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Final

SITE INSPECTION REPORT

NAVAL COMMAND, CONTROL AND OCEAN SURVEILLANCE CENTER, RDT & E DIVISION MORRIS DAM FACILITY

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LIST OF ACRONYMS

ac	Acre
Ag	Silver
Amu	Atomic Mass Unit
AOC	Area if Concern
As	Arsenic
AST	Aboveground Storage Tank
ASTM	American Society of Testing Materials
Ba	Barium
BA	Background Area
BC	Brown and Caldwell
Be	Beryllium
BFB	Bromofluorobenzene
bg	Below grade
BKG	Background
BTEX	Benzene, toluene, ethylbenzene & total xylenes
btoc	Below top of casing
Caltech	California Institute of Technology
CAM	California Assessment Manual
CCC	Calibration check compound
CCR	California Code of Regulations
CCV	Continuing calibration verification
Cd	Cadmium
CDHS	California Department of Health Services
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chemical of concern
CoC	Chain-of-Custody
COPC	Chemical of potential concern
Cr	Chromium
CRQL	Contract required quantitation limit
Cu	Copper
DFG	Department of Fish and Game
D.O.	Dissolved oxygen
DON	Department of Navy
DOT	Department of Transportation
DQO	Data Quality Objective
DTSC	California Department of Toxic Substances Control
Dup	Duplicate
DWR	Department of Water Resources
ECE	Environmental Compliance Evaluation
EPA	Environmental Protection Agency
ERL	Effective range-low
ERM	Effective range median
ESA	Environmental Site Assessment
FAL	Fixed Angle Launcher
FID	Flame Ionization Detector
FPD	Flame Photometric Detector
ft	Feet
ft^3	Cubic feet
gal	Gallon
GC/MS	Gas Chromotography/Mass Spectrophotometric
GFAA	Graphite Furnace Atomic Adsorption
gm/cm^3	Grams per cubic centimeter
GPM	Gallons per minute
GPR	Ground penetrating radar
GPS	Global positioning system
Ha	Hectare
HA	Hydrologic area
H_2SO_4	Sulfuric Acid
HCL	Hydrochloric Acid
HEAST	Health Effects Assessment Summary Table
Hg	Mercury
HNO3	Nitric Acid
HPLC	High Performance Liquid Chromatography
HRS	Hazard Ranking Score
HAS	Hydrologic subarea
HSDB	Hazardous Substance Data Base
HVOCs	Halogenated Volatile Organic Compounds
ICP	Inductively Coupled Plasma
ICV	Initial calibration verification
ID	Internal diameter
IDL	Instrument Detection Limit
IDW	Investigation-derived wastes
IRIS	Integrated Risk Information System
IS	Internal standards
kg	Kilograms
L	Liter
LACDPW	Los Angeles County Department of Public Works
LANL	Los Alamos National Laboratory
LC50	Lethal Concentration - 50 percent mortality
LCS/LCSD	Laboratory control sample/laboratory control sample duplicate
LDC	Laboratory Data Consultants
Li	Lithium
LIMS	Laboratory Information Management System
LPE	Linear polyethylene

LIST OF ACRONYMS
(Continued)

LUFT	Leaking Underground Fuel Tank
MCL	Maximum contaminant level
MDL	Method Detection Limit
mg/kg	Milligram per kilogram
mg/L	Milligram per liter
mg/l	Micrograms per liter
min	Minutes
MLE	Maximum likelihood method
Mo	Molybdenum
MS/MSD	Matrix spike/matrix spike duplicate
MSDS	Material Safety Data Sheet
msl	Mean sea level
MTBE	Methyl-tert-butyl ether
MW	Monitoring well
MWD	Metropolitan Water District of Southern California
N/A	Not applicable
NA	Not analyzed
NAVD	North American Vertical Datum
N/C	Not Calculated
NCCOSC	Naval Command, Control, and Ocean Surveillance Center
NEESA	Naval Energy and Environment Support Activity
NFESC	Naval Facilities Engineering Support Command
Ni	Nickel
NIOSH	National Institute of Safety and Health
NIST	National Institute of Standards and Technology
NOAA	National Oceanographic and Atmospheric Administration
NOSC	Naval Ocean Surveillance Center
NPL	National Priority List
NRAD	Naval Research and Development
NS&T	National Status and Trends
NUWES	Naval Undersea Warfare Engineering Station
O Pb	Organic lead
ORP	Oxidation reduction potential
OWS	Oil-Water Separator
PA	Preliminary Assessment
PAH	Polynuclear aromatic hydrocarbons
PARC	Precision, Accuracy, Representativeness, and Completeness
Pb	Lead
PCB	Polychlorinated biphenyls
PCDD/PCDF	Polychlorinated dibenzodioxin/ polychlorinated dibenzofurans
PCE	Tetrachloroethylene
PID	Photoionization detector
PPE	Personal Protective Equipment
ppm	Part per million
PRG	USEPA Region IX Preliminary Remedial Goal
PVC	Polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
R&D	Research and Development
RCRA	Resource Conservation and Recovery Act
RDL	Reporting detection limit
RDT&E	Research Development Testing and Evaluation
RF	Response Factor
RFP	Request for Proposal
RPD	Relative Percent Difference
RPM	Remedial Project Manager
RRF	Relative response factor
RSD	Relative Standard Deviation
RWQCB	Regional Water Quality Control Board
Sb	Antimony
Se	Selenium
SCAQMD	South Coast Air Quality Management District
SI	Site Inspection
SIWP	Site Inspection Work Plan
SPCC	System Performance Check Compound
SRM	Standard Reference Material
SSHP	Site Safety and Health Plan
STLC	Soluble threshold limit concentration
SVOC	Semivolatile Organic Compound
SWDIV	NAVFACENGCOM Southwest Division
SWRCB	State Water Resource Control Board
TBT	Tributyltin
TCE	Trichloroethene
TIC	Tentatively Identified Compound
Tl	Thallium
TOC	Total Organic Carbon
TOX	Total Organic Halogens
TPH	Total petroleum hydrocarbon
TPHd	Total petroleum hydrocarbon - diesel range
TPHg	Total petroleum hydrocarbon - gasoline range
TRPH	Total recoverable petroleum hydrocarbons
UCL	Upper confidence limits
µg/L	micrograms per liter
TTLC	Total threshold limit concentration
USA	Underground Service Alert
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USEPA	United States Environmental Protection Agency
UST	Underground storage tank

LIST OF ACRONYMS
(Continued)

V	Vanadium
VAL	Variable Angle Launcher
VOC	Volatile organic compounds
WMP	Waste Management Plan
yd^3	Cubic yards
Zn	Zinc

EXECUTIVE SUMMARY

INTRODUCTION AND BACKGROUND

A Site Inspection (SI) was conducted at the Department of Navy (DON), Naval Command Control and Ocean Surveillance Center (NCCOSC) Research, Development, Testing an Evaluation (RDT&E) Division, Morris Dam Research and Development (R&D) facility. The NCCOSC, RDT&E Division operated the Morris Dam R&D facility from approximately 1943 to 1993. Its primary mission was to test and evaluate DON torpedoes. Research conducted at the facility included studies of torpedo water surface impact and torpedo propulsion systems.

The Navy leased the Morris Dam property from the Metropolitan Water District of Southern California (MWD) from 1939 through 1993. A small portion of land at the northwestern part of the facility (near the entrance) is owned by the United States Forest Service.

Morris Dam was constructed in the early 1930s and is currently owned by MWD. The 20-acre Morris Dam R&D facility was constructed by DON in 1943. Navy operations at the facility ceased in June 1993. Demolition of all buildings and structures was conducted during 1997. Currently, only concrete building pads remain.

The Navy is currently transferring the land back to MWD. Ultimately, it is MWD's intention to transfer the land to the Los Angeles County Department of Public Works (LACDPW) to support operation of Morris and San Gabriel Reservoirs. As part of this land transfer, the Navy is conducting an investigation to determine whether its activities left conditions that would pose a risk to human health and the environment. This report presents the results of that investigation.

The project site is located on a peninsula extending into Morris Reservoir north of Azusa, Los Angeles County, California. Morris Reservoir is located in the San Gabriel Mountains, approximately 5 miles north of the City of Azusa, in Los Angeles County, California. The Reservoir is situated along the east side of California State Highway 39 in the Angeles National Forest. The NCCOSC test facility is located on a western shoreline peninsula of Morris Reservoir.

