AR803064. Also, the highest measured concentrations of acetone, ethylbenzene, xylene, 1,1-dichloroethane, 1,1,1-trichloroethane (10.7 mg/kg), 1,2-dichloroethane (0.308 mg/kg), and 4-methyl-2-pentanone were found in sample AR803064.

Request 804:

Anions and cyanide. The sediment from the 317 Area French Drain showed concentrations below 250 mg/kg.

Metals. Analytical results for metals in sediment are presented in Table 4.3.18. Of the 20 metals detected, the following 2 were below the CRDL in all three samples: cobalt and sodium. Of the remaining metals detected, arsenic ranged from 10 to 12 mg.kg, barium from 50 to 105 mg/kg, beryllium from 1 to 1.3 mg/kg, cadmium from 1.6 to 2.1 mg/kg, chromium from 12 to 20 mg/kg, copper from 23 to 32 mg/kg, lead from 29 to 36 mg/kg, mercury from 0.08 to 0.13 mg/kg, nickel from 20 to 27 mg/kg, silver from 2.3 to 3.3 mg/kg, and zinc from 91 to 134 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

PCBs and other extractables. Aroclor 1016 was indicated in one sample. Aroclor 1248 was indicated in two samples. Aroclor 1254 was indicated in three samples. All concentrations were below quantitation limits, and all were estimated to be less than 0.5 ppm.

Extractable organics. Sample AR804010 had three unknown compounds with estimated concentrations ranging from 10.7 to 41.8 ppm.

Volatile organics. There were six, seven, and nine compounds detected in these three respective samples. Acetone and methylene chloride were detected in all samples and also in the associated blank. All estimated concentrations were less than 0.010 mg/kg except for methylene chloride which was beyond the calibration range and was estimated as high as 0.072 mg/kg.

Analytical Data Evaluation:

Request 803:

Anions and cyanide. The calibration and subsequent verification of the instrument as well as the calibration blanks were in compliance. In addition, other quality control measures (see Environmental Problem 2) make the results reliable.

Metals. The following eleven metals were detected above the CRDL in the samples for Request 803: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

PCBs and other extractables. No aroclors were confirmed by GC/MS.

Extractable organics. Naphthalene was found in concentrations as high as 6.3 ppm in sample AR803031. Other target compounds were detected in measured or estimated concentrations of less than 1 ppm.

Volatile organics. Sample AR803064 had the highest measured concentrations of several compounds including 1,1,1-trichloroethane and 1,2-dichloroethane.

Request 804:

Anions and cyanide. The calibration and subsequent verification of the instrument as well as the calibration blanks were in compliance. In addition other quality control measures (see Environmental Problem 2) make the results reliable.

Metals. The following eleven metals of interest were detected above the CRDL in the samples for Request 804: arsenic, barium, beryllium, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc.

PCBs and other extractables. No aroclors were confirmed by GC/MS.

Extractable organics. Unknown compounds in sample AR804010 had estimated concentrations up to 41.8 ppm.

4.23.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. Even though only four to six samples were recovered, the prediction of rock in the subsurface is difficult. The overall analytical rating is Quality Level II.

Analytical Data:

Request 803:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for beryllium, silver, and sodium at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. All aroclors detected in this sample set are Quality Level II except those detected at levels below the quantitation limit, where the determined concentration is considered an estimate.

Extractable organics. Data are almost all of Quality Level III due to mass spectral uncertainties for tentatively identified compounds and to concentrations of target compounds being below quantitation limits.

Volatile organics. Data quality was Quality Level III for AR803031 and toluene in AR803053 because the appropriate internal standard or surrogate did not meet criteria. Data quality for all other target volatile compounds found at concentrations above their quantitation limits was Quality Level II. Target volatile compounds with levels estimated below their quantitation limits and TIC volatile compounds were Quality Level III. The high levels observed for methylene chloride were Quality Level II except for AR803020.

Request 804:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum and selenium at Quality Level II and antimony at Level III.

PCBs and other extractables. All aroclors detected in this sample set are Quality Level II except those detected at levels below the quantitation limit, where the determined concentration is considered an estimate.

Extractable organics. Data are almost all of Quality Level III due to mass spectral uncertainties for tentatively identified compounds and to concentrations of target compounds being below quantitation limits.

Volatile organics. Data quality was Quality Level III for AR804032 because the appropriate internal standard or surrogate did not meet criteria. Data quality for all other target volatile compounds found at concentrations above their quantitation limits was Quality Level II. Target volatile compounds with levels estimated below their quantitation limits and TIC volatile compounds were Quality Level III. The high levels observed for methylene chloride were Quality Level II except for AR804032.

Environmental Problem: 18
Request Number: 803

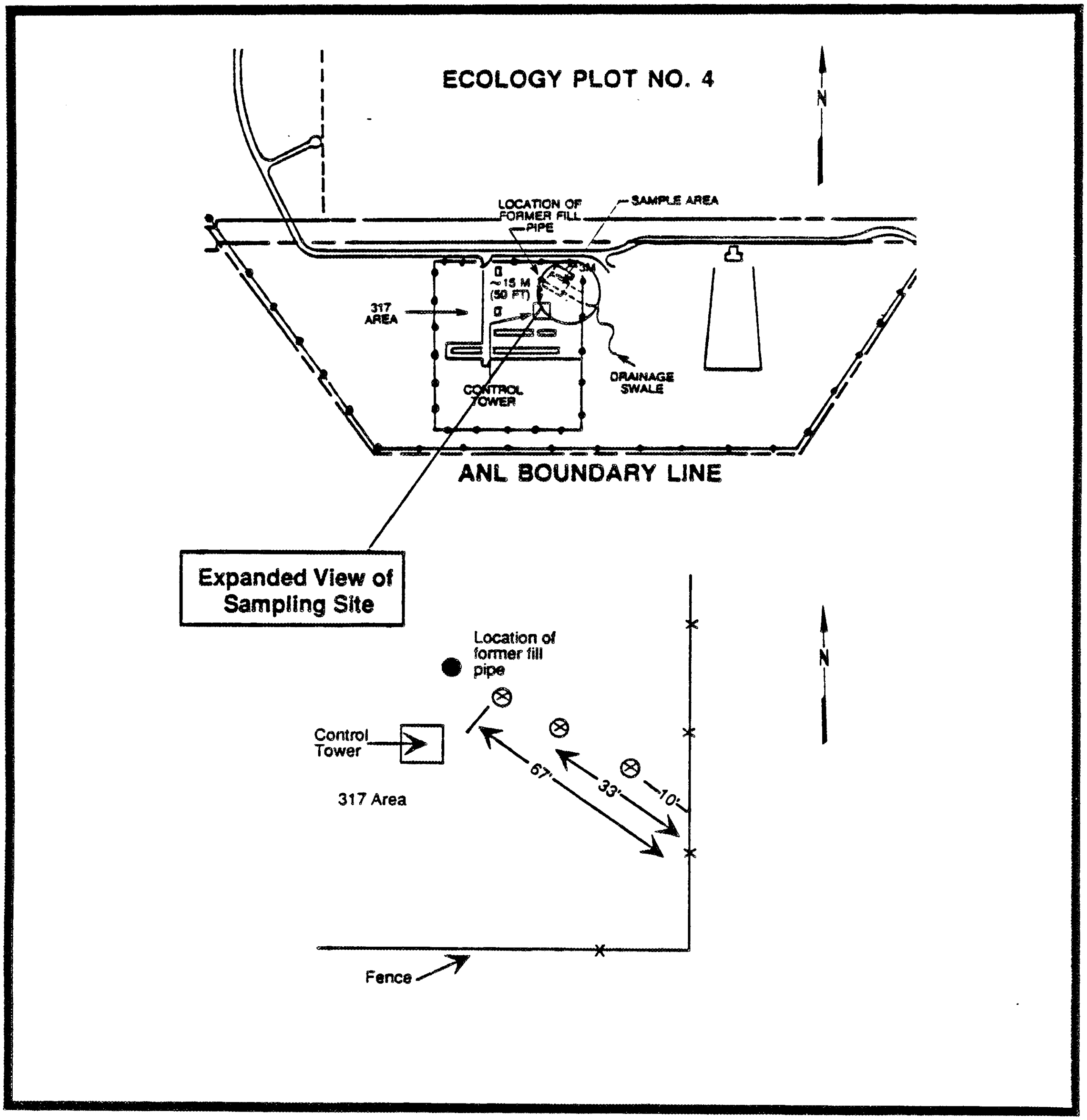

Figure 4.18a. 317 Area French Drain (Request 803)

Environmental Problem: 18
Request Number: 804

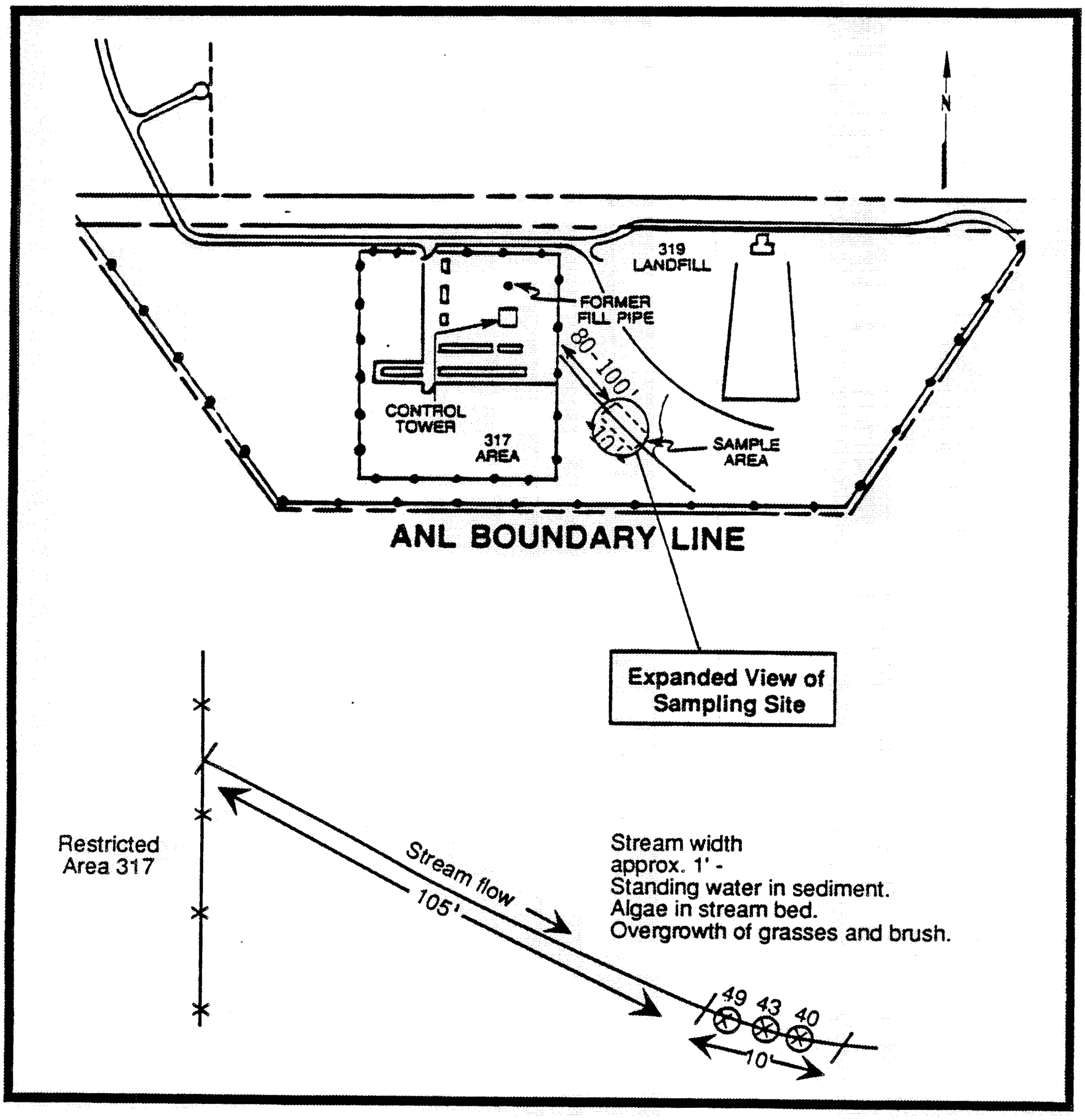

Figure 4.18b. Drainage Swale Southeast of the 317 Area French Drain (Request 804)

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TABLE 4.2.18 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 18

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR803	317 AREA	DRAINAGE	SOIL	6	5	GRAB	0	5	5	5	0	0	0	0	0	0	3	5	5	5	5	5	0	0
		MED TOTAL		6	5		0	5	5	5	0	0	0	0	0	0	3	5	5	5	5	5	0	0
AR804	SE 317 ARE	DRAINAGE	SEDIMENT	3	3	GRAB	0	3	3	3	0	0	0	0	0	0	3	3	3	3	3	3	0	0
		MED TOTAL		3	3		0	3	3	3	0	0	0	0	0	0	3	3	3	3	3	3	0	0
AR804	SE 317 ARE	DRAINAGE	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
		MED TOTAL		1	1		0	1	1	1	0	0	0	0	0	0	1	1	1	1	1	1	0	0
		EP TOTAL		10	9		0	9	9	9	0	0	0	0	0	0	7	9	9	9	9	9	0	0

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18
317 AREA FRENCH DRAIN

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S&A REQUEST: 803
LOCATION: 317 AREA FRENCH DRAIN
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR803020	AR803031	AR803053	AR803064		
PH (UNITS)		8.1	7.2	7.6	7.2		

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR803019D	AR803019D	AR803019E	AR803020D	AR803020D	AR803020E
	SDG NO:	AR801028C	AR803019D	AR803019E	AR801028C	AR803019D	AR803019E
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM				12600			14700
ARSENIC		7.9		9 UN	15		8.8 UN
BARIUM				55 E			62 E
BERYLLIUM				1.4 E			1.5 E
CADMIUM		2 B		1.5	2.5 B		0.56 B
CALCIUM				78500			75900
CHROMIUM				17			18
COBALT				8.9			11
COPPER				27			26
IRON				25000			26700
LEAD		15		19 B	16		7.3 U
MAGNESIUM				45000			42300
MANGANESE				481			562
MERCURY			0.1			0.04 B	
NICKEL				27			30
SILVER		0.95 U		1.3 B	0.95 U		0.88 U
SODIUM				350 B			438 B
VANADIUM				23			26
ZINC				81			65

METALS, INCLUDING CR+6 (MG/KG)							
	SAMP NO:	AR803031D	AR803031D	AR803031E	AR803053D	AR803053D	AR803053E
	SDG NO:	AR801028C	AR803019D	AR803019E	AR801028C	AR803019D	AR803019E
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM				9570			14600
ARSENIC		9.7		9.3 UN	9.8		8.8 UN
BARIUM				39 E			49 E
BERYLLIUM				1.5 E			1.6 E
CADMIUM		2.3 B		0.66 B	2.8 B		0.5 B
CALCIUM				116000			72300
CHROMIUM				14			20
COBALT				7.3 B			12
COPPER				22			26
IRON				19900			25600
LEAD		15		7.7 U	41		7.7 B
MAGNESIUM				63400			39200

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 — DRAFT DO NOT CITE

317 AREA FRENCH DRAIN

S&A REQUEST: 803
LOCATION: 317 AREA FRENCH DRAIN
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR803031D / AR801028C / GRAB	AR803031D / AR803019D / GRAB	AR803031E / AR803019E / GRAB	AR803053D / AR801028C / GRAB	AR803053D / AR803019D / GRAB	AR803053E / AR803019E / GRAB
MANGANESE				381			547
MERCURY			0.12			0.03 B	
NICKEL				21			32
SILVER		1 U		1.1 B	0.99 U		0.92 B
SODIUM				662 B			395 B
VANADIUM				18			25
ZINC				57			66

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR803064D / AR800050C / GRAB	AR803064D / AR803019D / GRAB	AR803064E / AR803019E / GRAB			
ALUMINUM				13400			
ARSENIC		7.5		9.8 UN			
BARIUM				46 E			
BERYLLIUM				1.7 E			
CADMIUM		2.2 B		0.58 B			
CALCIUM				101000			
CHROMIUM				20			
COBALT				9.2			
COPPER				24			
IRON				23400			
LEAD		20 N		15 B			
MAGNESIUM				55900			
MANGANESE				455			
MERCURY			0.06				
NICKEL				27			
SILVER		1 U		1.1 B			
SODIUM				658 B			
VANADIUM				24			
ZINC				63			

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR803019B / ARG03 / GRAB	AR803020B / ARG03 / GRAB	AR803031B / ARG03 / GRAB	AR803053B / ARG03 / GRAB	AR803064B / ARG03 / GRAB	
AROCLOR-1248		82 U	94 U	98 J	93 U	270 J	
AROCLOR-1254		240 J	190 U	550 J	190 U	490 J	
AROCLOR-1260		160 U	190 U	550 J	190 U	510 J	

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 803
LOCATION: 317 AREA FRENCH DRAIN
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR803019B	AR803020B	AR803031B	AR803053B	AR803064B
	SDG NO:	C106	C107	C107	C107	C107
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB
BENZO(A)ANTHRACENE		120 J	330 U	330 U	330 U	330 U
BENZO(B)FLUORANTHENE		190 J	91 J	330 U	130 J	330 U
BENZO(G,H,I)PERYLENE		87 J	44 J	42 J	66 J	330 U
BENZO(K)FLUORANTHENE		330 U	330 U	58 J	69 J	330 U
BIS(2-ETHYLHEXYL)PHTHALATE		120 J	74 J	97 J	750	100 J
BUTYLBENZYLPHTHALATE		330 U	330 U	330 U	65 J	330 U
CHRYSENE		330 U	69 J	63 J	330 U	330 U
DI-N-BUTYLPHTHALATE		330 U	10 J	330 U	35 J	330 U
DI-N-OCTYL PHTHALATE		330 U	330 U	330 U	130 J	330 U
DIBENZ(A,H)ANTHRACENE		21 J	330 U	330 U	53 J	330 U
DIBENZOFURAN		330 U	13 J	330 U	330 U	330 U
DIETHYLPHTHALATE		51 J	330 U	330 U	330 U	9 J
FLUORANTHENE		310 J	120 J	150 J	47 J	22 J
ISOPHORONE		330 U	330 U	140 J	330 U	730
NAPHTHALENE		330 U	330 U	6300 E	330 U	3700
PHENANTHRENE		140 J	89 J	120 J	330 U	21 J
PYRENE		330 U	130 J	330 U	330 U	22 J
1,2,4-TRICHLOROBENZENE		330 U	330 U	19 J	330 U	24 J
2-METHYLNAPHTHALENE		330 U	330 U	810	330 U	440
* UNKNOWN HYDROCARBON(7.42)					160 J	
* UNKNOWN HYDROCARBON(7.68)					480 J	
* UNKNOWN HYDROCARBON(7.91)					380 J	
* UNKNOWN HYDROCARBON(10.75)						750 J
* UNKNOWN HYDROCARBON(11.52)						2200 J
* UNKNOWN HYDROCARBON(12.07)						2100 J
* UNKNOWN HYDROCARBON(12.36)				2200 J		
* UNKNOWN HYDROCARBON(12.47)				2100 J		
* UNKNOWN HYDROCARBON(13.04)						840 J
* UNKNOWN HYDROCARBON(13.08)				2500 J		
* UNKNOWN HYDROCARBON(13.19)						900 J
* UNKNOWN HYDROCARBON(13.23)				2300 J		
* UNKNOWN HYDROCARBON(13.87)						2800 J
* UNKNOWN HYDROCARBON(14.25)				1800 J		
* UNKNOWN HYDROCARBON(14.43)						840 J
* UNKNOWN HYDROCARBON(15.05)				1400 J		
* UNKNOWN HYDROCARBON(15.22)				1500 J		
* UNKNOWN HYDROCARBON(15.96)				2500 J		
* UNKNOWN HYDROCARBON(24.46)					600 J	
* UNKNOWN(7.44)			220 J			
* UNKNOWN(7.48)		590 J			1100 J	
* UNKNOWN(7.50)			1300 J			1200 J
* UNKNOWN(7.54)				1500 J		

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 803
LOCATION: 317 AREA FRENCH DRAIN
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR803019B	AR803020B	AR803031B	AR803053B	AR803064B
	SDG NO:	C106	C107	C107	C107	C107
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(7.69)			580 J			
* UNKNOWN(7.94)			530 J			
* UNKNOWN(8.21)			120 J			
* UNKNOWN(10.13)		430 J			640 J	
* UNKNOWN(10.14)			480 J			
* UNKNOWN(10.78)				2100 J		
* UNKNOWN(11.01)				5900 J		
* UNKNOWN(11.14)		130 J				
* UNKNOWN(11.35)					490 J	
* UNKNOWN(11.41)			55 J			
* UNKNOWN(11.57)				3900 J		
* UNKNOWN(11.99)						1100 J
* UNKNOWN(12.12)				1800 J		
* UNKNOWN(12.22)						1300 J
* UNKNOWN(12.23)				2900 J		
* UNKNOWN(12.44)						1100 J
* UNKNOWN(12.64)		250 J				
* UNKNOWN(12.70)			49 J			
* UNKNOWN(12.73)						1700 J
* UNKNOWN(12.76)				3500 J		
* UNKNOWN(12.89)						960 J
* UNKNOWN(12.91)				2400 J		
* UNKNOWN(12.96)						970 J
* UNKNOWN(12.98)				2000 J		
* UNKNOWN(13.88)				2200 J		
* UNKNOWN(14.23)						1400 J
* UNKNOWN(14.57)						790 J
* UNKNOWN(14.59)				1300 J		
* UNKNOWN(15.01)						770 J
* UNKNOWN(15.06)		120 J				
* UNKNOWN(15.20)						890 J
* UNKNOWN(15.90)		130 J				
* UNKNOWN(15.93)						1500 J
* UNKNOWN(17.81)		140 J				
* UNKNOWN(17.84)				1100 J		
* UNKNOWN(21.27)		150 J				
* UNKNOWN(21.28)					150 J	
* UNKNOWN(22.11)		110 J				
* UNKNOWN(22.30)		120 J				
* UNKNOWN(22.56)		100 J				
* UNKNOWN(22.87)					150 J	
* UNKNOWN(24.37)					290 J	

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 317 AREA FRENCH DRAIN

DRAFT DO NOT CITE

S&A REQUEST: 803
LOCATION: 317 AREA FRENCH DRAIN
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR803019B C106 GRAB	AR803020B C107 GRAB	AR803031B C107 GRAB	AR803053B C107 GRAB	AR803064B C107 GRAB
* UNKNOWN(24.45)		310 J	100 J			
* UNKNOWN(24.95)		290 J				
* UNKNOWN(25.91)		300 J				
* UNKNOWN(27.12)		320 J				
* UNKNOWN(29.15)						1500 J
* UNKNOWN(30.10)					510 J	
* UNKNOWN(31.80)					540 J	
* UNKNOWN(33.05)					510 J	
* UNKNOWN(33.38)					620 J	
* UNKNOWN(34.57)					910 J	
* UNKNOWN(34.85)					460 J	
* UNKNOWN(35.13)			250 J			
* UNKNOWN(38.75)					690 J	
* UNKNOWN(40.77)		340 J				
* UNKNOWN(43.75)					1400 J	
* UNKNOWN(46.30)					2300 J	
* UNKNOWN(49.57)					2600 J	

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR803019A GN25 GRAB	AR803020A GN25 GRAB	AR803031A GN25 GRAB	AR803053A GD01 GRAB	AR803064A OD01 GRAB
ACETONE		19 B	26 B	12 U	24 B	586 B
BENZENE		6 U	6 U	6 U	4 J	155 U
CARBON TETRACHLORIDE		6 U	6 U	46 J	7	155 U
CHLOROFORM		6 U	6 U	2 J	2 J	155 U
ETHYLBENZENE		6 U	6 U	6 U	6 U	310
METHYLENE CHLORIDE		1700 BE	1100 BE	16 JB	3200 BE	189
TETRACHLOROETHENE		6 U	6 U	10 J	6 U	155 U
TOLUENE		4 U	6 U	6 U	10	155 U
TRICHLOROETHENE		6 U	8 U	22 J	69	368
XYLENE (TOTAL)		6 U	6 U	6 U	6 U	204
1,1-DICHLOROETHANE		6 U	6 U	9 J	6 J	394
1,1,1-TRICHLOROETHANE		3 J	5 J	450 JE	68	10700 E
1,2-DICHLOROETHANE		6 U	6 U	6 U	18	308
1,2-DICHLOROETHENE (TOTAL)		6 U	6 U	6 U	21	155 U
4-METHYL-2-PENTANONE		11 U	12 U	12 U	12 U	5930

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 804
LOCATION: DRAINAGE SWALE SOUTHEAST OF THE 317 AREA FRENCH DRAIN
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR804010	AR804021	AR804032			
PH (UNITS)		7.5	7.4	7.4			
TEMPERATURE (DEG C)		13	12	11			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR804010D AR800050C GRAB	AR804010D AR803019D GRAB	AR804010E AR802085F GRAB	AR804010E AR802085K GRAB	AR804021D AR800050C GRAB	AR804021D AR803019D GRAB
ALUMINUM				14000			
ARSENIC		10		12 U		11	
BARIUM				105 E			
BERYLLIUM				1.3			
CADMIUM		2.1 B		2		2.3 B	
CALCIUM				70600			
CHROMIUM				16			
COBALT				8.6 B			
COPPER				32			
IRON				30900			
LEAD		32 N		29 B		36 N	
MAGNESIUM				42600			
MANGANESE				1240			
MERCURY			0.08				0.11
NICKEL				27			
POTASSIUM					2600		
SILVER		1.2 U		2.2		1.5 B	
SODIUM				367 B			
VANADIUM				32			
ZINC				91			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR804021E AR802085F GRAB	AR804021E AR802085K GRAB	AR804032D AR800050C GRAB	AR804032D AR803019D GRAB	AR804032E AR802085F GRAB	AR804032E AR802085K GRAB
ALUMINUM		11400				8230	
ARSENIC		12 U		12		12 U	
BARIUM		67 E				50 E	
BERYLLIUM		1.2				1.1	
CADMIUM		2.1		2.4 B		1.6	
CALCIUM		61500				93800	
CHROMIUM		20				12	
COBALT		9.6 B				8.3 B	
COPPER		32				23	
IRON		24200				18700	

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 804
LOCATION: DRAINAGE SWALE SOUTHEAST OF THE 317 AREA FRENCH DRAIN
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR804021E / AR802085F / GRAB	AR804021E / AR802085K / GRAB	AR804032D / AR800050C / GRAB	AR804032D / AR803019D / GRAB	AR804032E / AR802085F / GRAB	AR804032E / AR802085K / GRAB
LEAD		39 B		29 N		22 B	
MAGNESIUM		37600				57600	
MANGANESE		619				713	
MERCURY					0.13		
NICKEL		25				20	
POTASSIUM			1900				1700
SILVER		3.3		1 U		2.4	
SODIUM		357 B				437 B	
VANADIUM		25				17	
ZINC		134				100	

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR804010B / ARG03 / GRAB	AR804021B / ARG03 / GRAB	AR804032B / ARG03 / GRAB
AROCLOR-1016		120 U	110 U	100 J
AROCLOR-1248		120 J	110 J	100 U
AROCLOR-1254		250 J	210 J	410 J

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR804010B / CD29 / GRAB	AR804021B / CD29 / GRAB	AR804032B / CD29 / GRAB
* UNKNOWN(7.22)		41900 J		
* UNKNOWN(7.28)		19300 J		
* UNKNOWN(7.32)			9730 J	
* UNKNOWN(7.52)			2080 J	
* UNKNOWN(7.54)		3380 J		
* UNKNOWN(7.56)				3010 J
* UNKNOWN(7.59)			5560 J	
* UNKNOWN(7.60)		6600 J		
* UNKNOWN(7.77)				1920 J
* UNKNOWN(7.78)			5420 J	
* UNKNOWN(7.79)		6600 J		
* UNKNOWN(8.01)			7640 J	1920 J
* UNKNOWN(8.02)		10800 J		
* UNKNOWN(9.30)		1770 J		
* UNKNOWN(11.25)		1290 J		
* UNKNOWN(11.38)		1610 J		
* UNKNOWN(11.39)			973 J	

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 804
LOCATION: DRAINAGE SWALE SOUTHEAST OF THE 317 AREA FRENCH DRAIN
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR804010B SDG NO: CD29 TYPE: GRAB	AR804021B CD29 GRAB	AR804032B CD29 GRAB			
* UNKNOWN(21.02)			1510 J			

VOLATILE ORGANICS (UG/KG)	SAMP NO: AR804010A SDG NO: GN16 TYPE: GRAB	AR804021A GN16 GRAB	AR804032A GN16 GRAB			
ACETONE	4 JB	4 JB	5 JB			
METHYLENE CHLORIDE	360 BE	720 BE	210 BE			
1,1-DICHLOROETHANE	8 U	3 J	9			
1,1,1-TRICHLOROETHANE	8 U	7 U	3 J			
* UNKNOWN(9.56)			4 J			

S&A REQUEST: 804
LOCATION: DRAINAGE SWALE SOUTHEAST OF THE 317 AREA FRENCH DRAIN
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: AR804043F SDG NO: AR307018G TYPE: RINSATE	AR804043F AR308042F RINSATE	AR804043F AR400012G RINSATE			
ANTIMONY		4.5 B				
CADMIUM			0.15 B			
LEAD			2 B			
MERCURY	0.05 B					

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO: AR804043E SDG NO: ARG05 TYPE: RINSATE					
HEPTACHLOR EPOXIDE	0.11 J					

TABLE 4.3.18 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 18 DRAFT DO NOT CITE
317 AREA FRENCH DRAIN

S&A REQUEST: 804
LOCATION: DRAINAGE SWALE SOUTHEAST OF THE 317 AREA FRENCH DRAIN
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR804043E SDG NO: DD28 TYPE: RINSATE					
BIS(2-ETHYLHEXYL)PHTHALATE	2 JB					
* HALOGENATED UNKNOWN	3 JB					
* UNKNOWN	4 J					

VOLATILE ORGANICS (UG/L)	SAMP NO: AR804043A SDG NO: GN12 TYPE: RINSATE					
ACETONE	9 JB					
METHYLENE CHLORIDE	1 JB					
TOLUENE	8					

4.24 Environmental Problem 19: Operation of the 319 Landfill

Request Number: 805.

Requester: B. Levitan.

Finding and Basis: The 319 Landfill operated between 1958 and the late 1960s. Waste included ash from the burn pits, construction debris, machine and waste oils, metals, and volatile and semivolatile organics. A French drain was located to the north of the trench area. Trenches (two or three) were approximately 100 m (300 ft) long. Hazardous constituents disposed of in the French drain and landfill have the potential to migrate into a nearby drainage where surface water and sediment may become contaminated. Wastes may also have migrated into the soil and groundwater.

4.24.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if the contaminants listed in Sect. 4.24.2 were present at minimum detection levels in sediments near the landfill.

Supporting Information: ANL had sampled soil at the landfill and groundwater and surface water at the site boundary 500 ft downgradient of the landfill. Tritium and strontium-90 in surface water were several times background concentrations, and tritium was elevated in soil and groundwater. Arsenic, cadmium, copper, mercury, and lead in surface water exceeded 1986 U.S. EPA water quality criteria, while cadmium, copper, lead, and mercury in soils exceeded background. Other wastes may have included pesticides, PCBs, cyanide, volatiles, and semivolatiles.

4.24.2 Sampling and Analytical Design

4.24.2.1 Sampling Design

Request 805: 319 Landfill Organic, Inorganic, Metal, and Radiological Contaminants (Sediment) (Fig. 4.19). Three sediment samples were to be collected (Sampling Method: Reference E5.3.1) to the depth of sediment from a drainage swale south of the 319 Landfill.

The Sampling Team arrived at the sampling location 05NOV87 at 1400. Skies were clear, the temperature was approximately 40^{o}F, and winds were out of the northwest at 12-15 mph. The area of interest was less than 100^{2} ft and was thought to have a concentration gradient. The area starting from 50 ft below the bushes in the drainage swale and extending 10 ft down gradient was divided into a 1 x 60-segment grid. Three segments were selected at random. Sample AR805011 was collected from grid 9 (1' 6") at 1414 from the 0-4 in. depth of sediment. The sample was medium brown and a shade lighter than the samples found 70-100 ft upstream (Environmental Problem 18). Sample AR805022 was collected from grid 22 (3' 8") at 1438 from the 0-5 in. depth of sediment similar to sample AR805011. Sample AR805033 was collected from grid 37 (6' 2") at 1451 from the 0-3 in. depth of sediment. Sample material was coarser and rockier and more material had to be collected to get all bottles filled. There was no particular change in the color of the sediment. The stream bed was narrow (approximately 1 ft wide). Sediment was only 3-5 in. deep in the stream bed.

4.24.2.2 Analytical Design

Request 805: The field parameter measured for Request 805 was pH. The parameters analyzed included volatiles, semivolatiles, pesticides, PCBs, CLP-metals, and cyanide.

4.24.3 Field and Analytical Data

Field Data: *The pH readings of the sediment samples from the stream are given in Table 4.3.19. The shallow surface sediments range from a pH of 7.5 to 7.7 over a span of about 5 ft.*

Field Data Evaluation: Because the instrument was calibrated prior to taking the readings, the results are reliable.

Analytical Data:

Anions and cyanide. Because the concentration of cyanide in the samples from the drainage swale of the 319 Landfill was below 250 mg/kg, data were not reported in the tables.

Metals. Analytical results for metals in sediment are presented in Table 4.3.19. Of the 20 metals detected, arsenic ranged from 10 to 12 mg/kg, barium from 73 and 283 mg/kg, beryllium from 1 to 1.3 mg/kg, cadmium from 1.8 to 2 mg/kg, cobalt from 11 to 12 mg/kg, copper from 28 to 35 mg/kg, lead from 23 to 34 mg/kg, mercury from 0.09 to 0.14 mg/kg, nickel from 27 to 28 mg/kg, silver from 1.7 to 2 mg/kg, and zinc from 81 to 108 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, sodium, and vanadium.

PCBs and other extractables. Aroclor 1248 was indicated in one sample. Aroclors 1254 and 1260 were each indicated in two samples. Concentrations were all below quantitation limits, but were estimated as high as 24 ppm in sample AR805011.

Extractable organics. There were three target compounds detected in sample AR805022, and none in the other samples. All were in concentrations below quantitation limits. Estimated concentrations of most of the unknowns were between 1 and 10 ppm, but in *sample AR805033 there were unknowns detected with estimated concentrations of 31 and 111 ppm.*

Volatile organics. There were five compounds detected in two of these samples and seven compounds detected in the remaining sample. No compounds were identified in measurable quantities. Methylene chloride and acetone were present in the blank. Methylene chloride exceeded the calibration range in all three samples, and was estimated in concentrations ranging from 0.75 mg/kg to 2 mg/kg.

Analytical Data Evaluation:

Anions and cyanide. Because the verification of calibration of the instrument, the calibration blanks, and other quality control measures were in compliance, the results were reliable.

Metals. The following twelve metals of interest were detected above the CRDL in the samples for Request 805: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc.

PCBs and other extractables. Some aroclors were indicated in each of the samples, but not confirmed by GC/MS.

Extractable organics. The three target compounds identified in sample AR805022 all had concentrations below quantitation limits. Unknowns in sample AR805033 had estimated concentrations as high as 111 ppm.

Volatile organics. Methylene chloride exceeded the calibration range in all three samples, and was estimated in concentrations ranging from 0.75 mg/kg to 2 mg/kg. No other volatile organic compounds were present in measured or estimated quantities as high as 0.010 mg/kg.

4.24.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: No limitations or qualifications are apparent.

Analytical Data:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum, selenium, and vanadium at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. All aroclors detected in AR805033 are Quality Level II. Aroclors detected in AR805011 are Quality Level III because the surrogate standard did not meet retention time criteria. Results for all single-component pesticides in AR805011 and AR805022 are unusable because the surrogate standard was not observed in the expected retention time window.

Extractable organics. Data are of Quality Level III due to mass spectral uncertainty for tentatively identified compounds and to concentrations below the quantitation limit for the three target compounds identified in sample AR805022.

Volatile organics. Data quality for all target volatile compounds detected at concentrations in excess of the quantitation limits was Quality Level III because a surrogate did not meet criteria. The elevated levels of methylene chloride should be considered estimates.