The SI Work Plan (Brown and Caldwell, 1997) and the SI Work Plan Addendum (Brown and Caldwell, 2000) were organized around sampling of media at "Objectives" throughout the site. The term "Objectives" was used purposefully in these plans because many activities took place in more than one area. Sampling and analysis schemes were targeted for specific constituents that may have been released as part of these activities. The definition of "Objective" then, as used in the SI Work Plan (Brown and Caldwell, 1997) and SI Work Plan Addendum (Brown and Caldwell, 2000), is a specific area or group of areas that included similar and specific sampling and analytical objectives. However, over the course of this project the distinction between different activities at some of these "Objectives" has changed. Review of the SI approach, which occurred during the preparation of this report highlighted potential confusion with use to the word "Objective." Hence, the Navy has decided to use a more conventional nomenclature and

renamed each "Objective" to either "Area of Concern" or "Background Area" depending upon the focus for sampling. If an Area of Concern (AOC) has locations separated by some distance, then the AOC is further broken down into Subareas. The AOC and Subarea nomenclature will be used in this report. To avoid confusion between the Work Plans and SI Report, the numbers for each AOC will correspond to those for the Objectives outlined in the Work Plan and Work Plan Addendum. In addition, the "Objective" identifier will be provided by the site description in this SI report in parentheses to facilitate comparison between the different documents.

Eleven Areas of Concern (Objectives) and two Background Areas (Objectives 12 and 13) were identified in the Work Plan and Work Plan Addendum (Brown and Caldwell, 1997 and 1999). These Areas of Concern (Objectives) or Background Areas are as follows:

- AOC (Objective) 1: Former Gasoline Station/Drum Storage Pad.
- AOC (Objective) 2: Oil/Water Separators.
- AOC (Objective) 3: Outfall Areas.
- AOC (Objective) 4: Propulsion System Testing Area.
- AOC (Objective) 5: Sewer Septic Tank and Leach Field Lines.
- AOC (Objective) 6: Sump and Collection Lines.
- AOC (Objective) 7: Temporary Drum Staging Area.
- AOC (Objective) 8: Groundwater Investigation
- AOC (Objective) 9: Slurry Outfall Pipe.
- AOC (Objective) 10: Electronic Testing Area.
- AOC (Objective) 11: Propellant Magazine.
- Background Area 1 (Objective 12): Background Soil Sampling.
- Background Area 2 (Objective 13): Background Rock Sampling.

The SI scope consisted of the following tasks that were conducted at the Areas of Concern:

- Sampling of different media including soil, soil gas, ground water, and rock.
- Geophysical surveys.
- Analysis conducted on the different media including volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), total petroleum hydrocarbon analysis (TRPH and TPH), Otto Fuel, polychlorinated biphenyls (PCB), metals, and mineralogical (including reflected light microscopy and electron microprobe analysis). Not all analyses were done at all sites; analysis was focused on AOC (Objective) historical uses.
- Risk screening for Human Health (using California Modified Preliminary Remediation Goals or PRGs)
- Initial Ecological Scoping Assessment

LOCAL GEOLOGY AND HYDROGEOLOGY

Part of the results from sampling and analysis indicates many metals are found at higher than expected concentrations. These metals include aluminum, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, vanadium, and zinc, among others. The expected concentrations are based on experience with metals found in soils from alluvial basins, below mountain ranges. For reasons discussed below, the Morris Dam R & D facility has a geologic framework much different than those found in alluvial basins, and hence, the rocks near the facility contribute metals at higher concentrations than would be expected.

The geological framework for the peninsula and surrounding areas is complex, consisting of rock that has undergone varying degrees of metamorphic and secondary alteration. Metamorphic alteration means the rock formations have undergone transformations due to heat and pressure. Metamorphic rocks often have changes in their original mineral assemblages when subjected to the heat and pressure. Secondary alteration occurs when rocks are exposed to fluids moving through the rock through fractures. These fluids, which can deposit secondary minerals, include those that originally come from magmas deep within the earth and seep upward in the rock column, as well as surface fluids that seep downward and interface with rock and other fluids with at depth. Fluids of magmatic origin would have been present in this area due to intrusion of magmas below the San Gabriel Mountains as they were built. Both types of fluids can be enriched in metals due to a variety of reasons including leaching of metals from the rocks they contact. Magmatic fluids can be enriched in metals because the original magma, which was their source, was enriched in metals.

Reconnaissance geological mapping of the Morris Dam area shows a wide variety of rock types most of which have been subject to varying degrees of metamorphic and secondary alteration. Further evidence of rock alteration is present in data from mineralogical analysis of the rock samples from Background Area 2 (Objective 13), both from metamorphism, and from fluids depositing secondary minerals in fractures. These rocks, which are exposed at the surface throughout the San Gabriel Mountains, then are the source material for soils as they weather and break down. While soil has formed over some of the peninsula and surrounding areas, it is generally a thin veneer, it has formed from the altered rock, and rock outcrops are found throughout the area. The altered rock and resulting soil provides additional sources for metals since the facility is located on a bedrock terrain. Reportedly, some of the soil and rock on site was used as fill material underneath pads prior to building construction.

Groundwater elevations were measured in three monitoring wells installed on site. The groundwater elevations in the three wells are very similar. The water elevation in the monitoring wells tracks closely with the reservoir elevation, suggesting direct hydraulic connection between the reservoir and groundwater below the peninsula. The groundwater gradient suggests flow is parallel to the axis of the reservoir, which in turn implies that the overall movement of water through the reservoir also controls groundwater movement below the peninsula.

RESULTS

This section summarizes the results of sampling and analysis and evidence that chemicals may have been released due to anthropogenic activities at the site. The following paragraphs summarize the results from background, or ambient, metals evaluation and different aspects of the SI.

Ambient Metals Concentrations

Metals exist naturally in soil and rock, so an analysis of natural ambient concentrations for metals was conducted during the SI. Samples collected to examine ambient conditions included 15 background soil samples, and approximately 20 rock samples. Additionally, the results from over 100 on site soil samples, along with the background rock and soil samples, were used in statistical analysis to evaluate the ambient metals concentrations. This evaluation was conducted using statistical procedures and examination of geochemical relationships from soil data. In addition mineralogical analysis was done of rock outcrop samples to identify if naturally-occurring minerals were present which could contain metals. Table ES-1 lists the metals detected, the range of concentrations in all soil samples, the statistically derived ambient concentration limit, and the highest concentration found as naturally occurring in the rock samples. Note that quite a few of the target metals, including aluminum, barium, beryllium, chromium, cobalt, iron, manganese, nickel, selenium, and vanadium were found in rock at concentrations exceeding or very close to the highest concentrations found in on site soil samples. Additionally, several other metals, including antimony, hexavalent chromium, copper, lithium, mercury, molybdenum, and zinc were found in the rock samples at concentrations near or exceeding their respective statistically derived ambient concentration limit. This evidence suggests that these metals could be present naturally at the concentration ranges observed in most of the soil samples on site. Three metals, including arsenic, lead, and silver, were not detected in rock samples at concentrations that would suggest the range observed in soil samples could be naturally occurring. Also, several metals (antimony, hexavalent chromium, copper, lithium, mercury, and zinc), while found in rock at concentrations suggesting they could be naturally occurring for most soil samples on site, were found in a few on site soil samples at concentrations exceeding the statistically derived ambient concentration limit and those concentrations found in rock samples, suggesting a potential for anthropogenic release.

Minerals present in much of the rock as evident from the mineralogical testing of on site rock samples from Background Area 2 (Objective 13) provided further evidence that many metals could exist at relatively higher concentrations in soil. Many minerals were identified that contain some of the metals in their chemical formulas. These minerals include different iron oxides, pyrite, chalcopyrite, millerite, pentlandite, zircon, apatite, covellite, chromite, and heazlewoodite, amongst others. While overall concentrations of these minerals are low (generally less than one percent of total rock matrix), large percentages are not required to compose parts per million levels of metals. Further mineralogical evidence from microprobe analysis suggests that metals also are composing a portion of more common minerals such as biotite. A geologic peridotite/pyroxenite dike was observed and sampled east of former Building 42015. Results of

the total metals analysis and mineralogical results suggest this dike could be a significant natural source of metals, especially chromium and nickel. However, this geological feature is relatively constrained and was only observed in one small area of the site.

Summarized Results from Sampling

No evidence of a significant release of free product petroleum hydrocarbon was found. TRPH was detected in most samples, but generally below 100 mg/kg. We interpret this result to suggest that no widespread release of petroleum based products were evident in the samples collected. Several samples did exhibit concentrations above 100 mg/kg, which might signify some release of hydrocarbons in localized areas as discussed below. TRPH was reported in some samples at concentrations near or at 100 mg/kg near the former gasoline station (AOC (Objective) 1). Some concentrations of gasoline range hydrocarbons were found near the former gasoline station, but the concentrations were not such that suggested a widespread significant surface release of these hydrocarbons. TRPH above 100 mg/kg was found in two samples from below the outfalls in AOC (Objective) 3, Subarea 1, which may suggest a release at these two locations. At one location the detection is likely associated with asphalt chips noted in the sample. TRPH was found in two samples near each of the leach fields in AOC (Objective) 5 above 100 mg/kg, and in one sample within AOC (Objective) 4 from the slope directly east of former Building 42015. Higher TRPH concentrations were also associated with the surface loess samples in AOC (Objective) 7, and are likely due to the asphalt chips noted in these samples during collection.