Environmental Problem: 19
Request Number: 805

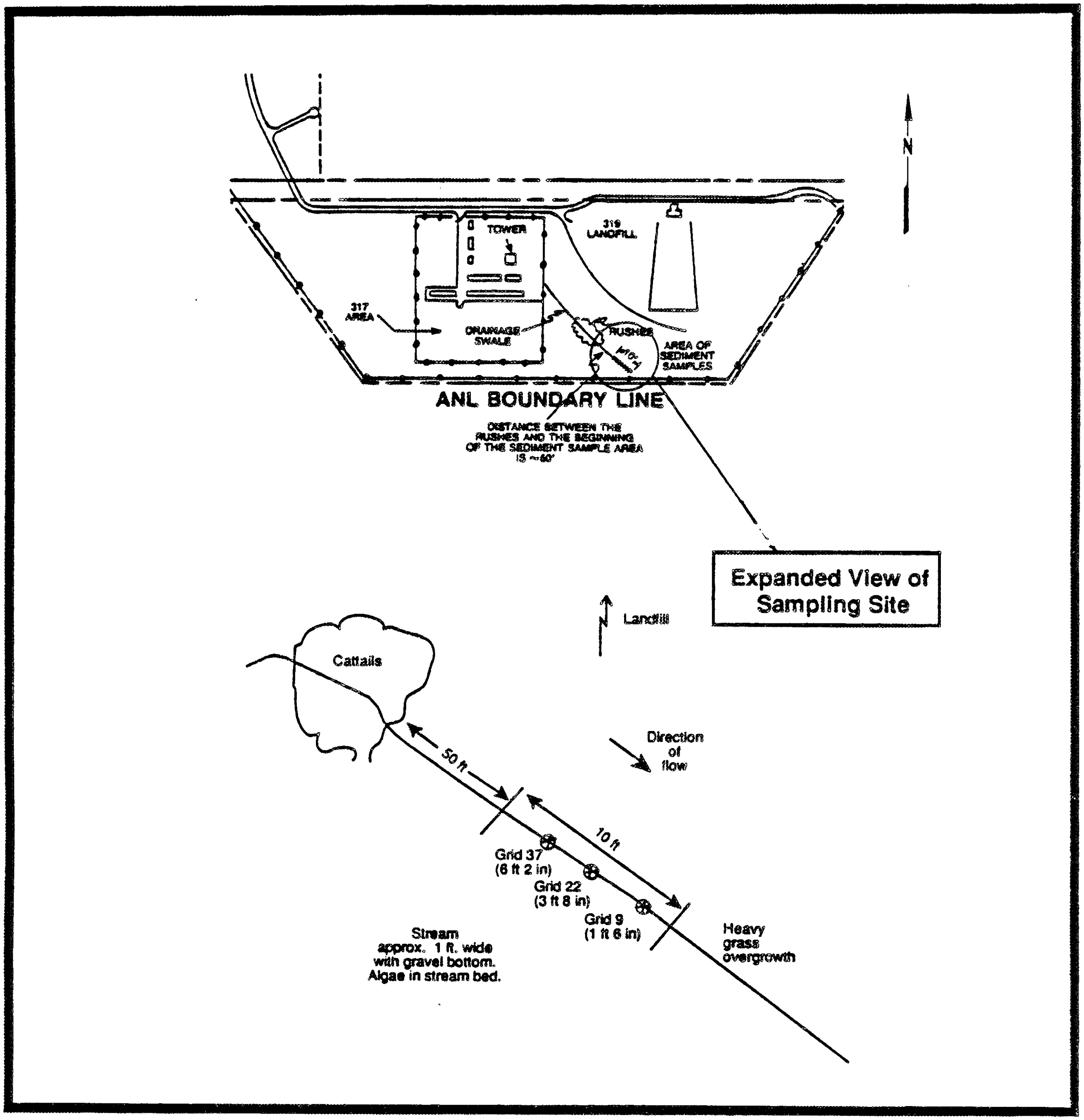

Figure 4.19. 319 Landfill (Request 805)

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TABLE 4.2.19 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 19

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR805	319 LANDFI	LANDFILL	SEDIMENT	3	3	GRAB	0	3	3	3	0	0	0	0	0	0	2	3	3	3	3	3	0	0
		MED TOTAL		3	3		0	3	3	3	0	0	0	0	0	0	2	3	3	3	3	3	0	0
		EP TOTAL		3	3		0	3	3	3	0	0	0	0	0	0	2	3	3	3	3	3	0	0

TABLE 4.3.19 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 19 — DRAFT DO NOT CITE

OPERATION OF THE 319 LANDFILL

S&A REQUEST: 805
LOCATION: 319 LANDFILL ORGANIC, INORGANIC, METAL, AND RADIOLOGICAL CONTAMINANTS
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO:	AR805011	AR805022	AR805033			
PH (UNITS)		7.6	7.7	7.6			
TEMPERATURE (DEG C)		11					

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805011D / AR800050C / GRAB	AR805011D / AR805022D / GRAB	AR805011E / AR802085F / GRAB	AR805011E / AR802085K / GRAB	AR805022D / AR800050C / GRAB	AR805022D / AR805022D / GRAB
ALUMINUM				10400			
ARSENIC		10		11 U		12	
BARIUM				73 E			
BERYLLIUM				1			
CADMIUM		2.2 B		1.9		1.8 B	
CALCIUM				49100			
CHROMIUM				16			
COBALT				11			
COPPER				35			
IRON				23400			
LEAD		34 N		32 B		31 N	
MAGNESIUM				27400			
MANGANESE				550			
MERCURY			0.14				0.09
NICKEL				27			
POTASSIUM					2300		
SILVER		1.1 U		1.7 B		1.1 U	
SODIUM				464 B			
VANADIUM				25			
ZINC				108			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805022E / AR802085F / GRAB	AR805022E / AR802085K / GRAB	AR805033D / AR800050C / GRAB	AR805033D / AR805022D / GRAB	AR805033E / AR802085F / GRAB	AR805033E / AR802085K / GRAB
ALUMINUM		11000				14000	
ARSENIC		11 U		12		11 U	
BARIUM		130 E				283 E	
BERYLLIUM		1.1				1.3	
CADMIUM		1.8		2 B		2	
CALCIUM		68700				66600	
CHROMIUM		15				20	
COBALT		12				12	
COPPER		28				30	
IRON		24000				25100	

TABLE 4.3.19 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 19 DRAFT DO NOT CITE
OPERATION OF THE 319 LANDFILL

S&A REQUEST: 805
LOCATION: 319 LANDFILL ORGANIC, INORGANIC, METAL, AND RADIOLOGICAL CONTAMINANTS
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805022E / AR802085F / GRAB	AR805022E / AR802085K / GRAB	AR805033D / AR800050C / GRAB	AR805033D / AR805022D / GRAB	AR805033E / AR802085F / GRAB	AR805033E / AR802085K / GRAB
LEAD		27 B		23 N		20 B	
MAGNESIUM		41200				40600	
MANGANESE		903				747	
MERCURY					0.12		
NICKEL		28				28	
POTASSIUM			2800				3200
SILVER		2		1.2 U		1.7 B	
SODIUM		777 B				1740	
VANADIUM		27				29	
ZINC		81				86	

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805011B / ARG06 / GRAB	AR805022B / ARG06 / GRAB	AR805033B / ARG03 / GRAB
AROCLOR-1248		24000 JD	12000 U	110 U
AROCLOR-1254		22000 JD	24000 U	1100 J
AROCLOR-1260		22000 JD	24000 U	1400 J

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805011B / CD29 / GRAB	AR805022B / CD29 / GRAB	AR805033B / CD29 / GRAB
BIS(2-CHLOROISOPROPYL)ETHER		320 U	88 J	32 U
BIS(2-ETHYLHEXYL)PHTHALATE		320	130 J	32 U
DI-N-BUTYLPHTHALATE		320 U	31 J	32 U
FLUORANTHENE		320 U	110 J	32 U
PYRENE		320 U	44 J	32 U
* UNKNOWN(7.43)				111000 J
* UNKNOWN(7.55)				31200 J
* UNKNOWN(7.70)		1460 J		
* UNKNOWN(7.74)				6390 J
* UNKNOWN(7.76)			1410 J	
* UNKNOWN(7.81)		1310 J		
* UNKNOWN(7.84)			1860 J	
* UNKNOWN(7.97)				4830 J
* UNKNOWN(8.04)		1900 J		
* UNKNOWN(8.09)			2790 J	
* UNKNOWN(9.32)		1010 J		
* UNKNOWN(9.37)			1550 J	

TABLE 4.3.19 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 19 OPERATION OF THE 319 LANDFILL

DRAFT DO NOT CITE

S&A REQUEST: 805
LOCATION: 319 LANDFILL ORGANIC, INORGANIC, METAL, AND RADIOLOGICAL CONTAMINANTS
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805011B CD29 GRAB	AR805022B CD29 GRAB	AR805033B CD29 GRAB			
* UNKNOWN(9.70)		190 J					
* UNKNOWN(10.24)		161 J					
* UNKNOWN(10.26)				5680 J			
* UNKNOWN(10.27)			388 J				
* UNKNOWN(11.02)		146 J					
* UNKNOWN(11.03)			186 J				
* UNKNOWN(11.45)		1750 J					
* UNKNOWN(11.50)			3100 J				
* UNKNOWN(11.92)			186 J				
* UNKNOWN(12.74)		876 J					
* UNKNOWN(13.41)				4260 J			
* UNKNOWN(15.13)				1280 J			
* UNKNOWN(18.18)		248 J					
* UNKNOWN(18.43)				1850 J			
* UNKNOWN(19.98)				3830 J			
* UNKNOWN(21.00)				1420 J			
* UNKNOWN(21.39)				1560 J			
* UNKNOWN(22.41)		292 J					
* UNKNOWN(22.57)				852 J			
* UNKNOWN(22.65)				4830 J			
* UNKNOWN(22.95)			186 J				
* UNKNOWN(24.53)			357 J				
* UNKNOWN(25.00)		3210 J					
* UNKNOWN(25.86)			295 J				
* UNKNOWN(26.84)			295 J				
* UNKNOWN(26.86)		2340 J					
* UNKNOWN(27.36)			7280 J				
* UNKNOWN(27.37)		8760 J					
* UNKNOWN(27.48)		1610 J					
* UNKNOWN(29.77)			605 J				
* UNKNOWN(29.78)		4380 J					
* UNKNOWN(29.98)		2190 J	2640 J				
* UNKNOWN(32.00)		3500 J					
* UNKNOWN(33.16)		1900 J	992 J				
* UNKNOWN(37.88)			853 J				
* UNKNOWN(37.89)		1900 J					
* UNKNOWN(39.95)			791 J				

TABLE 4.3.19 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 19 DRAFT DO NOT CITE
OPERATION OF THE 319 LANDFILL

S&A REQUEST: 805
LOCATION: 319 LANDFILL ORGANIC, INORGANIC, METAL, AND RADIOLOGICAL CONTAMINANTS
MEDIUM: SEDIMENT

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR805011A / GN16 / GRAB	AR805022A / GN16 / GRAB	AR805033A / GN16 / GRAB			
ACETONE		14 U	15 U	5 JB			
METHYLENE CHLORIDE		750 BE	2000 BE	770 BE			
* METHANE, TRICHLOROFLUOR(9.11)				5 J			

4.25 Environmental Problem 20: Unlined Earthen Lagoon at the Wastewater Treatment Plant

Request Number: 806.

Requester: B. Levitan.

Finding and Basis: The unlined lagoon was designed to serve as a holding basin for potentially radioactive liquids received from the laboratory drain sedimentation basins. It is not known how often the lagoon was used during its operating life from the mid-1950s to 1980. Because the holding lagoon is unlined, any liquid received had the potential to migrate through the soil, thus contaminating groundwater and nearby Sawmill Creek.

4.25.1 Sampling and Analysis Objectives

Statement: Samples were taken to determine if the contaminants listed in Sect. 4.25.2 were present in soil from the earthen lagoon at the wastewater treatment plant (Area 570) at minimum detection levels.

Supporting Information: Radiological monitoring data in 1960 or 1961 identified elevated alpha and beta activity in the soil in the area that carried overflow from the lagoon to Sawmill Creek. No data were available for non-radiological contaminants (organics, metals, etc.). Even though the lagoon was removed from service in 1980, there remained a potential for Sawmill Creek and groundwater contamination through migration of contaminants from the lagoon soil.

4.25.2 Sampling and Analytical Design

4.25.2.1 Sampling Design

Request 806: Earthen Lagoon at the Wastewater Treatment Plant - Soil (Fig. 4.20). Eight grab soil samples were to be collected (Sampling Method: Reference E5.2.3) from the unlined earthen lagoon.

The Sampling Team arrived at the sampling location at 0900 on 13NOV87. Skies were overcast and the temperature was 55°F. When the team arrived at the site, riggers were present with a 55-ton crane to lift and place the drill rig in the dry lagoon (Permit 176-1987). The lagoon bottom was vegetated with cattails; the berm slopes were covered with grass. The soil had greater than 50% soil moisture. A radiation scan of the area indicated 20 to 40 cpm. The lagoon bottom was approximately 500 m^2 and considered homogeneous. The bottom vegetated area was divided into an 80-segment, randomly numbered grid. Four segments were selected at random. Samples were to be collected by augering to a maximum depth of 10 ft in the vegetated area and collecting soil samples at 0-5 ft and 5-10 ft intervals. All soil pH readings were noted as "soil pH in water." QC rinsate sample AR806090 was collected at 0930. Sample AR806012 was collected at grid 37 at 1000 from 0.0 to 5.0 ft. The soil was moist and the first 12 in. were black with gravel. At the 3-ft point, the color graded into brown and was very wet. Sample AR806056 was collected at grid 37 at 1015 from 5.0 to 10.0 ft. Sample AR806023 was collected at grid 47 at 1045 from 0.0 to 5.0 ft. The soil was gray-black at the surface, grading to brown at 2 ft. At 5 ft, the auger hit a hard surface. Sample AR806067 could not be collected from grid 47 at the 5.0 to 10.0 depth because the auger was unable to penetrate the subsurface obstruction. Sample AR806034 was collected at grid 48 at 1145 from 0.0 to 5.0 ft. The soil (top 1 ft) was gray to brown with moisture at 4 ft. The team augered to rock at 5 ft. Sample AR806078 was collected from grid 48 at the 5.0 to 10.0 depth because the team was able to punch through the rocks at 5 ft. Mud was found at 10 ft. Sample AR806045 was collected from grid 51 at 1450 from 0.0 to 5.0 ft. The soil was brown with a blue tint. Sample

AR806089 was collected from grid 51 at 1500 from the 5.0 to 10 ft level. The team hit water at 9 to 10 ft. The auger was lost in the third hole and it was necessary to extract the auger with hand digging (resulting in a half-day delay in the sampling schedule).

4.25.22 Analytical Design

Request 806: The field parameter measured for Request 806 was pH. The parameters analyzed included volatiles, semivolatiles, PCBs, CLP-metals, cyanide, plutonium, tritium oxide, strontium-90, and cesium-137.

4.25.3 Field and Analytical Data

Field Data: *The pH readings for this problem are shown in Table 4.3.20. The readings range from 6.2 to 7.8.*

Field Data Evaluation: Because the instrument was calibrated prior to taking the readings, the results are reliable. The subsoil sample from Grid 47 (AR806023) could not be taken because a hard subsurface obstruction was encountered.

Analytical Data:

Anions and cyanide. Because soil from the lagoon showed less than 250 mg/kg of cyanide, the data are not reported in Table 4.3.20.

Metals. Analytical results for metals in soil are presented in Table 4.3.20. Of the 20 metals detected, arsenic ranged from 12 to 27 mg/kg, barium from 45 to 131 mg/kg, beryllium from 1.3 to 1.9 mg/kg, cadmium from 0.9 to 2.2 mg/kg, chromium from 15 to 48 mg/kg, cobalt from 10 to 12 mg/kg, copper from 30 to 44 mg/kg, lead from 23 to 31 mg/kg, mercury from 0.16 to 1.3 mg/kg, nickel from 26 to 38 mg/kg, silver from 1.9 to

4.4 mg/kg, and zinc from 53 to 118 mg/kg. Other metals detected were aluminum, calcium, iron, sodium, and vanadium.

PCBs and other extractables. Aroclor 1248 was indicated in two samples. Aroclor 1254 was indicated in six samples. Aroclor 1260 was indicated in three samples. All concentrations were below quantitation limits. The highest estimated concentration was 1.2 ppm of aroclor 1254 in sample AR806089, and all other estimated concentrations were less than 1 ppm.

Extractable organics. No target compounds were identified in these samples. Unknowns with estimated concentrations ranging from 18 to 112 ppm occurred in five of the samples, along with other unknowns with lesser estimated concentrations.

Volatile organics. The samples analyzed for Environmental Problem 20 consisted of seven soil samples and the associated rinsate. From five to eight target volatile compounds were detected in each of these samples. No tentatively identified volatile compounds were observed. Methylene chloride was detected in all soil samples at concentrations ranging from 0.11 to 0.91 mg/kg, but it exceeded the calibration range in all cases except two. The highest measured concentration was 0.150 mg/kg. Methylene chloride was also present in the associated blank. All other volatile compounds detected were present at levels of 0.03 mg/kg or lower.

Radiochemistry. For Grid 37, at the 0-5 ft depth, cesium-137 (1,200 pCi/kg), tritium (23,000 pCi/kg), potassium-40 (14,000 pCi/kg), plutonium-238 (12 pCi/kg), plutonium-239, (2,300 pCi/kg) and total strontium (1,200 pCi/kg) were detected. The 5-10 ft depth contained cesium-137 (230 pCi/kg), tritium (19,000 pCi/kg), potassium-40 (17,000 pCi/kg), plutonium-238 (14 pCi/kg), plutonium-239, (840 pCi/kg) and total strontium (1,400 pCi/kg).

For Grid 47, the 0-5 ft depth contained the following radionuclide quantities in pCi/kg: cesium-137, 450; tritium, 21,000; potassium-40, 18,000; and plutonium-238, 650. Because of an obstruction, no 5-10 ft depth sample was collected.

For Grid 48, the 0-5 ft. depth contained the following radionuclide quantities in pCi/kg: cesium-137, 110; tritium, 14,000; potassium-40, 15,000; plutonium-239, 350; and total strontium, 2,600. At the 5-10 ft depth, cesium-137, 400; tritium, 25,000; potassium-40, 18,000; plutonium-238, 2; plutonium-239, 130; and total strontium, 1,100 were found.

For Grid 51, the 0-5 ft depth contained cesium-137, 120; tritium, 13,000; potassium-40, 14,000; plutonium-238, 11; plutonium-239, 810; and total strontium, 1,300. The 5-10 ft. depth contained cobalt-60, 120; cesium-137, 560; tritium, 10,000; potassium-40, 21,000; plutonium-238, 12; plutonium-239, 190; and total strontium, 600.

Rinsate sample AR806090 contained small amounts of tritium (250 pCi/L), plutonium-238 (0.04 pCi/L), and total strontium (4.6 pCi/L).

Analytical Data Evaluation:

Anions and cyanide. The calibration of the instrument, followed by verification, showed that the instrument was in compliance. Because the calibration blanks and other quality control measures were also in compliance, the data are reliable.

Metals. The following twelve metals of interest were detected above the CRDL in the samples for Request 806: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc.

PCBs and other extractables. Some aroclors were indicated in these samples, but none were in sufficient concentrations to be confirmed by GC/MS.

Extractable organics. No target compounds were identified in these samples. Unknowns with estimated concentrations ranging from 18 to 112 ppm occurred in five of the samples.

Volatile organics. Methylene chloride was detected in all soil samples at concentrations ranging from 0.11 to 0.91 mg/kg, but it exceeded tha calibration range in all cases except two. The highest measured concentration of methylene chloride was 0.150 mg/kg and it was also detected in the associated blank. All other volatile compounds detected were present at levels of 0.03 mg/kg or lower.

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.25.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I even though one of the samples could not be obtained because a hard subsurface obstruction prevented deeper penetration. In another case, the auger was able to penetrate the rock which means the subsurface obstruction was not the same type of material encountered in the other sample. The overall analytical rating is Quality Level II.

Field Data: No limitations or qualifications were apparent.

Analytical Data:

Anions and cyanide. The data are Quality Level I for cyanide.

Metals. Analytical results were Quality Level I except for beryllium and sodium at Quality Level II and antimony at Quality Level III.

PCBs and other extractables. All aroclors detected in this sample set are Quality Level II with the exception of aroclor-1254 in AR806034 and in AR806056, which are Quality Level III because the detected levels fall below the quantitation limit for the method.

Extractable organics. All data are of Quality Level III due to mass spectral uncertainty for tentatively identified compounds. Surrogate recovery problems were also noted on the data quality summary.

Volatile organics. Results recorded for AR806056 and AR806045 were Quality Level III because a surrogate standard or an internal standard did not meet specifications. Any bias resulting from the internal standard or surrogate not meeting criteria is expected to be low. Therefore elevated results may be significant. Data quality for all other target volatile compounds detected at levels above their quantitation limits was either Quality Level I or II.

Radiochemistry. The quality level for the radionuclides is I.

Environmental Problem: 20
Request Number: 806

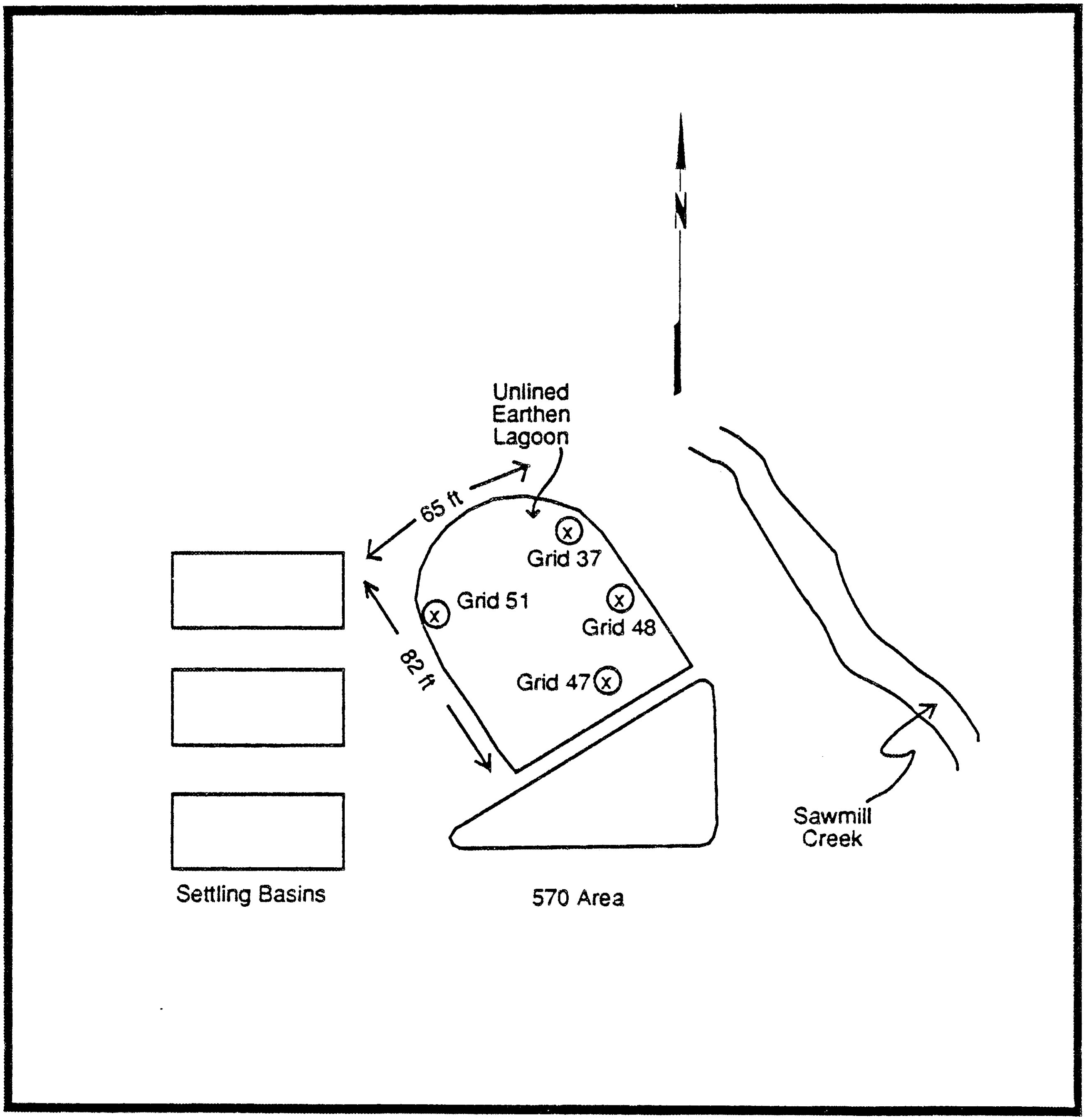

Figure 4.20. Unlined Earthen Lagoon in the 570 Area (Request 806)

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TABLE 4.2.20 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 20

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR806	570 HTP	LAGOON	SOIL	8	7	GRAB	0	7	7	7	0	0	0	0	0	0	6	7	7	7	7	7	7	7
			MED TOTAL	8	7		0	7	7	7	0	0	0	0	0	0	6	7	7	7	7	7	7	7
AR806	570 HTP	LAGOON	SUR WATER	1	1	QC RN	0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
			MED TOTAL	1	1		0	1	1	1	0	0	0	0	0	0	0	1	1	1	1	1	1	1
			EP TOTAL	9	8		0	8	8	8	0	0	0	0	0	0	6	8	8	8	8	8	8	8

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20
UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

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S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO: AR806012	AR806023	AR806034	AR806045	AR806056	AR806078
PH (UNITS)	7.6	6.2	7.1	6.8	7.8	7.3

FIELD MEASUREMENTS	SAMP NO: AR806089					
PH (UNITS)	6.8					

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR806012D SDG NO: AR806012D TYPE: GRAB	AR806012D AR809015A GRAB	AR806012E AR803019E GRAB	AR806023D AR806012D GRAB	AR806023D AR809015A GRAB	AR806023E AR803019E GRAB
ALUMINUM			14900			17200
ARSENIC	24		9.4 UN	18		11 UN
BARIUM			108 E			92 E
BERYLLIUM			1.5 E			1.9 E
CADMIUM	2.8 BN		2.2	3.2 BN		1.5
CALCIUM			37600			55300
CHROMIUM			35			25
COBALT			12			11
COPPER			37			44
IRON			33400			42400
LEAD	28		17 B	29		36 B
MAGNESIUM			23900			35200
MANGANESE			1140			722
MERCURY		1.3			0.58	
NICKEL			38			35
SILVER	0.97 UN		2.8	1.1 UN		1.3 B
SODIUM			826			889 B
VANADIUM			32			41
ZINC			93			116

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR806034D SDG NO: AR801028C TYPE: GRAB	AR806034D AR809015A GRAB	AR806034E AR803019E GRAB	AR806045D AR806012D GRAB	AR806045D AR809015A GRAB	AR806045E AR803019E GRAB
ALUMINUM			18600			23800
ARSENIC	19		9.8 UN	12		10 UN
BARIUM			109 E			131 E
BERYLLIUM			1.6 E			1.8 E
CADMIUM	2.4 B		1.1	3.1 BN		0.83 B
CALCIUM			28400			8480
CHROMIUM			48			39

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20 UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

DRAFT DO NOT CITE

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806034D / AR801028C / GRAB	AR806034D / AR809015A / GRAB	AR806034E / AR803019E / GRAB	AR806045D / AR806012D / GRAB	AR806045D / AR809015A / GRAB	AR806045E / AR803019E / GRAB
COBALT				12			11
COPPER				37			30
IRON				29000			30500
LEAD		31		23 B	23		15 B
MAGNESIUM				19000			8630
MANGANESE				623			241
MERCURY			0.23			0.69	
NICKEL				28			31
SILVER		3		4.4	1.2 BN		1.9
SODIUM				759 B			884
VANADIUM				40			58
ZINC				118			91

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806056D / AR801028C / GRAB	AR806056D / AR809015A / GRAB	AR806056E / AR803019E / GRAB	AR806078D / AR806012D / GRAB	AR806078D / AR809015A / GRAB	AR806078E / AR803019E / GRAB
ALUMINUM				10200			12500
ARSENIC		15		9.1 UN	27		9.9 UN
BARIUM				45 E			58 E
BERYLLIUM				1.3 E			1.5 E
CADMIUM		1.6 B		0.9	3.7 BN		1.4
CALCIUM				86300			91000
CHROMIUM				19			18
COBALT				10			7.9 B
COPPER				27			35
IRON				24100			40400
LEAD		31		15 B	31		10 B
MAGNESIUM				49900			56200
MANGANESE				541			518
MERCURY			0.26			0.16	
NICKEL				26			28
SILVER		0.97 U		1.9	1.1 UN		2.1
SODIUM				504 B			860
VANADIUM				20			28
ZINC				53			96

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20 DRAFT DO NOT CITE
UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806089D AR801028C GRAB	AR806089D AR809015A GRAB	AR806089E AR803019E GRAB			
ALUMINUM				10600			
ARSENIC		26		11 UN			
BARIUM				48 E			
BERYLLIUM				1.5 E			
CADMIUM		3.4 B		1.1			
CALCIUM				102000			
CHROMIUM				15			
COBALT				6.7 B			
COPPER				30			
IRON				36300			
LEAD		31		15 B			
MAGNESIUM				61900			
MANGANESE				483			
MERCURY			0.39				
NICKEL				26			
SILVER		1.1 U		1.8 B			
SODIUM				861 B			
VANADIUM				25			
ZINC				93			

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806012B ARG03 GRAB	AR806023B ARG03 GRAB	AR806034B ARG03 GRAB	AR806045B ARG03 GRAB	AR806056B ARG03 GRAB	AR806078B ARG03 GRAB
AROCLOR-1248		200 J	110 U	100 U	100 U	95 U	110 U
AROCLOR-1254		830 J	220 U	200 J	980 J	190 J	300 J
AROCLOR-1260		370 J	220 U	200 U	470 J	190 U	220 U

PCBS & OTHER EXTRACTABLES (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806089B ARG03 GRAB					
AROCLOR-1248		550 J					
AROCLOR-1254		1200 J					
AROCLOR-1260		640 J					

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20 DRAFT DO NOT CITE
UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR806012B SDG NO: CD30 TYPE: GRAB	AR806023B CD31 GRAB	AR806034B CD31 GRAB	AR806045B CD31 GRAB	AR806056B CD31 GRAB	AR806078B CD31 GRAB
* UNKNOWN(7.25)						
* UNKNOWN(7.51)			526 J	396 J		
* UNKNOWN(7.52)	52 J					
* UNKNOWN(7.57)			2630 J	2640 J		
* UNKNOWN(7.65)	598 J					
* UNKNOWN(7.77)			1320 J			
* UNKNOWN(7.78)				1320 J		
* UNKNOWN(7.80)	182 J					
* UNKNOWN(7.96)				264 J		
* UNKNOWN(8.01)	299 J		2630 J	2640 J		1400 J
* UNKNOWN(8.02)		151 J			1230 J	
* UNKNOWN(9.28)	351 J					
* UNKNOWN(9.29)		453 J				
* UNKNOWN(10.22)	299 J					
* UNKNOWN(10.24)		302 J				
* UNKNOWN(11.21)		151 J				
* UNKNOWN(11.23)						1120 J
* UNKNOWN(11.42)		106 J				
* UNKNOWN(11.76)					617 J	
* UNKNOWN(12.53)		60 J				
* UNKNOWN(15.13)	546 J					
* UNKNOWN(15.14)		453 J				
* UNKNOWN(15.78)			658 J			
* UNKNOWN(15.99)		76 J			494 J	
* UNKNOWN(16.26)		45 J				
* UNKNOWN(18.44)	429 J	302 J				
* UNKNOWN(19.28)			395 J			
* UNKNOWN(19.29)		45 J				
* UNKNOWN(21.37)	325 J					
* UNKNOWN(21.38)		151 J				
* UNKNOWN(24.01)	572 J	151 J				
* UNKNOWN(24.52)					494 J	
* UNKNOWN(26.29)	299 J					
* UNKNOWN(26.30)		121 J				
* UNKNOWN(29.81)				528 J		
* UNKNOWN(33.15)	1690 J				18500 J	
* UNKNOWN(33.16)			42100 J	112000 J		18200 J
* UNKNOWN(33.17)						
* UNKNOWN(33.18)		22600 J				
* UNKNOWN(35.21)		302 J				
* UNKNOWN(38.15)		906 J				
* UNKNOWN(43.97)		755 J				

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20
UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

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S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR806089B SDG NO: CD31 TYPE: GRAB
* UNKNOWN(7.25)	85 J
* UNKNOWN(7.51)	34 J
* UNKNOWN(7.52)	
* UNKNOWN(7.57)	340 J
* UNKNOWN(7.65)	
* UNKNOWN(7.77)	
* UNKNOWN(7.78)	170 J
* UNKNOWN(7.80)	
* UNKNOWN(7.96)	
* UNKNOWN(8.01)	340 J
* UNKNOWN(8.02)	
* UNKNOWN(9.28)	
* UNKNOWN(9.29)	
* UNKNOWN(10.22)	
* UNKNOWN(10.24)	
* UNKNOWN(11.21)	
* UNKNOWN(11.23)	
* UNKNOWN(11.42)	
* UNKNOWN(11.76)	
* UNKNOWN(12.53)	
* UNKNOWN(15.13)	
* UNKNOWN(15.14)	
* UNKNOWN(15.78)	
* UNKNOWN(15.99)	
* UNKNOWN(16.26)	
* UNKNOWN(18.44)	
* UNKNOWN(19.28)	
* UNKNOWN(19.29)	
* UNKNOWN(21.37)	
* UNKNOWN(21.38)	
* UNKNOWN(24.01)	
* UNKNOWN(24.52)	
* UNKNOWN(26.29)	
* UNKNOWN(26.30)	
* UNKNOWN(29.81)	
* UNKNOWN(33.15)	
* UNKNOWN(33.16)	
* UNKNOWN(33.17)	6800 J
* UNKNOWN(33.18)	
* UNKNOWN(35.21)	
* UNKNOWN(38.15)	
* UNKNOWN(43.97)	

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20
UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

DRAFT DO NOT CITE

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806012A GN22 GRAB	AR806023A ON22 GRAB	AR806034A ON24 GRAB	AR806045A ON22 GRAB	AR806056A ON22 GRAB	AR806078A GN23 GRAB
ACETONE		30 B	15 B	17 B	13 U	7 JB	14 B
BENZENE		6 U	7 U	6 U	6 U	1 J	7 U
CARBON DISULFIDE		6 U	7 U	6 U	6 U	2 JB	7 U
METHYLENE CHLORIDE		560 BE	150 B	620 BE	710 BE	910 BE	110 B
TOLUENE		6 U	7 U	1 U	6 U	9	7 U
TRICHLOROETHENE		6 U	7 U	6 U	6 U	3 J	7 U
XYLENE (TOTAL)		18	7 U	3 J	6 U	6 U	7 U
1,1,1-TRICHLOROETHANE		6 U	5 J	6 U	6 U	5 J	7 U

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR806089A GN23 GRAB					
ACETONE		19 B					
BENZENE		8 U					
CARBON DISULFIDE		8 U					
METHYLENE CHLORIDE		120 B					
TOLUENE		8 U					
TRICHLOROETHENE		8 U					
XYLENE (TOTAL)		8 U					
1,1,1-TRICHLOROETHANE		8 U					

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE:	AR806012F LLL7680 GRAB	AR806012G LLL7680 GRAB	AR806023F LLL7680 GRAB	AR806023G LLL7680 GRAB	AR806034F LLL7680 GRAB	AR806034G LLL7680 GRAB
CO-60			130		40 U		30 U
CS-137			1200		450		110
H-3		23000		21000		14000	
K-40			14000		18000		15000
PU-238			12		8		0
PU-239			1800		650		350
SR-TOT			1200		0		2600

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE:	AR806045F LLL7680 GRAB	AR806045G LLL7680 GRAB	AR806056F LLL7680 GRAB	AR806056G LLL7680 GRAB	AR806078F LLL7680 GRAB	AR806078G LLL7680 GRAB
CO-60			30 U		40 U		40 U

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20 UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

DRAFT DO NOT CITE

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SOIL

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE: AR806045F LLL7680 GRAB	AR806045G LLL7680 GRAB	AR806056F LLL7680 GRAB	AR806056G LLL7680 GRAB	AR806078F LLL7680 GRAB	AR806078G LLL7680 GRAB
CS-137		120		230		400
H-3	13000		19000		25000	
K-40		14000		17000		18000
PU-238		11		14		2
PU-239		810		840		130
SR-TOT		1300		1400		1100

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE: AR806089F LLL7680 GRAB	AR806089G LLL7680 GRAB				
CO-60		120				
CS-137		560				
H-3	10000					
K-40		21000				
PU-238		12				
PU-239		190				
SR-TOT		600				

S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO: / SDG NO: / TYPE: AR806090F AR403015G RINSATE	AR806090F AR806090F RINSATE	AR806090G AR300044B RINSATE	AR806090G AR300066K RINSATE		
ALUMINUM			133 BNE			
BARIUM			4.3 B			
CADMIUM	3 B					
CALCIUM			744 B			
IRON			180			
MAGNESIUM			402 B			
MANGANESE			8 B			
MERCURY		0.02 B				
NICKEL			6.4 B			
POTASSIUM				100		

TABLE 4.3.20 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 20 UNLINED EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT

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S&A REQUEST: 806
LOCATION: EARTHEN LAGOON AT THE WASTEWATER TREATMENT PLANT
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR806090F	AR806090F	AR806090G	AR806090G		
	SDG NO:	AR403015G	AR806090F	AR300044B	AR300066K		
	TYPE:	RINSATE	RINSATE	RINSATE	RINSATE		
ZINC				4.4 B			

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR806090E					
	SDG NO:	DD29					
	TYPE:	RINSATE					
BIS(2-ETHYLHEXYL)PHTHALATE		3 JB					
DI-N-BUTYLPHTHALATE		1 JB					
* HALOGENATED UNKNOWN(26.98)		5 JB					
* UNKNOWN HYDROCARBON(8.09)		5 JB					
* UNKNOWN(19.46)		3 JB					
* UNKNOWN(19.81)		4 JB					
* UNKNOWN(22.19)		13 J					
* UNKNOWN(29.35)		4 J					
* UNKNOWN(30.08)		7 JB					
* UNKNOWN(33.67)		13 J					
* UNKNOWN(33.81)		13 J					
* UNKNOWN(36.75)		23 J					
* UNKNOWN(37.14)		23 J					
* UNKNOWN(37.94)		9 J					
* UNKNOWN(44.58)		9 JB					

VOLATILE ORGANICS (UG/L)	SAMP NO:	AR806090A					
	SDG NO:	ON22					
	TYPE:	RINSATE					
ACETONE		5 JB					
METHYLENE CHLORIDE		5 JB					
TOLUENE		10					

RADIOCHEMISTRY (PCI/L)	SAMP NO:	AR806090I	AR806090J	AR806090K			
	SDG NO:	LLL7679	LLL7679	LLL7679			
	TYPE:	RINSATE	RINSATE	RINSATE			
H-3		250					
PU-238			0.04				
PU-239			0				
SR-TOT				4.6			

4.26 Environmental Problem 21: Acid Drains, Drain Field, and Underground Fuel Tank at the Abandoned NIKE Site

Request Numbers: 807 and 808.

Requester: B. Levitan.

Findings and Basis: The NIKE site was operated by the Department of Defense between the late 1950s and early 1970s. Machine-shop wastes may have been disposed of in drains and entered a drain field. A recently emptied underground fuel tank contained significant quantities of water (2,200 gallons) and fuel oil (1,750 gallons), suggesting a leak. Excess acids, possibly used during rocket fueling, may have been drained on site. These discharges may have contaminated the surface water or migrated into the soil and contaminated the groundwater.

4.26.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if contaminants listed in Sect. 4.26.2 were present in soils near the abandoned NIKE site at concentrations higher than background.

Supporting Information: Photoionization detector measurements from this site indicated high levels of organic vapors in the acid drain pipes. Machine shop wastes could have included metals.

4.26.2 Sampling and Analytical Design

4.26.2.1 Sampling Design

Request 807: NIKE Site - Soil (Fig. 4.21a). Two grab soil samples were to be collected from 0-1 ft below the surface in the swale east of the site near the acid drain pipe outlet. Six grab soil samples were to be collected (Sampling Method: Reference E.5.1) in the drainfield south of the distribution boxes at 0-5 ft and 5-10 ft below the surface.

The Sampling Team arrived onsite 16NOV87 at 1430. There were heavy rainfall, high winds, and heavy cloud cover. The request consisted of two areas. Area A was a 10 m^2 area consisting of the swale under and around the acid drainpipe outlet and may have had a concentration gradient. Area A was divided into a 50-segment grid and 2 segments were chosen downgradient, but very near the pipe discharge. The vegetative cover (fescue grass) was removed and soil samples AR807013 (grid 3) and AR807024 (grid 34) were collected at 1500 and 1510, respectively, from the 0-1 ft depth. A radiation scan indicated 20-30 cpm. Field soil pH was determined as noted in Appendix C of the ANL Sampling and Analysis Plan and noted as "soil pH in water."

Area B, a 5-yd radius semicircle, was in the drainfield approximately 9 m (30 ft) south of the distribution boxes. Area B was less than 100 m^2 and considered homogeneous. Sample collection from Area B began at about 1530. Heavy rain, cloudy skies, and high winds made report and data entry difficult. A radiation scan indicated 100 cpm, but was suspect due to water on the meter. Area B was divided into a 60-segment grid and 3 segments selected at random. Composite soil samples were to be collected from each segment at depths of 0-5 ft and 5-10 ft below the surface. Sample AR807035 was collected at 1600 from grid 3 at a depth of 0-5 ft. Sample AR807068 was collected at 5-10 ft depth. Sample AR807046 was collected at 1640 from grid 37 at a depth of 0-5 ft. Sample AR807079 was collected at the 5-10 ft depth. Because of darkness, collection of samples from grid 57 of Area B was postponed until the next day. Sample AR807057 was collected at 0920 from grid 57 at a depth of 0-5 ft on 17NOV87. Sample AR807080 was collected at 0930 from the 5-10 ft depth of grid 57. Generally, the 0-5 ft depth indicated black soil grading into mostly brown soil below 5 ft.

Request 808: Underground Fuel Storage Tank at the Abandoned NIKE Site - Soil (Fig. 4.21b). According to the ANL Sampling and Analysis Plan, four grab samples were to be collected (Sampling Method: Reference E.5.1) from the area around the underground tank.

The Sampling Team arrived at the sampling location at 1010 on 17NOV87. The temperature was 55°F and winds were gusty. (The temperature dropped rapidly and reached the mid-40s by noon.) The area was considered homogeneous with respect to soil contamination. The area around the tank had previously been divided into an 80-segment grid. Due to the small area (less than 100 m^2) available for sampling, only three samples (grids) were collected. The fourth grid (#61) was judged to be in excess of sample requirements. The specific area sampled was selected after discussions with J. Weirderich (ANL tank coordinator). He indicated that the tank was presently covered by a mound of soil. The sample points were approximately 8 ft south of the soil mound. QC rinsate sample AR808058 was collected at 1015. Sample AR808014 was collected at 1040 from the 8-10 ft depth of grid 1. There was a strong odor of fuel in the area and soil. Sample AR808025 was collected at 1100 from the 8-10 ft depth of grid 21. Sample AR808036 was collected at 1115 from the 8-10 ft depth of grid 41. Sample AR808047 was not collected from grid 61, because three soil samples were determined to be sufficient. During sampling, a strong odor of diesel fuel was detected in the first 1 ft of soil and was present to the 10 ft depth maximum in all holes. The eastern-most grid exhibited the strongest odor, and the western-most grid the least. The PID instrument did not function properly because of high soil moisture content.

4.26.2.2 Analytical Design

Request 807: The field parameter measured for Request 807 was pH. The parameters analyzed included volatiles, semivolatiles, and CLP-metals.

Request 808: No field parameter measurements were requested for Request 808. The parameter analyzed included hydrocarbons by GC.

4.26.3 Field and Analytical Data

Field Data:

Request 807: *The pH readings of the NIKE site soils are shown in Table 4.3.21. The shallow surface samples (0-1 ft) from Area A show pHs of 7.2 and 7.4 (AR807013 and*

-024). The remaining sample readings from Area B range from 7.4 to 7.8 with little difference in pH between the surface (0-5 ft) and the subsoil (5-10 ft).

Request 808: No field measurements were requested.

Field Data Evaluation:

Request 807: Because the instrument was calibrated prior to making the field measurements, the data are reliable.

Request 808: No field measurements were requested.

Analytical Data:

Request 807:

Metals. Analytical results for metals in soil are presented in Table 4.3.21. Of the 20 metals detected, silver and sodium were below the CRDL in all eight samples. Of the remaining metals, arsenic ranged from 9 to 14 mg/kg, barium ranged from 33 to 192 mg/kg, beryllium from 0.99 to 1.3 mg/kg, cadmium from 1.5 to 31 mg/kg, chromium from 12 to 108 mg/kg, cobalt from 8.7 to 16 mg/kg, copper from 20 to 78 mg/kg, lead from 20 to 7420 mg/kg, mercury from 0.05 to 0.08 mg/kg, nickel from 21 to 33 mg/kg, and zinc from 74 to 1450 mg/kg. Other metals detected were aluminum, calcium, iron, manganese, magnesium, potassium, and vanadium.

Extractable organics. Fluoranthene and pyrene were identified in estimated concentrations of 2.3 and 1.7 ppm, respectively, in sample AR807024. Otherwise, there were no target compounds identified in these samples. Estimated concentrations of some unknowns were in the 12-37 ppm range in samples AR807013 and AR807024. Other unknowns also occurred in these samples in lesser estimated concentrations. In the other samples, the unknowns gererally had estimated concentrations of less than 5 ppm (one exception being 7.7 ppm in sample AR807068).

<u>Volatile organics</u>. From six to ten volatile compounds were detected in each of the eight samples collected for Environmental Problem 21. Only volatiles on the Target Compound List were detected. With the exception of methylene chloride, no volatile compound was detected at a level greater than 0.035 mg/kg. Methylene chloride was present in each of the eight samples and also in the blank. Concentrations of methylene chloride exceeded the calibration range and were estimated as high as 3.4 mg/kg. The highest measured concentration of methylene chloride was 0.230 mg/kg. Acetone was also present in all samples and in the blank.

Request 808:

<u>Petroleum hydrocarbons</u>. The petroleum hydrocarbon concentrations in the soils of Request 808 are shown in Table 4.3.21. Two types of values are listed based on the standard used in the determination. Values followed by the letter "X" were determined using the JP-4 standard; the three sample values range from 170 to 1100 µg/g with an average of 705 µg/g. The three values obtained using the DF-21 standard range from 275 to 2100 µg/g with an average of 1300 µg/g.

<u>PCBs and other extractables</u>. Heptachlor epoxide was indicated with an estimated concentration of 0.06 µg/L in the rinsate. The concentration was below the quantitation limit. No other compounds were detected.

Analytical Data Evaluation:

Request 807:

<u>Metals</u>. Eleven metals of interest were detected above the CRDL in the samples for Request 807: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

<u>Extractable organics</u>. Fluoranthene and pyrene were identified in estimated concentrations of 2.3 and 1.7 ppm, respectively, in sample AR807024. Otherwise, there

were no target compounds identified in these samples. Estimated concentrations of unknowns were 37 ppm or less.