Otto Fuel, a torpedo propellant specifically targeted as part of the SI, was not detected in any samples submitted for this analysis. We suspect that this result is because of the inherent instability and breakdown of Otto Fuel as evident by the quick breakdown of standards submitted to the laboratory.

Organic compounds that were detected in the soil include polynuclear aromatic compounds (PNA) and PCBs. The PCBs were detected in the surface loess samples at AOC (Objective) 7. A transformer building did exist on a pad within AOC (Objective) 7, which would explain the PCB. PNAs were found in the soil at one outfall location in AOC (Objective) 3. AOC (Objective) 6 exhibited some SVOCs including some phthalate esters and a PNA (fluoranthene). We believe the phthalate esters are probably due to laboratory cross-contamination. The detected PNAs at several locations may be related to asphalt chips from the surrounding pavement, which were noted in field observations for some of these locations.

Organic (tetraethyl) lead was detected in several samples. This chemical is not present naturally, and indicates a release where it was detected. The most significant detection of this constituent was found at depth in AOC (Objective) 4, below the pad of former Building 42015. Organic lead was also detected in samples from AOC (Objective) 2, and may suggest a release near the two oil/water separators.

Passive soil vapor sampling at AOC (Objective) 7 did suggest that PCE and TCE could have been released at the site. Acetone, benzene, toluene, and xylenes were also detected, but their

presence was attributed to ambient conditions due to their corresponding presence in a background sample as well. The concentrations for all constituents were below 1 part per trillion.

As evident in Table ES-1, metals were found at concentrations varying over a couple orders of magnitude. Hence defining whether a metal is present due to anthropogenic (human induced) reasons or is present naturally requires a statistical comparison to ambient concentrations. Additional analysis of geochemical relationships is also helpful for defining when a metal may be present naturally or due to anthropogenic reasons.

For the purposes of risk assessment, metals concentrations that are below the statistically derived ambient concentration limits are not considered as releases at the site. However it is noteworthy that other evidence, from geochemical relationships and mineralogical results, which suggests that some metals that are found in concentrations above these calculated thresholds and may be naturally occurring because of the natural minerals scattered throughout the complex geological formations. Further interpretation of this evidence is discussed in the bullets below.

- Statistical analysis results in an ambient concentration limit for each metal. However, metals results from rock samples collected in Background Area 2 indicate that some metals may naturally exist at concentrations exceeding these limits. Decision making with respect to these metals needs to carefully consider such information.
- In general, aluminum, barium, beryllium, chromium, cobalt, manganese, nickel, and vanadium exhibit clear geochemical correlation with iron. In addition, these metals, plus selenium were found at concentrations in rock samples from Background Area 2 (Objective 13) that were similar or higher than the highest found in site soils. Both of these observations suggest that the concentrations are naturally occurring and unrelated to any anthropogenic activities that may have occurred at the facility
- Several metals, including copper, lithium, molybdenum, and zinc are detected in a few soil samples on site at higher concentrations than in the rock samples from Background Area 2 (Objective 13). However, most site soil samples were well below the highest rock concentration. For these metals, those locations that were significantly greater than the rock sample maximum concentrations could signify a release, or represent higher ends of the statistical population. To be conservative, they are assumed to represent potential releases in this report. These metals do not contribute appreciably to human health risk at any AOC, but may be important later in ecological risk assessment.
- Three metals, antimony, cadmium, and thallium, were detected infrequently, and did not provide a good basis for statistical calculation. High concentrations of these metals were not observed at any location, and we have interpreted that, where detected, they are unrelated to site activities.

- Arsenic and lead generally were not found at higher concentrations in rock samples from Background Area 2 (Objective 13) than soil samples. No minerals were found that corroborate a natural occurrence. Hence their presence at concentrations that exceed the statistically calculated ambient concentration limit may indicate a release due to anthropogenic activities.
- Chromium (VI) was detected in many on site samples and also rock samples from Background Area 2 (Objective 13). The detection of this metal is suspicious due to its unstable nature. Chromium exists in the +6 oxidation state only under the most oxidizing conditions, and is not normally present under natural conditions. It is possible that the listed detections are actually due to false positives from laboratory analysis. The detected concentrations are carried through a complete ambient calculation and risk analysis, but should be used with caution when making decisions.
- Silver was detected sporadically in site soils, and was not detected in rock samples from Background Area 2 (Objective 13). In general, where silver was detected, the concentrations suggest its presence could be attributed to a release from site activities.
- Mercury was not detected in many of the samples on site, or was within the range represented by the maximum rock background result from Background Area 2 (Objective 13). However, mercury was found in approximately 14 samples at concentrations greater than the maximum concentration found in rock. In these cases, it may be related to site activities.

Geographical distribution of metals that are considered chemicals of potential concern was relatively limited. At several of the AOCs, metal concentrations were relatively high compared with the ambient concentration limits, were associated with outliers that were removed from the ambient data set, and were identified as enriched with respect to cations. Most of the metals detected at higher concentrations in can be summarized into three general areas. First metals appear to be clustered with relatively high concentrations (above their respective ambient concentration limits) and enrichment ratios near and below pads for former Buildings 42010, 42011, 42015, 42016, 42038, and 42039, which encompass parts of AOCs 2 (Subarea 2 only), AOC (Objective) 4, and AOC (Objective) 6. This area in particular was used for much of the machining and propulsion testing, and the clustered metals in this area may signify a release due to these activities.

Second, arsenic (1 sample only), chromium (VI), copper, lead, and zinc were detected at concentrations above their respective ambient concentration limits in AOC (Objective) 7 loess and soil samples.

Finally, several sporadic detections of metals such as copper, lead, mercury, and zinc were detected near outfall pipes. These pipes were fed from the sump and collection lines targeted in AOC (Objective) 6. Silver was detected in one sample from the slope southeast of former Building 42015.

TCE was detected in groundwater at concentrations below the drinking water standards. Given the fractured nature of the bedrock into which the wells were completed, coupled with the low passive soil vapor concentrations obtained at AOC (Objective) 7, the presence of TCE certainly could be due to a release at the site. However, any further examination of this issue should address water upstream and downstream of the peninsula. The detection of TCE at low concentrations may not present a significant problem if the concentrations do not vary over time. This because the groundwater below the peninsula, while hydraulically connected with the reservoir water, would dilute considerably when it mixes with the reservoir water and migration occurs away from the peninsula. In addition, water from Morris Reservoir is directed downstream through a turbulent river channel and then allowed to infiltrate through spreading centers in the San Gabriel basin, which would likely result in TCE being significantly diluted and volatilized as it transports this relatively long distance (several miles) and then infiltrates.

Results from sediment sampling at AOC (Objective) 9 did exhibit some detection of VOCs including acetone and methylene chloride. The concentrations of these constituents were relatively low (near detection limits) and likely introduced from laboratory cross contamination during analysis and not due to site activities. Results for metals did not yield any unusual samples that would suggest a release had occurred.

Conceptual Model and Scoping Assessment Results

The ecological scoping assessment is used to define if further ecological risk screening is required at a particular site. The scoping assessment defines the need for further ecological risk screening by evaluating the chemicals of potential concern, the ecological receptors, and potential ecological pathways at the site.

Results from an Ecological Scoping Assessment shows that a number of ecological chemicals of potential concern ($COPC_E$) exist, several species of special status occur or may occur at the site. In addition, potentially complete pathways exist at the site. Given these conclusions a quantitative ecological risk screening should be completed.

Human Health Risk Screening Results

This human health screening risk assessment was conducted to determine the need for further risk assessment or remediation at the Morris Dam Facility to protect human health. Data from each media were compiled and chemicals of potential concern for human health ($COPC_H$) were selected. An exposure pathway analysis was conducted to determine how people could come into contact with the impacted media. Human health screening risk assessment levels were selected, and finally cancer risks and hazard indices were calculated for each AOC (Objective).

There are three possible future uses for the site:

- Truck and vehicle maintenance/storage facility
- Home(s) for certain LACDPW personnel
- Recreational/park

For protection of human health, the exposure pathways of most concern are defined through a future residential land use scenario. The human health risk screening criteria are the US Environmental Protection Agency Region IX Preliminary Remediation Goals (PRGs) using on CAL-EPA adjusted toxicity factors where appropriate. Chemicals of Potential Concern for human health ($COPC_H$s) were identified several of the AOCs (Objectives) and screened against the PRGs discussed above.

Results from this screening indicate that the potential risk to human health for AOCs (Objectives) 1, 3, 9, 10, and 11 are below the target risk cancer level of $1x10^{-6}$ and the target non cancer hazard index of 1. This indicates that no further action is warranted.