Volatile organics. With the exception of methylene chloride, no volatile compound was detected at a level greater than 0.035 mg/kg. Methylene chloride was present in each of the eight samples and also in the blank. Concentrations of methylene chloride exceeded the calibration range, and were estimated as high as 3.4 mg/kg. The highest measured concentration of methylene chloride was 0.230 mg/kg.

Request 808:

Petroleum hydrocarbons. The difference in the analysis is due to the standard used for calibration. When using the JP-4 as a standard, it was noted that the hydrocarbons were diesel range materials. The values obtained using DF-2 (diesel standard) for analysis are more accurate.

PCBs and other extractables. No PCBs/pesticides were confirmed in these samples.

4.26.4 Limitations and Qualifications:

Data Quality Level: The sampling plan and field sampling for this problem [which includes Requests 807 and 808 (no field measurements requested for 808)] are Quality Level I. The analytical Quality Level rating is II.

Field Data:

Request 807: No limitations or qualifications are apparent.

Request 808: No limitations or qualifications are apparent.

Analytical Data:

Request 807:

Metals. Analytical results were Quality Level I except for sodium at Quality Level II and antimony at Quality Level III.

Extractable organics. Data are of Quality Level III due to mass spectral uncertainties for unknowns. Data are also of Quality Level III for target compounds, due to concentrations being below quantitation limits and to problems with surrogate recovery, according to the data quality summary.

Volatile organics. The data quality for all target volatile compounds detected at levels above their quantitation limits was either Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. The concentrations determined for methylene chloride were either Quality Level I or II.

Request 808:

Petroleum hydrocarbons. The data are Quality Level I; the use of the proper standard enhanced the quality and reliability of the data.

PCBs and other extractables. No PCBs/pesticides were confirmed in these samples.

Environmental Problem: 21
Request Number: 807

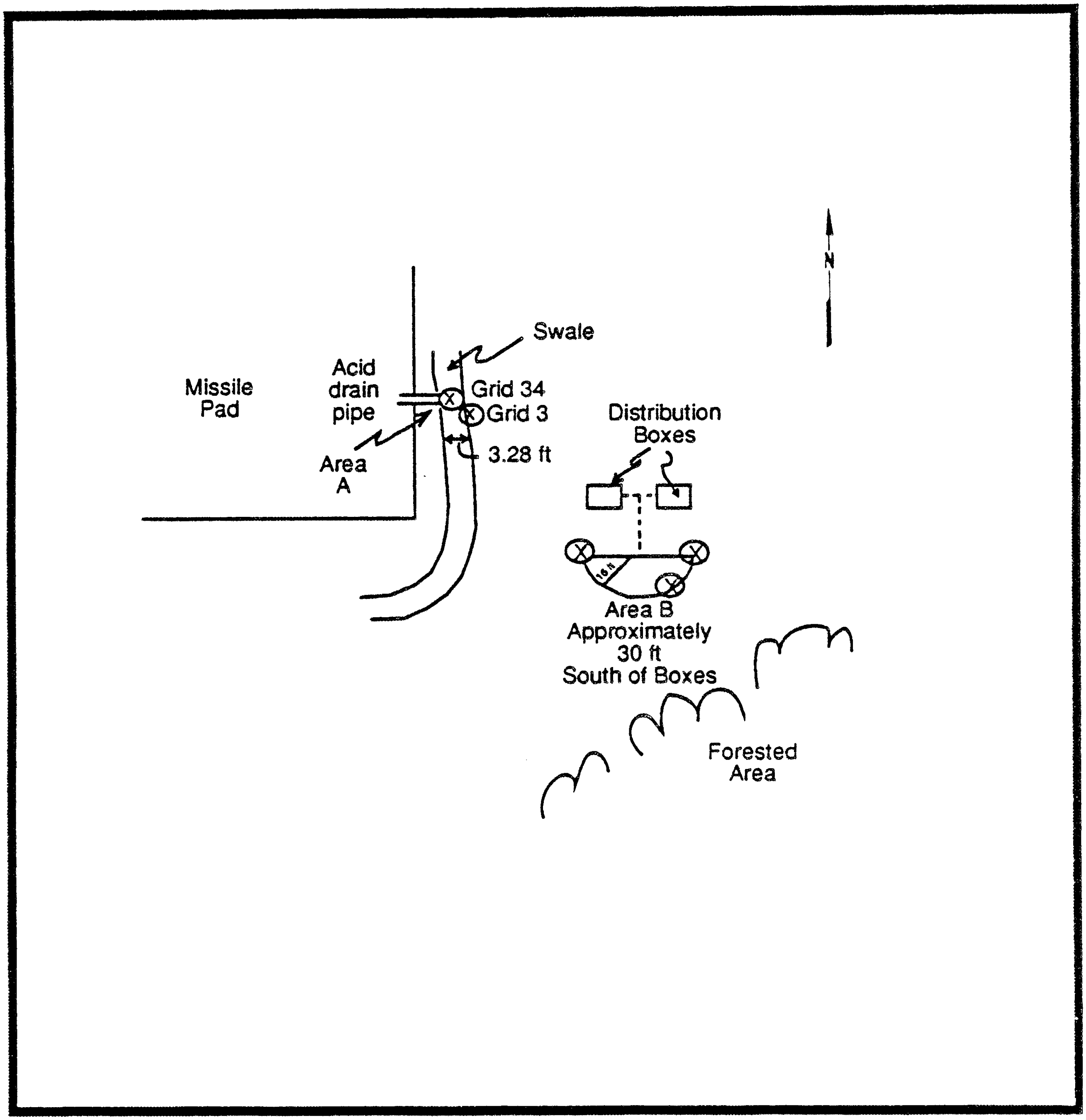

Figure 4.21a. Soil Sampling Collection Sites Associated with the Abandoned NIKE Site (Request 807)

Environmental Problem: 21
Request Number: 808

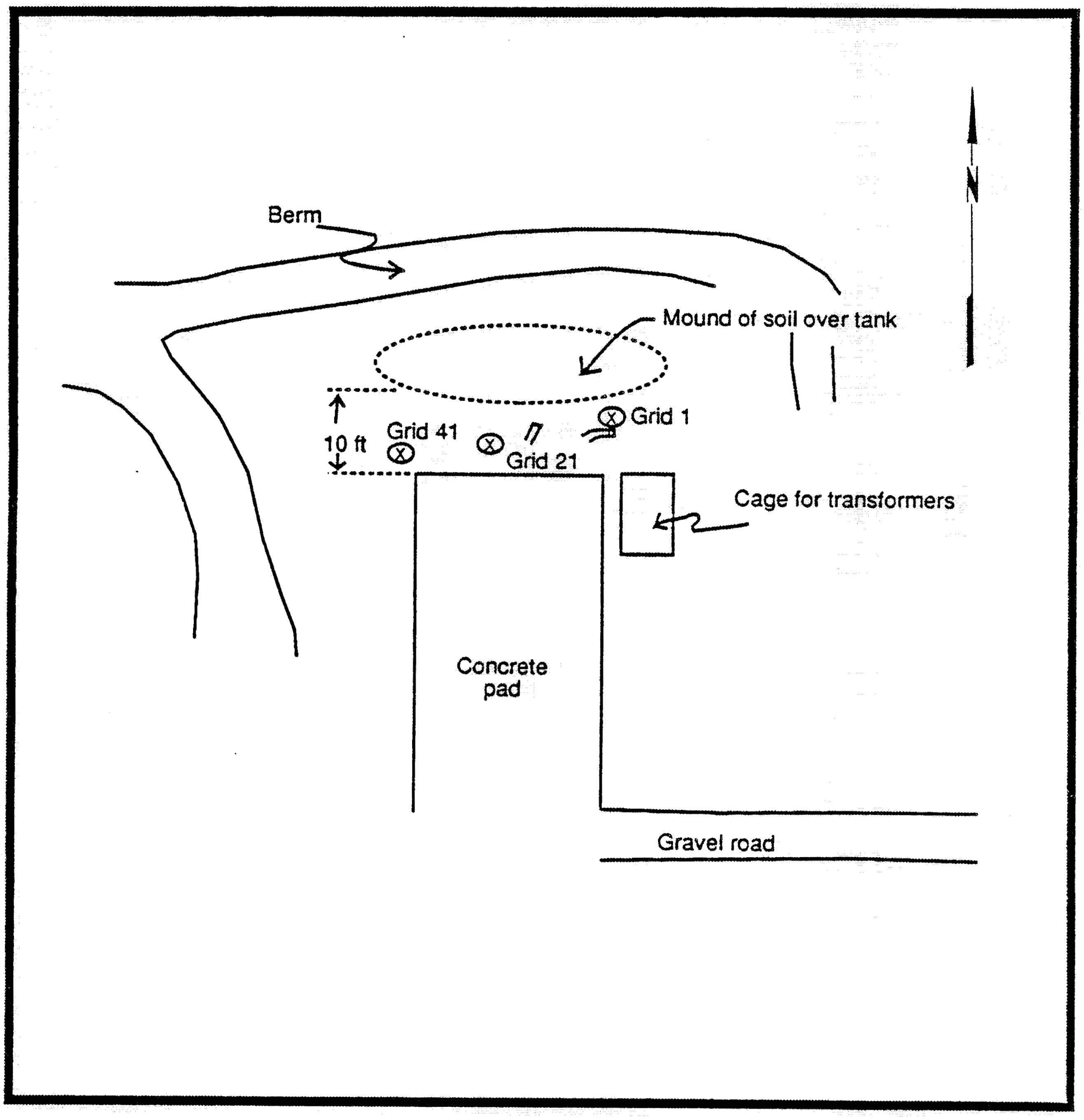

Figure 4.21b. Site of the Underground Fuel Storage Tank at the Abandoned NIKE Site(Request 808)

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TABLE 4.2.21 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 21

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR807	NIKE SITE	DRAINS	SOIL	8	8	GRAB	0	0	8	8	0	0	0	0	0	0	0	0	8	8	8	8	0	0
AR808	NIKE SITE	DRAINS	SOIL	4	3	GRAB	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0	0	0
		MED TOTAL		12	11		0	0	8	8	0	0	6	6	0	0	0	0	8	8	8	8	0	0
AR808	NIKE SITE	DRAINS	SUR WATER	1	1	QC RN	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
		MED TOTAL		1	1		0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
		EP TOTAL		13	12		0	0	8	8	0	0	6	6	0	0	1	1	9	9	8	8	0	0

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 DRAFT DO NOT CITE
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR807013	AR807024	AR807035	AR807046	AR807057	AR807068
PH (UNITS)		7.4	7.2	7.8	7.6	7.4	7.5

FIELD MEASUREMENTS	SAMP NO:	AR807079	AR807080				
PH (UNITS)		7.6	7.4				

	SAMP NO:	AR807013C	AR807013C	AR807013D	AR807013D	AR807024C	AR807024C
METALS, INCLUDING CR+6	SDG NO:	AR806012D	AR807080C	AR507010C	AR507010K	AR310013C	AR807080C
(MG/KG)	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM				13100			
ARSENIC		13		10 U		14 *	
BARIUM				63			
BERYLLIUM				1.2			
CADMIUM		14 N		2.6		31 **	
CALCIUM				28000			
CHROMIUM				27			
COBALT				13			
COPPER				43			
IRON				27300			
LEAD		2860		112		7420 *	
MAGNESIUM				18200			
MANGANESE				291			
MERCURY			0.06				0.08
NICKEL				29			
POTASSIUM					2500		
SILVER		1.1 UN		1 U		1.1 U	
SODIUM				160 B			
VANADIUM				30			
ZINC				180			

	SAMP NO:	AR807024D	AR807024D	AR807035C	AR807035C	AR807035D	AR807035D
METALS, INCLUDING CR+6	SDG NO:	AR507010C	AR507010K	AR310013C	AR807080C	AR507010C	AR507010K
(MG/KG)	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		9640				11000	
ARSENIC		12 U		9 *		10 U	
BARIUM		192				82	
BERYLLIUM		1.1				0.99	
CADMIUM		17		2.5 B**		1.5	
CALCIUM		52000				15700	

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR807024D AR507010C GRAB	AR807024D AR507010K GRAB	AR807035C AR310013C GRAB	AR807035C AR807080C GRAB	AR807035D AR507010C GRAB	AR807035D AR507010K GRAB
CHROMIUM		108				15	
COBALT		16				12	
COPPER		78				20	
IRON		24700				23500	
LEAD		2010		27 *		30 B	
MAGNESIUM		27500				10700	
MANGANESE		335				1030	
MERCURY					0.05		
NICKEL		22				22	
POTASSIUM			2200				2100
SILVER		1.3 B		1 U		1.6 B	
SODIUM		222 B				91 B	
VANADIUM		23				29	
ZINC		1450				74	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR807046C AR310013C GRAB	AR807046C AR807080C GRAB	AR807046D AR507010C GRAB	AR807046D AR507010K GRAB	AR807057C AR806012D GRAB	AR807057C AR807080C GRAB
ALUMINUM				14300			
ARSENIC		10 *		11 U		11	
BARIUM				59			
BERYLLIUM				1.2			
CADMIUM		2.4 B**		2		2.5 BN	
CALCIUM				36600			
CHROMIUM				20			
COBALT				12			
COPPER				28			
IRON				31200			
LEAD		20 *		29 B		26	
MAGNESIUM				23800			
MANGANESE				721			
MERCURY			0.05 B				0.05 B
NICKEL				30			
POTASSIUM					3400		
SILVER		1 U		1.1 B		1 UN	
SODIUM				193 B			
VANADIUM				33			
ZINC				81			

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR807057D	AR807057D	AR807068C	AR807068C	AR807068D	AR807068D
	SDG NO:	AR507010C	AR507010K	AR806012D	AR807080C	AR507010C	AR507010K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM		17500				17600	
ARSENIC		11 U		11		10 U	
BARIUM		105				88	
BERYLLIUM		1.3				1.3	
CADMIUM		1.6		2.7 BN		2	
CALCIUM		20800				11700	
CHROMIUM		21				24	
COBALT		13				14	
COPPER		22				28	
IRON		28200				32800	
LEAD		23 B		28		32 B	
MAGNESIUM		14500				10300	
MANGANESE		1040				961	
MERCURY					0.05		
NICKEL		26				33	
POTASSIUM			3200				3400
SILVER		1.1 U		1 UN		1.1 B	
SODIUM		114 B				190 B	
VANADIUM		41				44	
ZINC		78				85	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR807079C	AR807079C	AR807079D	AR807079D	AR807080C	AR807080C
	SDG NO:	AR806012D	AR807080C	AR507010C	AR507010K	AR302013D	AR807080C
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ALUMINUM				8610			
ARSENIC		14		9.6 U		14	
BARIUM				33			
BERYLLIUM				1			
CADMIUM		2.6 BN		1.7		3 B	
CALCIUM				76200			
CHROMIUM				12			
COBALT				8.7			
COPPER				25			
IRON				22000			
LEAD		67		18 B		27	
MAGNESIUM				45100			
MANGANESE				758			
MERCURY			0.04 B				0.04
NICKEL				21			
POTASSIUM					2800		

DRAFT DO NOT CITE

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR807079C AR806012D GRAB	AR807079C AR807080C GRAB	AR807079D AR507010C GRAB	AR807079D AR507010K GRAB	AR807080C AR302013D GRAB	AR807080C AR807080C GRAB
SILVER		1 UN		1.3 B		1 U	
SODIUM				286 B			
VANADIUM				20			
ZINC				75			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: SDG NO: TYPE:	AR807080D AR507010C GRAB	AR807080D AR507010K GRAB				
ALUMINUM		19400					
ARSENIC		11 U					
BARIUM		98					
BERYLLIUM		1.3					
CADMIUM		2					
CALCIUM		16300					
CHROMIUM		25					
COBALT		12					
COPPER		24					
IRON		31000					
LEAD		24 B					
MAGNESIUM		12500					
MANGANESE		871					
MERCURY							
NICKEL		32					
POTASSIUM			3000				
SILVER		1.1 B					
SODIUM		176 B					
VANADIUM		46					
ZINC		80					

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: SDG NO: TYPE:	AR807013B C104 GRAB	AR807024B C104 GRAB	AR807035B C104 GRAB	AR807046B C104 GRAB	AR807057B C104 GRAB	AR807068B C104 GRAB
FLUORANTHENE		3300 U	2300 J	330 U	330 U	330 U	330 U
PYRENE		3300 U	1700 J	330 U	330 U	330 U	330 U
* UNKNOWN(7.19)		390 J		72 J			
* UNKNOWN(7.28)							
* UNKNOWN(7.29)						4600 J	
* UNKNOWN(7.31)						30 J	

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG) SAMP NO: / SDG NO: / TYPE:	AR807013B C104 GRAB	AR807024B C104 GRAB	AR807035B C104 GRAB	AR807046B C104 GRAB	AR807057B C104 GRAB	AR807068B C104 GRAB
* UNKNOWN(7.33)				4300 J		
* UNKNOWN(7.38)						7700 J
* UNKNOWN(7.47)						
* UNKNOWN(7.50)						320 J
* UNKNOWN(7.51)		700 J	110 J		44 J	
* UNKNOWN(7.52)	920 J					
* UNKNOWN(7.56)		3200 J				
* UNKNOWN(7.58)	3400 J		1300 J	1000 J	1500 J	3000 J
* UNKNOWN(7.76)						970 J
* UNKNOWN(7.77)		1800 J	300 J	51 J		
* UNKNOWN(7.78)					130 J	
* UNKNOWN(7.79)	2000 J					
* UNKNOWN(7.97)						
* UNKNOWN(7.99)						860 J
* UNKNOWN(8.00)		1600 J	260 J	45 J	110 J	
* UNKNOWN(8.01)	2000 J					
* UNKNOWN(10.21)			250 J			
* UNKNOWN(10.23)					270 J	
* UNKNOWN(10.24)				340 J		
* UNKNOWN(10.27)						280 J
* UNKNOWN(10.28)						
* UNKNOWN(10.31)						
* UNKNOWN(11.24)						
* UNKNOWN(11.28)	510 J					
* UNKNOWN(11.36)				67 J		
* UNKNOWN(11.42)	300 J					
* UNKNOWN(11.43)		550 J				690 J
* UNKNOWN(11.46)					69 J	
* UNKNOWN(11.82)						260 J
* UNKNOWN(11.90)					79 J	
* UNKNOWN(11.91)			66 J			
* UNKNOWN(12.28)			83 J		110 J	
* UNKNOWN(12.29)				52 J		
* UNKNOWN(12.30)						
* UNKNOWN(12.75)			53 J		250 J	
* UNKNOWN(13.41)						310 J
* UNKNOWN(13.42)				76 J		
* UNKNOWN(15.99)	1600 J				53 J	
* UNKNOWN(17.29)	540 J					
* UNKNOWN(17.65)	540 J					
* UNKNOWN(17.91)	330 J					
* UNKNOWN(18.69)		570 J				

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 — DRAFT DO NOT CITE
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR807013B C104 GRAB	AR807024B C104 GRAB	AR807035B C104 GRAB	AR807046B C104 GRAB	AR807057B C104 GRAB	AR807068B C104 GRAB
* UNKNOWN(19.38)		1000 J					
* UNKNOWN(20.19)			1800 J				
* UNKNOWN(20.69)			480 J				
* UNKNOWN(20.74)							
* UNKNOWN(20.82)			1200 J				
* UNKNOWN(20.89)			670 J				
* UNKNOWN(22.39)			630 J				
* UNKNOWN(22.42)		3300 J					
* UNKNOWN(22.94)							
* UNKNOWN(24.42)							
* UNKNOWN(24.51)							
* UNKNOWN(24.52)			1300 J				
* UNKNOWN(24.53)		3600 J				120 J	
* UNKNOWN(25.86)							
* UNKNOWN(25.98)							
* UNKNOWN(27.21)							
* UNKNOWN(27.44)		1500 J					
* UNKNOWN(30.77)		4900 J					
* UNKNOWN(34.44)		5400 J	13000 J				
* UNKNOWN(36.24)			13000 J				
* UNKNOWN(44.32)		12000 J					
* UNKNOWN(46.66)			37000 J				

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR807079B C104 GRAB	AR807080B C104 GRAB				
FLUORANTHENE		330 U	330 U				
PYRENE		330 U	330 U				
* UNKNOWN(7.19)							
* UNKNOWN(7.28)		3200 J					
* UNKNOWN(7.29)							
* UNKNOWN(7.31)							
* UNKNOWN(7.33)							
* UNKNOWN(7.38)							
* UNKNOWN(7.47)			4700 J				
* UNKNOWN(7.50)							
* UNKNOWN(7.51)		87 J					
* UNKNOWN(7.52)							
* UNKNOWN(7.56)		1300 J	1500 J				
* UNKNOWN(7.58)							

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 DRAFT DO NOT CITE
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)			
	SAMP NO:	AR807079B	AR807080B
	SDG NO:	C104	C104
	TYPE:	GRAB	GRAB
* UNKNOWN(7.76)			
* UNKNOWN(7.77)		330 J	
* UNKNOWN(7.78)			
* UNKNOWN(7.79)			
* UNKNOWN(7.97)			84 J
* UNKNOWN(7.99)		270 J	
* UNKNOWN(8.00)			
* UNKNOWN(8.01)			
* UNKNOWN(10.21)			
* UNKNOWN(10.23)			
* UNKNOWN(10.24)			
* UNKNOWN(10.27)			
* UNKNOWN(10.28)		120 J	
* UNKNOWN(10.31)			200 J
* UNKNOWN(11.24)			380 J
* UNKNOWN(11.28)			
* UNKNOWN(11.36)			
* UNKNOWN(11.42)		520 J	
* UNKNOWN(11.43)			
* UNKNOWN(11.46)			
* UNKNOWN(11.82)			
* UNKNOWN(11.90)		93 J	
* UNKNOWN(11.91)			
* UNKNOWN(12.28)			
* UNKNOWN(12.29)			
* UNKNOWN(12.30)			110 J
* UNKNOWN(12.75)			
* UNKNOWN(13.41)			
* UNKNOWN(13.42)		82 J	
* UNKNOWN(15.99)			
* UNKNOWN(17.29)			
* UNKNOWN(17.65)			
* UNKNOWN(17.91)			
* UNKNOWN(18.69)			
* UNKNOWN(19.38)			
* UNKNOWN(20.19)			
* UNKNOWN(20.69)			
* UNKNOWN(20.74)		43 J	
* UNKNOWN(20.82)			
* UNKNOWN(20.89)			
* UNKNOWN(22.39)			
* UNKNOWN(22.42)			

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR807079B	AR807080B				
	SDG NO:	C104	C104				
	TYPE:	GRAB	GRAB				
* UNKNOWN(22.94)		51 J					
* UNKNOWN(24.42)		240 J					
* UNKNOWN(24.51)		630 J					
* UNKNOWN(24.52)							
* UNKNOWN(24.53)							
* UNKNOWN(25.86)			160 J				
* UNKNOWN(25.98)		280 J					
* UNKNOWN(27.21)		140 J					
* UNKNOWN(27.44)							
* UNKNOWN(30.77)							
* UNKNOWN(34.44)							
* UNKNOWN(36.24)							
* UNKNOWN(44.32)							
* UNKNOWN(46.66)							

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR807013A	AR807024A	AR807035A	AR807046A	AR807057A	AR807068A
	SDG NO:	GD01	GN24	GN24	GN24	GN24	GN24
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		19 B	14 B	10 JB	20 B	19 B	14 B
BENZENE		7 U	7 U	6 U	6 U	6 U	6 U
CARBON TETRACHLORIDE		7 U	7 U	6 U	6 U	6 U	6 U
CHLOROFORM		7 U	7 U	6 U	6 U	6 U	6 U
METHYLENE CHLORIDE		3400 BE	1100 BE	230 B	120 B	200 B	140 B
TETRACHLOROETHENE		7 U	7 U	6 U	6 U	6 U	6 U
TOLUENE		7 U	7 U	6 U	9	6 U	4 J
XYLENE (TOTAL)		7 U	7 U	6 U	6 U	6 U	6 U
1,1-DICHLOROETHANE		7 U	7 U	6 U	6 U	6 U	6 U
1,1,1-TRICHLOROETHANE		5 J	7 U	6 U	6 U	6 U	6 U

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR807079A	AR807080A				
	SDG NO:	ON24	ON25				
	TYPE:	GRAB	GRAB				
ACETONE		35 B	19 B				
BENZENE		3 J	7 U				
CARBON TETRACHLORIDE		4 J	7 U				
CHLOROFORM		3 J	7 U				
METHYLENE CHLORIDE		650 BE	118				
TETRACHLOROETHENE		2 J	7 U				

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21
ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 807
LOCATION: NIKE SITE
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR807079A	AR807080A
	SDG NO:	ON24	ON25
	TYPE:	GRAB	GRAB
TOLUENE		5 J	8
XYLENE (TOTAL)		6 U	8
1,1-DICHLOROETHANE		3 J	7 U
1,1,1-TRICHLOROETHANE		6 U	7 U

S&A REQUEST: 808
LOCATION: UNDERGROUND FUEL STORAGE TANK AT THE ABANDONED NIKE SITE
MEDIUM: SOIL

PETROLEUM HYDROCARBONS (UG/G)	SAMP NO:	AR808014A	AR808014A	AR808025A	AR808025A	AR808036A	AR808036A
	SDG NO:	AR405017A	AR405017A	AR405017A	AR405017A	AR405017A	AR405017A
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
PETROLEUM HYDROCARBONS		2100	1100 X	1540	850 X	275	170 X

S&A REQUEST: 808
LOCATION: UNDERGROUND FUEL STORAGE TANK AT THE ABANDONED NIKE SITE
MEDIUM: SURFACE WATER

PCBS & OTHER EXTRACTABLES (UG/L)	SAMP NO:	AR808058Z
	SDG NO:	ARG05
	TYPE:	RINSATE
HEPTACHLOR EPOXIDE		0.06 J

EXTRACTABLE ORGANICS (UG/L)	SAMP NO:	AR808058
	SDG NO:	DD30
	TYPE:	RINSATE
BIS(2-ETHYLHEXYL)PHTHALATE		2 J
* UNKNOWN HYDROCARBON(8.05)		24 JB
* UNKNOWN(19.49)		6 JB
* UNKNOWN(19.81)		5 JB

TABLE 4.3.21 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 21 ACID DRAINS, DRAIN FIELD, AND UNDERGROUND FUEL TANK AT THE ABANDONED NIKE SITE

DRAFT DO NOT CITE

S&A REQUEST: 808
LOCATION: UNDERGROUND FUEL STORAGE TANK AT THE ABANDONED NIKE SITE
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR808058 SDG NO: DD30 TYPE: RINSATE
* UNKNOWN(22.17)	18 J
* UNKNOWN(37.45)	29 J

4.27 Environmental Problem 22: Underwriter's Pond

Request Number: 809.

Requester: B. Levitan.

Finding and Basis: From 1965 to 1972, water-reactive chemicals (primarily sodium-containing compounds), a variety of metals (lithium, cesium), and some organics were disposed of in Underwriter's Pond. Because some materials are not reactive, there is the potential for accumulation in the pond sediments. Additionally, reaction products may also have settled in the pond. Because the pond is in a public forest preserve, there is the possibility of both human and wildlife contact.

4.27.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of contaminants listed in Sect. 4.27.2.2 in sediments at the Underwriter's Pond at minimum detection levels.

Supporting Information: Sediments were the likely sink for non-water-reactive solids, reaction products, and residues from incomplete reactions. Because of the potential for public access, and the uncertainty as to the extent of contamination, it was recommended that pond sediments be sampled. Surface water had been analyzed for metals, but no analyses had been made of sediments.

4.27.2 Sampling and Analytical Design

4.27.2.1 Sampling Design

Request 809: Underwriter's Pond - Sediment (Fig. 4.22). Three sediment samples were to be collected (Sampling Method: Reference E5.3.1) from the northeast corner of the Underwriter's Pond.

The Sampling Team arrived at the parking lot closest to the sampling location 10NOV87 at 1100. QC rinsate sample AR809048 was collected in the parking lot at 1100. The decontamination procedure was followed. The team arrived at the sampling site at 1117. The weather was cold (30°F) and skies were partly cloudy. The area of interest was approximately 100m^2 and considered homogeneous. Pond water had a black tint to it and the pond had a sheen on it. The pond apparently supported little life based on the lack of vegetation in the pond and the lack of inflow/outflow. The area was divided into a 60-segment grid and three segments were selected at random. A grab sample was collected from the top 15 cm of each segment selected. QC sample AR809048 was collected at 1100. Sample AR809015 was collected at 1117 from the 0-15 cm depth of grid 18. It was black and silty. Sample AR809026 was collected at 1117 from the 0-15 cm depth of grid 26. It was black, silty, and slurry. Sample AR809037 was collected at 1125 from the 0-15 cm depth of grid 55.

4.27.2.2 Analytical Design

Request 809: The field parameter measured for Request 809 was pH. The parameters to be analyzed included CLP-metals, lithium, and cesium.

4.27.3 Field and Analytical Data

Field Data: *Although the plan called for determining the pH of three sediment samples from the Underwriter's Pond, no pH measurements were made.*

Field Data Evaluation: A statement was made in the field log that pH measurements were "not applicable," without further elaboration.

Analytical Data:

<u>Metals</u>. Analytical results for metals in sediment are presented in Table 4.3.22. Of the 19 metals detected, the following 6 were below the CRDL in all three samples: barium,

beryllium, cadmium, cobalt, mercury, and sodium. Of the remaining metals detected, arsenic was 8.1 mg/kg, chromium ranged from 11 to 18 mg/kg, copper from 26 to 33 mg/kg, lead from 48 to 76 mg/kg, nickel from 17 to 23 mg/kg, and zinc from 103 to 124 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

Analytical Data Evaluation:

Metals. Six metals of interest--arsenic, chromium, copper, lead, nickel, and zinc--were detected above the CRDL in the samples for Request 809.

4.27.4 Limitation and Qualifications

Data Quality Level: The sampling plan is rated Quality Level I; the field sampling is rated Quality Level III; and the overall analytical rating is Quality Level I.

Field Data: Samples were collected from the pond for analyses for CLP-metals, lithium, and cesium. The rating of Quality Level III is based on the absence of pH readings without adequate justification and, most significantly, on the fact that two out of three analytical requests were not submitted for analysis (lithium and cesium).

Analytical Data:

Metals. Analytical results were Quality Level I except for aluminum, selenium, and vanadium at Quality Level II and antimony at Quality Level III.

Environmental Problem: 22
Request Number: 809

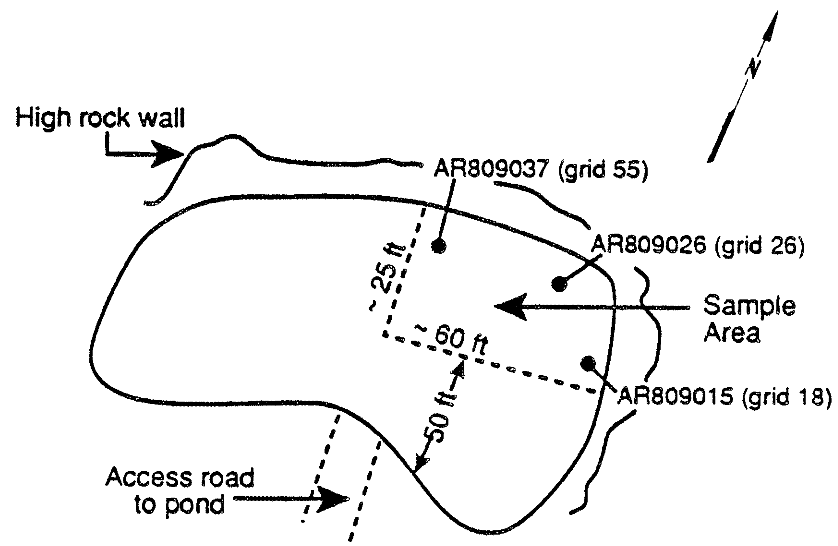

Figure 4.22. Underwriter's Pond (Request 809)

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TABLE 4.2.22 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 22

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR809	UNDWRTRS P	POND	SEDIMENT	3	3	GRAB	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	3	3		0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR809	UNDWRTRS P	POND	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	1	1		0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EP TOTAL	4	4		0	0	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 4.3.22 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 22 DRAFT DO NOT CITE
UNDERWRITER'S POND

S&A REQUEST: 809
LOCATION: SEDIMENT SAMPLES FROM THE NORTHEAST CORNER OF UNDERWRITER'S POND
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR809015A / AR800050C / GRAB	AR809015A / AR809015A / GRAB	AR809015B / AR802085F / GRAB	AR809015B / AR802085K / GRAB	AR809026A / AR800050C / GRAB	AR809026A / AR809015A / GRAB
ALUMINUM				5640			
ARSENIC		8.3 B		34 U		10 B	
BARIUM				64 BE			
BERYLLIUM				1.2 B			
CADMIUM		4 B		1.8 B		8.1 B	
CALCIUM				53300			
CHROMIUM				11			
COBALT				7.7 B			
COPPER				26			
IRON				22800			
LEAD		68 N		48 B		76 N	
MAGNESIUM				28900			
MANGANESE				162			
MERCURY			0.17 B				0.18 B
NICKEL				17 B			
POTASSIUM					1200 B		
SODIUM				306 B			
VANADIUM				24 B			
ZINC				124			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR809026B / AR802085F / GRAB	AR809026B / AR802085K / GRAB	AR809037A / AR806012D / GRAB	AR809037A / AR809015A / GRAB	AR809037B / AR802085F / GRAB	AR809037B / AR802085K / GRAB
ALUMINUM		10400				10600	
ARSENIC		33 U		8.1		26 U	
BARIUM		76 BE				68 BE	
BERYLLIUM		1.3 B				1.2 B	
CADMIUM		2 B		2.8 BN		1.7 B	
CALCIUM		29800				16300	
CHROMIUM		17				18	
COBALT		8.9 B				9.9 B	
COPPER		34				31	
IRON		25700				21500	
LEAD		53 B		48		42 B	
MAGNESIUM		12600				10600	
MANGANESE		184				209	
MERCURY					0.12 B		
NICKEL		23				24	
POTASSIUM			2200 B				2400
SODIUM		248 B				196 B	

TABLE 4.3.22 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 22 DRAFT DO NOT CITE
UNDERWRITER'S POND

S&A REQUEST: 809
LOCATION: SEDIMENT SAMPLES FROM THE NORTHEAST CORNER OF UNDERWRITER'S POND
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR809026B	AR809026B	AR809037A	AR809037A	AR809037B	AR809037B
	SDG NO:	AR802085F	AR802085K	AR806012D	AR809015A	AR802085F	AR802085K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
VANADIUM		32				33	
ZINC		121				103	

S&A REQUEST: 809
LOCATION: SEDIMENT SAMPLES FROM THE NORTHEAST CORNER OF UNDERWRITER'S POND
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)	SAMP NO:	AR809048A	AR809048A	AR809048B
	SDG NO:	AR401024A	AR500353F	AR300044B
	TYPE:	RINSATE	RINSATE	RINSATE
CADMIUM			0.48 B	
IRON				25 B
LEAD			26	
MERCURY		0.01 B		
NICKEL				6 B
SILVER			0.3 B	

4.28 Environmental Problem 23: Decontamination and Decommissioning (D&D) of Buildings 19 and 34

Request Number: 810.

Requester: B. Levitan.

Finding and Basis: Radioactively-contaminated solutions from Building 19 were transported to Building 34 (Industrial Waste Treatment Plant) by underground pipes and were stored in open, in-ground cement tanks attached to the latter building. During decommissioning, it was discovered that the pipe and tank had leaked, thereby contaminating soil. Decontamination was assessed by soil radioactivity with no analyses of hazardous substances.

4.28.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of contaminants listed in Sect. 4.28.2.2 in soil along the former transfer line from Building 19 to Building 34 and around the former tank attached to Building 34 at minimum detection levels.

Supporting Information: It was believed that the transfer line leaked during its operative life from the late 1940s to early 1970. Only soils containing radioactivity were removed, with no surveillance for chemical wastes during D&D. Because the area was backfilled, the sampling should have been deep enough to sample underneath the fill. It was believed that the area may have contained the parameters listed in Sect. 4.28.2.2.

4.28.2 Sampling and Analytical Design

4.28.2.1 Sampling Design

Request 810: Former Transfer Line Between Buildings 19 and 34 and Tank Attached to Building 34 (Fig. 4.23). Nine soil samples were to be collected (Sampling Method:

References E5.1 and E5.2.2) in native soil beneath fill along the former transfer line between Buildings 19 and 34, and along the north and west sides of the former Building 34.

The Sampling Team arrived at the sampling location on 14NOV87 at 0900. The weather was cool and clear. The region of interest consisted of three areas. Area A, approximately 40 ft long, was the soil beneath the former transfer line. Area A covered approximately 11m^2 (36 ft^2) and was considered homogeneous with respect to spatial distribution of contaminants beneath the fill material. Area B, along the north boundary of the former Building 34, was approximately 9m (30 ft) in length. Area C, along the west boundary of the former Building 34, was approximately 9 m (30 ft) in length. The NE corner of the former Building 34 was located with the aid of a scale drawing and triangulation of line intercepts. The intercept of a line from the SE corner of Building 24 (approximately 540 ft, E 70^{o}S) and a line from the SE corner of Building 40 (approximately 545 ft E 40^{o}S) was used to locate the reference corner of Building 34. By ground truth, the assumed location agreed with the memory of an ANL employee (name unknown) who participated in the decommissioning of Buildings 19 and 34. Lyle Cheever (ANL) and the employee visited the site 06NOV87 with W. Parsons and B. Hensley of the ORNL Sampling Team. Based on the assumed location of Building 34, all sampling points were located and sited as noted in the ANL Sampling and Analysis Plan. The depth of the fill soil above sampling depth was noted on each respective sample log sheet. A gamma scan of the area indicated 20-40 cpm. All soil pH measurements were noted as "soil pH in water."

Area A was divided into a 1 x 60-segment grid and 3 segments were selected. Three grab soil samples were collected below the transition from fill to native soil that occurred at a depth of 5 ft. Sample AR810018 was collected from grid 9 of Area A at 1010 at a depth of 6-7 ft. Sample AR810029 was collected from grid 29 of Area A at 1030 at a depth of 5-7 ft. Sample AR810030 was collected from grid 49 of Area A at 1050 at a depth of 5-7 ft. The color change indicated the transition from fill to native soil at 5 ft.

Area B was divided into a 1 x 60-segment grid and 3 segments were selected for sampling. Three grab soil samples were to be collected below the transition from fill to native soil. Sample AR810041 was collected from grid 14 of Area B at 1110 at a depth of 5-7 ft. The color change from fill to native soil occurred at 4-5 ft. Sample AR810052 was collected from grid 34 of Area B at 1130 at a depth of 5-6 ft. The color change of fill to native soil occurred at 5 ft. Sample AR810063 was collected from grid 54 of Area B at 1145 at a depth of 5-6 ft. The color change of fill to native soil occurred at 5 ft.

Area C was divided into a 1 x 60-segment grid and 3 segments were selected for sampling. Three 0-1 ft grab soil samples were to be collected below the transition from fill to native soil that occurred at 5 ft and composited for analysis. Sample AR810074 was collected from grid 17 at 1200 at a depth of 5-6 ft. Sample AR810085 was collected from grid 37 at 1215 at a depth of 5-6 ft. Sample AR810096 was collected from grid 57 at 1230 at a depth of 5-6 ft.

4.28.2.2 Analytical Design

Request 810: The field parameter measured for Request 810 was pH. It was reported as soil pH in water. The parameters analyzed included volatiles, semivolatiles, CLP-metals, and cyanide.

4.28.3 Field and Analytical Data

Field Data: *The pH readings of the soil samples obtained from the area between Buildings 19 and 34 are shown in Table 4.3.23. The data are grouped into three areas: Area A includes samples AR810018 through -30; Area B includes samples AR810041 through -063; and Area C includes samples AR810074 through -096. The pH of the samples ranged from 7.5 to 8.2. The highest pH, 8.2, was noted in sample AR810018 which is the only sample taken from a depth of 6-7 ft as compared to 5-7 or 5-6 ft for the other samples. The transition depth was 5 ft or less for all samples.*

Field Data Evaluation: Because the pH meter was calibrated and distilled water was used to make the soil suspension for the measurement, the results are reliable.

Analytical Data:

<u>Anions and cyanide</u>. Because the cyanide concentrations from three areas (A, B, C) were all below the action level of 250 mg/kg, they are not reported in Table 4.3.23.

<u>Metals</u>. Analytical results for metals in soil are presented in Table 4.3.23. Of the 19 metals detected, sodium was below the CRDL in all nine samples. Of the remaining metals detected, arsenic ranged from 10 to 14 mg/kg, barium from 52 to 79 mg/kg, beryllium from 1.4 to 1.5 mg/kg, cadmium from 0.78 to 6.9 mg/kg, chromium from 18 to 48 mg/kg, cobalt from 9.4 to 13 mg/kg, copper from 27 to 55 mg/kg, lead from 22 to 42 mg/kg, mercury from 0.05 to 0.12 mg/kg, nickel from 27 to 39 mg/kg, silver from 1.7 to 1.9 mg/kg, and zinc from 66 to 153 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, and vanadium.

<u>Extractable organics</u>. With the exception of small amounts (estimated at less than 0.1 ppm) of phenanthrene and fluoranthene in sample AR810029, there were no target compounds identified. In each sample, there was at least one unknown with an estimated concentration in the 13-83 ppm range.

<u>Volatile organics</u>. There were from six to nine compounds detected in each of the nine soil samples for Environmental Problem 23. Acetone was present at concentrations of 0.035 mg/kg or less in the samples and was also present in the blank. Methylene chloride was detected in concentrations outside the calibration range and estimated in concentration as high as 2.6 mg/kg. The highest measured concentration of methylene chloride was 0.170 mg/kg. Methylene chloride was also detected in the blank. Measured or estimated concentrations of other volatile organic compounds were always less than 0.015 mg/kg.