AOCs (Objectives) 2, 4, 5, 6, and 7 had cancer risk levels greater than 1×10^{-6}, a hazard index greater than 1, or a lead level above the PRG. In several cases, (AOC 2, Subarea 1, AOC Subarea 4, and AOC 5) the risk level is due solely to arsenic. At other Subareas or AOCs the risk was from several chemicals. Other chemicals contributing to the risk include chromium, chromium (VI), lead, mercury, and nickel; and organic chemicals (PCB and tetraethyl lead). Not all of these chemicals were detected at each AOC (Objective) (See Table 6-12).

Note that the PRG for chromium of 210 mg/kg assumes that the total chromium is $1/6^{th}$ hexavalent chromium. Trivalent chromium is substantially less toxic and the PRG is 100,000 mg/kg. By using the PRG for total and hexavalent chromium, the risk for hexavalent chromium is included twice. This notation is important only at those AOCs where the risk for total chromium is greater than 1×10^{-6}.

Results from the risk screening at AOC 8 yield cancer risk levels greater than 1×10^{-6}. This risk level was due solely to TCE. As discussed above, a complete pathway may not exist for TCE as a drinking water source, however, further action is warranted.

CONCLUSIONS AND RECOMMENDATIONS

Based on the above findings several conclusions and recommendations follow from the SI. The recommended actions primarily are derived from the human health risk screening results, but also follow from discussions with regulatory personnel during the SI and overall assessment of potential release areas that may not have been completely characterized during the SI.

The initial Ecological Scoping Assessment was for the terrestrial and aquatic environments at the site. The scoping assessment is intended only to define COPCs, whether sensitive species exist, and whether complete pathways exist. The scoping assessment does conclude that all three

conditions exist so further ecological risk screening is necessary. No ecological risk screening has been conducted for any of the AOCs (Objectives) because screening criteria for the site have not been determined, and further assessment of sediment results needs to occur.

Recommendations that do apply to specific AOCs (Objectives) are included below.

Area of Concern (Objective) 1. Results from risk screening indicate potential risk to human health is below target risk cancer level of $1x10^{-6}$, and target non-cancer hazard index of 1. No further action is recommended for soils at AOC (Objectives) 1.

AOC (Objective) 2. No further action is recommended for soils at AOC (Objective) 2, Subarea 1 (the Oil/Water Separator near former Building 42001). AOC (Objective) 2, Subarea 2 soils exhibit detection of chemicals similar to AOC (Objective) 6, Subarea 1, and it is recommended that this Subarea be combined with AOC 4 and AOC 6, Subarea 1 as discussed under the AOC 6 recommendations below

AOC (Objective) 3. Slope soils investigated below the outfall points do exhibit some evidence of potential releases, particularly in Subarea 1, on slopes east and south of the former gas station. However, human health risk screening suggests that incremental cancer risk is below the de minimus value of $1x10^{-6}$ and below a 1.0 non-cancer hazard index. Hence, no further action is recommended for these locations.

AOC (Objective) 4. Depending upon future use and the future of the concrete pads in this area, further evaluation of organic lead may necessary at AOC (Objective) 4. Samples should be collected to confirm the existence and extent of this compound in Subareas 1 and 2. Any evaluation of this area should be incorporated into planning with AOC (Objective) 6 given the close proximity of these two AOCs (Objectives). In fact, as recommended under AOC (Objective) 6 below, AOC 2, Subarea 2, AOC 4 and AOC 6 should be combined as one AOC for future actions. Additional samples also should be collected from slope soils southeast of Building 42015 to confirm if elevated silver and mercury concentrations exist in these soils and the extent of these constituents and petroleum hydrocarbons on the slopes. Upon confirmation, the Navy, in consultation with other decision makers may decide that hot spot removal is appropriate.

AOC (Objective) 5. AOC (Objective) 5 Subarea 2 (leach field) data suggest that some release of TRPH and arsenic may have occurred. Currently not enough data exist to define the extent of any release in this Subarea, so further soil sampling should occur in this Subarea to help define any hot spots. Upon further delineation, the Navy, in consultation with other parties may decide that hot spot removal of affected soil is appropriate.

AOC (Objective) 6. Data from AOC (Objective) 6, Subarea 1 suggest that releases of metals may have occurred throughout this Subarea. In fact, some other AOCs (Objectives) that overlap into this Subarea (e.g., AOC (Objective) 2, Subarea 2, and AOC (Objective) 4, all Subareas, suggest that the release may be fairly widespread throughout the entire area surrounding former Buildings 42010, 42011, 42015, and 42039, and the pads that surround them. We recommend the

Navy and other decision makers combine AOC 6, Subarea 1, AOC 2, Subarea 2, and AOC 4, Subareas 1, 2, 3, 4, and 5 into one AOC for all future activities due to the similar nature of detected constituents, and overlapping nature of these AOCs. Further action at this site completely depends on further usage. Currently soils that present a risk are below former building pads, and are not available for contact with either human or ecological receptors. Should these pads be removed during construction at a later date, the pathways for contact would be complete. The Navy should discuss future actions with all stakeholders at this facility to determine whether leaving the pads in place is a realistic long term scenario. If leaving the pads in place in the future is not a reasonable scenario, then further action should include removal of the pads and soil/rock material below that would case a risk to human health and the environment. Any removal action in this area should be cognizant of a natural geologic feature, the peridotite/pyroxenite igneous dike, that is observed east of former Building 42015, which could be a significant natural source of metals.

AOC (Objective) 7. The surface loess should be collected and removed from AOC (Objective) 7. Surface soil exposed near former Building 42116 (which housed transformers) at AOC (Objective) 7 should be sampled for metals and PCB, and removed if necessary. Several subsurface soil samples and passive soil vapor results suggest that a release may have occurred. The Navy should consider further delineation of VOCs and focused delineation of metals near bore holes 1 and 2 in Subarea 2, and hot spot removal of soils if further contamination if found in this area.

AOC (Objective) 8. In groundwater (AOC (Objective) 8), the low concentrations of trichloroethene do potentially represent a risk to human receptors. Further, given the possibility that a source for TCE could exist in fractures above the groundwater elevation as sampled during the SI, some groundwater monitoring should be considered to determine if a seasonal release does occur. Any monitoring program should include at least one event where samples are collected from the reservoir in areas surrounding the peninsula and water upstream and downstream of Morris Reservoir.

AOC (Objective) 9. Decisions for further action for AOC (Objective) 9 sediments should be postponed until additional data can be collected. These data were examined by Brown and Caldwell staff and Navy Quality Assurance personnel for their applicability, and found to not have supporting documentation that could meet all Navy guidelines for quality assurance and data validation. The Navy will consider validating the existing data to level III, and additional sediment sampling that will be sufficient to provide level IV data validation for satisfying overall Navy requirements. The Navy has conducted previous sediment sampling investigation (Law Crandall, 1993), and the sediment sampling that occurred during the SI. Neither of these samplings suggests that a release has occurred at this AOC (Objective). However, a full evaluation of all existing data should provide stronger conclusions regarding any impacts to human or ecological receptors.

The risk screening for AOC (Objective) 9 only evaluated the sediments with respect to human health screening criteria. No potential risk to human health was found. No risk screening values

for ecological receptors have been developed for this site, so no ecological risk screening was performed. Hence, additional ecological risk screening is necessary.

AOC (Objective) 10. Results from risk screening indicate potential risk to human health is below target risk cancer level of $1x10^{-6}$, and target non-cancer hazard index of 1. No further action is recommended for soils at AOC (Objectives) 10.

AOC (Objective) 11. Results from risk screening indicate potential risk to human health is below target risk cancer level of $1x10^{-6}$, and target non-cancer hazard index of 1 No further action is recommended for soils at AOC (Objectives) 11.

AOC (Objective) 12. No action is necessary for Background Area 1 (Objective 12) under any circumstances, since this area (Objective) targeted defining ambient conditions.

AOC (Objective) 13. No action is necessary for Background Area 2 (Objective 13) under any circumstances, since this area (Objective) targeted defining ambient conditions.

Table ES-1. Comparison of Different Data Sources

Metal	Concentration Range Observed in Site Soil Samples (mg/kg)	Statistical Ambient Concentration Limit (mg/kg)	Maximum Concentation in Rock (mg/kg)
Aluminum	950 - 43,000	22,729	41,400
Antimony	10 U - 36	10	9.53
Arsenic	1 4 - 270	32	14 7
Barium	10 - 450	263	1,770
Beryllium	0.11 - 1 5	1.3	1.43
Cadmium	0.1 U - 2 9	0.41	0.502 U
Chromium	2 0 - 750	46	967
Hex. Chromium	0.022 - 8.11	0 94	0.702
Cobalt	4.0 - 100	23	94 6
Copper	5.2 - 840	55	263
Iron	5,900 - 63,000	N/C	
Lead	1.3 - 2800	64	24.8
Lithium	5 U - 250	22	84.5
Manganese	93 - 1300	1,172	1,760
Mercury	0.1 U - 7.6	0.10	0 166
Molybdenum	2 U - 20	3.2	11.4
Nickel	4.0 - 930	63	820
Selenium	0.4 U - 57	33	105
Silver	1 U - 270	1 0	2.01 U
Thallium	0.3 U - 0.44	0.30	2 01 U
Vanadium	4 U - 110	122	94
Zinc	5.5 - 1100	125	252

N/C = Not calculated

1.0
INTRODUCTION

This report presents the results of a Site Inspection (SI) conducted at the Department of Navy (DON), Naval Command Control and Ocean Surveillance Center (NCCOSC) Research, Development, Testing and Evaluation (RDT&E) Division, Morris Dam Research and Development (R&D) facility. The project site is located on a peninsula extending into Morris Reservoir north of Azusa, Los Angeles County, California (Figure 1-1). The NCCOSC, RDT&E Division operated the Morris Dam R&D facility from approximately 1943 to 1993. Its primary mission was to test and evaluate DON torpedoes. Research conducted at the facility included studies of torpedo water surface impact and torpedo propulsion systems

DON leased the Morris Dam property from the Metropolitan Water District of Southern California (MWD) from 1939 through 1993. DON has demolished the facility and is in the process of transferring the land back to MWD. Ultimately, it is MWD's intention to transfer the land to the Los Angeles County Department of Public Works (LACDPW) to support operation of Morris and San Gabriel Reservoirs. As part of this land transfer, DON is conducting an investigation to determine whether its activities left conditions that would pose a risk to human health and the environment. This report presents the results of that investigation.

This SI Report was developed by Brown and Caldwell (BC) under Delivery Order 0015, issued 16 January 1997 by DON, Naval Facilities Engineering Command, Southwest Division (SWDIV) under Contract N68711-95-D-7531. The work documented herein has been completed in accordance with Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) guidance as prepared and disseminated by the United States Environmental Protection Agency (EPA). California Environmental Protection Agency Department of Toxic Substances Control guidance, DON policies, and standard environmental investigations practices have also been followed. Guidance documents followed as during preparation of this report include, but are not limited to, EPA (1989a, 1989b, 1992, and 1996), DTSC (1994, 1996, and 1997), and Department of Navy (SWDIV, 1997). The Morris Dam R&D facility is not included under the purview of CERCLA, but the property lease requires that a Preliminary Assessment/Site Inspection (PA/SI) be performed (as described in CERCLA guidance documents) prior to transfer back to MWD

1.1 SCOPE AND OBJECTIVE OF SITE INSPECTION

The primary objective of the SI is to investigate potential environmental impairments in areas identified from the revised Preliminary Assessment, and to determine whether remedial actions are necessary prior to property transfer from DON to MWD. The scope of this report is as follows:

- Present and describe SI data collection activities consistent with the approved Work Plan (Brown and Caldwell, 1997) and Work Plan Addendum (Brown and Caldwell, 2000).

- Evaluate SI results to identify chemicals of potential concern (COPC) and the risks these chemicals may pose to human health.
- Determine if biological receptors exist near the site along with the extent to which complete exposure pathways exist for these receptors.
- Recommend further actions to facilitate return of the leased property to MWD.

Organization and content of the report are discussed in more detail in Section 1.3 below.

1.2 REGULATORY INVOLVEMENT

As described in more detail in Section 2.0, DON has leased the subject property from MWD for over 50 years. No title transfer is associated with the lease termination. However, as part of the lease agreement, DON is required to perform a Preliminary Assessment and Site Inspection before releasing the property back to MWD. The Preliminary Assessment has already been completed (Brown and Caldwell, 1995).

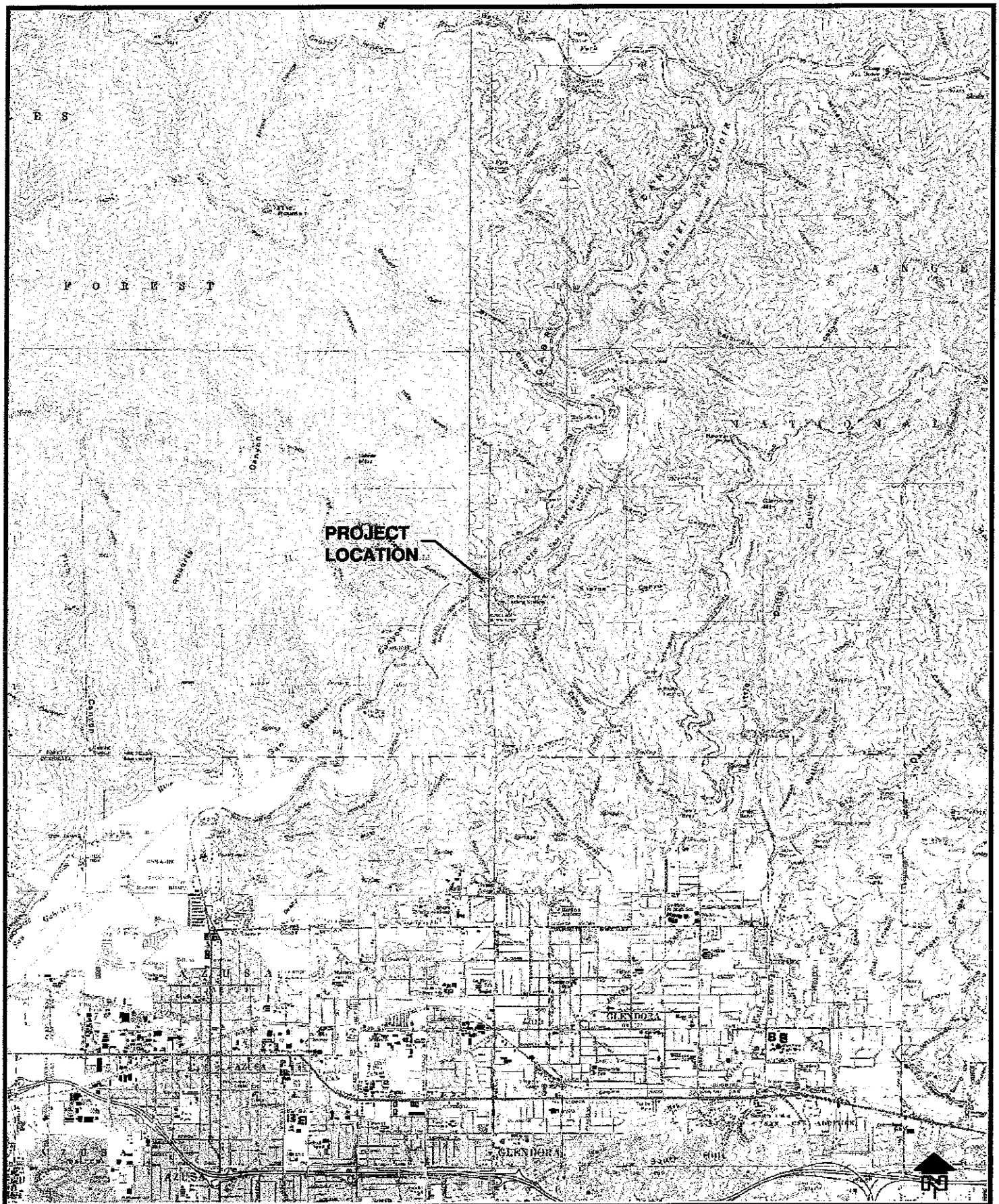
The California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) is involved in the project as the representative of the State of California and to provide third-party evaluation of the completeness and adequacy of the SI.

1.3 REPORT ORGANIZATION

This report is organized to provide a historical perspective for the site followed by a discussion of the environments that could be impaired by releases of site-related chemicals. Data obtained from the field investigation and laboratory analysis is presented and evaluated. A summary of each section of the report follows:

The Executive Summary presents an overview of the project, the results obtained by sampling activities and data evaluation, and conclusions and recommendations. Section 1.0 introduces the project along with the goals and objectives of the SI. Section 2.0 discusses the site and its history, and critically evaluates data collected during previous environmental investigations conducted at the Morris Dam R&D facility since the 1980s. This section also discusses the current and future potential land uses of the site. Section 2.0 concludes by presenting an overview of the SI and discussing the rationale for sampling locations. Section 3.0 presents the environmental setting of the site, examining topography, meteorology, geology, and surface water hydrology and groundwater hydrogeology. All of this information is essential to an understanding of the pathways by which chemicals could migrate to places where human or ecological exposure could occur. Section 4.0 summarizes and discusses the data collected during SI field activities and the quality of the data obtained from these efforts. Section 5.0 presents a conceptual model and results of the scoping assessment, and the rationale for determining chemicals of potential concern (COPCs). Section 6.0 presents an Area of Concern (AOC) by AOC risk screening with any COPCs. Section 7.0 presents conclusions and recommendations for further action at the site. Section 8.0 lists references cited in the report.