Analytical Data Evaluation:

Anions and cyanide. The instrument, followed by verification, and the calibration blanks were all in compliance. These steps, together with other quality control measures, make the data reliable.

Metals. The following twelve metals of interest were detected above the CRDL in the samples for Request 810: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, and zinc.

Extractable organics. Phenanthrene and fluoranthene were identified in sample AR810029, but the amounts were estimated (at less than 0.1 ppm) because concentrations were below the quantitation limit. No other target compounds were detected. Estimated concentrations of unknowns were 83 ppm or less, and these estimates are associated with mass spectral uncertainties according to the data quality summaries.

Volatile organics. Acetone was present at concentrations of 0.035 mg/kg or less in the samples, and was also present in the blank. Methylene chloride was also detected in the blank and was beyond calibration range in several samples. The highest measured concentration of methylene chloride was 0.170 mg/kg. Measured or estimated concentrations of other volatile organic compounds were always less than 0.015 mg/kg.

4.28.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: No limitations or qualifications are apparent.

Analytical Data:

Anions and cyanide. The data are Quality Level I.

Metals. Samples AR810018, -29, -30, -41, and -52 were Quality Level I except for beryllium and sodium at Quality Level II and antimony at Quality Level III. Samples AR810063, -74, -85, and -96 were Quality Level I except for beryllium, silver, and sodium at Quality Level II and antimony at Quality Level III.

Extractable organics. Data are of Quality Level III due to mass spectral uncertainty for unknowns and to concentrations below the quantitation limit for the two target compounds identified in sample AR810029.

Volatile organics. Because the appropriate internal standard did not meet specifications, toluene, xylene, or tetrachloroethene in AR810029, AR810030, AR810041, AR810085, and AR810096 were Quality Level III. Any bias resulting from this internal standard not meeting specification is expected to be low. Data quality for all other target volatile compounds detected at levels above their quantitation limits was either Quality Level I or II. Target volatile compounds with levels estimated below their quantitation limits were Quality Level III. Data quality for the two instances in which the TIC volatile compound trichlorofluoromethane was detected was Quality Level II for AR810096 and Quality Level III for AR810052.

Environmental Problem: 23
Request Number: 810

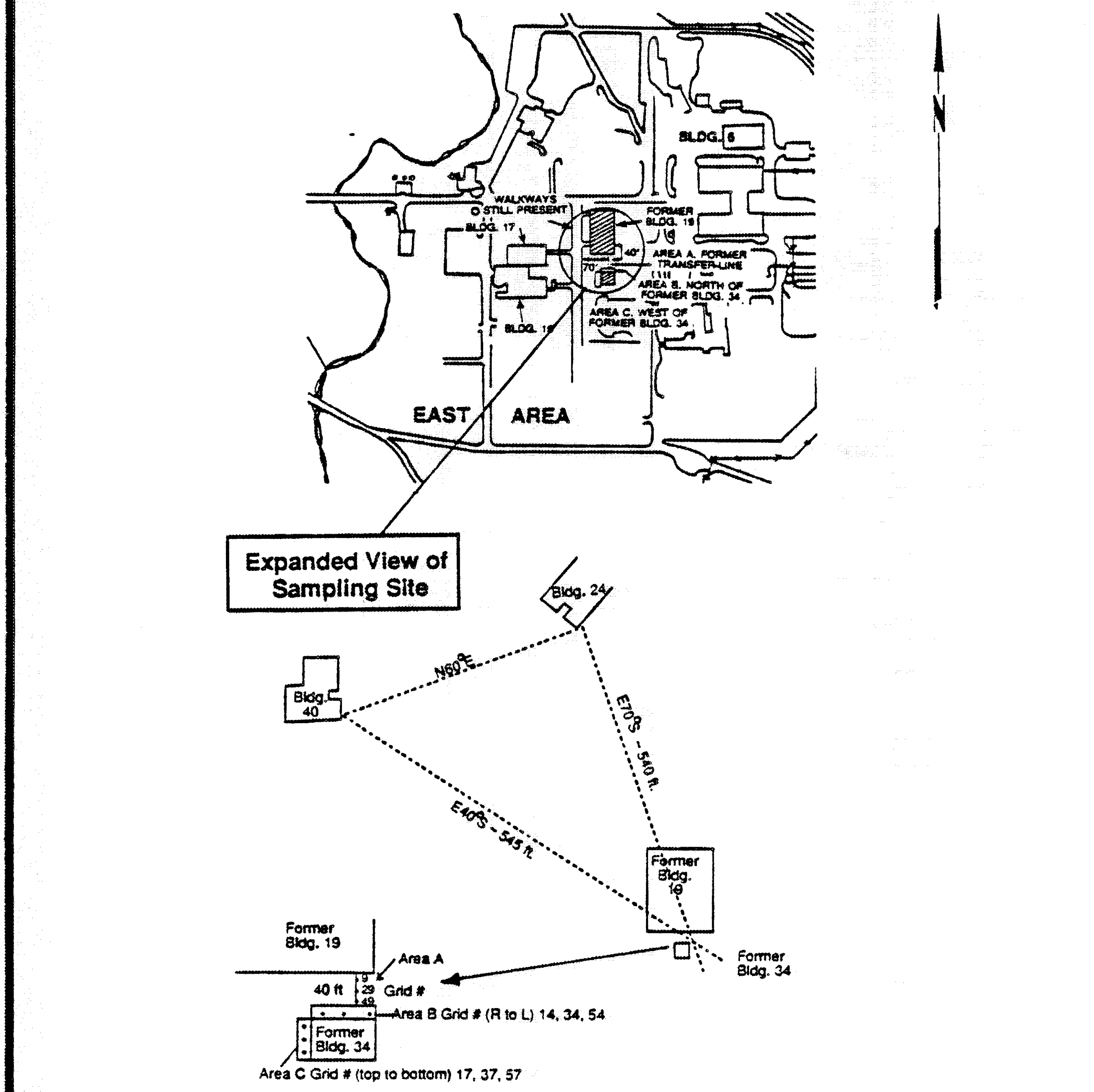

Figure 4.23. Decontamination and Decommissioning of Buildings 19 and 34 Sampling Location (Request 810)

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TABLE 4.2.23 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 23

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR810	BLDG 19/34	D&D	SOIL	9	9	GRAB	0	9	9	9	0	0	0	0	0	0	0	0	9	9	9	9	0	0
			MED TOTAL	9	9		0	9	9	9	0	0	0	0	0	0	0	0	9	9	9	9	0	0
			EP TOTAL	9	9		0	9	9	9	0	0	0	0	0	0	0	0	9	9	9	9	0	0

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

DRAFT DO NOT CITE

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO: AR810018	AR810029	AR810030	AR810041	AR810052	AR810063
PH (UNITS)	8.2	7.6	7.7	7.5	7.9	7.6

FIELD MEASUREMENTS	SAMP NO: AR810074	AR810085	AR810096			
PH (UNITS)	7.7	7.7	7.9			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR810018D SDG NO: AR801028C TYPE: GRAB	AR810018D AR810018D GRAB	AR810018E AR803019E GRAB	AR810029D AR302013D GRAB	AR810029D AR810018D GRAB	AR810029E AR803019E GRAB
ALUMINUM			12800			12100
ARSENIC	14		9.3 UN	13		9.2 UN
BARIUM			62 E			56 E
BERYLLIUM			1.4 E			1.4 E
CADMIUM	5.3		2.4	4.2 B		1.1
CALCIUM			65300			71200
CHROMIUM			30			18
COBALT			10			10
COPPER			38			28
IRON			25000			23500
LEAD	35		20 B	29		13 B
MAGNESIUM			35900			39300
MANGANESE			571			526
MERCURY		0.12			0.07	
NICKEL			31			28
SILVER	0.97 U		1.5 B	1 U		1.2 B
SODIUM			351 B			470 B
VANADIUM			25			23
ZINC			137			81

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR810030D SDG NO: AR310013C TYPE: GRAB	AR810030D AR810018D GRAB	AR810030E AR803019E GRAB	AR810041D AR801028C GRAB	AR810041D AR810018D GRAB	AR810041E AR803019E GRAB
ALUMINUM			14400			13100
ARSENIC	10 *		8.8 UN	11		9.1 UN
BARIUM			69 E			53 E
BERYLLIUM			1.5 E			1.5 E
CADMIUM	6.9 **		5.5	3.2 B		1.5
CALCIUM			59100			80600
CHROMIUM			48			25

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

DRAFT DO NOT CITE

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR810030D / AR310013C / GRAB	AR810030D / AR810018D / GRAB	AR810030E / AR803019E / GRAB	AR810041D / AR801028C / GRAB	AR810041D / AR810018D / GRAB	AR810041E / AR803019E / GRAB
COBALT				12			9.4
COPPER				55			32
IRON				25400			23300
LEAD		42 *		28 B	27		10 B
MAGNESIUM				31900			43800
MANGANESE				576			472
MERCURY			0.05 B			0.07	
NICKEL				39			27
SILVER		1.2 B		2	0.98 U		1.2 B
SODIUM				390 B			514 B
VANADIUM				27			24
ZINC				153			77

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR810052D / AR801028C / GRAB	AR810052D / AR810018D / GRAB	AR810052E / AR803019E / GRAB	AR810063D / AR310013C / GRAB	AR810063D / AR810018D / GRAB	AR810063E / AR803019E / GRAB
ALUMINUM				13900			14200
ARSENIC		11		9.3 UN	10 *		9 UN
BARIUM				52 E			62 E
BERYLLIUM				1.6 E			1.5 E
CADMIUM		2.6 B		0.78	3 B**		1.1
CALCIUM				80100			69700
CHROMIUM				19			21
COBALT				10			13
COPPER				27			30
IRON				24700			27400
LEAD		23		7.7 U	22 *		14 B
MAGNESIUM				42100			37200
MANGANESE				505			592
MERCURY			0.04			0.06	
NICKEL				28			30
SILVER		0.99 U		1.3 B	0.93 U		1.1 B
SODIUM				507 B			455 B
VANADIUM				26			27
ZINC				66			74

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR810074D SDG NO: AR310013C TYPE: GRAB	AR810074D AR810018D GRAB	AR810074E AR803019E GRAB	AR810085D AR310013C GRAB	AR810085D AR810018D GRAB	AR810085E AR803019E GRAB
ALUMINUM			17400			14900
ARSENIC	10 *		9.3 UN	11 *		9 UN
BARIUM			80 E			70 E
BERYLLIUM			1.5 E			1.5 E
CADMIUM	2.6 B**		1.2	2.5 B**		0.93
CALCIUM			44000			71800
CHROMIUM			24			31
COBALT			13			10
COPPER			35			30
IRON			31000			24300
LEAD	22 *		12 B	23 *		11 B
MAGNESIUM			27800			42300
MANGANESE			727			553
MERCURY		0.06			0.05	
NICKEL			38			32
SILVER	0.97 U		0.93 U	0.96 U		1.7
SODIUM			285 B			361 B
VANADIUM			32			27
ZINC			88			73

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR810096D SDG NO: AR310013C TYPE: GRAB	AR810096D AR810018D GRAB	AR810096E AR803019E GRAB
ALUMINUM			13500
ARSENIC	11 *		9 UN
BARIUM			55 E
BERYLLIUM			1.4 E
CADMIUM	2.2 B**		0.87
CALCIUM			69200
CHROMIUM			22
COBALT			10
COPPER			29
IRON			24100
LEAD	22 *		15 B
MAGNESIUM			37700
MANGANESE			537
MERCURY		0.05	
NICKEL			29
SILVER	0.98 U		1.1 B
SODIUM			418 B

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DRAFT DO NOT CITE
DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:					
	SAMP NO:	AR810096D	AR810096D	AR810096E		
	SDG NO:	AR310013C	AR810018D	AR803019E		
	TYPE:	GRAB	GRAB	GRAB		
VANADIUM				25		
ZINC				71		

EXTRACTABLE ORGANICS (UG/KG)							
	SAMP NO:	AR810018B	AR810029B	AR810030B	AR810041B	AR810052B	AR810063B
	SDG NO:	CD31	CD31	CD31	C101	C101	C101
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
FLUORANTHENE		330 U	66 J	3300 U	3300 U	3300 U	3300 U
PHENANTHRENE		330 U	37 J	3300 U	3300 U	3300 U	3300 U
* UNKNOWN(7.19)				19000 J			
* UNKNOWN(7.24)							
* UNKNOWN(7.25)							17000 J
* UNKNOWN(7.26)						590 J	
* UNKNOWN(7.28)							
* UNKNOWN(7.34)							
* UNKNOWN(7.52)							
* UNKNOWN(7.53)					430 J		550 J
* UNKNOWN(7.54)				356 J			
* UNKNOWN(7.55)							
* UNKNOWN(7.58)					1800 J	1600 J	2200 J
* UNKNOWN(7.59)							
* UNKNOWN(7.60)				2380 J			
* UNKNOWN(7.63)		400 J	536 J				
* UNKNOWN(7.78)						1100 J	
* UNKNOWN(7.79)					1600 J		1800 J
* UNKNOWN(7.80)							
* UNKNOWN(7.81)				1190 J			
* UNKNOWN(8.01)						2000 J	
* UNKNOWN(8.02)			67 J		2500 J		2800 J
* UNKNOWN(8.03)				2380 J			
* UNKNOWN(8.04)							
* UNKNOWN(9.28)		267 J	268 J				
* UNKNOWN(9.33)							
* UNKNOWN(10.26)			121 J				
* UNKNOWN(10.29)		40 J					
* UNKNOWN(11.28)						430 J	
* UNKNOWN(11.30)							350 J
* UNKNOWN(11.64)		27 J					
* UNKNOWN(11.77)		53 J	54 J				
* UNKNOWN(12.54)		40 J	54 J				
* UNKNOWN(12.77)		27 J					

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23
DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

DRAFT DO NOT CITE

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR810018B CD31 GRAB	AR810029B CD31 GRAB	AR810030B CD31 GRAB	AR810041B C101 GRAB	AR810052B C101 GRAB	AR810063B C101 GRAB
* UNKNOWN(13.60)							
* UNKNOWN(15.14)		533 J					
* UNKNOWN(15.15)			536 J				
* UNKNOWN(15.98)						460 J	520 J
* UNKNOWN(15.99)				713 J	850 J		
* UNKNOWN(16.00)			54 J				
* UNKNOWN(16.26)				356 J			
* UNKNOWN(16.27)		40 J	67 J		410 J		
* UNKNOWN(17.41)				356 J			
* UNKNOWN(17.91)			67 J		320 J		250 J
* UNKNOWN(17.92)				713 J			
* UNKNOWN(18.44)		133 J					
* UNKNOWN(18.45)			268 J				
* UNKNOWN(19.68)							300 J
* UNKNOWN(19.69)			121 J	594 J	540 J	320 J	
* UNKNOWN(19.72)		27 J					
* UNKNOWN(20.74)					270 J		
* UNKNOWN(20.75)				475 J			
* UNKNOWN(21.37)					630 J		
* UNKNOWN(21.38)			134 J	832 J			
* UNKNOWN(21.39)							
* UNKNOWN(22.95)			67 J	475 J	280 J		
* UNKNOWN(24.44)			107 J				
* UNKNOWN(24.52)		67 J					
* UNKNOWN(24.53)			134 J		1100 J	1100 J	
* UNKNOWN(24.54)				1190 J			
* UNKNOWN(25.93)							
* UNKNOWN(26.01)			134 J				
* UNKNOWN(33.15)					13000 J		
* UNKNOWN(33.16)				76000 J		13000 J	13000 J
* UNKNOWN(33.17)		16000 J					
* UNKNOWN(33.18)			17400 J				
* UNKNOWN(33.23)			268 J				
* UNKNOWN(38.65)					13000 J		
* UNKNOWN(44.50)					15000 J		

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR810074B C101 GRAB	AR810085B C101 GRAB	AR810096B C101 GRAB			
FLUORANTHENE		3300 U	3300 U	3300 U			

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

DRAFT DO NOT CITE

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR810074B SDG NO: C101 TYPE: GRAB	AR810085B C101 GRAB	AR810096B C101 GRAB
PHENANTHRENE	3300 U	3300 U	3300 U
* UNKNOWN(7.19)			
* UNKNOWN(7.24)			16000 J
* UNKNOWN(7.25)			
* UNKNOWN(7.26)			
* UNKNOWN(7.28)	210 J		390 J
* UNKNOWN(7.34)		83000 J	
* UNKNOWN(7.52)		1400 J	
* UNKNOWN(7.53)	1500 J		
* UNKNOWN(7.54)			
* UNKNOWN(7.55)			1300 J
* UNKNOWN(7.58)			
* UNKNOWN(7.59)	3000 J	2900 J	
* UNKNOWN(7.60)			2400 J
* UNKNOWN(7.63)			
* UNKNOWN(7.78)			
* UNKNOWN(7.79)	3300 J	3100 J	
* UNKNOWN(7.80)			3200 J
* UNKNOWN(7.81)			
* UNKNOWN(8.01)			
* UNKNOWN(8.02)		6600 J	
* UNKNOWN(8.03)	5000 J		
* UNKNOWN(8.04)			4700 J
* UNKNOWN(9.28)			
* UNKNOWN(9.33)			300 J
* UNKNOWN(10.26)			
* UNKNOWN(10.29)			
* UNKNOWN(11.28)			
* UNKNOWN(11.30)			
* UNKNOWN(11.64)			
* UNKNOWN(11.77)			
* UNKNOWN(12.54)			
* UNKNOWN(12.77)			
* UNKNOWN(13.60)			270 J
* UNKNOWN(15.14)			
* UNKNOWN(15.15)			
* UNKNOWN(15.98)			
* UNKNOWN(15.99)			250 J
* UNKNOWN(16.00)			
* UNKNOWN(16.26)			
* UNKNOWN(16.27)			
* UNKNOWN(17.41)			

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23 DRAFT DO NOT CITE
DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR810074B	AR810085B	AR810096B			
	SDG NO:	C101	C101	C101			
	TYPE:	GRAB	GRAB	GRAB			
* UNKNOWN(17.91)							
* UNKNOWN(17.92)							
* UNKNOWN(18.44)							
* UNKNOWN(18.45)							
* UNKNOWN(19.68)				330 J			
* UNKNOWN(19.69)							
* UNKNOWN(19.72)							
* UNKNOWN(20.74)							
* UNKNOWN(20.75)							
* UNKNOWN(21.37)							
* UNKNOWN(21.38)							
* UNKNOWN(21.39)				390 J			
* UNKNOWN(22.95)							
* UNKNOWN(24.44)							
* UNKNOWN(24.52)							
* UNKNOWN(24.53)				680 J			
* UNKNOWN(24.54)							
* UNKNOWN(25.93)		2400 J					
* UNKNOWN(26.01)							
* UNKNOWN(33.15)							
* UNKNOWN(33.16)			3100 J	13000 J			
* UNKNOWN(33.17)		13000 J					
* UNKNOWN(33.18)							
* UNKNOWN(33.23)							
* UNKNOWN(38.65)							
* UNKNOWN(44.50)							

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR810018A	AR810029A	AR810030A	AR810041A	AR810052A	AR810063A
	SDG NO:	GN23	GN23	GN23	GN23	GN23	GN23
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		30 B	30 B	30 B	27 B	30 B	35 B
METHYLENE CHLORIDE		2000 BE	2200 BE	2600 BE	2500 BE	1600 BE	2300 BE
TETRACHLOROETHENE		6 U	6 U	6 U	6 U	6 U	6 U
TOLUENE		12	7	10	10	6	6 J
XYLENE (TOTAL)		6 U	6 U	6 U	6 U	6 U	6 U
1,1,1-TRICHLOROETHANE		3 J	6 U	6 U	6 U	6 U	6 U
2-BUTANONE		12 U	12 U	12 U	12 U	12 U	12 U
* METHANE, TRICHLOROFLUORO-							
* TRICHLOROFLUOROMETHANE(9.23)						7 J	

DRAFT DO NOT CITE

TABLE 4.3.23 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 23
DECONTAMINATION AND DECOMMISSIONING (D&D) OF BUILDINGS 19 AND 34

S&A REQUEST: 810
LOCATION: FORMER TRANSFER LINE BETWEEN BLDGS 19 & 34 AND TANK ATTACHED TO BLDG 34
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR810074A ON24 GRAB	AR810085A ON24 GRAB	AR810096A ON24 GRAB			
ACETONE		24 B	31 B	33 B			
METHYLENE CHLORIDE		1000 BE	149 B	170 B			
TETRACHLOROETHENE		6 U	5 J	6 U			
TOLUENE		8	13	10			
XYLENE (TOTAL)		6 J	8	12			
1,1,1-TRICHLOROETHANE		6 U	4 J	6 U			
2-BUTANONE		6 J	6 U	12 U			
* METHANE, TRICHLOROFLUORO-				7 J			
* TRICHLOROFLUOROMETHANE(9.23)							

4.29 Environmental Problem 24: High-Activity, Low-Level Waste Storage Vault in the 317 Area

Request Number: 811.

Requester: B. Levitan.

Finding and Basis: In 1984, water was found in the high-activity vaults in the 317 Area. The water had flooded drums containing radioactive material and was itself radioactive. Radioactivity in sediments of an off-site stream that received discharge from the footing drains of the vault had the same isotopic ratios as the water in the vault. Therefore, water may have seeped into the vault footing drain system and migrated off site. Soil and groundwater may also be contaminated.

4.29.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of radioactive contaminants listed in Sect. 4.29.2.2 in soil around the 317 Area high-activity, low-level vault.

Supporting Information: In 1986, sediment and water analyses from a stream receiving runoff from the 317 Area indicated that the sediment contained elevated cesium-137, cobalt-60, and strontium-90 levels and the water had elevated tritium, strontium-90, and cesium-137 concentrations.

4.29.2 Sampling and Analytical Design

4.28.2.1 Sampling Design

Request 811: 317 Area High-Activity, Low-Level Waste Storage Vault - Soil (Fig. 4.24). Six vertical composite grab soil samples were to be collected at two depths (20-25 ft and 25-30 ft) from three locations south of the easternmost vault in the 317 Area (Sampling Method: Reference E.5.1).

The Sampling Team arrived at the sampling site on 16NOV87 at 0930. The temperature was 55-60^{o}F with occasional heavy rain. A rad scan of the area 4 ft from the vault was 5000 cpm. Sampling depths were altered, however, because drill rod lengths were 0-8 and 8-16 ft in length. The area of interest was a line along the edge of the vault no closer than 4 ft south of the vault. (The total area was less than 100 m^2.) The team divided the area into a 1 x 60-segment grid and selected 3 segments at random. Sample AR811019 was collected from grid 25 at 0950 from the 0-8 ft depth. Soil was light brown in color and much like powder. Sample AR811042 was collected from grid 25 at 0956 from the 8-16 ft depth. Sample AR811020 was collected from grid 32 at 1010 from the 0-8 ft depth. Sample AR811053 was collected from grid 32 at 1020 from the 8-16 ft depth. Sample AR811031 was collected from grid 55 at 1030 from the 0-8 ft depth. Sample AR811064 was collected from grid 55 at 1045 from the 8-16 ft depth. Samples collected only read 50 cpm.

4.29.2.2 Analytical Design

Request 811: No field parameter measurements were requested for Request 811. Parameters analyzed included plutonium, tritium oxide, strontium-90, and cesium-137.

4.29.3 Field and Analytical Data

Field Data: *None requested.*

Field Data Evaluation: Not applicable.

Analytical Data:

Radiochemistry. *For Grid 25, for the 0-8 ft depth, radionuclide concentrations in pCi/kg were as follows: cobalt-60, 6,200; cesium-137, 10,000; tritium, 2,000; potassium-40, 15,000; plutonium-238, 12; plutonium-239, 730; and total strontium, 150,000. In the 8-16 ft depth, concentrations were: cobalt-60, 6,600; cesium-137, 9,200; potassium-40,* *12,000; plutonium-238, 19; plutonium-239, 860; and total strontium, 120,000. No tritium was detected.*

For Grid 32, at the 0-8 ft depth, concentrations in pCi/kg were: cobalt-60, 12,000; cesium-137, 34,000; tritium, 4,000; potassium-40, 14,000; plutonium-239, 1,100; and total strontium, 66,000. The 8-16 ft depth contained: cobalt-60, 15,000; cesium-137, 41,000; potassium-40, 16,000; plutonium-238, 3.2; plutonium-239, 35; and total strontium, 66,000.

For Grid 55, the 0-8 ft depth contained, in pCi/kg: cobalt-60, 1,900; cesium-137, 8,200; tritium, 3,000; potassium-40, 17,000; plutonium-238, 11; plutonium-239, 73; and total strontium, 1,600. At the 8-16 ft depth, values were: cobalt-60, 1,700; cesium-137, 10,000; potassium-40, 14,000; plutonium-238, 4; plutonium-239, 57; and total strontium, 1,100.

Analytical Data Evaluation:

Radiochemistry. Analytical instrumentation was verified daily. All continuing calibrations were within 10% of the initial instrument calibration. Because all laboratory control results were within acceptable ranges, radiological data are considered reliable.

4.29.4 Limitations and Qualifications

Data Quality Level: The sampling plan is rated Quality Level I; the field sampling is rated Quality Level II. Overall radiological data are rated Quality Level I.

Field Data: The depth of sampling by the team was 0-8 and 8-16 ft; the sampling plan called for 20-25 and 25-30 ft. The depth limit was established by the length of the drill rod which was 16 ft. The Sampling Team should have brought the proper length of drill rod to the field to obtain samples from the requested depths.

Analytical Data:

Radiochemistry. A data Quality Level of I was assigned to radiochemistry.

Environmental Problem: 24
Request Number: 811

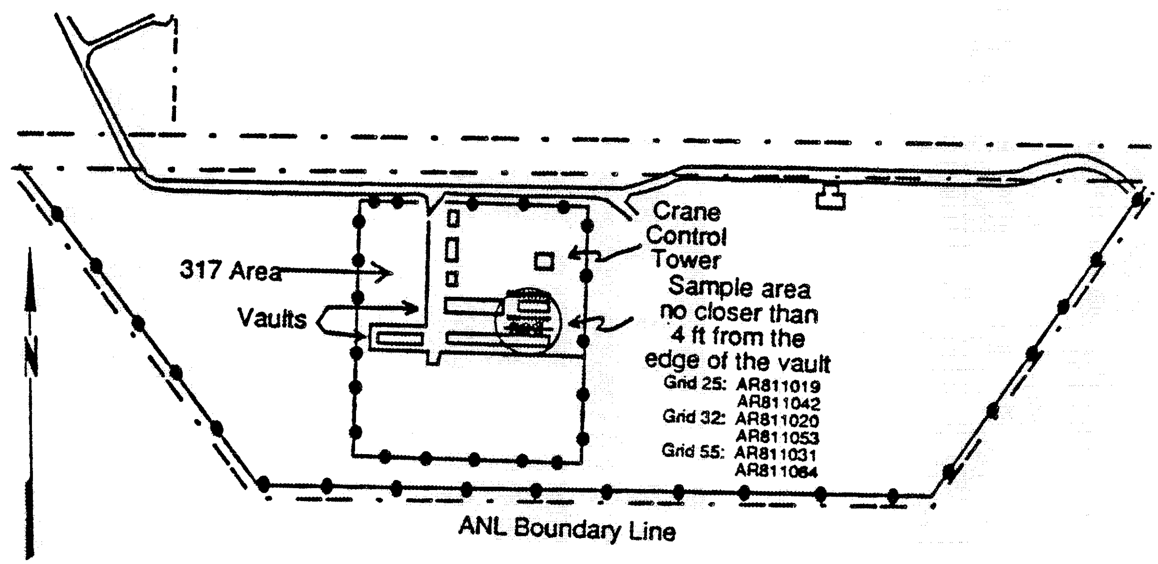

Figure 4.24. 317 Area Low-Level Waste Storage Vault (Request 811)

Draft - Do Not Cite

TABLE 4.2.24 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 24

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS		METALS		O&G		PET HYDRO		SOIL GAS		PES/H/PCB		SEMIVOLS		VOLS		RADS	
							NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL	NUMB HITS	NUMB ANAL
AR811	317 VAULT	LOW L. WAST	SOIL	6	6	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
		MED TOTAL		6	6		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6
		EP TOTAL		6	6		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6

TABLE 4.3.24 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 24 DRAFT DO NOT CITE
HIGH-ACTIVITY, LOW-LEVEL WASTE STORAGE VAULT IN THE 317 AREA

S&A REQUEST: 811
LOCATION: 317 AREA HIGH-ACTIVITY, LOW-LEVEL WASTE STORAGE VAULT
MEDIUM: SOIL

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE:	AR811019A LLL7700 GRAB	AR811019B LLL7700 GRAB	AR811020A LLL7700 GRAB	AR811020B LLL7700 GRAB	AR811031A LLL7700 GRAB	AR811031B LLL7700 GRAB
CO-60			6200		12000		1900
CS-137			10000		34000		8100
H-3		2000		4000		2000	
K-40			15000		14000		17000
PU-238			12		0		10
PU-239			730		1100		42
SR-TOT			150000		66000		1600

RADIOCHEMISTRY (PCI/KGD)	SAMP NO: / SDG NO: / TYPE:	AR811042A LLL7700 GRAB	AR811042B LLL7700 GRAB	AR811053A LLL7700 GRAB	AR811053B LLL7700 GRAB	AR811064A LLL7700 GRAB	AR811064B LLL7700 GRAB
CO-60			6600		15000		1700
CS-137			9200		41000		10000
H-3		0		0		0	
K-40			12000		16000		14000
PU-238			19		3.2		4
PU-239			860		35		57
SR-TOT			120000		66000		1100

4.30 Environmental Problem 25: Facilities at Site A (Septic Drain Field, Lead Melting and Casting, Landfill, and Gasoline Station), Including the Demolition of a Research Reactor

Request Numbers: 812, 813, 814, and 815.

Requester: B. Levitan.

Finding and Basis: Site A was operational between 1943 and 1954. Employee interviews indicate that chemicals were disposed of in laboratory drains which flowed into the drain field. Records conflict as to the location and operation of the lead melting and casting activities. The disposition of the underground gasoline tank of a service station is unknown. The landfill was for non-radioactive materials, but some hazardous substances may have been disposed of there. The Chicago Pile-3 (CP-3) research reactor was buried at Site A. In 1976 a radiological survey confirmed the presence of tritium surrounding the reactor at Site A.

4.30.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of contaminants listed in Sect. 4.30.2.2 in soil at the site of the former septic drain field, lead melting and casting operations, underground gasoline tank, and landfill, as compared to background levels.

Supporting Information: A septic tank and drain field were located east of Site A. Researchers recalled that small quantities of TCE and other chemicals were used in experiments. The potential existed that these materials were disposed of into laboratory drains and subsequently flowed into the drain field. An old site plan drawing identified a proposed lead smelting facility on the south side of Site A. A researcher who worked at Site A recalled that, in the summer of 1943, an open fire/pot arrangement was used to melt and cast lead bricks. Because there were no exact details of either procedure, samples were collected at the locations indicated on Fig. 4.25b, which was the combination of the proposed location and memory recollection of open-fire smelting.

Site plans indicated the presence of an underground gasoline tank in the northeast corner of the site. The disposition of the tank was not known. However, a potential existed for soil and groundwater contamination.

A landfill was noted in aerial photographs and in references in some early reports. Because there were no records of materials being disposed of in the landfill, it was essential to screen for a variety of parameters.

4.30.2 Sampling and Analytical Design

4.30.2.1 Sampling Design

Request 812: Former Drain Field Site - Soil (Fig. 4.25a). Six grab soil samples were to be collected (Sampling Method: Reference E5.2.3) from a depth gradient at the former septic drain field east of the CP-3 historical marker.

The Sampling Team arrived at the sampling location on 13NOV87 at 1015. Skies were partly cloudy, the temperature was approximately 40°F, and winds were 0-5 mph. The area of interest constituted a 20-ft radius around the marked sampling point. The area was considered homogeneous and contained some small trees (4-10 in. in diameter) and green vegetation in particular. The team divided the area into a 10 x 6-segment grid and selected 3 segments at random. According to the ANL Sampling and Analysis Plan, each segment was to be sampled from auger holes to a maximum depth of 26 ft and soil collected at the 4-14 and 14-24 ft depths. However, sampling depths were altered in the field because of the 20+ yr overgrowth of vegetation. Sample AR812010 was collected at 1030 from grid 2 at a depth of 0-2.5 ft. Sample AR812043 was collected at 1040 from grid 2 at a depth of 2.5-5.0 ft. Soil at grid 2 was dark brown, loosely compacted humus to about 5-in, then light brown. Sample AR812021 was collected at 1040 from grid 6 at a depth of 0-2.5 ft. Sample AR812054 was collected at 1100 from grid 6 at a depth of 2.5-5 ft. Soil at grid 6 was compacted clay to 5 ft. Sample AR812032 was collected at 1115 from grid 8 at a depth of 0-2.5 ft. Sample AR812065 was collected at 1135 from grid 8 at a depth of 2.5-5.0 ft. Soil at grid 8 was dark brown, loose humus in the top 3-6 in., then hard clay.

Request 813: Suspected Sites of Lead Melting and Casting Facility at Site A - Soil (Fig. 4.25b). Six grab soil samples were to be collected (Sampling Method: Reference E5.2.2) at two suspected sites of lead melting and casting.

The Sampling Team arrived at the sampling location on 13NOV87 at 1421. Skies were overcast and the temperature was approximately 50^{o}F. Because two areas may have been used, Areas A and B were both sampled. Although exact locations were not known, suspect locations were inferred from scale site plan drawings and employee recollections. Samples were collected within a 5-ft radius of the indicated sample point. A rad scan of the general area indicated 15-80 cpm with the GM survey meter.

Area A was on a line 114 m (375 ft) south and 61 m (200 ft) west of the CP-3 historical marker. The area was considered homogeneous. A black piece of wax found at the sampling site was believed to have been used at the casting facility, which was historically at Site A. Glass, clinkers, firebrick, and lead material were found on the surface of Area A. According to the ANL Sampling and Analysis Plan, the area was to be divided into a 60-segment grid and 3 segments selected at random. However, the area was divided as shown in Fig. 4.25b. The sample holes were dug to a depth of 1.5 ft, and samples collected at 0.5-1.5 ft from holes in lines radiating from the center of the sampling area. Samples were collected in 125 mL glass, wide mouth, type A bottles because the 250-mL C-WMHDPE type was not available (as requested in the ANL Sampling and Analysis Plan). Sample AR813011, a composite sample of three holes, was collected at 1457. Pieces of black-gray wax were found. The top 4-6 in. of the surface was humus and below 6-in., clay. Sample AR813022 was collected at 1506. Several pieces of firebrick were found on the ground near and in the sample location. The soil was dark, loosely compacted humus to 1 ft. Below 1 ft, the soil changed to a light clay. Request AR813033 was collected at 1521. Paraffin wax was found in the sample hole. The sample was brown, rust-colored, and clayey.

The Sampling Team arrived at Area B at 1548. The sampling site was a broad, flat area approximately 400 ft EW by 300 ft NS. The area was assumed to be homogeneous. The area was divided into a 60-segment grid and 3 samples were selected at random. A rad scan of the area indicated between 50 and 100 cts/min. Samples were collected at a depth of 0.5-1.5 ft. Sample AR813044, collected at 1549 from grid 38, was brown to rust colored with charcoal inclusions. It was generally clayey. Sample AR813055 was collected at 1558 from grid 42. Sample AR813066 was collected at 1600 from grid 46. Although not requested in the ANL Sampling and Analysis Plan, sample AR813077 was added because there was a substantial amount of paraffin (used for making casts) scattered around the area. In general, no evidence of a smelting or casting process was apparent.

Request 814: Underground Gasoline Tank at Site A - Soil (Fig. 4.25c). Six soil-gas samples were to be collected in accordance with E5.4 around the suspected location of the underground gasoline tank.

The Sampling Team arrived at the proposed sampling location 14NOV87 at 1430. Weather was mild and sunny with a temperature of 55°F. The granite historical marker was assumed to be the site of the buried CP-3 reactor shield. Using a Site A drawing of the marker with building configurations superimposed, the assumption was accurate. From a scale drawing, the site of the gasoline tank was judged to be on an azimuth N37° E, a distance of approximately 367 ft. After locating the supposed site, additional relic structures were located to confirm the accuracy of the location for sampling (e.g., garage foundation and drainage hole, east and west quonset lab foundations). The Sampling Team judged that their selected sampling sites were within 5 m of the directions in the ANL Sampling and Analysis Plan, and probably closer if the tank was positioned as depicted in the reference sketch. The team could not determine if the tank was still in place, or if it had been removed. A high-resolution metal detector was used to determine if the tank was still in place. Although the instrument was sensitive enough to detect such a ferrous structure at a depth of 20 ft, no large object was identified--suggesting that the tank had been removed. The site was vegetated with an overstory of trees up to 20-in. in diameter. Because of the four decades of plant growth, use of the drill rig was not possible. The team drove a steel rod into the soil to a depth of approximately 2.5 ft. The soil was moist and free of stones. It was not possible to probe deeper. Because volatiles (gasoline) were of interest and vapor dispersion would be to the surface, the team decided to take the soil-gas samples from the 2 1/2-ft holes after a 24-hr equilibrium period. Considering the hole volume and the sphere of contribution, 1 L samples would suffice. Therefore, only one tube per hole would be used. The area was divided into a 60-segment grid and 3 segments selected for sampling. Sample AR815012 was equilibrated from 14NOV87 at 1458 until 15NOV87 at 1500 from grid 16 and collected at 250 cc/min for 4 min. At the sample location, there was a heavy overstory of trees at this location that was 95 ft east of a drainage hole, south of the garage foundation. Sample AR814023 was equilibrated from 14NOV87 at 1503 until 15NOV87 at 1508 from grid 36 and collected at 250 cc/min for 4 min. Sample AR814034 was equilibrated from 14NOV87 at 1508 until 15NOV87 at 1515 from grid 56 and collected at 250 cc/min for 4 min. A field blank, as suggested by Henry Kerfoot (EPA), was collected on 15NOV87 at 1515. Sample IDs AR814045, -056, and -067 were not collected because only one 1-L sample per hole was collected.

Request 815: Suspected Location of the Former Site A Landfill - Soil (Fig. 4.25d). Twelve grab soil samples were to be collected (Sampling Method: Reference E5.2.3) at the suspected site of the Site A non-radioactive landfill.

The Sampling Team arrived at the suspected sampling location on 13NOV87 at 1330. The team attempted to locate the Site A landfill with a metal detector after measuring off from the known reference point (granite engraved stone). The area could not be located according to the ORNL Team Leader after extensive surveillance (approximately 1 hr). QC rinsate sample AR815137 was collected at 1400. Samples AR815013, -024,-035, -046, -057, -068, -079, -080, -091, -104, -115, and -126 could not be collected because the landfill could not be located.

4.30.2.2 Analytical Design

Request 812: The parameter to be measured for Request 812 included pH. The parameters to be analyzed included volatiles, semivolatiles, and CLP-metals.

Request 813: No measurements of field parameters were requested for Request 813. The parameter to be analyzed was ICP-lead.

Request 814: The parameter to be measured for Request 814 included PID. The parameter to be analyzed was VOA.

Request 815: The parameter to have been measured for Request 815 included pH. The parameters to have been analyzed included volatiles, semivolatiles, pesticides, and CLP-metals.

4.30.3 Field and Analytical Data

Field Data:

Request 812: *Four pH values are given in Table 4.3.25. They range from 6.5 to 6.9. Sample AR812010 represents the 0-2.5 ft reading; the corresponding 2.5 to 5.0 ft reading is sample AR812043. Both samples show identical pHs of 6.5. The other augered samples are AR812021 (surface) at pH 6.9 and AR812054 (subsoil) at pH 6.8.*

Request 813: *Although no field measurements were requested, pH and soil moisture were recorded and are shown in Table 4.3.25. Samples AR813011 through -033 represent the pHs from Area A; the remaining samples were from Area B. The pH of Area A samples was 6.8. Area B samples ranged from 6.3 to 6.8. The soil moisture ranged from 25% to 62% for the 0.5-1.5 ft depth samples.*

Request 814: *This request required PID measurements in the field. The data shown are for the flow rates measured in collecting the vapor in the field. No PID readings were* *taken because the hole was made with a rod and no meaningful readings could be obtained.*

Request 815: *No data were provided because extensive efforts to locate the Site A landfill were unsuccessful and use of a metal detector failed to uncover suspected buried materials.*

Field Data Evaluation:

Request 812: This request called for six samples from three sites. The third set of samples was collected according to the field notes, but no pH data were provided. The plan called for samples to be taken from the 4-14 and 14-24 ft depths; the field notes stated that the sampling depths were "altered in the field because of the 20+ yr overgrowth of vegetation."

Request 813: Because the instrument was calibrated prior to field measurements, the pH readings are reliable. The moisture content was determined in the laboratory and is likely to be reliable.

Request 814: The rate of gas flow will be "useful" in interpreting the vapors collected for analysis. No PID readings were made.

Request 815: There are no field data to evaluate.

Analytical Data:

Request 812:

Metals. Analytical results for metals in soil are presented in Table 4.3.25. Of the 20 metals detected, silver and sodium were below the CRDL in all six samples. Of the remaining metals detected, arsenic ranged from 6.5 to 10 mg/kg, barium from 54 to 85 *mg/kg, beryllium from 0.99 to 1.5 mg/kg, cadmium from 1.4 to 2.2 mg/kg, chromium from 19 to 28 mg/kg, cobalt from 11 to 26 mg/kg, copper from 21 to 40 mg/kg, lead from 22 to 28 mg/kg, mercury was 0.06 mg/kg, nickel ranged from 20 to 53 mg/kg, and zinc from 53 to 82 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.*

Extractable organics. No target compounds were identified in any of these samples. Unknowns were detected in these samples in concentrations estimated at less than 5 ppm.

Volatile organics. There were six compounds detected in each of four samples, and seven compounds detected in each of the remaining two samples. Acetone was detected in all samples (maximum concentration of 0.035 mg/kg) and also in the blank. Methylene chloride was out of calibration range in five of the samples (highest estimated concentration was 0.969 mg/kg) and measured at 0.148 mg/kg in the other. All other compounds were present in measured or estimated concentrations of less than 0.010 mg/kg.

Request 813:

Metals. Analytical results for metals in soil samples AR813011, -22, -33, -44, -55, and -66 are presented in Table 4.3.25. These six samples were only analyzed for ICP lead, which ranged from 75 to 141 mg/kg in two samples. In the remaining samples, lead was detected below the CRDL. Sample AR813077 was not requested in the ANL Sampling and Analysis Plan but was collected by the field team because they observed paraffin (used in making casts) around the area. Lead in sample AR813077 was 77 mg/kg.

Request 814:

Soil gas. There were four, five, and eight compounds detected, respectively, in these three soil gas measurements. Carbon tetrachloride was measured as high as 520 ng/tube and was beyond the calibration range, but estimated at 6400 ng/tube in sample AR814034. Chloroform was measured at 1500 and 1700 ng/tube in two of the samples. N,N-dimethylformamide was detected as high as 33,000 ng/tube in sample AR814034, and was also present in the field blank. Trichloroethylene was measured as high as 39 ng/tube and estimated at 3400 ng/tube in sample AR814034.

Request 815: *No samples were collected because the sampling site could not be located.*

Analytical Data Evaluation:

Request 812:

Metals. The following eleven metals of interest were detected above the CRDL in the samples for Request 812: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, mercury, nickel, and zinc.

Extractable organics. No target compounds were identified in any of these samples. Concentrations of unknowns were estimated at less than 5 ppm.

Volatile organics. Acetone was detected in all samples and also in the blank. Methylene chloride was out of calibration range in five of the samples (highest concentration estimated at 0.969 mg/kg) and measured at 0.148 mg/kg in the other. All other compounds were present in measured or estimated concentrations of less than 0.010 mg/kg.

Request 813:

Metals. Lead was detected from 75 to 141 mg/kg in three of seven samples collected for Request 813.

Request 814:

Soil gas. Carbon tetrachloride was measured as high as 520 ng/tube and was beyond the calibration range, but estimated at 6400 ng/tube in one sample. Chloroform was measured at 1500 and 1700 ng/tube in two of the samples. N,N-dimethylformamide was detected as high as 33,000 ng/tube in sample AR814034, and was also present in the field blank. Trichloroethylene was measured as high as 39 ng/tube and estimated at 3400 ng/tube in sample AR814034.

Request 815: Not applicable.

4.30.4 Limitations and Qualifications

Data Quality Level: The sampling plan for Requests 812, 813, and 814 is rated Quality Level I; Request 815 is rated Quality Level III. The field sampling was rated Quality Level II for Request 812, Quality Level I for Request 813, Quality Level II for Request 814, and Quality Level III for Request 815. The analytical rating is Quality Level II for Request 812, Quality Level I for Request 813, and Quality Level III for Request 814. No analyses were performed for Request 815 and thus no Quality Level can be assigned.

Field Data: Although no field data were provided for one set of samples, the field notes report that samples were taken for Request 812. In Request 814, the PID readings were not reported. In Request 815, the plan was inadequate to locate the site, and field sampling could not be implemented.

Analytical Data:

Request 812:

Metals. Analytical results were Quality Level I except for sodium at Quality Level II and antimony at Quality Level III.

Extractable organics. Data are all of Quality Level III due to mass spectral uncertainty and low concentrations of compounds.

Volatile organics. Methylene chloride in AR812010 was Quality Level I. Data quality for all other target volatile compounds detected at levels above their quantitation limits was Quality Level II. Xylene in AR812021 was estimated to be present at a concentration below its quantitation limit and was, therefore, Quality Level III.

Request 813:

Metals. All samples (except AR813077) were Quality Level I except for aluminum, selenium, and vanadium at Quality Level II and antimony at Quality Level III. Sample AR813077 was Quality Level I except for the following metals at Quality Level II: aluminum, antimony, arsenic, calcium, manganese, selenium, silver, and sodium.

Request 814: The data quality level for the soil gas analysis is Quality Level III. The contamination in the blank make the concentrations in the sample suspect.

Environmental Problem: 25
Request Number: 812

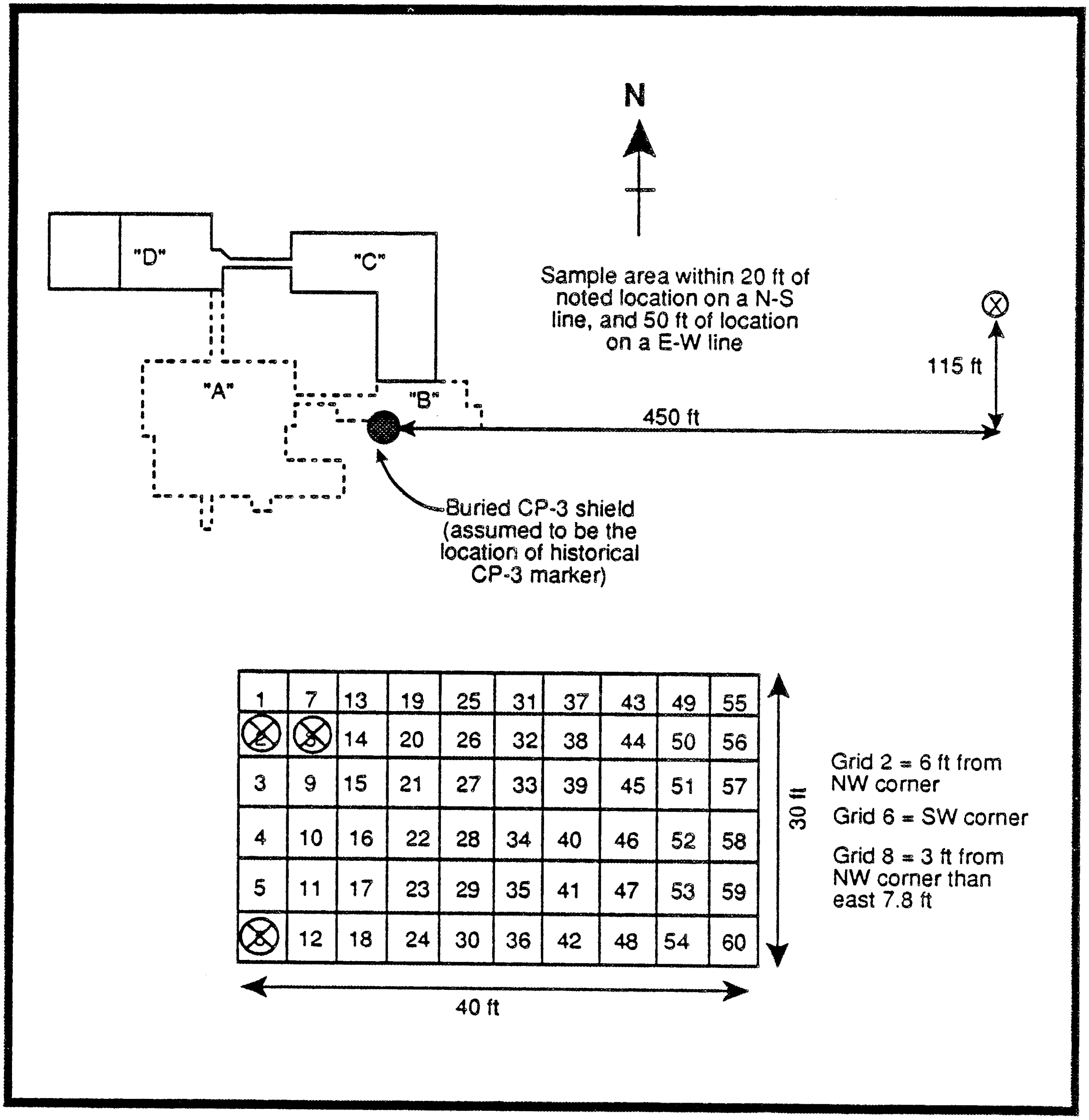

Figure 4.25a. Former Drain Field Site (Request 812)

Environmental Problem: 25
Request Number: 813

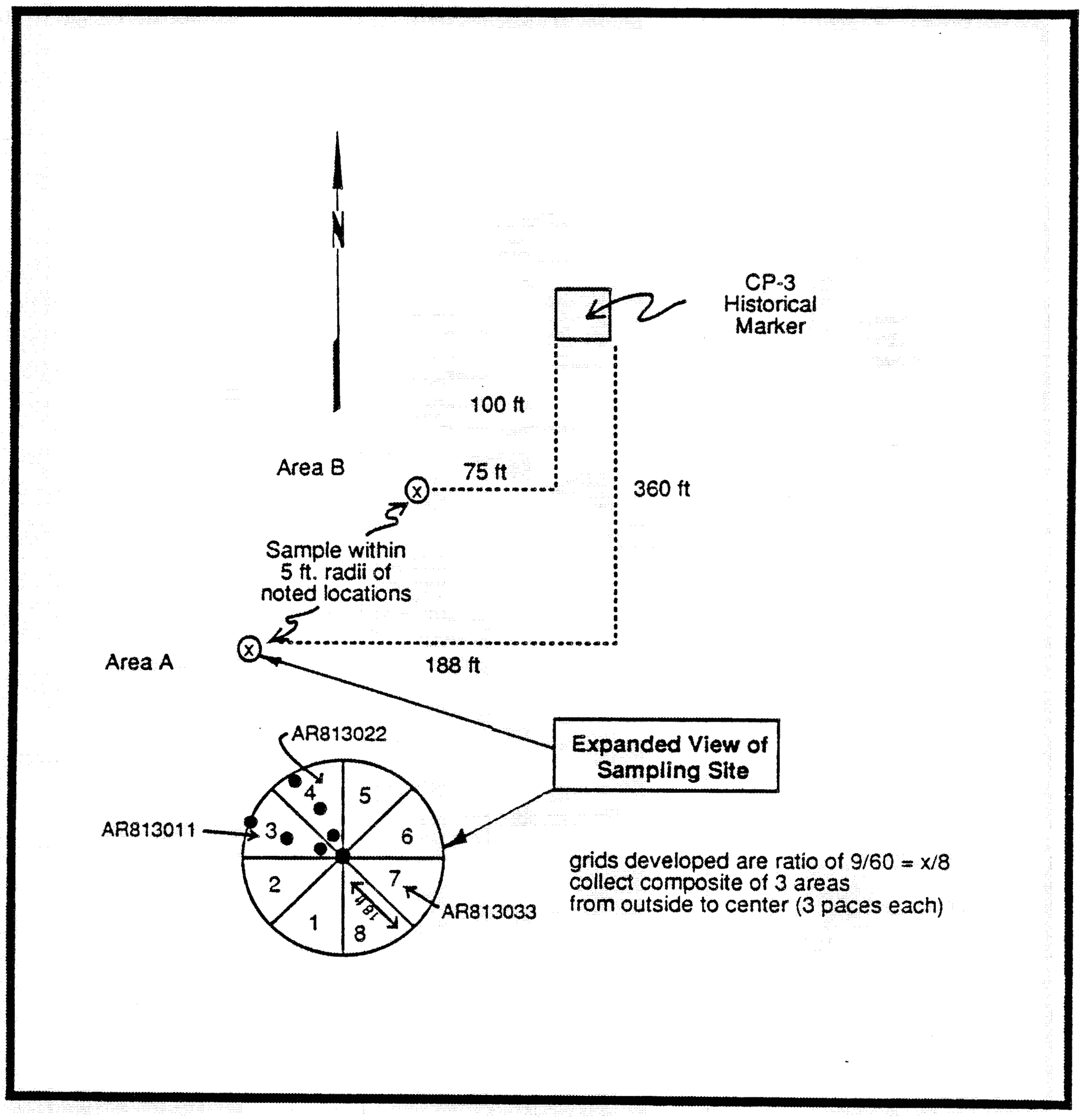

Figure 4.25b. Site A Lead Melting and Casting Facility (Request 813)

Environmental Problem: 25
Request Number: 814

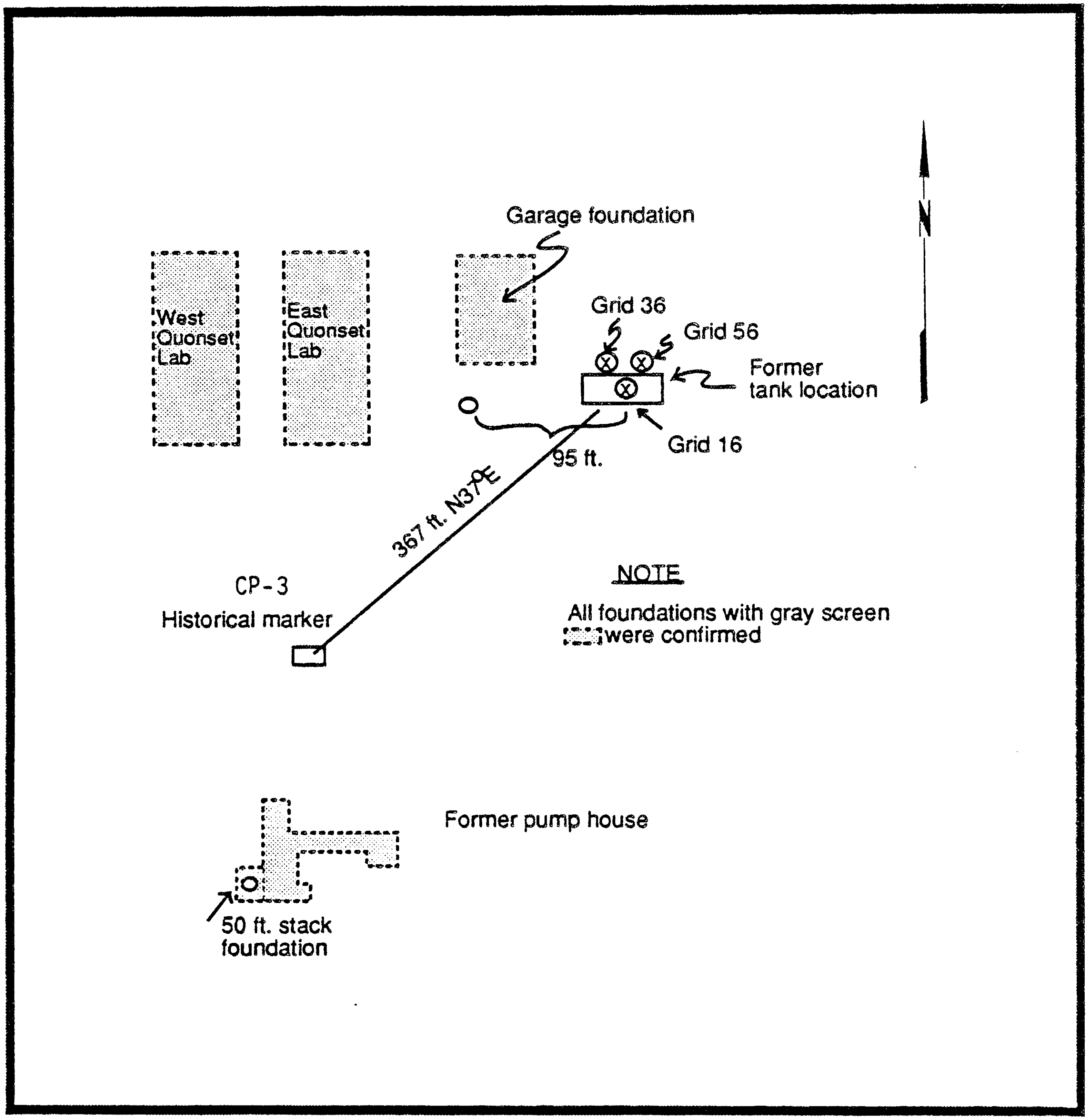

Figure 4.25c. Underground Gasoline Tank at Site A (Request 814)

Environmental Problem: 25
Request Number: 815

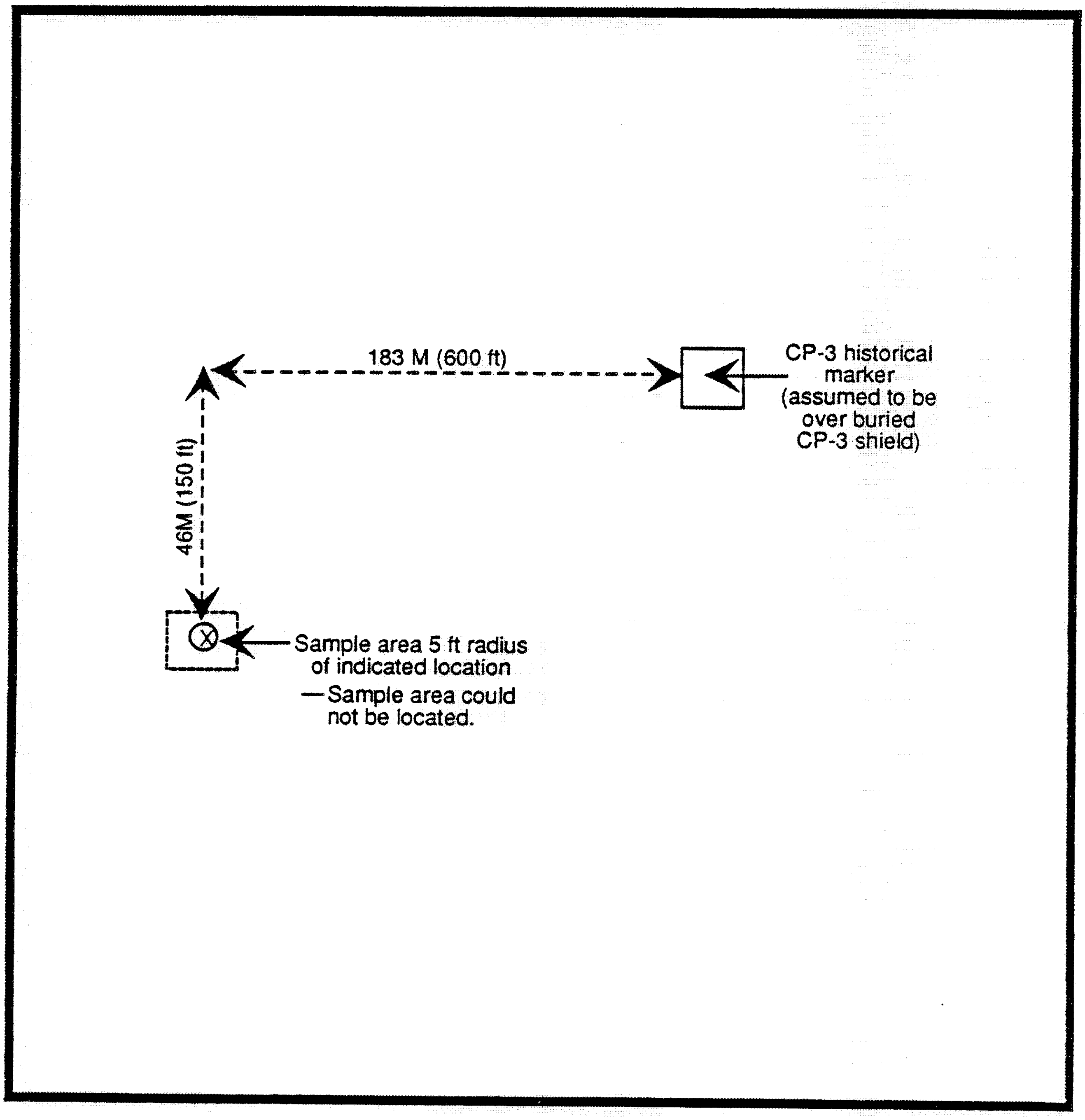

Figure 4.25d. Location of the Former Site A Landfill (Request 815)

TABLE 4.2.25 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 25

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	ORG NUMB HITS	ORG NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR812	CP-3 AREA	SITE A	SOIL	6	6	GRAB	0	0	6	6	0	0	0	0	0	0	0	0	6	6	6	6	0	0
AR813	SITE A	SITE A	SOIL	7	7	GRAB	0	0	7	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR815	SITE A	SITE A	SOIL	12	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	25	13		0	0	13	13	0	0	0	0	0	0	0	0	6	6	6	6	0	0
AR814	SITE A	SITE A	AIR	1	1	QC FL	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
AR814	SITE A	SITE A	AIR	6	3	GRAB	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0
			MED TOTAL	7	4		0	0	0	0	0	0	0	0	4	4	0	0	0	0	0	0	0	0
AR815	SITE A	SITE A	SUR WATER	1	1	QC RN	0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0
			MED TOTAL	1	1		0	0	1	1	0	0	0	0	0	0	0	1	1	1	1	1	0	0
			EP TOTAL	33	18		0	0	14	14	0	0	0	0	4	4	0	1	7	7	7	7	0	0

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25 DRAFT DO NOT CITE
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

S&A REQUEST: 812
LOCATION: FORMER DRAIN FIELD SITE
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR812010	AR812021	AR812043	AR812054		
PH (UNITS)		6.5	6.9	6.5	6.8		

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812010C / AR805022D / GRAB	AR812010C / AR812010C / GRAB	AR812010D / AR507010C / GRAB	AR812010D / AR507010K / GRAB	AR812021C / AR805022D / GRAB	AR812021C / AR812010C / GRAB
ALUMINUM				16700			
ARSENIC			10 N	10 U			8.9 N
BARIUM				61			
BERYLLIUM				0.99			
CADMIUM			2.7 BN	1.8			4.1 BN
CALCIUM				7550			
CHROMIUM				24			
COBALT				12			
COPPER				25			
IRON				27400			
LEAD			28	23 B			26
MAGNESIUM				8150			
MANGANESE				543			
MERCURY		0.05 B				0.06	
NICKEL				25			
POTASSIUM					2900		
SILVER			0.97 U	1.2 B			0.98 U
SODIUM				113 B			
VANADIUM				36			
ZINC				70			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812021D / AR507010C / GRAB	AR812021D / AR507010K / GRAB	AR812032C / AR805022D / GRAB	AR812032C / AR812010C / GRAB	AR812032D / AR507010C / GRAB	AR812032D / AR507010K / GRAB
ALUMINUM		13500				14900	
ARSENIC		9.7 U			6.5 N	9.7 U	
BARIUM		54				63	
BERYLLIUM		0.69 B				1.3	
CADMIUM		1.9			3.1 BN	1.4	
CALCIUM		973				3690	
CHROMIUM		20				19	
COBALT		11				16	
COPPER		22				21	
IRON		23700				22300	
LEAD		26 B			22	22 B	

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25 DRAFT DO NOT CITE
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

S&A REQUEST: 812
LOCATION: FORMER DRAIN FIELD SITE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812021D / AR507010C / GRAB	AR812021D / AR507010K / GRAB	AR812032C / AR805022D / GRAB	AR812032C / AR812010C / GRAB	AR812032D / AR507010C / GRAB	AR812032D / AR507010K / GRAB
MAGNESIUM		3630				4980	
MANGANESE		456				649	
MERCURY				0.05 B			
NICKEL		23				20	
POTASSIUM			2600				1900
SILVER		1.1 B			0.99 U	1 B	
SODIUM		46 B				90 B	
VANADIUM		31				30	
ZINC		76				53	

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812043C / AR805022D / GRAB	AR812043C / AR812010C / GRAB	AR812043D / AR507010C / GRAB	AR812043D / AR507010K / GRAB	AR812054C / AR805022D / GRAB	AR812054C / AR812010C / GRAB
ALUMINUM				16600			
ARSENIC			12 N	10 U			9.9 N
BARIUM				85			
BERYLLIUM				1.3			
CADMIUM			4 BN	2.2			3 BN
CALCIUM				13100			
CHROMIUM				23			
COBALT				24			
COPPER				40			
IRON				33300			
LEAD			27	24 B			23
MAGNESIUM				12500			
MANGANESE				684			
MERCURY		0.06				0.06	
NICKEL				53			
POTASSIUM					3800		
SILVER			0.96 U	1.1 B			0.96 U
SODIUM				239 B			
VANADIUM				34			
ZINC				82			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812054D / AR507010C / GRAB	AR812054D / AR507010K / GRAB	AR812065C / AR805022D / GRAB	AR812065C / AR812010C / GRAB	AR812065D / AR507010C / GRAB	AR812065D / AR507010K / GRAB
ALUMINUM		18400				22000	

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

DRAFT DO NOT CITE

S&A REQUEST: 812
LOCATION: FORMER DRAIN FIELD SITE
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO:	AR812054D	AR812054D	AR812065C	AR812065C	AR812065D	AR812065D
	SDG NO:	AR507010C	AR507010K	AR805022D	AR812010C	AR507010C	AR507010K
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ARSENIC		9.7 U			7.7 N	11 U	
BARIUM		73				79	
BERYLLIUM		1.5				1.5	
CADMIUM		2			3.2 BN	1.8	
CALCIUM		31000				2710	
CHROMIUM		24				28	
COBALT		14				25	
COPPER		28				32	
IRON		28800				32700	
LEAD		17 B			24	21 B	
MAGNESIUM		21800				6810	
MANGANESE		540				633	
MERCURY				0.04 B			
NICKEL		39				34	
POTASSIUM			4200				4600
SILVER		0.97 U			0.97 U	1.1 U	
SODIUM		220 B				237 B	
VANADIUM		35				43	
ZINC		74				82	

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR812010B	AR812021B	AR812032B	AR812043B	AR812054B	AR812065B
	SDG NO:	C104	C105	C105	C105	C105	C105
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
BIS(2-ETHYLHEXYL)PHTHALATE		330 U	110 J	130 J	75 J	80 J	86 J
DI-N-BUTYLPHTHALATE		330 U	18 J	56 J	38 J	36 J	24 J
DI-N-OCTYL PHTHALATE		330 U	330 U	330 U	8 J	10 J	330 U
DIETHYLPHTHALATE		330 U	650	1800	960	710	370
DIMETHYLPHTHALATE		330 U	16 J	150 J	150 J	150 J	330 U
* UNKNOWN HYDROCARBON(7.89)				320 J			
* UNKNOWN(7.33)			4900 J				
* UNKNOWN(7.35)		410 J					
* UNKNOWN(7.40)				150 J			
* UNKNOWN(7.41)						260 J	
* UNKNOWN(7.46)				1300 J			
* UNKNOWN(7.48)			1700 J				
* UNKNOWN(7.50)							840 J
* UNKNOWN(7.59)		530 J					
* UNKNOWN(7.66)			200 J	410 J			
* UNKNOWN(7.68)							140 J
* UNKNOWN(7.89)			190 J				

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25 FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

DRAFT DO NOT CITE

S&A REQUEST: 812
LOCATION: FORMER DRAIN FIELD SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR812010B C104 GRAB	AR812021B C105 GRAB	AR812032B C105 GRAB	AR812043B C105 GRAB	AR812054B C105 GRAB	AR812065B C105 GRAB
* UNKNOWN(7.91)							100 J
* UNKNOWN(8.18)				150 J			
* UNKNOWN(10.10)					330 J		
* UNKNOWN(10.12)						260 J	
* UNKNOWN(10.13)				1000 J			630 J
* UNKNOWN(10.18)			410 J				
* UNKNOWN(10.23)		250 J					
* UNKNOWN(11.16)			110 J				
* UNKNOWN(11.22)		190 J					
* UNKNOWN(11.32)				450 J			380 J
* UNKNOWN(11.35)			81 J				
* UNKNOWN(11.44)		31 J					
* UNKNOWN(11.68)							56 J
* UNKNOWN(12.19)			170 J				
* UNKNOWN(12.22)				72 J			91 J
* UNKNOWN(12.63)				55 J			
* UNKNOWN(15.06)					250 J		
* UNKNOWN(15.07)						2100 J	
* UNKNOWN(16.18)						220 J	
* UNKNOWN(18.35)					440 J		
* UNKNOWN(18.36)						2300 J	
* UNKNOWN(18.67)						240 J	
* UNKNOWN(20.45)			58 J				
* UNKNOWN(20.91)			63 J				
* UNKNOWN(21.29)					400 J		
* UNKNOWN(21.30)						1800 J	
* UNKNOWN(23.92)						2300 J	
* UNKNOWN(23.93)					460 J		
* UNKNOWN(24.26)			120 J				
* UNKNOWN(24.31)				180 J			
* UNKNOWN(24.41)				93 J			
* UNKNOWN(25.74)				140 J			
* UNKNOWN(25.75)					140 J		
* UNKNOWN(25.87)				100 J			
* UNKNOWN(26.20)					340 J	1700 J	
* UNKNOWN(26.73)				79 J			
* UNKNOWN(27.10)				160 J			
* UNKNOWN(27.88)				81 J			
* UNKNOWN(27.89)			150 J				
* UNKNOWN(28.22)					230 J		
* UNKNOWN(28.24)						1200 J	
* UNKNOWN(28.39)				110 J			

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

DRAFT DO NOT CITE

S&A REQUEST: 812
LOCATION: FORMER DRAIN FIELD SITE
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO:	AR812010B	AR812021B	AR812032B	AR812043B	AR812054B	AR812065B
	SDG NO:	C104	C105	C105	C105	C105	C105
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
* UNKNOWN(28.70)				87 J			
* UNKNOWN(30.10)					290 J	1300 J	
* UNKNOWN(31.79)						1200 J	
* UNKNOWN(31.80)					240 J		
* UNKNOWN(33.03)				170 J			190 J
* UNKNOWN(33.04)					180 J		
* UNKNOWN(33.35)					260 J	1300 J	
* UNKNOWN(33.43)				410 J	160 J		
* UNKNOWN(33.44)			360 J				170 J
* UNKNOWN(34.82)					260 J		
* UNKNOWN(34.83)						1300 J	
* UNKNOWN(36.20)					270 J		
* UNKNOWN(37.48)					270 J		
* UNKNOWN(37.49)						1200 J	
* UNKNOWN(38.71)					230 J	1300 J	
* UNKNOWN(40.06)						950 J	
* UNKNOWN(40.07)					190 J		
* UNKNOWN(41.68)						750 J	
* UNKNOWN(41.69)					160 J		
* UNKNOWN(41.99)			280 J		160 J		
* UNKNOWN(43.69)						580 J	
* UNKNOWN(46.22)						510 J	

VOLATILE ORGANICS (UG/KG)	SAMP NO:	AR812010A	AR812021A	AR812032A	AR812043A	AR812054A	AR812065A
	SDG NO:	ON25	ON25	ON25	ON25	OD01	OD01
	TYPE:	GRAB	GRAB	GRAB	GRAB	GRAB	GRAB
ACETONE		19 B	14 B	18 B	21 B	35 B	18 B
ETHYLBENZENE		6 U	6 U	6 U	6 U	6	5 U
METHYLENE CHLORIDE		726 E	969 E	942 E	353 E	148	900 E
XYLENE (TOTAL)		6 U	7	6 U	6 U	5 U	5 U

DRAFT DO NOT CITE

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

S&A REQUEST: 813
LOCATION: SUSPECTED SITES OF LEAD MELTING AND CASTING FACILITY AT SITE A
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO:	AR813011	AR813022	AR813033	AR813044	AR813055	AR813066
MOISTURE (%)		55	25	30	45	62	55
PH (UNITS)		6.8	6.8	6.8	6.8	6.3	6.5

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR813011A / AR802085F / GRAB	AR813011A / AR802085K / GRAB	AR813022A / AR802085F / GRAB	AR813022A / AR802085K / GRAB	AR813033A / AR802085F / GRAB	AR813033A / AR802085K / GRAB
ALUMINUM							
BARIUM							
BERYLLIUM							
CADMIUM							
CALCIUM							
CHROMIUM							
COBALT							
COPPER							
IRON							
LEAD		141		75		22 B	
MAGNESIUM							
MANGANESE							
NICKEL							
POTASSIUM			1600		2600		1600
SILVER							
SODIUM							
VANADIUM							
ZINC							

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR813044A / AR802085F / GRAB	AR813044A / AR802085K / GRAB	AR813055A / AR802085F / GRAB	AR813055A / AR802085K / GRAB	AR813066A / AR802085F / GRAB	AR813066A / AR802085K / GRAB
ALUMINUM							
BARIUM							
BERYLLIUM							
CADMIUM							
CALCIUM							
CHROMIUM							
COBALT							
COPPER							
IRON							
LEAD		20 B		15 B		12 B	
MAGNESIUM							
MANGANESE							

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

DRAFT DO NOT CITE

S&A REQUEST: 813
LOCATION: SUSPECTED SITES OF LEAD MELTING AND CASTING FACILITY AT SITE A
MEDIUM: SOIL

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR813044A / AR802085F / GRAB	AR813044A / AR802085K / GRAB	AR813055A / AR802085F / GRAB	AR813055A / AR802085K / GRAB	AR813066A / AR802085F / GRAB	AR813066A / AR802085K / GRAB
NICKEL							
POTASSIUM			2500		2300		2100
SILVER							
SODIUM							
VANADIUM							
ZINC							

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR813077A / AR406030M / GRAB	AR813077A / AR813077K / GRAB				
ALUMINUM		5040					
BARIUM		42 E					
BERYLLIUM		0.25 B					
CADMIUM		0.93					
CALCIUM		1020					
CHROMIUM		7.1					
COBALT		4 B					
COPPER		6					
IRON		6150 E					
LEAD		77					
MAGNESIUM		1040					
MANGANESE		393 N*					
NICKEL		6.7					
POTASSIUM			900				
SILVER		3 N					
SODIUM		44 B					
VANADIUM		13					
ZINC		37					

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25 DRAFT DO NOT CITE
FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

S&A REQUEST: 814
LOCATION: UNDERGROUND GASOLINE TANK AT SITE A
MEDIUM: AIR

FIELD MEASUREMENTS	SAMP NO:	AR814012	AR814023	AR814034
AIR PUMP (CC/MI)		250	250	250

SOIL GAS (NG/TUBE)					
	SAMP NO:	AR814012A	AR814023A	AR814034A	AR814078A
	SDG NO:	AR814012A	AR814012A	AR814012A	AR814012A
	TYPE:	GRAB	GRAB	GRAB	FIELD BLANK
BENZENE		12 B	8 B	660 B	410
CARBON TETRACHLORIDE		390	520	6400 E	58 U
CHLOROFORM		47 U	1500	1700	47 U
ETHYL ACETATE		16 U	16 U	16 U	91000 E
METHYL ISOBUTYL KETONE		14 U	14 U	28	14 U
METHYLENE CHLORIDE		54 U	54 U	170	54 U
N,N-DIMETHYLFORMAMIDE		890 B	700 B	33000 B	5200 E
TETRAHYDROFURAN		8 U	8 U	240	8 U
TRICHLOROETHYLENE		39	27	3400 E	23 U

S&A REQUEST: 815
LOCATION: SUSPECTED LOCATION OF THE FORMER SITE A LANDFILL
MEDIUM: SURFACE WATER

METALS, INCLUDING CR+6 (UG/L)					
	SAMP NO:	AR815137F	AR815137F	AR815137G	AR815137G
	SDG NO:	AR403015G	AR500046F	AR300066K	AR500046G
	TYPE:	RINSATE	RINSATE	RINSATE	RINSATE
ALUMINUM					1820
BARIUM					16 BE
CADMIUM		0.4 B			
CALCIUM					313 BE
CHROMIUM					60
IRON					1530
LEAD		2.4 B			
MAGNESIUM					237 BE
MANGANESE					47
MERCURY			0.02 B		
NICKEL					20 B
POTASSIUM				400 B	
SILVER		3 B			
ZINC					90

TABLE 4.3.25 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 25 FACILITIES AT SITE A, INCLUDING THE DEMOLITION OF A RESEARCH REACTOR

S&A REQUEST: 815
LOCATION: SUSPECTED LOCATION OF THE FORMER SITE A LANDFILL
MEDIUM: SURFACE WATER

EXTRACTABLE ORGANICS (UG/L)	SAMP NO: AR815137E SDG NO: DD30 TYPE: RINSATE					
BIS(2-ETHYLHEXYL)PHTHALATE	30					
* UNKNOWN HYDROCARBON(8.05)	20 JB					
* UNKNOWN PHTHALATE(35.07)	28 JB					
* UNKNOWN(19.49)	9 JB					
* UNKNOWN(19.81)	7 JB					

VOLATILE ORGANICS (UG/L)	SAMP NO: AR815137A SDG NO: GD01 TYPE: RINSATE					
ACETONE	82 B					
METHYLENE CHLORIDE	14 B					
TOLUENE	13					

4.31 Environmental Problem 26: Gasoline Spill at the Sunoco Station on Meridian Road

Request Number: 816.

Requester: B. Levitan.

Finding and Basis: A gasoline spill at the Sunoco station may adversely affect ground and surface waters. Soil was removed, but no analyses were made to determine if all contaminated soils were removed.

4.31.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if the contaminants listed in Sect. 4.31.2.2 were present in soils near the Sunoco service station at minimum detection levels.

Supporting Information: Approximately 20 gal. of unleaded gasoline spilled into a swale in 1986.

4.31.2 Sampling and Analytical Design

4.31.2.1 Sampling Design

Request 816: Gasoline Spill at the Sunoco Station on Meridian Road - Soil-Gas (Fig. 4.26). Six soil-gas (air) samples were to be collected (Sampling Method: Reference E5.4) by active sampling methods from a swale off Meridian Road. Duplicate collection tubes were to be used at each location. One tube (sample) was to be archived pending analysis of the first sample.

The Sampling Team arrived at the Sunoco station on 11NOV87 at approximately 0900. The weather was sunny, clear, and the temperature was approximately 45°F. The area of interest was within 50 ft south of the service island driveway. The area below the fill was considered homogeneous. The team divided the area of interest into a 1 x 60-

segment grid and 3 segments were selected at random. The team dug three, 2-in. diameter holes to a depth of 5 ft below the fill at grid segments 1, 12, and 24 (permit number 181-1987). The first hole was dug at 0950, the second at 1025, and the third at 1050. PID readings for the first hole were 200 at 2 ft, 5.6 at 4 ft, and 15.6 at 5 ft. All readings were below the 1 ft fill of gray soil. Below 1 ft, a color change was noted (tan). The second hole yielded only a single positive PID reading of 2.0 at 4 ft. Below 1 ft, the soil changed from gray to tan. The third hole yielded two positive PID readings of 3 (at 4 ft) and 6 (at 7 ft). The soil color change at 1 ft was from gray to black. At 7 ft, water was present. Each hole was sealed to permit soil gas to equilibrate for 24 hrs. The team returned on 12NOV87 to collect soil gas by active sampling methods. A metal detector was used to identify an underground gas line. The thermal desorption tube was placed in the hole at the depth of the highest reading at each grid. Sample AR816014 was collected on 12NOV87 at 1206 from grid 1. Soil gas was collected in the thermal desorption tube at a rate of 250 cc/min for 4 min. (Note: Sample volumes were changed from 2 L and 4 L samples for each hole to the rate recommended by Henry Kerfoot, EPA subcontractor - EPA Las Vegas.) Sample AR816047 was collected on 12NOV87 at 1213 from grid 1. Soil gas was collected at a rate of 250 cc/min for 8 min (total of 2000 cc). Sample AR816025 was collected on 12NOV87 at 1230 from grid 12. Soil gas was actively sampled at 250 cc/min for 4 min. Total gas sampled was 1000 cc. Sample AR816058 was collected on 12NOV87 at 1232 from grid 12. Soil gas was actively sampled at 250 cc/min for 8 min (total of 2000 cc). Sample AR816036 was collected on 12NOV87 at 1252 from grid 24. The sample was collected at a sample rate of 250 cc/min for 4 min. However, until the tube was withdrawn from the hole, the team did not know that the hole had filled with water to 4 ft. Therefore, sample AR816036 was rendered useless. Sample AR816069 was collected on 12NOV87 from grid 24 at 1252. The sample was collected at a rate of 250 cc/min for 4 min. Although the ANL Sampling and Analysis Plan did not request field blanks for this request, field blanks were added at the recommendation of Henry Kerfoot (EPA subcontractor). Field blank sample AR816070C was collected on 12NOV87 at 1220 from grid 1. The field blank tube was removed from the container and exposed to ambient air during the active soil-gas sampling at grid 1. Field blank sample AR816081C was collected on 12NOV87 at 1240 from grid 12. It was removed from its container and exposed to ambient air during active soil-gas sampling at grid 12. Field blank sample AR816092C was collected on 12NOV87 at 1300 from grid 24. It was removed from its container and exposed to ambient air during active soil-gas sampling at grid 24.

4.31.2.2 Analytical Design

Request 816: The field parameter measured for Request 816 included PID. The parameter analyzed included VOA.

4.31.3 Field and Analytical Data

Field Data: *The PID readings are given in Table 4.3.26. The readings were taken twice in each hole. The readings for the first hole were 16 ppm for each sample. For the second and third holes, the readings were 2 ppm. In all cases, the rate of gas removal was 250 cc/minute for the laboratory samples.*

Field Data Evaluation: Because the PID instrument was calibrated prior to taking field readings, the results are considered reliable. In the first hole, the readings were: 200 at 2 ft, 5.6 at 4 ft, and 15.6 at 5 ft. In the second hole, the reading was 2. In the third hole, the readings were: 3 ppm at 5 ft and 6 ppm at 7 ft.

Analytical Data:

<u>Soil gas</u>. *Results of the soil gas analysis are given in Table 4.3.26. Of the four grab samples, samples AR816025 and -058 were taken from the same hole (Grid 12), sample AR816025 was a 1-L volume removal, and AR816058 represented a volume of 2-L. Sample AR816047 represented a 2-L volume from Grid 1; its 1-L volume "mate" (AR816014) was taken but no analysis was reported. Sample AR816069 represented a 1-L volume from Grid 24; its "mate" was discarded when it was found to be in water.*

From four to seven compounds were detected in these four soil gas samples. Benzene, N,N-dimethylformamide, ethyl acetate, and acetone were detected in field or analytical blanks and also in at least some of the samples. Highest estimated concentrations included: trichloroethylene estimated at 3,800 ng/tube, but out of calibration range in AR816025; tetrahydrofuran out of calibration range, but estimated at 13,000 ng/tube in AR816069; and chloroform out of calibration range, but estimated at 11,000ng/tube in AR816069. The highest measured concentrations include 3,100 ng/tube of carbon tetrachloride, 1,800 of ng/tube chloroform, 66 ng/tube of methyl ethyl ketone, 1000 ng/tube of methyl isobutyl ketone, 36,000 ng/tube of N,N-dimethylformamide, and 440 ng/tube of trichloroethylene.