Supporting information is contained in twelve appendices. The first ten of these appendices are included in the first two volumes of the report. These first ten appendices include a determination of ambient metals concentrations, a discussion of the specific sampling methods employed as part of the investigation, boring logs from drilling activities, the report from the geophysical investigation of the former leach field, condensed analytical data tables, a data quality assessment, survey data, grain size analyses results, mineralogical analysis data results, and photographs from rock outcrop sampling locations. Two other appendices, data validation reports and the raw analytical reports, have been included in volumes 3 through 19.



DATE	PROJECT NUMBER
FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

GENERAL VICINITY MAP

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

0 2500 5000
SCALE IN FEET

FIGURE 1-1

LAF 14796038.DWG

2.0
SITE DESCRIPTION AND HISTORY

This section discusses the location and operating history of the NCCOSC RDT&E Morris Dam R&D facility.

2.1 LOCATION

Morris Reservoir is located in the foothills of the San Gabriel Mountains, approximately 5 miles north of the City of Azusa, in Los Angeles County, California (Figure 1-1). The Reservoir is situated along the east side of California State Highway 39 in the Angeles National Forest (Figure 2-1). The NCCOSC RDT&E Morris Dam R&D facility (Morris Dam R&D facility) was located on a western shoreline peninsula of Morris Reservoir.

2.2 FACILITY HISTORY

Morris Dam was constructed in the early 1930s and is currently owned by MWD. MWD also owns the land surrounding the Reservoir, as well as the majority of the land the NCCOSC facility occupies. The United States Forest Service owns a small portion of land at the northwestern part of the facility (near the entrance).

DON constructed the 20-acre Morris Dam R&D facility in 1943. On October 1, 1945, DON entered into a lease with MWD, and this agreement was renewed on July 1, 1968. Navy operations at the facility ceased in June 1993. The historical facility layout is shown in Figure 2-2. Demolition of all buildings and structures was conducted during 1997. Currently, only concrete building pads remain.

The Morris Dam R&D facility was designed and initially operated for DON by the California Institute of Technology (Caltech). Caltech operated the facility from 1943 to 1950 as an annex of Naval Weapons Station, China Lake. During the 1940s, the primary research conducted on-site focused on identifying the hydrodynamic properties of torpedoes and developing a sonar system for detecting underwater objects. Caltech performed no propulsion system studies, and no fuels were used in this research.

Caltech turned over the entire operation to the Navy by 1950. The Morris Dam R&D facility subsequently was used primarily for testing torpedo performance. Field testing procedures consisted of launching torpedoes into the Reservoir to evaluate entry into water. These tests were conducted in four separate locations:

- The Fixed Angle Launcher (FAL) was used to test torpedoes in the mid-1940s. The FAL consisted of a concrete channel directed toward the north end of the Reservoir at a 19-degree angle.
- The Variable Angle Launcher (VAL), Building 42119, was used for testing large caliber projectiles. The VAL is 300-foot long tube formerly supported by pontoons

and directed toward the south end of the Reservoir (the pontoons were later removed to accommodate a drop in water level resulting from the draining of the Reservoir by the MWD). Torpedoes were launched through the VAL into the water at angles varying from 3 to 38 degrees from horizontal. The VAL could also vary the impact of the torpedoes by changing the thrust and hence the speed of entry. A bridge, a crane, and several buildings housing photographic equipment were also constructed to support VAL testing.

- The Small Caliber Ballistic Range, including the Slingshot Facility, was used to observe projectile entry into the water and behavior under the water. The Slingshot Facility was located at the southeast corner of the Reservoir, near the north side of Morris Dam.
- The Air Drop Range, marked by buoys on the water surface, was used in testing torpedoes dropped by helicopters. The Air Drop Range was located northeast of the Slingshot facility.

The Slingshot Facility and Air Drop Range were dismantled in the mid-1970s. Field testing of torpedoes in the Reservoir terminated in the early 1980s.

An early Preliminary Assessment (Vogel, 1988) mentions that Los Alamos National Laboratory (LANL) used the Morris Dam R&D facility for weapons testing in the 1960s and 1970s. No further information regarding the time and extent of LANL involvement has been determined during this SI.

Due to the nature of the testing being performed, chemicals (e.g., solvents, etc.) were not used at the Slingshot Facility and Air Drop Range. However, fuels (e.g., gasoline or diesel) and oil/grease were used at the Slingshot Facility. Additionally, there was equipment on-shore for testing torpedo propellant systems. Other fuels, (such as Otto fuel, and a mixture of lithium and sulfur hexafluoride), solvents, oils and other chemicals, were used in the on-shore testing equipment. A detailed discussion of the chemicals used at the facility is presented in Section 2.4.

The Morris Dam R&D facility underwent periodic construction and modification during its existence. Many of the construction projects required fill material to prepare and level ground for new buildings. Areas that have had appreciable fill added include the upper portion of the peninsula below Buildings 42001 and 42002, and the middle of the peninsula near the flat surface surrounding Building 42116. Lower portions of the peninsula that received appreciable fill include the areas below Buildings 42010, 42013, 42011, 42015, 42016, and 42018 (Figure 2-2). Fill also was used below the former gas station (Building 42003) and Buildings 42005, and 42018. Reportedly (personal communication, Mr. David Willis, 1997), no imported fill was used for these construction projects. Instead, all fill was obtained by excavating and removing material from the cliffs behind where Building 42029 existed. This material was stockpiled temporarily in the middle of the peninsula where Building 42116 was eventually located, and then moved to locations where fill was needed as construction progressed. After most construction was finished, the remaining fill was pushed out and around to form the pad surrounding Building 42116.

2.3 DESCRIPTION OF FACILITY OPERATIONS

As noted previously, Caltech and DON utilized the Morris Dam R&D facility from approximately 1943 to 1993 to test torpedo systems. Generally, two primary operations occurred at the facility: 1) field testing of torpedo impacts on the water surface, and 2) laboratory testing of torpedo propulsion systems.

2.3.1 Torpedo Impact Studies

The MCA-46 Torpedo Project was conducted at the Morris Dam R&D facility. Various tests were performed to study the trajectory of the torpedoes upon entering the water. The fuel compartment of the torpedoes was filled with water during field testing (the physical properties of water resemble Otto fuel, which was used for conventional torpedoes). The torpedoes were launched from the VAL using compressed air. Lead shot was sometimes used as ballast in the torpedoes during firing and may be present in a small area (approximately 50 by 50 feet) adjacent to the VAL on the Reservoir bank below the current water line. Video cameras were situated above and adjacent to the VAL to record torpedo entry into the Reservoir. While the Reservoir was drained in 1990, mock torpedoes constructed of concrete and an empty torpedo shell were found in the sediment.

Hydrazine was used during torpedo testing. Upon entry into the water, bags attached to the torpedo would inflate with hydrazine, thereby raising it to the surface. The torpedo reportedly would then be recovered. Hydrazine is considered hazardous to human beings and is a carcinogen, according to the National Institute for Occupational Safety and Health (NIOSH). According to NCCOSC, RDT&E Division personnel, the use of hydrazine was infrequent (lasting about one year), and was discontinued when field testing of torpedoes was terminated in 1969. No information regarding spills or releases of hydrazine was available at the time of this SI.

Tests to simulate submarine torpedo launchings were conducted in the 1950s. A "pop-up device" was anchored to the bottom of the Reservoir and torpedoes were fired in an upward direction using compressed air. The location of these tests has not been positively identified to date, although, to the best of DONs' knowledge, these tests were conducted north of the peninsula and south of the helopad

The Slingshot Facility was located on pontoons in the southwest portion of the Reservoir, near Morris Dam. This facility was used to model airdrops, and photograph and observe torpedo entry into the water. Torpedoes were fired into the water using elastic cords to exert thrust. A large net was used to retrieve the torpedoes. No explosives, chemicals or engines were incorporated into the torpedoes tested.

2.3.2 Torpedo Propulsion System Studies

Torpedo propulsion systems also were tested at the Morris Dam R&D facility. Compounds tested for torpedo propulsion included Otto fuel and a mixture of lithium and sulfur hexafluoride. Otto

fuel is composed of propylene glycol dinitrate, dibutyl sebecate and nitrophenylamine. According to NCCOSC, RDT&E Division personnel, Otto fuel was used in testing from the early 1960s until the facility ceased operation in June 1993, and lithium and sulfur hexafluoride were used from 1988 until 1993.

Otto fuel propulsion testing was conducted in Building 42011 and Building 42028 until 1985, and in Building 42015 until the facility ceased operation. During testing, the combustion chamber filled with Otto fuel was ignited. The condition of ignition was observed and recorded by high-speed cameras, and instrument load cells measured the engine propulsion.