Analytical Data Evaluation:

Soil gas. Samples AR816025, AR814034, AR816047, AR816058, and AR816069 contained numerous chromatographable compounds which were not calibrated compounds. These compounds made identification and measurement of the targeted compounds very difficult and tentative. With the field blank (AR814078) showing similar characteristics, the reliability of the data is questionable.

The highest estimated concentrations included: trichloroethylene estimated at 3,800 ng/tube, but out of calibration range in AR816025; tetrahydrofuran out of calibration range, but estimated at 13,000 ng/tube in AR816069; and chloroform out of calibration range, but estimated at 11,000 ng/tube in AR816069. The highest measured concentrations included 3,100 ng/tube of carbon tetrachloride, 1,800 of ng/tube chloroform, 66 ng/tube of methyl ethyl ketone, 1000 ng/tube of methyl isobutyl ketone, 36,000 ng/tube of N,N-dimethylformamide, and 440 ng/tube of trichloroethylene.

4.31.4 Limitations and Qualifications

Data Quality Level: The sampling plan is rated Quality Level II. The field sampling is rated Quality Level I. The overall analytical rating is Quality Level III.

Field Data: The sampling plan called for a fixed depth of 5 ft prior to taking PID readings. It also stated that this would be the transition zone to the top of the native soil. The Sampling Team found higher readings much closer to the surface which provide important insight into the problem.

Analytical Data:

Soil gas. The overall Quality Level of III is based on the presence of suspect impurity compounds and the PID reading not corresponding to the high concentrations found in the tubes.

Environmental Problem: 26
Request Number: 816

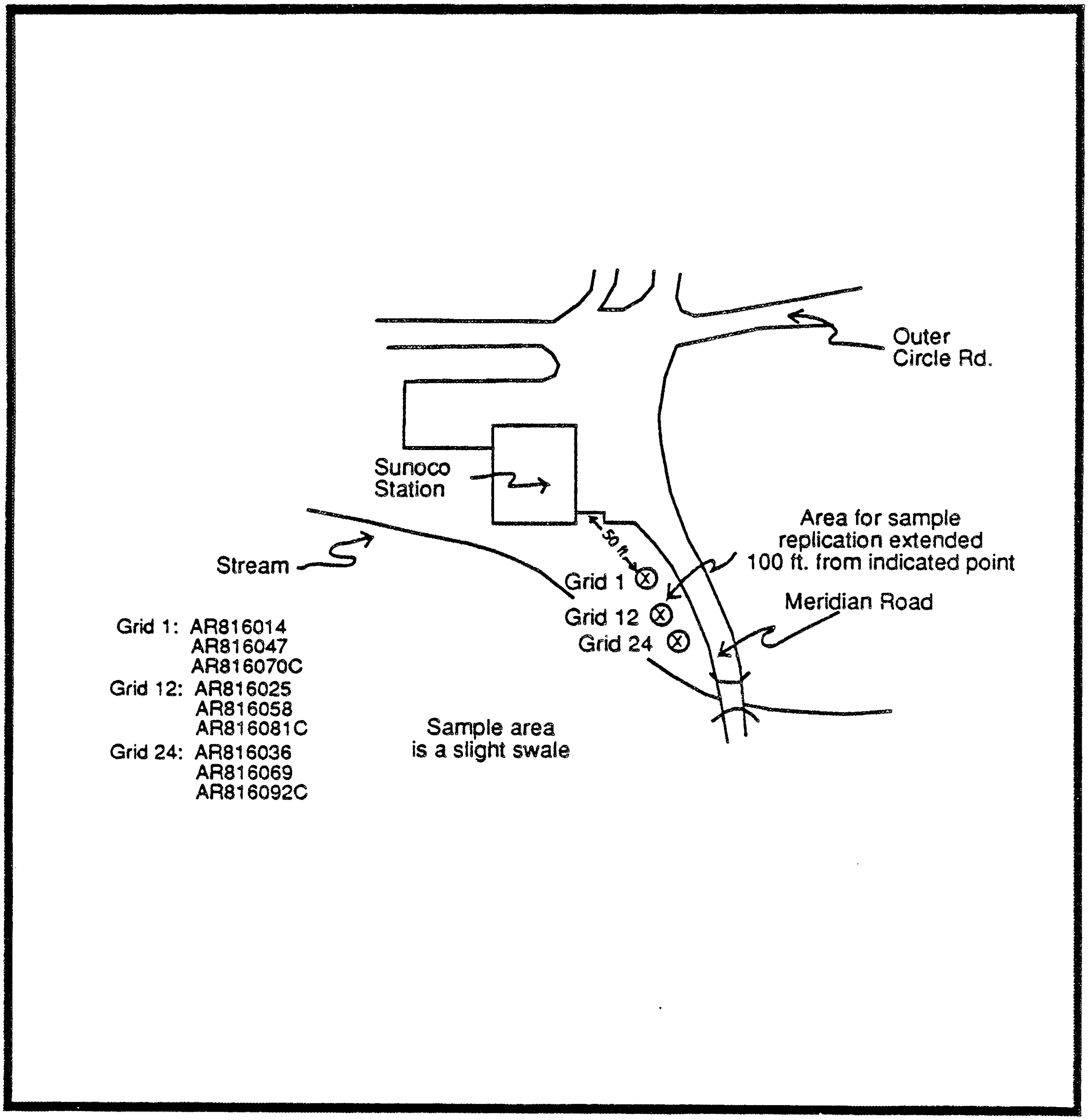

Figure 4.26. Location of Gasoline Spill at the Meridian Road Sunoco Station (Request 816)

TABLE 4.2.26 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 26

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR816	SUNOCO STA	GAS SPILL	SOIL	2	1	GRAB	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
			MED TOTAL	2	1		0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0
AR816	SUNOCO STA	GAS SPILL	AIR	3	3	QC FL	0	0	0	0	0	0	0	0	2	2	0	0	0	0	0	0	0	0
AR816	SUNOCO STA	GAS SPILL	AIR	4	4	GRAB	0	0	0	0	0	0	0	0	3	3	0	0	0	0	0	0	0	0
			MED TOTAL	7	7		0	0	0	0	0	0	0	0	5	5	0	0	0	0	0	0	0	0
			EP TOTAL	9	8		0	0	0	0	0	0	0	0	6	6	0	0	0	0	0	0	0	0

TABLE 4.3.26 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 26 DRAFT DO NOT CITE
GASOLINE SPILL AT THE SUNOCO STATION ON MERIDIAN ROAD

S&A REQUEST: 816
LOCATION: GASOLINE SPILL AT THE SUNOCO STATION ON MERIDIAN ROAD
MEDIUM: SOIL

FIELD MEASUREMENTS	SAMP NO: AR816036	AR816069
AIR PUMP (CC/MI)	250	250
FID/PID (PPM)	2	2

SOIL GAS (NG/TUBE)	SAMP NO: AR816069A SDG NO: AR814012A TYPE: GRAB
BENZENE	410 B
CARBON TETRACHLORIDE	1600
CHLOROFORM	11000 E
METHYL ISOBUTYL KETONE	200
N,N-DIMETHYLFORMAMIDE	6200 B
TETRAHYDROFURAN	13000 E
TRICHLOROETHYLENE	2500 E

S&A REQUEST: 816
LOCATION: GASOLINE SPILL AT THE SUNOCO STATION ON MERIDIAN ROAD
MEDIUM: AIR

FIELD MEASUREMENTS	SAMP NO: AR816014	AR816025	AR816047	AR816058
AIR PUMP (CC/MI)	250	250	250	250
FID/PID (PPM)	16	2	16	2

SOIL GAS (NG/TUBE)	SAMP NO: AR816025A SDG NO: AR814012A TYPE: GRAB	AR816047A AR814012A GRAB	AR816058A AR814012A GRAB	AR816070C AR814012A FIELD BLANK	AR816081C AR814012A FIELD BLANK
ACETONE	22 U	22 U	22 U	110	430 B
BENZENE	7 U	7 U	14 B	7 U	7 U
CARBON TETRACHLORIDE	58 U	1900	3100	58 U	81
CHLOROFORM	47 U	47 U	1800	47 U	47 U
ETHYL ACETATE	16 U	170 B	16 U	16 U	16 U
METHYL ETHYL KETONE	13 U	66	54	13 U	13 U
METHYL ISOBUTYL KETONE	790	53	1000	14 U	14 U
N,N-DIMETHYLFORMAMIDE	18000 B	23000 B	36000 B	47 U	47 U
TETRAHYDROFURAN	45	8 U	8 U	8 U	8 U
TRICHLOROETHYLENE	3800 E	440	350	23 U	73

4.32 Environmental Problem 27: Drum Near Building 145

Request Number: 817.

Requester: B. Levitan.

Finding and basis: A drum of unknown and potentially hazardous liquid was observed leaking near Building 145. An unknown quantity of liquid leaked and has the potential to migrate into the soil and contaminate the surface and groundwaters.

4.32.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine the presence of contaminants listed in Sect. 4.32.2.2 at minimum detection levels in soil at the site of drum leakage.

Supporting Information: Site personnel indicated the drum content was waste oil, but the label identified pyridine as the contents. It is estimated that from 8 to 200 L (2 to 55 gal.) may have leaked.

4.32.2 Sampling and Analytical Design

4.32.2.1 Sampling Design

Request 817: Leaking Drum Near Building 145 - Soil (Fig. 4.27). Two surface soil samples were to be collected (Sampling Method: Reference E5.1) from area(s) of obvious leakage. Leakage was minimal.

The Sampling Team arrived at the sampling location on 09NOV87 at 1443. Skies were clear, the temperature was 45^{o}F, and winds were 5-10 mph. There was a concrete stab underneath the wooden palette about 1 in. below the surface. The slab was about the same size as the pallet. The drum leakage area was on white gravel and sand. Obvious areas of drainage extended about 10 ft towards the ditch, but the heaviest discoloration areas were under or near the palette. The soil in the area seemed wet, and it had recently rained. Sample AR817015 was collected at 1443 from grid 35 at the edge of the pallet at a depth of 1 in. The sample was to have been collected from 0-3 in., but because of concrete, the 3-in. depth was not attainable. Sample AR817026 was collected at 1445 from grid 46 at a depth of 0-3 in., 1 ft from the pallet.

4.32.2.2 Analytical Design

Request 817: No field measurements were requested for Request 817. Parameters analyzed included volatiles, semivolatiles, and pyridine.

4.32.3 Field and Analytical Data

Field Data: *No field measurements were requested.*

Field Data Evaluation: Not applicable.

Analytical Data:

Extractable organics. There was some 2-methylnaphthalene identified in an estimated concentration of 0.12 ppm in sample AR817015. No other target compounds were identified. Unknowns were present in estimated concentrations of up to 7 ppm, with the highest estimated concentrations generally being in sample AR817015, which also contained the 2-methylnaphthalene.

Volatile organics. Each of the four soil samples analyzed for this environmental problem contained from six to eight detectable compounds. Acetone was present in all samples (highest concentration was 0.078 mg/kg) and in the associated blank. Methylene chloride was present in all samples and also in the blank. Concentrations of methylene chloride were beyond calibration range in all samples, but estimates were as high as 4 mg/kg.

Pyridine. No data for pyridine were reported due to uncertainties in the results.

Analytical Data Evaluation:

Extractable organics. There was some 2-methylnaphthalene identified in sample AR817015, but the concentration was below the quantitation limit and was estimated at 0.12 ppm. Estimated concentrations of unknowns did not exceed 7 ppm.

Volatile organics. Methylene chloride was present in all samples and also in the blank. Concentrations of methylene chloride were beyond calibration range in all samples, but estimates were as high as 4 mg/kg.

Pyridine. Inconclusive results were obtained using the direct method of solvent extraction and gas chromatography. Spectral comparison with volatile and semivolatile analysis did not show the presence of pyridine.

4.32.4 Limitations and Qualifications

Data Quality Level: The sampling plan and the sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Field Data: Although the plan called for sampling from 0-3 in., sample AR817015 was 0-1 in. due to the shallow "soil" over a concrete pad.

Analytical Data:

Extractable organics. Data are all of Quality Level III due to mass spectral uncertainties for the unknowns and to the concentration being below the quantitation limit for the 2-methylnaphthalene.

Volatile organics. Data quality for all target volatile compounds detected at levels above their quantitation limits was Quality Level II with the exception of toluene in AR817026 which was Quality Level III because the appropriate internal standard did not meet criteria. The TIC volatiles (methyl acetate and trichlorofluoromethane) in AR817015 were Quality Level II. The elevated levels of methylene chloride were Quality Level II in AR817015 and Quality Level I in AR817026.

Pyridine. The data for this compound are Quality Level III. A direct method should have been used which did not depend on the spectral data from volatile and semivolatile analyses.

Environmental Problem: 27
Request Number: 817

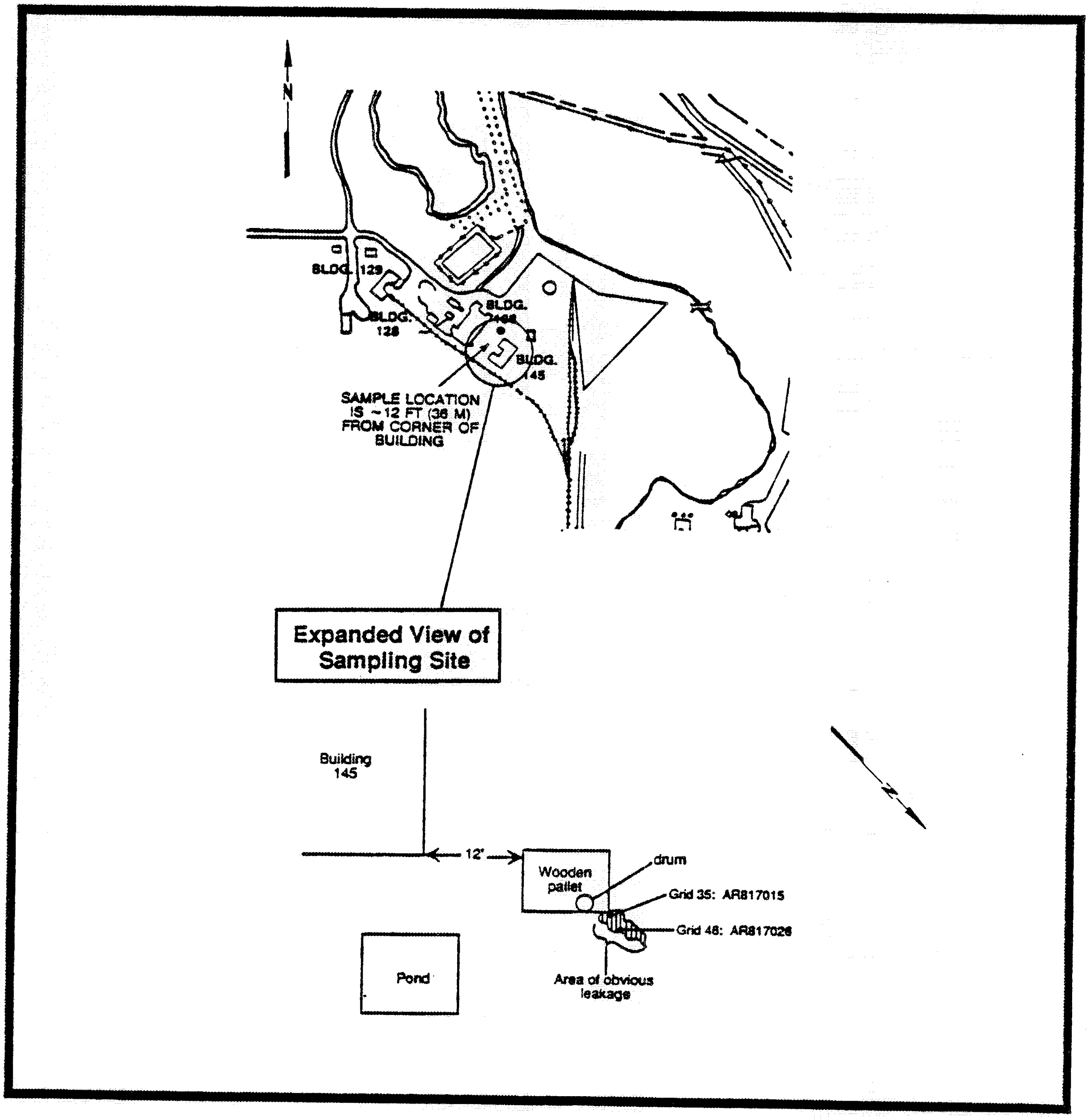

Figure 4.27. Leaking Unlabeled Drum Adjacent to Building 145 (Request 817)

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TABLE 4.2.27 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 27

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR817	B145 DRUM	DRUM	SOIL	2	2	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	4	0	0
			MED TOTAL	2	2		0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	4	0	0
			EP TOTAL	2	2		0	0	0	0	0	0	0	0	0	0	0	0	2	2	4	4	0	0

TABLE 4.3.27 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 27
DRUM NEAR BUILDING 145

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S&A REQUEST: 817
LOCATION: LEAKING DRUM NEAR BUILDING 145
MEDIUM: SOIL

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: AR817015C SDG NO: CD25 TYPE: GRAB	AR817026C CD25 GRAB
2-METHYLNAPHTHALENE	120 J	350 U
* UNKNOWN HYDROCARBON(7.98)	1200 J	
* UNKNOWN HYDROCARBON(24.59)	5500 J	
* UNKNOWN HYDROCARBON(25.93)	2100 J	
* UNKNOWN HYDROCARBON(26.07)	7000 J	
* UNKNOWN HYDROCARBON(26.52)	910 J	
* UNKNOWN HYDROCARBON(27.19)	3400 J	
* UNKNOWN HYDROCARBON(27.28)	2300 J	
* UNKNOWN HYDROCARBON(28.58)	4000 J	
* UNKNOWN HYDROCARBON(29.56)	6800 J	
* UNKNOWN HYDROCARBON(31.46)	1500 J	
* UNKNOWN HYDROCARBON(34.34)	1300 J	
* UNKNOWN(7.45)	310 J	
* UNKNOWN(7.59)	670 J	
* UNKNOWN(7.72)	920 J	
* UNKNOWN(9.31)	160 J	
* UNKNOWN(9.47)	360 J	
* UNKNOWN(11.49)	140 J	
* UNKNOWN(15.19)	200 J	
* UNKNOWN(18.24)	250 J	
* UNKNOWN(18.35)		27 J
* UNKNOWN(21.20)		81 J
* UNKNOWN(23.95)	1100 J	
* UNKNOWN(24.55)		29 J
* UNKNOWN(25.05)		29 J
* UNKNOWN(27.24)		100 J
* UNKNOWN(27.62)		27 J
* UNKNOWN(28.57)		35 J
* UNKNOWN(29.21)		62 J
* UNKNOWN(31.01)		210 J
* UNKNOWN(31.53)		170 J
* UNKNOWN(35.80)		140 J
* UNKNOWN(37.90)		1400 J
* UNKNOWN(38.76)		230 J
* UNKNOWN(39.48)		270 J
* UNKNOWN(42.00)		250 J
* UNKNOWN(45.14)		230 J
* UNKNOWN(48.18)		240 J

TABLE 4.3.27 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 27 DRAFT DO NOT CITE
DRUM NEAR BUILDING 145

S&A REQUEST: 817
LOCATION: LEAKING DRUM NEAR BUILDING 145
MEDIUM: SOIL

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR817015A GN20 GRAB	AR817015A ON15 GRAB	AR817026A GN20 GRAB	AR817026A ON15 GRAB		
ACETONE		78 B	32 B	14 B	15 B		
METHYLENE CHLORIDE		4000 BE	370 BE	2000 BE	730 BE		
TOLUENE		6 U	6 U	6	5 JB		
XYLENE (TOTAL)		43	6 U	22	5 U		
* ACETIC ACID, METHYL ESTER			14 J				
* TRICHLOROFLUOROMETHANE			4 J				

4.33 Environmental Problem 28: Plot M

Request Numbers: 818 and 819.

Requester: B. Levitan.

Finding and Basis: Due to inadequate physical and institutional controls, radioactive and hazardous wastes disposed of in Plot M could result in unacceptable environmental exposure from human intrusion or natural disruptions. Radioactive and chemical wastes from the University of Chicago Metallurgical Laboratory and Site A were buried in Plot M. Both solids and liquids in glass and metal containers were placed in trenches. No inventory is available to identify the quantity or kinds of contaminants involved. The site was capped in 1956 with a concrete box cover. Although Plot M has been well characterized radiologically, very few chemical analyses have been performed.

4.33.1 Sampling and Analysis Objectives

Statement: Samples were collected to determine if contaminants listed in Sect. 4.33.2.2 were present in water and sediment at minimum detection levels in a seep near Plot M.

Supporting Information: There were no records of the kinds or quantities of materials disposed of at Plot M. Because wastes from Site A were placed in Plot M, it was inferred that materials used at Site A were likely disposed of in Plot M. These materials included ammonium, sodium, potassium hydroxide, potassium permaganate and dichromate, potassium iodide, hydrazine, acetone, ethanol, carbon tetrachloride, etc. It was estimated that 10,000 ft^3 of radiological and chemical wastes may have been disposed of in Plot M. These may have included volatiles, semivolatiles, and cyanide.

Although chemical sampling was initiated at Plot M in 1986, only groundwater was sampled. To indicate whether chemical contamination had occurred in other media, it was recommended that sampling be expanded to include sediment and surface water.

4.33.2 Sampling and Analytical Design

4.33.2.1 Sampling Design

Request 818: Seep North of the Northeast Corner of Plot M - Water (Fig. 4.28a). Three grab samples of water were to be collected (Sampling Method: Reference E4.2.4) from the seep north of Plot M from pooled water nearest the seep origin on three separate days.

The Sample Team arrived at the sampling location on 04NOV87 at 1500. Although the seep area was located, there was too little moisture to sample or to use to obtain field measurements. For this reason, QC rinsate sample AR818049 and samples AR818016, -027, and -038 were not collected.

Request 819: Plot M Seep (Sample Point No. 6 in the Palos Park Surveillance Program) - Sediment (Fig. 4.28b). Three grab sediment samples were to be collected (Sampling Method: Reference E5.3.1) in the area of the Plot M seep. Replicates were to be restricted to the area of active seepage for maximum detection.

The Sampling Team arrived at the sampling location on 04NOV87 at 1500. Winds were out of the N-NW at 3 mph and the temperature was approximately 65^{o}F. The area of interest was down gradient of Plot M and covered less than 100 m^{2}. The sediment was considered homogeneous with respect to possible contamination. The area below the seep (10 x 6 ft) was divided into a 10 x 6-segment grid and 3 segments were selected at random. Samples were collected at each designated segment to the depth of sediment (5-7 in.). The site below the Plot M seep and the adjacent creek was dry on this date (04NOV87). The sediment at the seep was very dark brown and, in the area between the stream and the seep, appeared dark brown to almost black in color. Sample AR819017 was collected from grid 11 at 1516 at a depth of 6 in. Sample AR819028 was collected from grid 20 at 1524 at a depth of 5 in. Sample AR819039 was collected from grid 36 at 1531 at a depth of 7 in.

4.33.2.2 Analytical Design

Request 818: Field parameters to have been measured for Request 818 included pH, temperature, and specific conductivity. Parameters to have been analyzed included volatiles, semivolatiles, CLP-metals, and cyanide.

Request 819: The field parameter measured for Request 819 included pH. The parameters analyzed included volatiles, semivolatiles, CLP-metals, and cyanide.

4.33.3 Field and Analytical Data

Field Data:

Request 818: *Because the seep was too dry, no samples were collected.*

Request 819: *The pH readings for Request 819 are shown in Table 4.3.28. The values for the sediment range from 7.9 to 8.1.*

Field Data Evaluation:

Request 818: Not applicable.

Request 819: Because the instrument was calibrated prior to taking field readings, the results are reliable.

Analytical Data:

Request 818: *No samples were collected.*

Request 819:

Anions and cyanide. Because the cyanide concentrations for the sediment samples for Request 819 were below the action level of 250 mg/kg, they were not reported in the table.

Metals. Analytical results for metals in sediment are presented in Table 4.3.28. Of the 20 metals detected, silver and sodium were below the CRDL in all three samples. Of the remaining metals, arsenic ranged from 8.8 to 11 mg/kg, barium ranged from 68 to 136 mg/kg, beryllium was 1.1 mg/kg, cadmium ranged from 1.4 to 2.0 mg/kg, chromium from 12 to 14 mg/kg, cobalt from 11 to 19 mg/kg, copper from 21 to 25 mg/kg, lead from 39 to 51 mg/kg, mercury from 0.08 to 0.09 mg/kg, nickel from 22 to 29 mg/kg, and zinc from 82 to 117 mg/kg. Other metals detected were aluminum, calcium, iron, magnesium, manganese, potassium, and vanadium.

Extractable organics. No target compounds were identified in these samples. One unknown in sample AR819017 had an estimated concentration of 15 ppm. All other estimated concentrations of unknowns were below 5 ppm in these samples.

Volatile organics. There were six compounds detected in one of the samples and five compounds in each of the remaining two samples. Methylene chloride was beyond the calibration range in two samples and was estimated in these samples to be 0.970 and 2.3 mg/kg. Trichlorofluoromethane was also tentatively identified in sample AR819028A at an estimated concentration of 0.019 mg/kg. With the above exceptions, concentrations of all detected volatile compounds were estimated at less than 0.01 mg/kg.

Analytical Data Evaluation:

Request 818: No samples were collected.

Request 819:

Anions and cyanide. Although the request for cyanide also included the water samples from the associated seep from Plot M (Request 818), the water volume was too low to sample. For the sediment analysis, the results are reliable.

Metals. The following eleven metals of interest were detected above the CRDL in the samples for Request 819: arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, and zinc.

Extractable organics. No target compounds were identified in these samples. Estimates of concentrations of unknown compounds never exceeded 15 ppm.

Volatile organics. Methylene chloride was beyond the calibration range in two samples and was estimated in these samples to be 0.970 and 2.3 mg/kg. With these two exceptions, concentrations of volatile organic compounds were all estimated at less than 0.020 mg/kg.

4.33.4 Limitations and Qualifications

Data Quality Level: The sampling plan and field sampling are rated Quality Level I. The overall analytical rating is Quality Level II.

Analytical Data:

Request 819:

Anions and cyanide. The data are Quality Level I.

Metals. Analytical results were Quality Level I except for aluminum, selenium, and vanadium at Quality Level II and antimony at Quality Level III.

Extractable organics. Data were all of Quality Level III due to mass spectral uncertainty.

Volatile organics. Data are Quality Level II.

Environmental Problem: 28
Request Number: 818

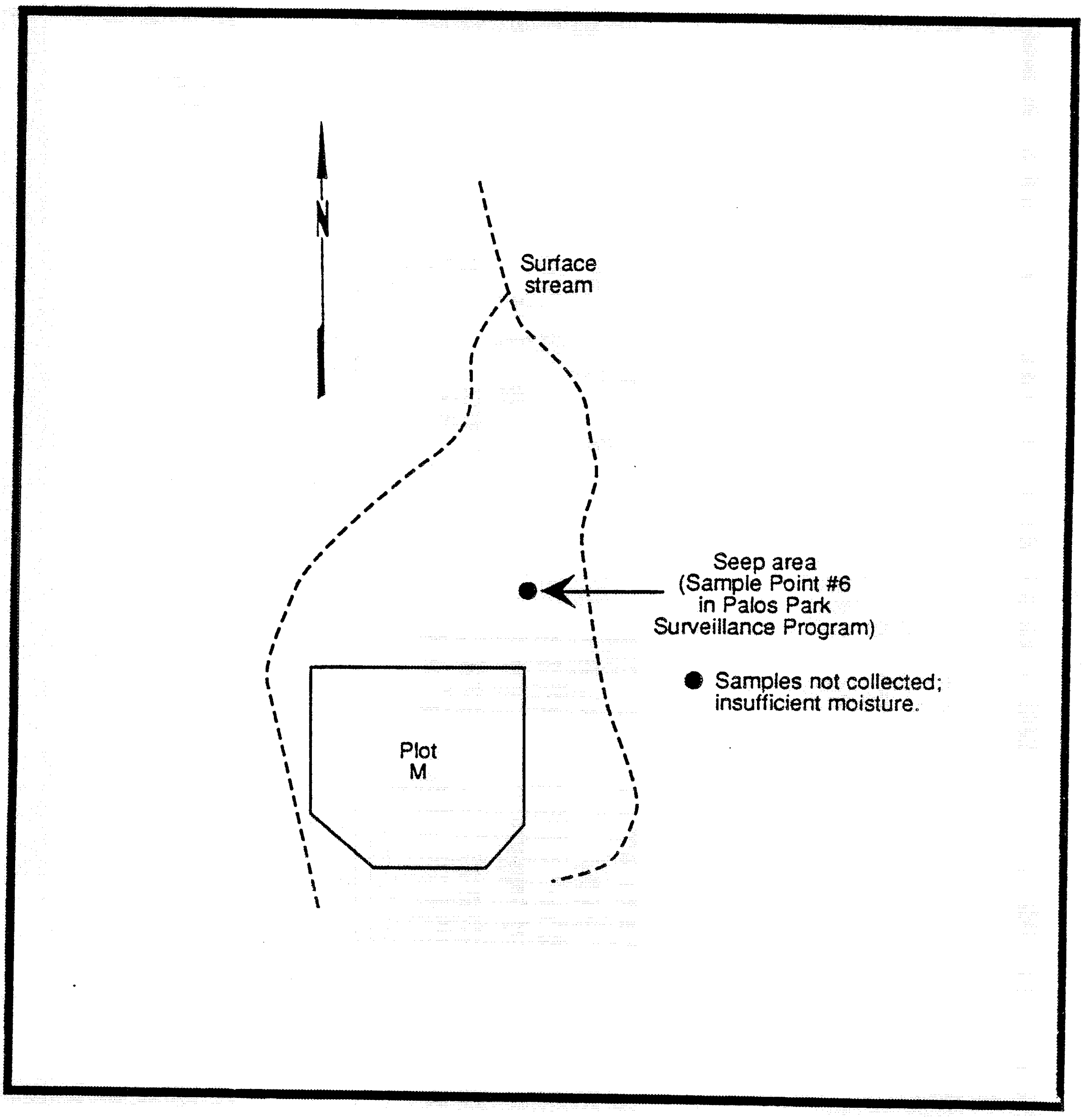

Figure 4.28a. Seep North of Low-Level Radioactive Disposal Site (Plot M) (Request 818)

Environmental Problem: 28
Request Number: 819

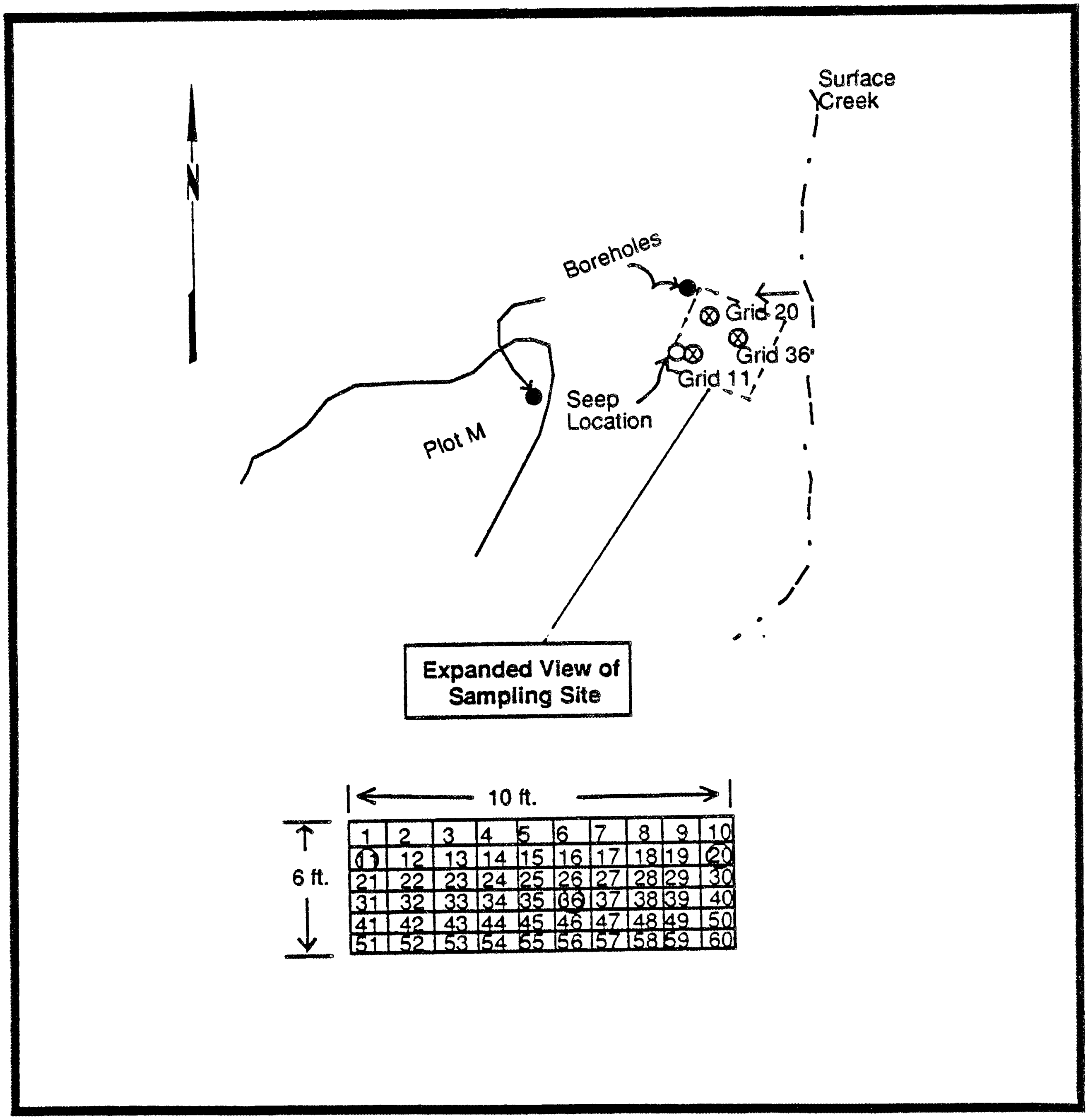

Figure 4.28b. Seep Near Site M (Request 819)

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TABLE 4.2.28 SAMPLING AND ANALYSIS DATA SUMMARY
ENVIRONMENTAL PROBLEM - 28

REQUEST NUMBER	LOCATION	TYPE LOCATION	MEDIA	NUMB REQ	NUMB COLL	TYPE	ANIONS NUMB HITS	ANIONS NUMB ANAL	METALS NUMB HITS	METALS NUMB ANAL	O&G NUMB HITS	O&G NUMB ANAL	PET HYDRO NUMB HITS	PET HYDRO NUMB ANAL	SOIL GAS NUMB HITS	SOIL GAS NUMB ANAL	PES/H/PCB NUMB HITS	PES/H/PCB NUMB ANAL	SEMIVOLS NUMB HITS	SEMIVOLS NUMB ANAL	VOLS NUMB HITS	VOLS NUMB ANAL	RADS NUMB HITS	RADS NUMB ANAL
AR819	PLOT M	SEEP	SEDIMENT	3	3	GRAB	0	3	3	3	0	0	0	0	0	0	0	0	3	3	3	3	0	0
			MED TOTAL	3	3		0	3	3	3	0	0	0	0	0	0	0	0	3	3	3	3	0	0
AR818	PLOT M	SEEP	SUR WATER	1	0	QC RN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	1	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
AR818	PLOT M	SEEP	GRN WATER	3	0	GRAB	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			MED TOTAL	3	0		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
			EP TOTAL	7	3		0	3	3	3	0	0	0	0	0	0	0	0	3	3	3	3	0	0
			TOTAL	341	259		36	129	189	191	12	17	6	23	10	10	52	123	160	160	183	186	54	54

TABLE 4.3.28 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 28 PLOT M

DRAFT DO NOT CITE

S&A REQUEST: 819
LOCATION: PLOT M SEEP (SAMPLE POINT NO. 6 IN PALOS PARK SURVEILLANCE PROGRAM)
MEDIUM: SEDIMENT

FIELD MEASUREMENTS	SAMP NO: AR819017	AR819028	AR819039			
PH (UNITS)	8.1	7.9	7.9			
TEMPERATURE (DEG C)	19	18	18			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR819017D SDG NO: AR310013C TYPE: GRAB	AR819017D AR802018E GRAB	AR819017E AR802085F GRAB	AR819017E AR802085K GRAB	AR819028D AR310013C GRAB	AR819028D AR812010C GRAB
ALUMINUM			8330			
ARSENIC		9.5 N	12 U			11 N
BARIUM			68 E			
BERYLLIUM			0.89 B			
CADMIUM		3 B	1.4			4.1 BN
CALCIUM			10200			
CHROMIUM			12			
COBALT			11			
COPPER			21			
IRON			19300			
LEAD		39	34 B			51
MAGNESIUM			6940			
MANGANESE			640			
MERCURY	0.05 B				0.08	
NICKEL			22			
POTASSIUM				1300		
SILVER		1.2 U	1.4 B			1.1 U
SODIUM			131 B			
VANADIUM			23			
ZINC			82			

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: AR819028E SDG NO: AR802085F TYPE: GRAB	AR819028E AR802085K GRAB	AR819039D AR310013C GRAB	AR819039D AR812010C GRAB	AR819039E AR802085F GRAB	AR819039E AR802085K GRAB
ALUMINUM	10200				9430	
ARSENIC	11 U			8.8 N	12 U	
BARIUM	136 E				82 E	
BERYLLIUM	1.1				1.1	
CADMIUM	2			2.9 BN	1.5	
CALCIUM	11700				15100	
CHROMIUM	14				13	
COBALT	19				14	
COPPER	25				23	
IRON	23500				21500	

TABLE 4.3.28 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 28
PLOT M

S&A REQUEST: 819
LOCATION: PLOT M SEEP (SAMPLE POINT NO. 6 IN PALOS PARK SURVEILLANCE PROGRAM)
MEDIUM: SEDIMENT

METALS, INCLUDING CR+6 (MG/KG)	SAMP NO: / SDG NO: / TYPE:	AR819028E AR802085F GRAB	AR819028E AR802085K GRAB	AR819039D AR310013C GRAB	AR819039D AR812010C GRAB	AR819039E AR802085F GRAB	AR819039E AR802085K GRAB
LEAD		44			40	38 B	
MAGNESIUM		8040				9450	
MANGANESE		1980				1140	
MERCURY				0.09			
NICKEL		29				24	
POTASSIUM			1800				1600
SILVER		1.4 B			1.2 U	1.7 B	
SODIUM		144 B				142 B	
VANADIUM		30				27	
ZINC		117				92	

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR819017B CD30 GRAB	AR819028B CD30 GRAB	AR819039B CD30 GRAB			
BIS(2-ETHYLHEXYL)PHTHALATE		120 J	150 U	330			
BUTYLBENZYLPHTHALATE		260 J	150 U	220 J			
DI-N-BUTYLPHTHALATE		29 J	150 U	300 U			
DIETHYLPHTHALATE		770	400	480			
* UNKNOWN(7.62)				832 J			
* UNKNOWN(7.66)			973 J				
* UNKNOWN(7.77)			283 J	304 J			
* UNKNOWN(7.78)		616 J					
* UNKNOWN(8.00)			471 J	448 J			
* UNKNOWN(8.01)		923 J					
* UNKNOWN(8.43)		107 J					
* UNKNOWN(9.33)			612 J	576 J			
* UNKNOWN(9.36)		1180 J					
* UNKNOWN(10.23)			157 J				
* UNKNOWN(10.24)				155 J			
* UNKNOWN(10.25)		308 J					
* UNKNOWN(11.00)				640 J			
* UNKNOWN(11.01)		956 J	550 J				
* UNKNOWN(11.07)			119 J				
* UNKNOWN(11.23)				672 J			
* UNKNOWN(11.43)				736 J			
* UNKNOWN(12.51)			83 J				
* UNKNOWN(12.87)			345 J				
* UNKNOWN(15.13)		648 J		1310 J			
* UNKNOWN(15.14)			926 J				
* UNKNOWN(16.24)				142 J			

TABLE 4.3.28 ANALYTICAL DATA SUMMARY BY MEDIUM FOR ENVIRONMENTAL PROBLEM 28 DRAFT DO NOT CITE
PLOT M

S&A REQUEST: 819
LOCATION: PLOT M SEEP (SAMPLE POINT NO. 6 IN PALOS PARK SURVEILLANCE PROGRAM)
MEDIUM: SEDIMENT

EXTRACTABLE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR819017B / CD30 / GRAB	AR819028B / CD30 / GRAB	AR819039B / CD30 / GRAB
* UNKNOWN(16.25)			102 J	
* UNKNOWN(16.69)				134 J
* UNKNOWN(18.43)		194 J	612 J	1070 J
* UNKNOWN(18.78)			116 J	
* UNKNOWN(19.70)			155 J	
* UNKNOWN(19.71)				192 J
* UNKNOWN(20.63)				160 J
* UNKNOWN(20.66)			100 J	
* UNKNOWN(21.37)				624 J
* UNKNOWN(21.38)			298 J	
* UNKNOWN(22.41)			100 J	
* UNKNOWN(24.00)			550 J	800 J
* UNKNOWN(24.44)				368 J
* UNKNOWN(26.28)				384 J
* UNKNOWN(33.15)		14900 J	1880 J	1920 J
* UNKNOWN(34.53)		664 J		
* UNKNOWN(35.56)		826 J		
* UNKNOWN(38.85)		4860 J		
* UNKNOWN(44.57)		2920 J		

VOLATILE ORGANICS (UG/KG)	SAMP NO: / SDG NO: / TYPE:	AR819017A / ON17 / GRAB	AR819028A / ON17 / GRAB	AR819039A / ON17 / GRAB
ACETONE		14 JB	11 JB	7 JB
METHYLENE CHLORIDE		970 BE	7 JB	2300 BE
* METHANE, TRICHLOROFLUOR(9.22)			19 J	

5.0 QUALITY ASSURANCE AND QUALITY CONTROL (QA/QC)

This section covers quality assurance and quality control requirements addressed by QA/QC plans for the ANL Site. Section 5.1 reviews the QA/QC plan for the ANL Site and provides a summary of the quality control samples generated and collected in the field. An analysis of results, a summary of laboratory QA/QC procedures for stable and radioactive contaminants, and a discussion of audits conducted by the EPA and others are also provided. (Please refer to specific environmental problems in Sect. 4.0 for data limitations.) Section 5.2 addresses stable chemistry, laboratory radiological chemistry, and field radiological chemistry, as well as audits conducted by the EPA and others.

Table 5.1 provides a cross-reference for correlating and locating QA/QC information in the ANL Sampling and Analysis Data Document, ORNL's ANL Sampling and Analysis Plan, and Battelle's addendum (see Appendix F), and the August 1987 version of the DOE Environmental Survey Manual.

5.1 Field QA/QC

The ANL Sampling and Analysis Plan and Battelle's addendum were reviewed by EMSL-LV and approved by DOE. Items 5, 8, 11, and 12 from the QA/QC plan (see Table 5.1) are addressed in the paragraphs that follow.

Item 5. QA Objectives for Completeness. The goal for completeness of field measurements was 100%, although 90% was acceptable. The objective for sampling completeness for effluent and groundwater samples was 95%.

Table 5.2 summarizes sampling completeness for the ANL effort. The overall completeness based on revisions (media collections vs planned deletions) was 99% for the sampling effort. The groundwater and surface water sampling effort met the objective of 95% sampling completeness.

Table 5.1. Quality Assurance/Quality Control Project Plan Locator

	Essential Elements**	Data Document	ORNL ANL S&A Plan and BCD Addendum***	Survey Manual*
1.	TITLE PAGE WITH APPROVAL SIGNATURES	COVER PAGE	COVER PAGE	COVER PAGE
2.	TABLE OF CONTENTS	THIS PAGE		APPEND F
3.	PROJECT DESCRIPTION	1.0	1.2.1	
4.	PROJECT ORGANIZATION AND RESPONSIBILITIES	1.1	6.2	Sect. 2
5.	QA OBJECTIVES FOR MEASUREMENT DATA (Precision, accuracy, completeness, representativeness, and comparability)	5.1	6.3	APPEND F
6.	SAMPLING PROCEDURES	3.1	Sect. 4.0	APPEND E
7.	SAMPLING CUSTODY	3.0	5.11	APPEND I
8.	CALIBRATION PROCEDURES AND FREQUENCY	5.1	6.6.4	APPEND E
9.	ANALYTICAL PROCEDURES	3.2	6.6.5	APPEND D
10.	DATA REDUCTION, VALIDATION, AND REPORTING	4.0	6.6.6	APPEND H
11.	INTERNAL QC CHECKS AND FREQUENCY	5.1	6.10	APPEND F
12.	PERFORMANCE AND SYSTEM AUDITS AND FREQUENCY	5.1 and APPEND C	6.11, 6.15	APPEND F
13.	PREVENTIVE MAINTENANCE PROCEDURE AND SCHEDULE		6.6.4	
14.	ROUTINE PROCEDURES FOR DATA ASSESSMENT (Precision, accuracy, and completeness of measurement parameters involved)	5.2 and APPEND D	6.6.6	APPEND H
15.	CORRECTIVE ACTION	5.1	6.12	APPEND F
16.	QUALITY ASSURANCE REPORTS TO MANAGEMENT	5.0	6.14	APPEND F

* Please refer to the August 1987 DOE Environmental Survey Manual.

** Reference EPA's "Interim Guidelines and Specifications for Preparing Quality Assurance Plans" (EPA 1983).

*** Please refer to Appendix F of this data document for a copy of Battelle's addendum to ORNL's ANL Sampling and Analysis Plan.

Table 5.2. Field Sampling Completeness for the ANL Site

	Number of Samples[a]			
Media Type	Planned	Collected	Deleted	Not Collected
Surface Water[b]	102	81	21	0
Groundwater	31	23	7	1
Soils	149	128[c][d]	20	2
Sediment/Sludge	42	42	0	0
Soil Gas	12	8	4	0
TOTAL	336	282	48	3

(a) No blanks or rinsates are included.

(b) Includes effluent in tanks.

(c) One additional sample obtained under Environmental Problem 23 Request 810.

(d) Twenty-five samples collected but not analyzed. See text for explanations.

Item 8. Calibration Procedures and Frequency. An important factor in the collection of accurate field data is instrument calibration. The guidance provided in Table 6.1 of the ANL Sampling and Analysis Plan was followed; dates, standards, and problems were recorded in the field logbooks. In some cases, there were problems with instrument stabilization, and where data are suspect, it is noted in the tables or text associated with each environmental problem (see Sect. 4.0).

Item 11. Internal Quality Control Checks. The ANL QA/QC plan called for the collection of trip blanks for volatile organic samples and rinsate samples to check on equipment decontamination. The frequency of use for each of these types of QC samples is shown in Table 5.3. However, the guidance in the final version of the DOE Environmental Survey Manual was changed. Table 5.4 lists the field QC samples requested at ANL. Analytical results are discussed in Sect. 4.2.1. In cases where multiple bottles were indicated for a given analysis, only a single bottle was analyzed.

Item 12. Performance and System Audits. The complete text of EPA's audit of field sampling activities at ANL can be found in Appendix C of this data document. No formal response to the audit was prepared by ORNL because the text of the audit was received by the Field Team Leader one year after the sampling was done.

5.2 Analytical QA/QC

Analytical QA/QC is divided into four major sections: analytical chemistry (5.2.1), radiological quality assurance (5.2.2), data management QA/QC (5.2.3), and the analytical QC summary (Appendix D).

Design and implementation of analytical QA plans for the DOE Environmental Survey have been based on the fundamental principle of "data of known quality." Although a Survey program such as this can effectively use data of varying quality levels, it is important that data users be provided with a data quality assessment for any given sample set. In this way, the Survey Team can interpret the analytical data from a

Table 5.3. Field QC Samples Planned for the ANL Site

		Solids	Water	Air
Rinsate Blanks	Organics	1/20	1/201	1/20
	Metals	1/20	1/20	1/20
	Rads	NA[a]	NA[a]	NA[a]
Trip Blanks	Organics	NA	1/20	1/20
	Metals	NA	NA	NA
	Rads	NA	NA	NA

NA = Not available, not applicable, or not recommended.

1/20 = One QC sample for 1 to 20 samples, 2 for 20 to 40, 3 for 40 to 60, etc.

a. Hand-held instruments were used to detect radioactive contamination.

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	ANIONS	EXOTC	HAZ WAS	HE	METALS	O&G
ARN01013A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN01013B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN05017A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN07019A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN08010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN11015A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN11015B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN12016A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN12016B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN15019A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN16010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN19013A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN19013B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN21017A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN24010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN26012A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN26012B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN28014A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN29026A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN34012A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
ARN36014A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	0
AR300077A	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	1	0
AR300088A	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	0
AR300088B	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	0
AR300088C	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	0
AR300088D	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	0
AR307041A	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041B	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041C	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041D	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041E	QC RINSATE	SEEP	SURF WATER	2	0	0	0	0	0	0
AR307041F	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	1	0
AR307041G	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	1	0
AR307041H	QC RINSATE	SEEP	SURF WATER	1	1	0	0	0	0	0
AR307041I	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR308042A	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042B	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042C	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042D	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042E	QC RINSATE	RUNOFF	SURF WATER	2	0	0	0	0	0	0
AR308042F	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	1	0
AR308042G	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	1	0
AR308042H	QC RINSATE	RUNOFF	SURF WATER	1	1	0	0	0	0	0
AR308042I	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	1
AR309043A	FIELD BLNK	DRAINAGE	SURF WATER	1	0	0	0	0	1	0
AR309043B	FIELD BLNK	DRAINAGE	SURF WATER	1	0	0	0	0	0	1
AR311070A	QC RINSATE	DISCHARGES	SURF WATER	2	0	0	0	0	0	0
AR311070B	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	1	0
AR401024A	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	1	0
AR401024B	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	1	0
AR401024C	FIELD BLNK	WELLS	GRND WATER	1	1	0	0	0	0	0
AR401024D	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	0	0
AR401024E	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	0	0

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TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	ANIONS	EXOTC	HAZ WAS	HE	METALS	O&G
AR406052A	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR406052B	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR406063A	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR406063B	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR407155A	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155B	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155C	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155D	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155E	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155F	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155G	QC RINSATE	WELL	SURF WATER	1	1	0	0	0	0	0
AR407155H	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155I	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155J	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	1	0
AR407155K	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR408032A	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR408032B	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR413039A	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR413039B	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR413040A	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR413040B	TRIP BLANK		WATER	1	0	0	0	0	0	0
AR413051A	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	1	0
AR413051B	FIELD BLNK	WELL	GRND WATER	1	1	0	0	0	0	0
AR413051C	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051D	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051E	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051F	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051G	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051H	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062A	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062B	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062C	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062D	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062E	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062F	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062G	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	1	0
AR413062H	QC RINSATE	WELL	GRND WATER	1	1	0	0	0	0	0
AR413062I	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062J	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062K	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR418034A	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	1	0
AR418034B	FIELD BLNK	WELL	GRND WATER	1	1	0	0	0	0	0
AR418034C	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR418034D	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038A	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038B	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038C	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038D	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038E	QC RINSATE	WELL	GRND WATER	2	0	0	0	0	0	0
AR420038F	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	1	0
AR420038G	QC RINSATE	WELL	GRND WATER	1	1	0	0	0	0	0
AR420038H	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038I	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	ANIONS	EXOTC	HAZ WAS	HE	METALS	O&G
AR420038J	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR500706A	FIELD BLNK	WASTEWATER	SURF WATER	1	0	0	0	0	1	0
AR500706B	FIELD BLNK	WASTEWATER	SURF WATER	1	0	0	0	0	1	0
AR500706C	FIELD BLNK	WASTEWATER	SURF WATER	1	1	0	0	0	0	0
AR500717A	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717B	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717C	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717D	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717E	QC RINSATE	WASTEWATER	SURF WATER	2	0	0	0	0	0	0
AR500717F	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	1	0
AR500717G	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	1	0
AR500717H	QC RINSATE	WASTEWATER	SURF WATER	1	1	0	0	0	0	0
AR501070A	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070B	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070C	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070D	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070E	QC RINSATE	SLUDGE	SURF WATER	2	0	0	0	0	0	0
AR501070F	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	1	0
AR501070G	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	1	0
AR501070H	QC RINSATE	SLUDGE	SURF WATER	1	1	0	0	0	0	0
AR501070I	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR503049A	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	0	0
AR503049B	QC RINSATE	DISCHARGES	SURF WATER	1	1	0	0	0	0	0
AR503049C	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	1	0
AR504073A	QC RINSATE	SEEPAGE	SURF WATER	1	1	0	0	0	0	0
AR504073B	QC RINSATE	SEEPAGE	SURF WATER	1	0	0	0	0	1	0
AR508044A	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	0
AR508044B	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	0
AR508044C	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	0
AR508044D	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	0
AR508044E	QC RINSATE	SILT	SURF WATER	2	0	0	0	0	0	0
AR804043A	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR804043B	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR804043C	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR804043D	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR804043E	QC RINSATE	DRAINAGE	SURF WATER	2	0	0	0	0	0	0
AR804043F	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	1	0
AR804043G	QC RINSATE	DRAINAGE	SURF WATER	1	1	0	0	0	0	0
AR806090A	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090B	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090C	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090D	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090E	QC RINSATE	LAGOON	SURF WATER	2	0	0	0	0	0	0
AR806090F	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	1	0
AR806090G	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	1	0
AR806090H	QC RINSATE	LAGOON	SURF WATER	1	1	0	0	0	0	0
AR806090I	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090J	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090K	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR808058A	QC RINSATE	DRAINS	SURF WATER	1	0	0	0	0	0	0
AR809048A	QC RINSATE	POND	SURF WATER	1	0	0	0	0	1	0
AR809048B	QC RINSATE	POND	SURF WATER	1	0	0	0	0	1	0
AR814078A	FIELD BLNK	SITE A	AIR	1	0	0	0	0	0	0

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	ANIONS	EXOTC	HAZ WAS	HE	METALS	O&G
AR815137A	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR815137B	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR815137C	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR815137D	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR815137E	QC RINSATE	SITE A	SURF WATER	2	0	0	0	0	0	0
AR815137F	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	1	0
AR815137G	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	1	0
AR816070C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	0	0
AR816081C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	0	0
AR816092C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	0	0
AR818049A	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049B	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049C	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049D	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049E	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049F	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	1	0
AR818049G	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	1	0

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	PCBS& OTHER EXTRA	PET HYDRO	RADS	SEMI-VOLS	SOIL GAS	VOLS
ARN01013A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN01013B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN05017A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN07019A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN08010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN11015A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN11015B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN12016A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN12016B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN15019A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN16010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN19013A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN19013B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN21017A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN24010A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN26012A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN26012B	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN28014A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN29026A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN34012A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
ARN36014A	TRIP BLANK	TRIP BLANK	WATER	1	0	0	0	0	0	1
AR300077A	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	0
AR300088A	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	1
AR300088B	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	1
AR300088C	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	1
AR300088D	FIELD BLNK	EFFLUENT	SURF WATER	1	0	0	0	0	0	1
AR307041A	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR307041B	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR307041C	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR307041D	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR307041E	QC RINSATE	SEEP	SURF WATER	2	1	0	0	1	0	0
AR307041F	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041G	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041H	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR307041I	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR308042A	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	1
AR308042B	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	1
AR308042C	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	1
AR308042D	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	1
AR308042E	QC RINSATE	RUNOFF	SURF WATER	2	1	0	0	1	0	0
AR308042F	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042G	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042H	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR308042I	QC RINSATE	RUNOFF	SURF WATER	1	0	0	0	0	0	0
AR309043A	FIELD BLNK	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR309043B	FIELD BLNK	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR311070A	QC RINSATE	DISCHARGES	SURF WATER	2	1	0	0	1	0	0
AR311070B	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	0	0
AR401024A	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	0	0
AR401024B	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	0	0
AR401024C	FIELD BLNK	WELLS	GRND WATER	1	0	0	0	0	0	0
AR401024D	FIELD BLNK	WELLS	GRND WATER	1	0	0	1	0	0	0
AR401024E	FIELD BLNK	WELLS	GRND WATER	1	0	0	1	0	0	0

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	PCBS& OTHER EXTRA	PET HYDRO	RADS	SEMI-VOLS	SOIL GAS	VOLS
AR406052A	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR406052B	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR406063A	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR406063B	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR407155A	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155B	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155C	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155D	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155E	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155F	QC RINSATE	WELL	SURF WATER	1	0	0	0	1	0	0
AR407155G	QC RINSATE	WELL	SURF WATER	1	1	0	0	0	0	0
AR407155H	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR407155I	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155J	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	1
AR407155K	QC RINSATE	WELL	SURF WATER	1	0	0	0	0	0	0
AR408032A	TRIP BLANK		WATER	1	0	0	1	0	0	0
AR408032B	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR413039A	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR413039B	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR413040A	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR413040B	TRIP BLANK		WATER	1	0	0	0	0	0	1
AR413051A	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051B	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR413051C	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413051D	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413051E	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413051F	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413051G	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413051H	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR413062A	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR413062B	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR413062C	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR413062D	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR413062E	QC RINSATE	WELL	GRND WATER	1	0	0	0	1	0	0
AR413062F	QC RINSATE	WELL	GRND WATER	1	1	0	0	0	0	0
AR413062G	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062H	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR413062I	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0
AR413062J	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0
AR413062K	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0
AR418034A	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR418034B	FIELD BLNK	WELL	GRND WATER	1	0	0	0	0	0	0
AR418034C	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR418034D	FIELD BLNK	WELL	GRND WATER	1	0	0	1	0	0	0
AR420038A	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR420038B	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR420038C	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR420038D	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	1
AR420038E	QC RINSATE	WELL	GRND WATER	2	1	0	0	1	0	0
AR420038F	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038G	QC RINSATE	WELL	GRND WATER	1	0	0	0	0	0	0
AR420038H	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0
AR420038I	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0

TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	PCBS& OTHER EXTRA	PET HYDRO	RADS	SEMI-VOLS	SOIL GAS	VOLS
AR420038J	QC RINSATE	WELL	GRND WATER	1	0	0	1	0	0	0
AR500706A	FIELD BLNK	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500706B	FIELD BLNK	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500706C	FIELD BLNK	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717A	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	1
AR500717B	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	1
AR500717C	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	1
AR500717D	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	1
AR500717E	QC RINSATE	WASTEWATER	SURF WATER	2	1	0	0	1	0	0
AR500717F	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717G	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR500717H	QC RINSATE	WASTEWATER	SURF WATER	1	0	0	0	0	0	0
AR501070A	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	1
AR501070B	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	1
AR501070C	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	1
AR501070D	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	1
AR501070E	QC RINSATE	SLUDGE	SURF WATER	2	1	0	0	1	0	0
AR501070F	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070G	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070H	QC RINSATE	SLUDGE	SURF WATER	1	0	0	0	0	0	0
AR501070I	QC RINSATE	SLUDGE	SURF WATER	1	0	0	1	0	0	0
AR503049A	QC RINSATE	DISCHARGES	SURF WATER	1	1	0	0	0	0	0
AR503049B	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	0	0
AR503049C	QC RINSATE	DISCHARGES	SURF WATER	1	0	0	0	0	0	0
AR504073A	QC RINSATE	SEEPAGE	SURF WATER	1	0	0	0	0	0	0
AR504073B	QC RINSATE	SEEPAGE	SURF WATER	1	0	0	0	0	0	0
AR508044A	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	1
AR508044B	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	1
AR508044C	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	1
AR508044D	QC RINSATE	SILT	SURF WATER	1	0	0	0	0	0	1
AR508044E	QC RINSATE	SILT	SURF WATER	2	1	0	0	1	0	0
AR804043A	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	1
AR804043B	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	1
AR804043C	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	1
AR804043D	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	1
AR804043E	QC RINSATE	DRAINAGE	SURF WATER	2	1	0	0	1	0	0
AR804043F	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR804043G	QC RINSATE	DRAINAGE	SURF WATER	1	0	0	0	0	0	0
AR806090A	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	1
AR806090B	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	1
AR806090C	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	1
AR806090D	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	1
AR806090E	QC RINSATE	LAGOON	SURF WATER	2	1	0	0	1	0	0
AR806090F	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090G	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090H	QC RINSATE	LAGOON	SURF WATER	1	0	0	0	0	0	0
AR806090I	QC RINSATE	LAGOON	SURF WATER	1	0	0	1	0	0	0
AR806090J	QC RINSATE	LAGOON	SURF WATER	1	0	0	1	0	0	0
AR806090K	QC RINSATE	LAGOON	SURF WATER	1	0	0	1	0	0	0
AR808058A	QC RINSATE	DRAINS	SURF WATER	1	0	1	0	0	0	0
AR809048A	QC RINSATE	POND	SURF WATER	1	0	0	0	0	0	0
AR809048B	QC RINSATE	POND	SURF WATER	1	0	0	0	0	0	0
AR814078A	FIELD BLNK	SITE A	AIR	1	0	0	0	0	1	0

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TABLE 5.4 ARGONNE SITE ENVIRONMENTAL SURVEY FIELD QC SAMPLES

SAMPLE NUMBER	SAMPLE TYPE	TYPE LOCATION	MEDIUM	NUMBER ANALYSES REQUESTED	PCBS& OTHER EXTRA	PET HYDRO	RADS	SEMI-VOLS	SOIL GAS	VOLS
AR815137A	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	1
AR815137B	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	1
AR815137C	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	1
AR815137D	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	1
AR815137E	QC RINSATE	SITE A	SURF WATER	2	1	0	0	1	0	0
AR815137F	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR815137G	QC RINSATE	SITE A	SURF WATER	1	0	0	0	0	0	0
AR816070C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	1	0
AR816081C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	1	0
AR816092C	FIELD BLNK	GAS SPILL	AIR	1	0	0	0	0	1	0
AR818049A	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR818049B	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR818049C	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR818049D	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	1
AR818049E	QC RINSATE	SEEP	SURF WATER	1	0	0	0	1	0	0
AR818049F	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0
AR818049G	QC RINSATE	SEEP	SURF WATER	1	0	0	0	0	0	0

programmatic perspective, while considering the analytical limitations imposed on the data. Data quality assessments require that all phases of laboratory support be designed to address the fundamental principles of precision, representativeness, accuracy, comparability, and completeness. The analytical QA program plan has accomplished this through the use of standard procedures, quality control practices, data reporting requirements, and data quality evaluations. A brief summary of some of the major analytical QA components follows.

Sampling and analysis support to the DOE Environmental Survey is a very large scale effort, requiring the contributions of a number of laboratories. From an analytical perspective, data comparability is ensured by adopting a program-wide set of standard analytical procedures, quality control practices, and reporting requirements. These procedures, which are documented in Appendix D to the DOE Environmental Survey Manual, are based on a number of well-documented, EPA-approved methods. In cases where a standard EPA method had not been developed for a given analyte, procedures that have been fully tested and documented were selected. All analytical procedures used for the laboratory analysis of ANL samples are described in Sect. 3.0 and cited in Sect. 6.0 of this data document. The majority of the nonradiological determinations for this program use the EPA CLP protocols. Radiological determinations use a series of procedures which have been developed and/or tested within the DOE national laboratory system. In this way, all of the participating laboratories are required to meet standard performance criteria regarding the precision and accuracy of their analyses. A summary of data quality objectives, as described in the defined EPA method, is presented in Table 5.5 for ANL samples.

All participating laboratories have developed a series of Standard Operating Procedures (SOPs) which establish policies and practices for all phases of laboratory operations. The SOPs provide the basis for day-to-day operation of the laboratory, and serve as the foundation for a technical systems audit.

Table 5.5. Data Quality Objectives

Analyte(s)	Method	Precision	Accuracy
Volatile organics	7/87 CLP SOW	As specified in protocol	
Semivolatile organics	7/87 CLP SOW	As specified in protocol	
Pesticides/PCBs	7/87 CLP SOW	As specified in protocol	
Petroleum hydrocarbons	*	Not available	Not available
Soil gases	*	Not available	Not available
Inorganic metals	7/87 CLP SOW	As specified in protocol	
Potassium	*	Not available	Not available
Mercury	EPA 245.1	4 µg/L	10% for concen > µg/L
Cyanide (soil)	EPA 9010	Std Dev. 0.1 mg/L	20% (for wastewater)
Cyanide (water)	EPA 335.2	±.031 mg/L CN at 0.28 mg/L CN	-15% bias at 0.28 mg/L CN
Oil and grease	EPA 413.1	± 0.9 mg/L at 12.6 mg/L	-7% bias at 12.6 mg/L
Anions	EPA 300.0	Std Dev. 1 mg/L at 10 mg/L	20% for drinking water 40% for wastewater

*Non-EPA methods are cited in Sect. 6.0 of this data document.

Table 5.5. Data Quality Objectives (Continued)

Analyte(s)	Method	Precision	Accuracy
Gross alpha & beta in water	Survey Manual	20% at 95% confidence level	15%
Isotopic uranium	Survey Manual	15%	Not available
Total uranium in water	Survey Manual	±0.5 µg/L at 95% confidence level	5%
Plutonium isotopes	Survey Manual	20%	Not available
Gamma emitting nuclides	Survey Manual	As low as 1%	±6%
Total strontium	Survey Manual	12% at 95% confidence level	-5% bias (wastewater); +25% bias (soil)
Gamma spectrometry	Survey Manual	20%	10%
Tritium	EPA 906.0	30%	30%

*Non-EPA methods are cited in Sect. 6.0 of this data document.

At a minimum, quality control practices adopted by the individual laboratories must include items mandated by the analytical protocols. In the case of inorganic determinations, these include the use of preparation blanks, calibration blanks, laboratory duplicate samples, laboratory control samples, matrix spikes, analytical spikes, interference check samples, and calibration verification solutions. For organic determinations, these include rigorous tuning criteria, matrix spike samples, matrix spike duplicate samples, method blanks, internal standards, and surrogates. In addition to these requirements, which are imposed by the analytical protocols, the laboratory is required to monitor method performance over time.

Data reporting procedures for the DOE Environmental Survey program were established with the objective of providing a technically defensible, legally admissible data set. Deliverables include CLP reporting forms for organics and inorganics, and reporting forms which provide appropriate levels of QC data for non-CLP analyte parameters. Data comparability is provided by the adoption of a program-wide set of defined deliverables. ORNL will be responsible for a comprehensive data archiving and closeout for the ANL Site. These case files include all of the raw data and documentation associated with a site in an auditable structure.

External evaluations of the quality of the analytical support effort for the DOE Environmental Survey provided an independent assessment of performance and technical systems. These external assessments of analytical performance included participation in EPA performance evaluation programs (round robins). Organic and inorganic laboratories received regular sets of performance evaluation samples from the EPA during the time ANL samples were being analyzed. These included quarterly blinds (CLP analytes) from EMSL-LV, water pollution series samples (classical analytes) from EMSL-Cincinnati, and quarterly round-robin samples (radiological determinations) from EMSL-LV. A summary of performance results pertinent to the ANL sampling and analysis time period appears in Appendix C. A related, but distinctly different, function was served by the technical systems audits performed by EPA (and NEIC). In this case, on-site evaluations of the laboratory operation were performed during and following the sampling and analysis period. These audits were a qualitative evaluation of the overall laboratory operation, including facilities, equipment, documentation, data validation, and quality control procedures.

5.2.1 Analytical Chemistry QA

Analytical support to the majority of the ANL sampling and analysis effort was provided by four laboratories within ORNL. Battelle Columbus Division (BCD), Columbus, OH, also provided analytical services for the determination of organic and inorganic parameters. Any radiometric analyses provided by Battelle were performed at the Battelle Pacific Northwest Laboratory (PNL), Richland, WA, under the coordination of BCD.

Detailed data quality assessments are presented for the samples associated with a given environmental problem/location in Sect. 4.0. Results obtained for ORNL analyses of volatiles, semivolatiles, and pesticides/PCBs were reviewed by the Data Usability Team. The team was composed of representatives from DOE, EPA EMSL-LV, LEMSCo, and Martin Marietta Energy Systems. The organic data were reviewed according to the protocol defined in revision 3 of the SOP for Oak Ridge Data Validation. (A copy of this document appears in Appendix D.) The team determined the usability of "validated" organic data, organized by environmental problem, based on the following criteria:

1. Holding times
2. Initial calibrations
3. Continuing calibrations
4. Blanks
5. GC/MS tunes
6. Surrogate recovery
7. Internal standards
8. Tentatively identified compounds

9. Pesticide retention standard
10. Analyte retention time (pesticide fraction)

According to the SOP, compliance to holding time requirements was calculated from the validated time of sample receipt (VTSR). All sample results were assigned a Quality Level of I, II, or III depending upon compliance with requirements for each of the ten review criteria.

Data quality assessment/data usability determination for ICP metals analyses performed at ORNL was determined using a procedure similar to that developed by the EPA for use in EPA contract compliance determinations. The ORNL protocol, "Data Quality Evaluation--Preliminary Operating Procedure for ICP (Including K)," appears in Appendix D. The preliminary protocol is designed to allow the determination of the utility or quality level of DOE Site Survey ICP and potassium (K) analyses. The format for this procedure also provides a summary of all QC problem areas. The following QC areas are reviewed:

1. Calibration verification
2. Preparation blank
3. Calibration blank
4. Spike recovery
5. Serial dilution
6. Interference check standard
7. Laboratory control standard
8. Duplicate analyses
9. Holding time

Each element in a given SDG is assigned a Quality Level of I, II, or III according to compliance with CLP limits in the above QC areas. Holding time compliance is calculated from the date of sample collection.

Data quality assessment/data usability determination for all other analytical methods was made using a modification of a checklist developed by the Idaho National Engineering Laboratory and documented in Volume I of the April 1988 issue of the Hanford Site Sampling and Analysis Data Document. The checklist, "Analysis Quality Level Evaluation," used to evaluate the quality of ANL results can be found in Appendix D. The checklist addresses the same QC areas as the previously described assessments, but in a less rigorous manner. The checklist was used to verify that the components essential to sampling, analysis, and quality control were integrated into the environmental problem evaluation. Data were evaluated on an SDG basis for those analytical methods in which multiple analyte concentrations were determined (e.g., CLP organics, anions, ICP, high explosives). The exception to this is when an analyte did not conform to the majority of the analytes in a given analytical method. Data quality of this analyte was then assessed separately and entered in the exception portion of the checklist. For those analytical methods in which a single analyte was determined or only a few sample requests were received, all data were combined to determine the quality of the analytical method.

To perform the evaluation, the pertinent information was included in the allowed space or attached to the checklist and referenced. The level of quality for a given determination was assessed according to the compliance of sample results to six performance criteria specified in the checklist. These performance criteria include determination of compliance to CLP requirements in the following categories:

1. Holding time
2. Duplicates
3. Blanks
4. Laboratory control standards
5. Calibration verification
6. Spike recovery

Holding time compliance was calculated from the date of sample collection. Data in compliance with all six performance criteria were assigned a Quality Level of I. A data Quality Level of II was assigned to SDGs in which the numerical average of non-compliance results for the six performance criteria was less than or equal to 20% of the required limits. A Quality Level of III was assigned to any data in which the average deviation from compliance was greater than 20%. Data quality results associated with the overall ANL data set are located in Sect. 4.0 of this data document.

In subsequent discussion, overall data quality for the ANL data set is presented in two formats:

1. Accomplishment of data quality objectives, and
2. Data quality by type of analysis.

5.2.1.1 Accomplishment of Data Quality Objectives

Objectives for the overall data quality for the ANL data set were established in five data quality categories. The categories are completeness, representativeness, comparability, precision, and accuracy. Evaluations of the program's accomplishments within each category follow.

5.2.1.1.1 Completeness

The characteristic of completeness measures the amount of data obtained compared to the amount expected or planned. The program objective was to obtain data for 90% of all samples planned for collection and not deleted. Analytical data were generated for 97% of all samples planned for collection. By general types of analysis, the percentage of samples for which analytical data were obtained for the ANL site is as follows:

- o Volatile organic compounds, 95%
- o Semivolatile organic compounds, 95%

- o Pesticides/PCBs, 95%
- o Soil gases, 91%
- o Petroleum hydrocarbons, 82%
- o Inorganic metals, 100%
- o Anions, 100%
- o Cyanide, 100%
- o Exotics, 96%
- o Radiological parameters, 100%

Exotics refers to requests for the analysis of oil and grease and for total uranium. Program objectives for completeness were satisfied for all analytical methods with the exception of petroleum hydrocarbons; 4 of 22 samples were not analyzed.

Instances where analytical data were not obtained were mainly the result of the following problems:

- o Sample not collected
- o Sample collected but analysis not performed
- o Sample lost during chemical processing
- o Sample results lost during instrument analysis

5.2.1.1.2 Representativeness

Sampling and measurements were carefully conducted so that results were as representative as possible of the media (e.g., air, soil, water) and conditions being measured. Sampling protocols were selected and developed where necessary to meet those objectives. Sample-handling protocols (e.g., splitting into aliquots, field and travel blanks, preservation, storage, transportation) were selected to evaluate and protect the representativeness of collected samples.

Recording procedures were used to document adherence to proper protocols for sampling, identifying samples, and maintaining sample integrity. ANL coolers containing samples to be analyzed by ORNL were shipped by Federal Express and delivered to the ORNL receiving department. ANL coolers containing samples to be analyzed by BCD were shipped by Federal Express and delivered to the BCD receiving department. At both laboratories the air bills were removed by the receiving department and retained. Coolers were delivered to the respective chemistry section sample receiving room. Coolers were opened and inventoried in the secure specimen storage area. Two sets of forms filled out by the sampling team were received with each sample cooler: The "DOE Environmental Survey Chain of Custody for Inorganics/Organics" and the "Request for Analytical Services, Department of Environmental Management." Coolers were inventoried upon opening, and a "Shipping Container Login Form" was completed that listed the contents of the cooler, noting ANL identification numbers, sample tag numbers, and discrepancies, if any. Internal sample identification (ID) labels were attached to all samples. At ORNL a "cooler folder" was created to permanently file the packing lists, chain-of-custody (COC) sheets, login sheets, and sample tags. BCD maintained a similar file based on the COC sheets. An "ORNL CAPA Group Receipt Record/Chain of Custody" form or BCD "Internal Sample Chain of Custody Record" form was used when transferring samples outside the custody of the respective Sample Login Rooms. Samples designated for specific chemical analyses were delivered on the same or following day to the appropriate analyses groups where they were retained under appropriate storage conditions.

The only instance of a discrepancy in documentation noted by the ORNL Sample Receiving Room was the lack of a "Request for Analytical Services" form accompanying cooler 023. Receiving personnel wrote out a request form for the affected samples. With the exception of leakage observed from three samples submitted for volatile organic analysis, no irregularities in sample identification were noted in case narratives supplied by the individual analysis groups at BCD or PNL.

Field and travel blank results indicate that contamination of target analytes during sampling or sample transportation was minor. For all analytes, field and transportation contamination occurred in less than 10.2% of the individual batches of samples collected and shipped to the laboratories. The levels of contamination that did infrequently occur were low and did not require rejection of analytical data.

Analytical program objectives for representativeness were established for each analysis type. The quality control requirements monitored to evaluate representativeness were analyte-specific holding times. Table 5.6 shows the actual adherence to required extraction and analysis holding times and program objectives as percentages of samples analyzed. Holding times are calculated from the date of sample collection for all regular samples. Holding time requirements are those listed in Test Methods for Evaluating Solid Waste, U.S. EPA SW-846, 3rd ed., November 1986. Values appearing within the parentheses denote the actual number of samples in compliance compared to the total number of samples analyzed.

Objectives for adherence to CLP requirements were not met for extraction holding times in semivolatile, pesticide/PCB, and inorganic metal analyses. Volatile samples did not meet the data quality objective for analysis holding times. Exceeding the holding times may have allowed degradation or transformation of the target analytes. The usual result of noncompliance to holding times is that the measured and reported concentrations may underestimate the true value of the analyte.

5.2.1.1.3 Comparability

The characteristic of comparability reflects both internal consistency of measurements and the expression of results in units consistent with other organizations reporting similar data. Generating comparable data requires utilizing methodologies which produce comparable results (e.g., metals data obtained by total dissolution of soil is not comparable to data obtained by incomplete dissolution of soil, such as the normally used acid leaching methods) and conducting analyses with calibrated analytical instruments

Table 5.6. Adherence to Holding Time Requirements

	Analyses Within Holding Time Requirements (%)			
	Extraction Time		Analysis Time	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles	NA		86 (170 of 198)	90
Semivolatiles	73 (111 of 152)	85	NA	
Pesticides/PCBs	68 (84 of 123)	85	NA	
Inorganic Metals+	69 (232 of 334)	98	NA	
Mercury	NA		95 (123 of 129)	90
Cyanide	NA		84 (97 of 116)	75
Anions	NA		50 (7 of 14)*	50
Rads	NA		100 (116 of 116)	90

+ Calculation based on total results of ICP, GFAA, and CVAA analytes.

NA = Not applicable.

*Because various anions differ in holding time requirements, percentage compliance of this analytical method only was based on the number of analytes rather than on the number of samples.

NI = No information available to determine preparation holding times.

within the proper calibration ranges. To ensure comparability of analytical results, all program laboratories utilized only analytical methods specified in the experimental plan. A documented analytical procedure was selected for those determinations not specified in the environmental plan. Additionally, appropriate standard units were utilized for each measurement system, which yielded internally and externally comparable results, assuming other comparability criteria were met.

To monitor the ability of the laboratories to generate comparable data, quarterly blind (QB) performance samples from the EPA (EMSL-LV) were analyzed for CLP analytes during the ANL analytical program. Similarly, EPA quarterly round robin samples were used to assess comparability for radiological samples. The analytical program objective for comparability was to generate acceptable results for the CLP QB samples. This objective was satisfactorily accomplished for ORNL inorganic and non-target list parameters and for all but one of the organic samples (score = 62.3). The objective was not met for two of the three organic QB samples pertinent to the analysis of ANL samples by BCD. Results are available for only two BCD inorganic QB samples performed during the time frame of ANL analysis. The QB2 Fiscal Year (FY) 88 sample was analyzed on two ICP instruments being used in the laboratory. The QB result for the instrument being phased out was 66.3; the score for the newer ICP instrument was 90.1. The result for inorganic QB3 FY 88 was 89. Scores for succeeding quarters have either not been received or BCD did not participate in the QB program. A table summarizing the ORNL and BCD performance scores and copies of the respective EPA QB evaluation reports are provided in Appendix C.

5.2.1.1.4 Precision

Precision, the ability to replicate an analytical value, was evaluated through duplicate analysis of 5% to 10% of the samples analyzed. The program objectives for the precision of analytical measurements were to satisfy CLP precision control limits for 80% of all aqueous analyses and 70% of all soil analyses. The reported data meet CLP precision criteria (RPD) for 90% of all aqueous measurements and for 89% of all soil measurements. The adherence to precision requirements is summarized for each analysis method according to the sample matrix in Table 5.7. The values appearing within the parentheses denote the actual number of analytes in compliance with CLP requirements in comparison to the total number of analytes measured. The data quality objective was not met for semivolatile and pesticide/PCB analyses in aqueous samples performed by ORNL.

5.2.1.1.5 Accuracy

Accuracy, the ability to obtain a true value, is optimized and evaluated for an analytical system through specific quality control (QC) procedures and measurements. The exact QC procedures and measurements required to ensure acceptable accuracy depend on the method, but all chemical methods generally require instrument calibration, method blank analysis, check standard or laboratory control sample analysis (i.e., analysis of sample of known analyte concentration), and matrix spike. Organic analyses usually incorporate additional QC procedures to optimize accuracy; the additional procedures referred to are internal standards and surrogate compounds added to every sample. Analytical determinations based on CLP protocol incorporated the required QC samples to assess the accuracy of analytical results. Similar QC samples were also included in all non-CLP procedures; QC results were calculated, but no determination of compliance was made because CLP requirements are not established for these methods.

The program objectives for accuracy of analytical measurements were to meet: CLP tuning criteria for 90% of all GC-MS analyses; inorganic CLP continuing calibration criteria for 90% of all ICP and GFAA analyses; volatile water surrogate recoveries for 85% of all analyses; semivolatile water surrogate recoveries for 75% of all analyses; and pesticide/PCB water surrogate recoveries for 75% of all analyses.

Evaluation of tuning criteria for volatiles and semivolatiles was performed by using the CLP Form V (GC-MS Tuning and Mass Calibration Form) for both the volatile and semivolatile fractions. ORNL instrument tuning criteria were met for 98% and 97% of

Table 5.7 Adherence to Precision Requirements

	Analyses Within CLP Precision Requirements (%)			
	Water Samples		Soil Samples	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles				
ORNL	97 (29 of 30)	80	100 (30 of 30)	70
BCD	100 (5 of 5)	80	100 (5 of 5)	70
Semivolatiles				
ORNL	48 (16 of 33)	80	73 (32 of 44)	70
BCD	100 (11 of 11)	80	100 (11 of 11)	70
Pesticides/PCBs				
ORNL	17 (2 of 2)	80	75 (9 of 12)	70
BCD	100 (6 of 6)	80	100 (6 of 6)	70
Inorganic Metals+				
ORNL	98 (165 of 168)	80	97 (84 of 87)	70
BCD	**		92 (66 of 72)	70
Anions				
ORNL	100 (2 of 2)	80	100 (3 of 3)	70
Cyanide				
ORNL	*		100 (5 of 5)	70
BCD	100 (2 of 2)	80	100 (1 of 1)	70
Rads				
ORNL	94 (15 of 16)	80	70 (21 of 30)	70
PNL	100 (12 of 12)	80	100 (3 of 3)	70

** No sample of this matrix type analyzed.

+ Calculation based on total results of ICP, GFAA, and CVAA analytes.

* No duplicate samples were prepared for this sample matrix.

Note: All calculations are based on the number of analytes in compliance for a given analytical method.

volatile and semivolatile organic data, respectively. BCD instrument tuning criteria were met for 100% of volatile and semivolatile organic data.

The remaining results of accuracy of QC measurements associated with the ANL data are summarized in the categories of calibration (Table 5.8), blanks (Table 5.9), control samples (Table 5.10), and matrix spikes (Table 5.11). Also listed in the summaries for comparison are program objectives, where objectives have been established.

Entries for percentage compliance for initial and continuing calibration results are summarized in Table 5.8. Percentage compliance for pesticide/PCB analysis is based on results tabulated from Form 8 D (Check for Linearity), Form 8 E (Retention Time Shift of DBC), and Form 9 (Standard Summary). Radiometric continuing calibrations were assumed to be in compliance if results fell within ±10% of that observed for the initial calibration of the instrument. With the exceptions of pesticide/PCB analysis by ORNL and cyanide analysis by BCD, all calibration data met program objectives. ORNL noncompliance to CLP calibration criteria was observed in the results of the three pesticide/PCB standards, aldrin, endrin, and 4,4'-DDT. A complete discussion of the remedial action and impact on pesticide/PCB analytical results is presented in Sect. 5.2.1.2.3.

The results in Table 5.9 demonstrate that all blank measurements satisfied the program objectives and imply relatively contamination-free analyses. Although blanks were run by BCD in the analysis of cyanide and radiological parameters, full documentation was not available to assess data quality.