Lithium and sulfur hexafluoride propulsion testing was conducted in Building 42015 beginning in 1988 (concurrently with Otto fuel testing). Sulfur hexafluoride was mixed in the boiler with solid lithium to initiate a combustion reaction. During combustion, the water in the boiler was converted to steam used to propel the torpedo.

2.3.3 Slurry Testing

The Morris Dam R&D facility also tested slurry mixtures to reduce torpedo surface resistance upon entering the water. Two types of slurry compounds were tested. The first type was manufactured at the facility; this operation ceased in 1973. An East Coast Navy laboratory supplied the second type of slurry compound. The composition of these slurries is presented in Section 2.4.3.

Several buildings were used for slurry testing. Slurry was diluted in the tank adjacent to Building 42027 and piped to Building 42029, where the majority of the tests were conducted. According to NCCOSC, RDT&E Division personnel, the used slurry was diluted extensively with water prior to discharge into the Reservoir. Diluted slurry was disposed either by spraying it from a tower located next to Building 42029 (until the 1970s), or by discharging it to the bottom of the Reservoir through an outfall (these practices reportedly occurred from the early 1970s to August 1991). Construction details of the outfall pipe are not available, but the location and extent of the outfall pipe is documented in the Sediment Investigation Report (LACDPW, 1995). This report is discussed further in Section 2.5.

2.4 WASTE GENERATION ACTIVITIES

The following subsections discuss the different waste generation activities that occurred at the Morris Dam R&D facility. An inventory of hazardous materials stored at the facility is presented in Appendix C of the Revised Preliminary Assessment (PA) (Brown and Caldwell, 1995).

2.4.1 Otto Fuel Waste

Otto fuel was used exclusively in Building 42011, Building 42015, and Building 42028. It was stored in 55-gallon drums north of Building 42005. These drums were secured on a covered, elevated platform surrounded by a catch basin.

Prior to 1977, liquid Otto fuel waste was stored in a concrete sump located southeast of Building 42015. An overflow of Otto fuel waste could have occurred during testing and cleaning procedures. Heavy rainfall could have caused an overflow, resulting in the Otto fuel wastes spilling onto the Reservoir bank east of Building 42015. However, no information regarding this type of incident has been recovered.

During and after 1977, facility personnel began exercising precautionary measures when handling Otto fuel (for example, steam cleaning Building 42015 after tests were completed). Waste Otto fuel and exhaust residues (mainly water) were washed off the sides of the enclosure walls and concrete floors, with wash water directed into the concrete sump southeast of the building. Between 1977 and 1985, the Otto fuel waste was pumped into a 500-gallon holding tank, and manually transferred to a 4,000-gallon above ground tank located west of Building 42015. In 1985, the 4,000-gallon above ground tank was replaced with a 5,000-gallon above ground tank. In 1988, a sump pump was used to transfer the Otto fuel waste directly to the 5,000-gallon tank.

The 5,000-gallon aboveground tank ("old tank") was relocated to an area west of Building 42029 in 1988, and a new 5,000-gallon aboveground tank ("new tank") was installed in its place west of Building 42015. Waste Otto fuel was then transported to the relocated "old tank". The "new tank" was used to store waste lithium fuel (see Subsection 4.3.2 below). Both tanks were double-walled and bermed for containment purposes.

A thorough cleaning procedure was followed when removing the remaining Otto fuel and residue from a test torpedo. This cleaning was conducted in Building 42038. The Otto fuel wastes generated in Building 42038 were contained within the building.

Otto fuel spills were cleaned using detergent and rags. These rags constitute the second type of Otto fuel waste. Liquid detergent was determined to be the most effective cleaner for Otto fuel spills. Rags soaked in the detergent-treated spilled Otto fuel, as well as any personnel clothing or other disposable items, were stored in 55-gallon drums located north of Building 42005. This procedure was followed from 1977 until the facility ceased operations in 1993.

Otto fuel wastes stored in the 5,000-gallon tank were periodically transported off-site. A contractor working for the Naval Undersea Warfare Engineering Station (NUWES), Keyport, Washington periodically removed the 55-gallon drums from the site.

2.4.2 Lithium and Sulfur Hexafluoride Waste

Lithium compound propulsion testing began in 1988. Lithium was stored in sealed canisters in a shack west of Building 42029. The mixing of lithium and sulfur hexafluoride was conducted in Building 42013, Building 42015, and Building 42028. However, propulsion system testing was conducted in Building 42015 only.

The lithium was handled very carefully due to its propensity to react violently with moisture. Building 42013 was used to load the lithium compound into the boiler. The boiler was then moved

to Building 42015 where propulsion system testing was conducted. Residue from a tested boiler was mixed with a solution of ethylene glycol and held until the lithium was no longer reactive. The deactivation process was performed in an isolated room in Building 42028, and took from two days to two weeks. Some boilers were transported to NUWES, Keyport, Washington for analysis of structural integrity. Most boilers were moved to the concrete pad outside of Building 42015 and steam-cleaned following lithium deactivation. The contaminated water was contained in the concrete sump south of Building 42015 and pumped into the new 5,000-gallon tank described in Section 2.4.1.

No spills or accidents involving lithium and sulfur hexafluoride have been recorded at the Morris Dam R&D facility. The annual amount of lithium waste generated was approximately 2,500 gallons. Environmental Dynamics, a disposal contractor, periodically removed the lithium waste from the site.

2.4.3 Slurry Mixtures

Two types of slurry were tested at the Morris Dam R&D facility in Building 42029:

- Prior to 1973, the facility manufactured a slurry mixture which was composed of such chemicals as "Calgon", "Bentone", polyglycol P400, propylene carbonate, and polyacrylamide. "Calgon" is sodium hexametaphosphate. Bentone is a commercial product of bentonite, which is a natural clay. The Material Safety Data Sheets (MSDS) for polygycol P400 and propylene carbonate were presented in the Revised PA (Brown and Caldwell, 1995). Data regarding polyacrylamide were searched through the USEPA Integrated Risk Information System (IRIS), USEPA Health Effects Assessment Summary Tables (HEAST), Hazardous Substance Data Base (HSDB), and Tomes Plus™ Information Systems. The revised PA contains printouts from those systems that contained information regarding these chemicals.
- The Naval Research Laboratory located in Washington, D.C. manufactured another type of slurry used on-site, which included polyethylene oxide, in addition to the compounds listed above. The data regarding polyethylene oxide were searched through the IRIS, HEAST, HSDB, and Tomes Plus™ Information Systems. The data search results from those systems that contained information regarding this chemical are presented in the revised PA.

According to NCCOSC, RDT&E Division personnel, approximately 150 gallons of slurry were used annually at the facility prior to 1991. Discharge of spent slurry to the Reservoir was terminated in November 1991. Slurry samples were analyzed by an independent laboratory in May/June 1994. These results are presented in the Revised PA (Brown and Caldwell, 1995).

2.4.4 Solvents, Waste Oils, Paints and Drum Storage

Solvents were used to clean the torpedo combustion chambers. This cleaning process occurred exclusively in Buildings 42015 and 42038. In the early 1960s, Stoddard Solvent (NIOSH #WJ8925000) was used to clean the torpedoes following each test. The use of this chemical was terminated due to its hazardous nature. Agitene replaced Stoddard Solvent. The MSDS for agitene is presented in the Revised PA (Brown and Caldwell, 1995). The annual usage of agitene at the facility was approximately 80 gallons. The solvents were also used to clean engine parts and may have been contaminated with Otto fuel. Solvent used for torpedo cleaning and engine parts was kept within the cleaning device located in Building 42038. Solvents were removed directly from the cleaning device approximately once a quarter and replenished by the company that owned the device and manufactured the solvent (Dave Willis, 2001). No manifests have been found relating to this activity.

Waste oil was generated from various vehicles and engines used at the facility. Vehicles visiting the service station may have left the minor stains observed on the concrete pavement during a site visit in 1991 (Jacobs, 1991). Small-quantity gasoline and diesel spills were reported during the operation of the service station. The service station underground storage tanks (USTs) have been removed (see Section 2.5 for a discussion of the tank removal process).

The facility maintained a small inventory of paints, which were used for minor painting or touch-up jobs. Paints and solvents were stored in their original containers in several buildings at the facility. Paint and solvent wastes generated during operation were stored in 55-gallon drums and disposed by the NCCOSC, RDT&E Division [formerly Naval Ocean Systems Center (NOSC)] contractor or by the Navy Public Works Center.

A small drum storage area was maintained at the service station. According to NCCOSC, RTD&E Division personnel, stained soil was noticed in the vicinity of the drum storage area prior to construction of the containment structure.

2.5 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Several environmental assessments have been performed at the Morris Dam R&D facility over the past ten years. The following paragraphs summarize the results of these investigations. Figure 2-2 shows the locations of past sampling activities.