Laboratory control sample analyses were not conducted for most types of analyses. Such analyses were reported for ICP metals and radiometric analytes. Results for laboratory control samples were considered to be in control for radiometric analysis if they were within ±20% of the true value. Results presented in Table 5.10 indicate excellent accuracy for both analytical methods. The matrix of the radiological controls analyzed by PNL was not documented in the data package. Because results were used

Table 5.8. Adherence to Calibration Requirements

	Analyses With Acceptable Calibrations (%)			
	Water Samples		Soil Samples	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles				
ORNL	93 (193 of 208)	90	92 (191 of 208)	90
BCD	100 (40 of 40)	90	100 (20 of 20)	90
Semivolatiles				
ORNL	94 (176 of 187)	90	78 (186 of 238)	90
BCD	100 (102 of 102)*	90	100 (102 of 102)*	90
Pesticides/PCBs				
ORNL	75 (543 of 726)	90	78 (513 of 655)	90
BCD	100 (361 of 361)*	90	100 (361 of 361)*	90
Inorganic Metals+				
ORNL	97 (694 of 716)	90	95 (678 of 716)	90
BCD	**		99 (310 of 313)	90
Anions				
ORNL	100 (3 of 3)	90	100 (3 of 3)	90
Cyanide				
ORNL	100 (6 of 6)*	90	100 (6 of 6)*	90
BCD	67 (4 of 6)*	90	67 (4 of 6)*	90
Rads				
ORNL	96 (186 of 193)*	90	96 (186 of 193)*	90
PNL	100 (16 of 22)*	90	100 (16 of 22)*	90

+ Calculations based on total of ICP, GFAA, and CVAA analytes.

* Instrument calibration used for both water and soil samples.

**No samples of this matrix type were analyzed.

Note: All calculations are based on the number of analytes in compliance for a given analytical method.

Table 5.9. Adherence to Method Blank Requirements

	Analyses With Method Blanks Below CRQL (%)			
	Water Samples		Soil Samples	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles				
ORNL	100 (510 of 510)	95	100 (510 of 510)	95
BCD	100 (68 of 68)	95	100 (34 of 34)	95
Semivolatiles				
ORNL	99 (389 of 390)	95	98 (127 of 130)	95
BCD	100 (65 of 65)	95	100 (130 of 130)	95
Pesticides/PCBs				
ORNL	100 (81 of 81)	95	100 (27 of 27)	95
BCD	100 (27 of 27)	95	100 (27 of 27)	95
Inorganic Metals+				
ORNL	99 (1025 of 1028)	95	99 (929 of 930)	95
BCD	NS		100 (424 of 424)	95
Anions				
ORNL	100 (1 of 1)	95	100 (2 of 2)	95
Cyanide				
ORNL	100 (3 of 3)**	95	100 (3 of 3)**	95
BCD	**		**	
Rads				
ORNL	100 (16 of 16)	95	100 (3 of 3)	95
PNL	**		**	

+ Calculations based on total of ICP, GFAA, and CVAA analytes.

NS = No samples of this matrix submitted for analysis.

** Reagent blank used for both soil and water SDGs.

Note: All calculations are based on the number of analytes in compliance for a given analytical method.

Table 5.10. Adherence to Control Sample Requirements

	Analyses With Acceptable Control Sample Analyses (%)			
	Water Samples		Soil Samples	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles	*	80	*	80
Semivolatiles	*	80	*	80
Pesticides/PCBs	*	80	*	80
Inorganic Metals+				
ORNL	98 (125 of 128)	80	98 (105 of 107)	80
BCD	NS		89 (63 of 71)	80
Anions	NA	80	NA	80
Cyanide				
ORNL	NA	80	NA	80
BCD	NA	80	NA	80
Rads				
ORNL	95 (39 of 41)	80	91 (10 of 11)	80
PNL	100 (37 of 37)**	80	100 (37 of 37)**	80

+ Calculations based on total of ICP, GFAA, and CVAA analytes.

*Not applicable.

NA: Not analyzed.

NS: No samples of this matrix submitted for analysis.

** Same control samples used for both solid and aqueous matrices.

Note: All calculations are based on the number of analytes in compliance for a given analytical method.

Table 5.11. Adherence to Matrix Spike Requirements

	Analyses With Acceptable Matrix Spike Analyses (%)			
	Water Samples		Soil Samples	
Analysis Type	Analyses	Objective	Analyses	Objective
Volatiles (TC)				
ORNL	100 (60 of 60)	80	97 (58 of 60)	70
BCD	100 (10 of 10)	80	100 (10 of 10)	70
Volatiles (IS)				
ORNL	99 (481 of 483)	90	74 (189 of 255)	80
BCD	100 (9 of 9)	90	100 (3 of 3)	80
Volatiles (SC)				
ORNL	74 (111 of 150)	90	77 (228 of 297)	80
BCD	73 (25 of 34)	90	100 (21 of 21)	80
Semivolatiles (TC)				
ORNL	20 (13 of 66)	80	91 (80 of 88)	70
BCD	100 (22 of 22)	80	100 (22 of 22)	70
Semivolatiles (IS)				
ORNL	88 (420 of 480)	90	85 (445 of 522)	80
BCD	100 (78 of 78)	90	100 (18 of 18)	80
Semivolatiles (SC)				
ORNL	70 (303 of 432)	90	70 (381 of 546)	80
BCD	100 (54 of 54)	90	100 (42 of 42)	80
Pesticides/PCBs (TC)				
ORNL	38 (9 of 24)	80	79 (19 of 24)	70
BCD	100 (12 of 12)	80	100 (12 of 12)	70
Pesticides/PCBs (SC)				
ORNL	74 (23 of 31)	90	100 (31 of 31)	80
BCD	92 (11 of 12)	90	89 (8 of 9)	80
Inorganic Metals+				
ORNL	91 (117 of 128)	80	87 (58 of 67)	70
BCD	NS		71 (57 of 80)	70
Anions	100 (2 of 2)	80	100 (2 of 2)	70
Cyanide				
ORNL	60 (9 of 15)	80	100 (6 of 6)	70
BCD	100 (2 of 2)	80	100 (1 of 1)	70
Rads				
ORNL	93 (13 of 14)	80	100 (5 of 5)	70
PNL	NA	80	NA	70

Table 5.11. Adherence to Matrix Spike Requirements (Continued)

+ Calculations based on total of ICP, GFAA, and CVAA analytes.

NA = Matrix spikes not analyzed for this matrix.

NS = No samples of this matrix submitted for analysis.

TC = Calculations based on the results of target compound recovery.

IS = Calculations based on the results of internal standard compound recovery.

SC = Calculations based on the results of surrogate compound recovery.

Note: All calculations are based on the number of analytes in compliance for a given analytical method.

to verify data accuracy of both water and soil samples, the same figures appear in Table 5.10 in both matrix columns.

The performance of matrix spike organic samples (Table 5.11) was based on the recovery of target compounds (TC), internal standard compounds (IS), and surrogate compounds (SC). The performance objective for matrix spike soil samples was realized for all analytical procedures in which matrix spike compounds were analyzed by BCD.

Surrogate compound recoveries analyzed at ORNL met data quality objectives for only pesticides/PCBs. Surrogate compound recoveries analyzed by BCD met data quality objectives for all but volatile compounds in aqueous samples. Internal standard recoveries analyzed at ORNL met data objectives for aqueous volatile samples and soil semivolatile samples. Internal standard recoveries performed by BCD met all data quality objectives. Additionally, recovery of target analytes analyzed by ORNL in semivolatile, pesticide/PCB, and cyanide analysis was poor in a number of water samples.

5.2.1.2 Data Quality by Type of Analysis

General observations and facts that should be considered when interpreting data from the ANL Site are provided in this section. Also included is a summary of QA/QC protocol used for non-CLP methods. The discussions are presented by general type of analysis in the following order: volatiles, semivolatiles, pesticides/PCBs, petroleum hydrocarbons, soil gases, pyridine, inorganic metals, cyanide, anions, and radiochemical analytes.

5.2.1.2.1 Volatile Organic Compounds

A number of analytes and tentatively identified compounds (TICs) are often introduced to the samples rather than originating from the samples themselves. However, no TICs or TCLs above the CLP limit were found in any of the blanks analyzed by either ORNL or BCD. Acetone and methylene chloride were present in all ORNL blanks at less than 24 µg/L. Toluene was present in many blanks at levels less than 2 µg/L.

The majority of volatile organic analyses were performed by ORNL. True method blanks were not conducted for volatile soil analyses. Instead, a water blank was analyzed with each SDG containing soil samples. If cross contamination occurred during chemical processing of soil samples, it is possible such contamination was not indicated by the aqueous method blank.

The EPA's 7/87 CLP protocol for low level soil analysis requires that the extraction be performed at 40^{o}C. However, due to the lack of equipment, all soil samples analyzed at ORNL were extracted at ambient temperature (i.e., 20 to 25^{o}C) using a needle sparge apparatus.

Deviation from CLP QA/QC protocol included a number of instances where analytes, primarily vinyl chloride, did not meet criteria for continuing calibration checks. Because vinyl chloride was not observed in any samples, remedial action was not deemed necessary. Noncompliance to CLP limits was observed in a number of surrogate recoveries, particularly for toluene which tended to be recovered above the required limit. A significant number of low recoveries of the internal standards, particularly d_5-chlorobenzene, were observed in samples analyzed by ORNL. Nonconformances to CLP requirements are so noted on the CLP reporting forms; time restraints did not permit reanalysis of affected samples.

BCD analyzed volatile contaminants in well samples for Environmental Problem 4. A VOCOL™ (Supelco, Inc.), 60 m long by 0.75 mm ID with 1.5 µm film glass capillary, was employed by BCD for the analysis of these organic compounds. All chromatograms, spectra, and quantitation reports were incorrectly labeled as to column dimensions. The target compound (1,1,2,2-tetrachloroethane) and the surrogate compound (4-bromofluorobenzene [BFB]) coelute during the analysis of the initial calibration standards for samples on the VOCOL™ column. Because 1,1,2,2-tetrachloroethane has a fragment ion at m/z 95 (which is the primary quantitation for BFB) the average relative response factor (RRF) for BFB for the initial calibration was artificially high. This caused the surrogate recovery value of BFB in the method blanks to be less than the 86% minimum criteria. The ion at m/z 174 was, therefore, selected as the primary quantitation ion for BFB. Using the quantitation ion at m/z 174, an RRF was established for BFB which gave acceptable surrogate recoveries for BFB for all standards, blanks, and samples.

During the initial calibration performed by BCD, both acetone and 2-butanone were not detectable at the lowest calibration level, 20 µg/L, in the water and medium-level soil calibrations. A four-point calibration was used for both of these analytes.

Quantitation of TIC compounds by BCD was based on peak height because their coelution with target compounds made area measurements unreliable.

All BCD sample analyses of volatile contaminants exceeded the 14-day holding time limit by 50 to 95 days because of instrument malfunction. Noncompliance to holding times may result in an underestimation of analyte concentration.

5.2.1.2.2 Semivolatile Organic Compounds

Semivolatile organic compound analyses are prone to their own unique set of contamination problems. Phthalates are a very common contaminant in semivolatile analyses. These compounds are used as plasticizers and are easily extracted with organic solvents and often introduced to samples or their associated extracts at numerous points in the sample analysis process. One of eight aqueous blanks prepared by ORNL contained diethylphthalate slightly above (72 µg/L) the CLP limit. No compounds were observed above CLP limits in the three blanks prepared by BCD.

The time between sampling and extraction is the most critical with respect to losses. Once samples are extracted, it is less likely that losses will occur. Where samples were not extracted within the holding time, false negatives and/or quantitation biased low are possible. However, where the holding time was exceeded by only a few days, minor losses are expected. Very few samples fall into this category, as most of the samples were extracted before their holding times expired. Therefore, the interval between extraction and analysis was 80 to 90 days for all of the samples. False negatives, quantitation biased low due to losses, or quantitation biased high due to evaporation of the extraction solvent were possible results of this delay. Within limits, surrogate recoveries can be used to assess whether these errors have occurred and to what extent.

The majority of semivolatile analyses were performed at ORNL. Twenty-five percent of these samples exceeded the extraction time limit by 1-6 days. Twenty-two of the 23 SDGs analyzed by ORNL contained noncompliant continuing calibration data. Low recovery of at least one surrogate compound was observed in approximately 60% of the samples. Recovery of target matrix spike compounds met CLP requirements for 20% of the analytes in water samples. Precision for these samples was also poor. Noncompliance to internal standard requirements generally was observed in the compounds chrysene-d12 and perylene-d12 which were recovered above the CLP limit. Nonconformances to CLP requirements are so noted on the CLP reporting forms; time restraints did not permit reanalysis of affected samples.

The analysis of semivolatile compounds was requested for TCLP extracts of samples retrieved from the Environmental Problem 11 site. Because no semivolatile hits were observed in the original sample, analysis of their TCLP extracts was not required.

Semivolatile analysis of well samples for Environmental Problem 4 was performed at BCD. All nine samples were extracted within the required time. Quantitation of TIC compounds in these samples was based on peak height because their coelution with target compounds made area measurements unreliable. All CLP requirements were met in the analysis of these samples.

5.2.1.2.3 Pesticides and Polychlorinated Biphenyls

ORNL performed the majority of pesticide/PCB analyses for the ANL Site. All sample preparations were carried out according to the EPA's 7/87 CLP SOW for Organic Analysis. An exception to these procedures was the use of Mirex instead of dibutylchlorendate (DBC) as a pesticide surrogate compound. Mirex was chosen because it had greater stability relative to DBC and because it had similar retention times when using either the quantitative or confirmation column. It is recognized that the use of a different surrogate is a significant departure from the specified protocol. Because subsequent studies show the recovery of Mirex and DBC to be similar under controlled conditions (see Table 5.12), the same QC recovery limits were used.

The time between sampling and extraction is the most critical with respect to losses. Once samples are extracted, it is less likely that losses will occur. Where samples were not extracted within the holding time, false negatives and/or quantitation biased low are possible. However, where the holding time was exceeded by only a few days, minor losses are expected. Very few samples fall into this category, as most of the samples were extracted before their holding times expired. Therefore, the interval between extraction and analysis was 80 to 90 days for all of the samples. False negatives, quantitation biased low due to losses, or quantitation biased high due to evaporation of the extraction solvent were possible results of this delay. Within limits, surrogate recoveries can be used to assess whether these errors have occurred and to what extent.

A 10.0% relative standard difference (RSD) linearity criteria is required on columns being used for pesticide/PCB quantitation. The linearity check yielded %RSD values outside QC limits for the packed and capillary columns for SDGs analyzed at ORNL. The nonlinearity occurs with the Eval Mix A standard and is probably due to a contaminated GC system which causes a small breakdown of pesticides. This particularly affects low level standard results. The sample analyses were continued, but the results from Eval Mix A were not used. Instead, a five-point IND AB linearity check was

Table 5.12. Mirex and DBC Surrogate Recoveries Comparison

Soil Matrix

Date of Analysis	Request No.	ACD	Surrogate Recoveries DBC	Surrogate Recoveries Mirex	Type of Analysis
880427	91868	880329-000 SB	36.7	39.2	PCBs
880427	91868	880329-000 A SB	36.2	34.5	PCBs
880428	91872	880329-000 A SB	41.0	50.1	PCBs
880502	91871	880329-000 A SB	32.6	42.7	PCBs
880512	91882	880405-000 SB	76.3	54.3	PCBs
880517	91875	880331-000 SB	59.6	52.9	PCBs
880526	91876	880331-000 SB	42.1	42.1	PCBs
880526	91876	880331-000 A SB	42.8	42.3	PCBs
880602	91874	880331-000 B SB	43.0	43.1	PCBs
880602	91874	880331-000 C SB	49.8	49.4	PCBs
880602	91877	880331-000 D SB	38.6	39.8	PCBs
880602	91877	880331-000 E SB	40.6	40.9	PCBs

Water Matrix

Date of Analysis	Request No.	ACD	Surrogate Recoveries DBC	Surrogate Recoveries Mirex	Type of Analysis
880416	91863	880405-000 WB	29.6	28.9	PCB Rinse
880510	91908	880428-000 WB	38.7	42.4	PE
880525	91925	880513-000 WB	37.3	21.1	PCBs
880525	91929	880517-000 WB	35.2	22.5	PCBs
880607	91946	880525-017 WB	73.9	45.8	Control

PE: EPA Performance Evaluation Sample.

incorporated into all sequences and used for the calibration and to determine linearity of the instruments. Calibration factors used for calculating sample results were obtained by averaging the concentration (in ppb [parts per billion]) per area for all occurrences of a specific compound in all standards. Therefore, a calibration factor was determined using a minimum of five standards for each single-component pesticide. The CLP calculation method involves the determination of the calibration from the nearest standard. Table 5.13 compares the calibration factors and sample concentrations as calculated by each method. The percent breakdown of Endrin and 4,4'-DDT have been calculated using concentrations, rather than areas, because the calibration factor for these two pesticides and their respective breakdown products do not show a 1:1 relationship.

Noncompliance to CLP limits was observed in a number of continuing calibration checks, surrogate recoveries, matrix spike/matrix spike duplicates, and internal standard recoveries. These are so noted on the CLP reporting forms; time restraints did not permit reanalysis of these samples.

Pesticide analysis of TCLP extracts was requested for six samples in Environmental Problem 11 if the pesticide concentrations were above the regulatory level for TCLP pesticide toxicants. The concentration of PCBs in these samples was so high that a 1/100 dilution of the samples was required prior to analysis of CLP pesticide/PCBs. No pesticides were observed at this dilution; the pesticide would not have been observed in the undiluted sample due to the high level of PCB contamination. Therefore, an analysis of the TCLP extracts of the original samples was not deemed necessary.

Nine samples for Environmental Problem 4 were analyzed for pesticides/PCBs by BCD. All extraction holding times were met. In a deviation from CLP protocol, a capillary megabore column (DB-608™, 30 m x 0.53 mm ID, 0.83 μm film) was used for the primary column. All of the individual pesticides were resolvable. The secondary column was also a capillary megabore column (DB-5™) according to protocol. The column ID is 0.53 mm, not 0.25 mm as stated on all of the secondary GC column analysis sheets.

Table 5.13. Comparison of Data Calculation Methods
—Argonne—

Units: PPB

SDG No.	EPA Sample No.	ACD No.	Pesticide	RRF (CLP)	RRF (Reported)	RRF% Difference	Sample Conc (CLP)	Sample Conc (Reported)
ARG01	AR505029SS	871111-371	4,4'-DDE	1844.0600	1419.9854	23.00%	55.93	73.00
			4,4'-DDD	810.5600	715.6102	11.71%	26.14	30.00
			4,4'-DDT	422.3000	291.0057	31.09%	138.59	200.00
ARG02	AR307030WS	871111-393	Endrin	11506.0400	11999.0843	-4.29%	0.14	0.13
			4,4'-DDT	7713.9500	5813.2426	24.64%	0.50	0.66
	AR500013WS	871111-394	4,4'-DDT	7713.9500	5813.2426	24.64%	0.19	0.25
	AR500091WS	871111-396	4,4'-DDT	7713.9500	5813.2426	24.64%	0.15	0.20
	AE500295WS	871111-398	Alpha-BHC	5151.3500	3835.5101	25.54%	0.06	0.08
			Gamma-BHC	4276.7200	3457.9297	19.15%	0.14	0.17
			Aldrin	4673.7100	3362.7311	28.05%	0.15	0.20
			4,4'-DDD	1413.3300	2195.1965	-55.32%	0.27	0.18
	AR500319WS	871111-399	Endosulfan I	3020.1100	3015.6611	0.15%	0.10	0.10
			Endrin	2414.6000	1870.8484	22.52%	0.22	0.29
ARG03	No pesticides above detection limits							
ARG04	No pesticides above detection limits							
ARG05	AR500080WS	871116-208	Heptachlor EPO	34599.9000	33337.9538	3.65%	0.08	0.08
	AR804043WS	871116-210	Heptachlor EPO	34599.9000	33337.9538	3.65%	0.11	0.11
	AR500342WS	871117-239	Delta-BHC	33330.1900	32658.8184	2.01%	0.07	0.07
			Heptachlor EPO	35285.3700	33337.9538	5.52%	0.08	0.08
	AR500046WS	871123-132	Heptachlor EPO	33596.3700	33337.9538	0.77%	0.08	0.08
	AR500273WS	871123-133	Heptachlor EPO	1699.0200	1404.8801	17.31%	0.10	0.12
	AR500557WS	871123-137	Heptachlor EPO	36314.1700	33337.9538	8.20%	0.08	0.08
	AR500579WS	871123-139	Delta-BHC	2111.7200	1749.5752	17.15%	0.07	0.08
			Heptachlor	35623.2800	32497.8471	8.77%	0.24	0.26
			Heptachlor EPO	1749.4400	1404.8801	19.70%	0.09	0.11
ARG06	No pesticides above detection limits							

All individual pesticides, except the DDE-dieldrin pair, were resolvable. All QC requirements were met for these samples.

5.2.1.2.4. Petroleum Hydrocarbons

A non-CLP EPA method was used for the analysis of petroleum hydrocarbons. Two SDGs were analyzed; four concentration levels of DF-2 were used for the internal standard calibration of SDG AR01. The method of internal standards was used with a single concentration level of JP-4 for the first run of SDG AR02 samples. When diesel-range material was detected in three of the samples contained in this SDG, four concentration levels of DF-2 were used for an internal standard calibration in a reanalysis of the three samples. (These three samples are flagged with an X qualifier on the data sheets.) Duplicates of each sample in SDG AR02 were analyzed to provide a more accurate analysis result. The average value of the two measurements was reported for each sample. Extraction blanks were prepared and analyzed in all analysis runs; blanks were free of detectable interferences or fuels. Spike recoveries for SDG AR01 were 101 and 102%. The JP-4 spike recoveries in run 1 of SDG AR02 were 81 and 82%. Recoveries for the matrix spike and matrix spike duplicate in run 2 were 112 and 84%, respectively.

5.2.1.2.5 Soil Gases

There is no CLP method for soil gas analysis. Much of the QC protocol required in CLP procedures was incorporated into the analysis of soil gas samples to assess the limitations of the method. Two levels of standard concentrations were used for instrument calibration in the analysis of samples grouped in a single SDG. The percent relative standard deviation (%RPD) in peak area of eleven standard compounds ranged from 13 to 37%. The %RPD in retention times of the standard compounds ranged from 0.2 to 0.8%. No spiked samples were analyzed with the SDG because it was thought that soil gases would be lost upon introduction of the spike solution into the sample sorbent tubes.

Three field (trip) blanks accompanied this set of samples. Two were analyzed with this SDG. Some instrumental problems were experienced in the analysis of the blanks, requiring two desorptions. The blanks were heavily contaminated with organic compounds, although few of those chromatographic peaks were identified as the target compounds. Because of this contamination found in the blanks, it is quite likely that the target compound identifications in the samples are a result of interferences. Most of the soil gas samples collected at the ANL Site contained large amounts of numerous gas chromatographable compounds which were not calibrated components. These compounds made identification and measurement of the targeted compounds very difficult and tentative. The chromatograms for the calibrating standards were clean, indicating that the instrument was not contributing to the background.

Tetrachloroethane could not be determined with the manual desorption unit used in the analysis. The reason for this is not clear. The data qualifier "X" on the data sheets indicates this omission. The "B" qualifier shows that the calibrated compound also was found in the blank. The "E" qualifier denotes that the measurement was outside the calibration range.

5.2.1.2.6 Pyridine

Data for pyridine are treated as missing. Although a direct method for the analysis of pyridine was used to determine contaminant concentration in a set of soil samples, the extended holding time makes this data suspect. Identification of pyridine in samples could be noted in the CLP volatile and semivolatile data generated for the samples if it was in high enough concentration to be among the 20 most concentrated uncalibrated constituents (TICs).

5.2.1.2.7 Inorganic Metals

In general, inorganic analyses were performed according to EPA CLP protocol. A brief discussion of each analytical method used to determine inorganic metal concentration follows.

ICP Analyses. The metals determined at ORNL by ICP optical emission spectrometry include all those specified in the DOE protocol except potassium (flame photometric method), thallium (graphite furnace method), and mercury (modified cold vapor method). Twenty-one of a total of 178 samples exceeded the 180-day preparation holding time by two weeks. Difficulty was encountered in maintaining the sodium primary, sodium secondary, and aluminum primary ICP channel calibration within the 10% CLP limit for the continuing calibration verification. Because sodium was not deemed an element of primary significance (particularly at the 500 ppb concentration level), an ICP run was not terminated if all other elemental standards met the CLP control limit. In general, the soil samples received from the ANL Site contained a large number of artifacts, mainly rocks and roots. Instances of noncompliance to duplicate and pre-digest sample results in soil samples are attributed to the inconsistency in sample material. In the case of antimony recovery for soil digestions, it appears that the element was lost during sample digestion. The ICP spike level for arsenic was selected according to those specified in CLP protocol for the GFAA method. These levels were within a factor of three times the ICP IDL for this element. Consequently, recoveries for arsenic often did not fall within the CLP control limit.

BCD analyzed 15 elements (aluminum, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, magnesium, manganese, nickel, potassium, vanadium, and zinc) using ICP. ICP metal analysis was based on a two-point calibration performed prior to initiating analyses of reference standard and sample solutions. Off-peak background correction was applied. Approximately 20% of the samples were digested beyond the 180-day holding time limit. All but one of a total of 78 samples were soils. Noncompliance in duplicate and spike results probably reflect the inhomogeneity common in soil samples.

FAA Analyses. Sodium analyses were performed at BCD using FAA. Samples were analyzed approximately eleven months after sample receipt. Instrument calibration was based on measurements of three aqueous standard solutions and a standard blank solution. All blanks (ICB, CCB, and PB) for the sample analyses met contract requirements.

ORNL analyzed cesium and lithium using FAA. All QC results met CLP requirements.

GFAA Analyses. Due to the unusually heavy load of samples arriving at ORNL during the ANL analysis period, all solid samples were forwarded to BCD for analysis so that holding times could be met. Only six of 178 samples analyzed at ORNL did not meet the required analysis holding time. ORNL analyzed aqueous samples for antimony, arsenic, cadmium, lead, selenium, silver, and thallium. At least one duplicate, spike, and laboratory control sample were run for each element. All QC requirements were met for these analyses. Standard addition was not required for any of the GFAA analyses. BCD misplaced nine solid samples collected from the Environmental Problem 15 site. Because holding times were exceeded by the time the samples were found, BCD decided not to analyze the samples. The samples were returned to ORNL. Following instructions from the DOE Environmental Survey Officer, the nine samples were analyzed for lead by GFAA. All of the samples were diluted by a factor of 100 to 10000 to bring the lead content within the linear response range of the instrument. With the exception of holding time, all QC criteria were met in the analysis of these samples.

BCD analyzed samples for antimony, arsenic, cadmium, lead, selenium, silver, and thallium by GFAA. Because the samples requiring antimony analysis were prepared separately, antimony results are reported in SDGs separate from the remaining metal results. Generally, all QC requirements were met, with the exception of matrix spike recoveries and laboratory control sample results. Approximately 30% of the spike recoveries and 10% of laboratory control results did not meet CLP protocol. Nonconformance may be the result of inhomogeneity in the soil samples.

CVAA Analyses. Mercury was quantified using cold vapor atomic absorption (CVAA) spectrometry. Six of 129 samples exceeded the analysis holding time by one day. All analytical results met CLP requirements.

5.2.1.2.8 Cyanide

Cyanide analyses were performed by both ORNL and BCD. Fifteen of 106 samples received at ORNL exceeded the 14-day analysis limit by 1-2 days. Both laboratories analyzed aqueous samples according to EPA Method 335.2 as presented in the EPA's 7/87 CLP SOW. BCD also used EPA Method 335.2 for solid samples. ORNL analyzed soil samples according to the procedure described in Appendix D (pp. D-427 through D-433) of the DOE Environmental Survey Manual. Under this procedure, only the hydrogen cyanide gas evolved under the test conditions, rather than the total cyanide concentration, is analyzed. Values for cyanide concentration in soil samples analyzed at ORNL should be considered as a lower limit estimate of the cyanide concentration in the sample.

At ORNL, proper system operation was verified at the time of calibration by comparison to the previous day's standard responses. Calibration verification met compliance limits for all but one SDG in which the procedure was omitted. Blanks were run with each SDG; the value of the blanks was subtracted from the gross sample value to provide a net absorbance value. Three of seven SDGs did not contain duplicate samples because of insufficient sample volume. All other duplicate results met CLP requirements. Six aqueous spike recoveries were below CLP requirements limits, probably due to a chemical interferant which could not be eliminated. No laboratory control sample was analyzed.

Four of ten samples analyzed at BCD exceeded the analysis holding time by 22 days. The initial calibration solution for the soil samples did not meet CLP criteria. This was attributed to photolysis of the diluted solution which was contained in a clear container. Because the spike recoveries and the distilled standards were within tolerance limits, the run data were considered acceptable.

5.2.1.2.9 Anions

Sulfate ion was analyzed using ion chromatography with conductance detection. Seven samples were analyzed within the 28-day holding time limit; six samples exceeded the limit by one day. A final sample was analyzed 55 days beyond the limit. The DOE method detection limit (MDL) was not met for sulfate; the MDL at maximum instrument sensitivity was <5000 µg/L. All calibration blanks were less than this MDL. An anion standard prepared from NBS materials was used to calibrate the instrument. Proper detector response was verified at this time by comparison to the previous day's standard responses. In-house prepared quality control solutions were analyzed following each calibration. All calibration responses, duplicate results, and spike recoveries were in compliance. No laboratory control sample was analyzed.

5.2.2 Radiological Quality Assurance

The majority of the radiological analyses were performed by the Low-Level Radiochemical Analysis Group (LLRAG) at ORNL. The basic purpose of the quality assurance (QA) program for the LLRAG is to ensure that the data produced are of sufficient quality, accuracy, and completeness so that valid interpretations can be made. This purpose is accomplished by assuring that proper sample procedures are followed; the instruments yield accurate, reproducible results; and adequate information is available concerning each sample. All aspects of the work carried out by the LLRAG were thoroughly documented.

Although the basic QA program for LLRAG has many aspects, only the quality control (QC) aspects of the QA program that concern accuracy and reproducibility of measurements are summarized in this data document. These aspects include results of routine standards (both primary and secondary), blanks for background measurements, and analysis of interlaboratory comparison standards.

Approximately 5% of the total number of samples analyzed at LLRAG were control samples. A control sample could be any of the following:

Spike - A sample aliquot with a known amount of analyte added.

In-house - An in-house sample with a known concentration of analyte.

EMSL - A control sample from the EPA laboratory in Las Vegas (EMSL-LV).

Table E.1 in Appendix E includes the LLRAG laboratory performance on these samples, Table E.1 identifies the sample type, the type of control, the nuclide measured, the result obtained, and the known value or expected result. The R value in the table is the ratio of the result obtained and the expected result expressed as a percent and indicates the level of performance. For the DOE Survey, an R value between 80 and 120 is considered acceptable.

5.2.2.1 Gross Alpha-Beta Measurements at LLRAG

In order to ensure accuracy of the results obtained by the gross alpha-beta measurements, a beta standard traceable to NBS was counted daily when the LB-4000 instrument was in use, and blanks (i.e., backgrounds) for both alpha and beta were also obtained daily. In addition to these routine checks, prior to initiation of the measurements of ANL Site samples, the instrument underwent a full calibration that included the determination of plateaus.

The results of the daily calibration checks, performed with a beta standard (RNS2-40B) consisting of strontium-90 and tritium-90, are presented in Appendix E Table E.2. No alpha efficiencies for the LB-4000 are available for inclusion in this data document; the beta efficiency alone is used to check the calibration of the instrument. (The instrument counts both alpha and beta simultaneously.) These results are presented in Appendix E Table E.3. The mean beta efficiency of the LB-4000 was 35.6% with a standard deviation of 1.7% and a range of 33.12% to 39.77%. All beta efficiency measurement checks indicated a result within the acceptable range of 36±4% for the LB-4000. Because all beta efficiency checks indicated results within the acceptable range, the LB-4000 can be considered to have been accurately calibrated and sufficiently constant during the period of the measurements of the Argonne samples.

The results of the background (i.e., blank) measurements are also included in Appendix E Table E.3 for alpha and beta measurements. Examination of this table indicates that the backgrounds were relatively constant throughout the measurement period of Argonne. The alpha background of the LB-4000 had a mean of 0.03 cpm, a standard deviation of 0.01 cpm, and a range of 0 to 0.06 cpm. The beta background of the LB-4000 had a mean of 0.89 cpm, a standard deviation of 0.17 cpm, and a range of 0.62 to 1.45 cpm. Both the alpha and beta backgrounds of the instrument, therefore, were of low enough levels that they did not adversely affect the measurements.

5.2.2.2 Isotopic Alpha Measurements at LLRAG

Alpha measurements on individual isotopes (e.g. plutonium-239) are performed using a Nuclear Data ND-9900 proportional counting system. The mean alpha efficiency of the ND-9900 was 21.1% with a standard deviation of 3.7% and a range of 14% to 34%. The mean alpha background of the ND-9900 was 0.006 cpm with a standard deviation of 0.004 cpm and a range of 0.002 to 0.023 cpm. All of the measurement checks showed results within the acceptable range, indicating that the ND-9900 was operating properly during the period of the ANL Site measurements. Table E.4 in Appendix E summarizes the efficiency and background data for each of the 12 detectors. Data on the calibration of the 12 detectors in this system are presented in Table E.5 in Appendix E. These data indicate that each detector in the system was well within the specified calibration limits during the time period of the ANL measurements.

5.2.2.3 Gamma Spectral Measurements at LLRAG

To ensure accuracy and reproducibility of results obtained by the gamma spectral measurements (gamma scans), a secondary standard consisting of cesium-137 and cobalt-60 was counted daily; a mixed-radionuclide standard traceable to NBS was counted routinely; and backgrounds (i.e., blanks) were counted routinely. The gamma standards are used to check that the energy calibration and efficiency of the instrument remains constant. The mixed-radionuclide standard is used as an additional verification of proper instrument operation and a check of the energy and efficiency calibration.

LLRAG used six gamma-ray detectors attached to a common computer (a MicroVAX) for data collection and analysis. Appendix E Table E.6 presents the results of the daily checks with the gamma standards for each of the six detectors. The count rates, centroids, and peak widths for the cesium-137 661 keV and cobalt-60 1332 keV peaks are used in the QC check. Examination of the data in these tables indicates that peak widths were very constant during the Argonne measurements. The centroids exhibited only slight variations, and these variations were accounted for by the analyzer system which provided an energy calibration for each gamma-ray spectrum. The count rates for each of the gamma rays were also relatively constant, showing a range (minimum-to-maximum value) of 8% or less. The results indicate that the efficiency of each detector was constant during the period of the ANL Site measurements.

Results of the QC checks using the mixed-radionuclide standard are also included in Appendix E Table E.6 for the six gamma-ray detectors. The results for each detector indicate that the differences between the measured and true values were all less than the 6% uncertainty in the true values.

Appendix E Table E.7 presents a summary of the measured intensities of all the gamma rays observed in the background (i.e., blanks) for the six gamma-ray detectors. The data indicate that the background was low and relatively constant.

5.2.2.4 Liquid Scintillation Measurements by LLRAG

Tritium samples were counted using a Packard 460C Tri-Carb liquid scintillation counter. A Packard tritium standard is counted daily to ensure the accuracy and reproducibility of the results obtained by the system. Backgrounds (i.e., blanks) are also counted daily. The results for the standard and background counts performed during the time that the ANL Site samples were counted are given in Appendix E Table E.8, along with the efficiency data for that time period. The background for the Packard 460C was 13.5 cpm, with a standard deviation of 1.4 cpm and a range of 11.9 to 17.0 cpm. The efficiency of the Packard 460C was 58.5%, with a standard deviation of 0.1% and a range of 58.3% to 58.7%. All data indicate that the Packard 460C was accurately calibrated, sufficiently constant, and had a low enough background such that no degradation of sample results occurred during the period of the ANL Site sample measurements.

5.2.2.5 Interlaboratory Comparisons by LLRAG

During the period of the ANL Site measurements, LLRAG participated in the EPA Cross Check Program for gross alpha and gross beta in water, strontium-90 in water, tritium in water, total uranium in water, and for gamma isotopics in water. The results, presented in Appendix E Table E.9, measured by LLRAG did not exceed the warning limits, indicating that sufficiently accurate results were being obtained by LLRAG procedures and instruments.

5.2.2.6 Radiometric Analysis by Battelle's PNL

A total of 43 samples were received by Battelle's Pacific Northwest Laboratory (PNL) for laboratory radiological analysis. These included regular samples and field rinsates from Wells 6 and 9, pump samples from Plot M, and grab samples from Landfill 319 of the ANL Site. A discussion of PNL radiological results follows. A complete listing of radiological control sample results is included in Table E.1 of Appendix E.

Ten samples were analyzed for tritium oxide content; all regular samples were analyzed in duplicate. Soil samples were weighed as received. Counting efficiencies were determined from the analysis of NBS-traceable spikes and water blanks that were concurrently analyzed in duplicate with each sample group. Table E.10 summarizes the daily measurement of tritium counting efficiency and instrument background (determined using a water blank). The average value of four measurements of instrument counting efficiencies was 33.6 ±1.3%. Count rates of sealed standards and blanks were determined to verify long-term instrument stability. The average background count of four water blanks was 14.55 ±0.39 cpm. Measured values presented on the data forms are the count rates on the dates of the calibration check. The known value of the standard is the count rate of the initial calibration made on December 11, 1987, to which all measured values were compared. The percent difference (%D) between the measured and known value of the five tritium laboratory control samples ranged from -0.9% to +0.4%.

The gross alpha count was determined for four water samples. These samples were run in duplicate, versus a reagent blank. Three instruments were used to obtain alpha counts. Table E.11 summarizes the daily efficiencies of the three instruments. The average efficiency for each instrument, based on two measurements, was 46.1, 45.8, and 45.8. The daily background counts for three instruments used to determine the gross alpha count are listed in Table E.12. The average of the two determinations of the alpha background on each instrument was 0.603, 0.353, and 1.899 cpm for a 1000 min counting time. Six calibration checks were made using a control sample. The measured values appearing on the data forms are the count rate of the continuing calibration checks; the known values are the count rates of the standard on December 1 or December 2, 1987, to which all measured values are compared. The %D ranged from-1.2% to -0.1% for the six determinations.

A single sample was submitted for total uranium analysis. Its analysis was performed on the Alpha-1 instrument. The alpha background count and the instrument efficiency, measured on the day following the analysis, were 0.632 ±0.025 cpm and 55.0%, respectively. An initial calibration and two continuing calibration checks were made using a gross alpha control standard. The %Ds of the two continuing calibration checks were -1.2% and -0.7%, respectively.

The gross beta counts of four water samples were determined using the Beta-66 and Beta-67 instruments. The instrument efficiencies, as determined from Table E.13 data, are 52.4% and 53.3%, respectively. The daily measurement of beta instrument background counts is presented in Table E.14. The average instrument backgrounds for the Beta-66 and Beta-67 instruments were 15.5 and 15.2 cpm, respectively. Regular samples were determined in duplicate versus reagent blanks.

The concentration of strontium-90 was determined in a single water sample, using the Lobeta-1 instrumentation. The instrument efficiency and background on the date of analysis were 54.8% and 0.584+0.024 cpm, respectively. The initial calibration of the pertinent instrumentation was made on December 9 and 11, 1987. The %Ds of two continuing calibration checks for this instrumentation did not differ from the initial checks.

Gamma spectrometry was used to determine the isotopic content of 16 water samples. Results were reported for 500-mL aliquots of the samples. The peak energies and measured intensities of the instrumentation were checked with americium-241, cesium-137, and cobalt-60 isotopic standards. The stability of the Detector BNW is demonstrated in Table E.16. The Long Term August values are taken as the known values to determine the %D of the radiometric QA/QC results tabulated in the data package. The %D of the peak intensity in the continuing calibrations ranged from -1.8% to 2.3%. Known values for peak position are not documented in the data tables.

Two water samples were submitted for the analysis of plutonium-238, using the PNL-C1 instrumentation. An isotopic plutonium standard was analyzed to confirm the efficiency and the system energy calibration of the instrumentation. Data presented in Table E.15

represent the % efficiency and instrument background measured one week after sample analysis.

5.2.2.7 Conclusions

The results of the QC checks presented by LLRAG indicate that the performances of the alpha-beta instrument and the gamma-ray spectrometers at LLRAG were adequate to ensure accuracy and reproducibility of the results obtained using them. In addition, the background seen by each instrument/detector was sufficiently low and sufficiently constant to ensure accurate removal of background effects. Results summarized in the PNL analyses reflect the excellent accuracy that can be attributed to the analytical results, as based on the calibration checks. However, no documentation has been received to describe PNL performance in interlaboratory cross-check comparisons, as a further check of analytical accuracy.

5.2.3 Data Management QA/QC

All analytical data entered into the Data Management System (DMS) goes through a series of verification and validation (V&V) routines to ensure that the data are of the highest quality possible. These V&V routines are designed to capture two potential types of data errors: transcription and consistency.

Data transcription problems (i.e., data entry errors) can be eliminated through the use of electronic data transfer techniques. For ANL Site data, all ICP data and most organic data were electronically transferred from the instruments to the data base. The remaining, manually-entered data were initially reviewed for legibility, entered, and then 100% visually checked for accuracy. All transcription errors are corrected at the time of discovery and are not documented.

Data consistency problems consist of miscoded information, missing data, incomplete data, and conflicting sample identification codes. After the information has been entered into the data base and all transcription problems corrected, the data is then printed and returned to the field team supervisor or analytical chemist for review. During this review, any missing or incomplete data is corrected and sent back for addition to the data base. Miscoded information is corrected and documented. Conflicting sample identification codes are reviewed and resolved by data management personnel working with field and analytical staff.

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