<u>Preliminary Assessment Report NOSC Morris Dam Facility, Naval Energy and Environment Support Activity (NEESA), March 1988</u>

This report (NEESA, 1988) is the first documented environmental investigation of the Morris Dam R&D facility. The PA was performed primarily to investigate a hydraulic oil spill area adjacent to the VAL. The PA report included background and historical information regarding the physical characteristics of the surrounding area, the activities that occurred as part of the mission, and waste generation and disposal. A Hazard Ranking Score of 7.31 was calculated for the stained area, which indicates the site did not contain adequate hazard for ranking on the CERCLA National Priority

List. The study recommended that a site inspection be performed to sample the stained soil near the VAL, and that sediment samples be collected from areas where the facility storm drain discharged into the Reservoir. No samples were collected during this investigation.

NOSC Morris Dam Preliminary Assessment, Jacobs/IT Corp., November 11, 1991

A second PA was performed in 1991 (Jacobs, 1991) with the objectives of determining whether a release or threatened release of hazardous substances existed at the Morris Dam R&D facility; the relative threat to the public health and the environment, and what further action(s), if any, were necessary. This PA provided more background and historical information, which was derived from four sources: review of historical aerial photographs, personnel interviews, research and review of available documents, and a site inspection. The report concluded that the aerial photographs did not provide definitive information regarding the handling of hazardous materials and waste, but suggested that the facility was a small-quantity generator.

NCCOSC Morris Dam Site Inspection Report, Jacobs/IT, March 10, 1992

A site inspection was conducted in 1991 and 1992 (Jacobs, 1992) to investigate potentially impacted areas highlighted in the 1991 PA. This inspection included the hydraulic oil spill, which occurred near the VAL and downslope of several outfalls, and Building 42015. Twenty-three soil samples were collected in and around the hydraulic oil spill area (including two background locations), and one soil sample was collected from each of four downslope-sampling locations. Figure 2-3 shows the location of these samples. All soil samples were analyzed for volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), polychlorinated biphenyls (PCBs), pesticides, and inorganic substances (metals and fluoride). Lithium (one location), hexavalent chromium (one sample), and organic lead (two locations) also were investigated at the downslope areas.

Table 2-1 summarizes the analytical results of this investigation, which showed detection of all analytes except hexavalent chromium. The hydraulic spill area exhibited detected concentrations of VOCs, SVOCs, pesticides/PCB, and metals. Several analytes detected in this area exceeded the screening criteria used in the report, including N-nitrosodiphenylamine and bis (2-ethylhexyl) phthalate, several PCB isomers and pesticides, and lead. Very low concentrations of VOCs were detected in the downslope sampling locations, along with several SVOCs (primarily polynuclear aromatic hydrocarbons), and lead. Most of the contaminants were below the benchmark concentrations used as screening criteria, with the exception of lead. The report concluded that no serious threat to human health or the environment existed due to the detected VOCs, SVOCs, or PCBs/pesticides. However, the report also concluded that lead concentrations detected at the hydraulic spill area, and in two of the downslope locations, were a health and environmental concern, and recommended that further sampling be conducted in these locations. As discussed below, an immediate removal action was performed to remediate soils in the hydraulic spill area.

NCCOSC Morris Dam Site Inspection, RWQCB, August 1991

The California Regional Water Quality Control Board, Los Angeles Region (RWQCB), conducted this inspection on August 14, 1991 as part of the Well Investigation Programs. It focused on

identifying past and present methods for handling chemicals and wastes at the site. A letter regarding this inspection summarizes the information provided, observations noted during the visit, and discusses items that should be addressed during an initial subsurface investigation. No sampling was conducted as part of the RWQCB inspection.

NOSC Morris Dam Activity, Azusa, CA, Emergency Removal Report, Jacobs/IT, April 12, 1993

This report (Jacobs, 1993) documents an emergency removal of soil from the hydraulic spill area adjacent to the VAL. The primary objective of this action was to remove soil contaminated with lead. Soil was removed using progressive and sequential excavation and analysis. Analysis of the soil after removal indicated that the lead concentration was reduced to approximately 14 milligrams per kilogram (mg/kg). Figure 2-4 and Table 2-2 show the verification sampling locations and summarize the verification sampling analytical data, respectively. The removed soil was transported to a permitted facility where it was treated and landfilled. The report recommended site closure.

USACE and LACDPW, EIS/EIR for San Gabriel Canyon Sediment Management Plan, August 1994

The objective of this report (USACE, 1994) was to present the environmental consequences of maintenance and major cleanouts of the three Reservoirs in San Gabriel Canyon (Morris, San Gabriel, and Cogswell Reservoirs). The report presents extensive background information that is used throughout this SI report.

Sediment Sampling Report, Law/Crandall, Inc., 1993

Sediment sampling was conducted (Law/Crandall, 1993) near the former outfalls of Building 42015 and Building 42029 to major Reservoir. Twelve locations were sampled approximately 15 feet offshore at depths of 0 and 2 feet below the Reservoir bottom using an electronic vibracore system. Figure 2-2 shows the approximate location of this sampling. Samples were analyzed for VOCs, SVOCs, polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (PCDD/PCDF), metals, pesticides/PCBs, phenolics, cyanide and asbestos.

Table 2-3 summarizes the results of this investigation. As observed in the table, no PCDD/ PCDF, pesticides, phenolics, cyanide or asbestos was detected. Two VOCs were detected (methylene chloride, acetone), but these were attributed to laboratory contamination. PCBs were detected in two samples at concentrations at or below the EPA Region IX Preliminary Remediation Goals (PRGs). One polynuclear aromatic compound was detected (benzo [g,h,i] perylene) at a concentration approximately twice the detection limit. Several metals were detected. All of the detected metals concentrations were below the EPA Region IX residential PRGs, with the exception of arsenic, which was below the non-cancer endpoint PRG but above the cancer endpoint PRG.

The data gathered from this sampling effort was reviewed to determine its adequacy for use in this SI. SWDIV and BC examined data reports and quality assurance/quality control sample results as part of this review. It was concluded that the data are of sufficient quality, but have not been properly validated. As a result, SWDIV and BC determined that for current purposes the data could

be used for qualitative comparison, but could not be used in a quantitative risk evaluation. The Navy has decided, so that this data may be used for risk calculations during later portions of evaluation, that level III data validation will be conducted on those data with sufficient backup information in the laboratory tests, and that additional samples will be collected to complete Navy requirements for Level IV data validation for the overall data set.

Report on the Removal of Seven USTs Located at NCCOSC RDT&E Division Morris Dam Facility, Azusa, CA, T.G. Hulett & Associates, January 13, 1994

This report (Hulett and Assoc., 1994) discusses the removal of seven steel USTs located at the Morris Dam facility. Five diesel and two unleaded gasoline storage tanks (each with a 1,250-gallon capacity) were removed. Figure 2-2 shows the location of these removals. The tanks reportedly were intact when removed. Seventeen soil samples were collected and analyzed for total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylene isomers (BTEX). Two soil samples were collected from three feet below the bottom of each excavation (approximately 10 feet below grade, or bg), and three samples were collected from the soil stockpiles. No TPH or BTEX compounds were detected. No groundwater was encountered during the tank removal. The excavations were backfilled with clean imported fill material. The report recommended that no further action was necessary near the tanks. Site closure for the USTs was obtained from the RWQCB in 1994.

Phase I Environmental Site Assessment for Morris Reservoir, LA County, CA, Woodward-Clyde Consultants for LACDPW, February 15, 1994

This report (WWC, 1994) describes the results from a Phase I Environmental Site Assessment (ESA) conducted for Morris Reservoir. The purpose was to evaluate whether hazardous materials were present in sediment or in the surrounding soil or groundwater as a result of activities on or nearby the Reservoir. This investigation was primarily conducted to gather information that would be used to evaluate options for removing sediment accumulating in the Reservoir bottom.

The report presents a historical review, an aerial photograph review, and the results from the site reconnaissance. No sampling was conducted. The report concluded that there were indications that potential hazardous material releases had occurred which may have impacted the Morris Reservoir sediments. In addition, the conclusions concur with a RWQCB document (described previously) that requested soil sampling be performed beneath the concrete floor and five feet bg in Building 42015 and Building 42038. The report recommends that the sanitary sewer system be investigated, and that sediment sampling be performed in the Reservoir.

Revised Preliminary Assessment for NCCOSC RDT&E Division Morris Dam, Azusa, CA, February 1995

The Revised PA (Brown and Caldwell, 1995) was conducted to update the 1991 PA discussed previously. The Revised PA added discussions regarding the emergency soil removal conducted at the hydraulic spill area and several miscellaneous sampling events. No sampling was conducted as part of the revision to the PA. The Revised PA also discussed the results of an ESA conducted by MWD. This document, which provides much of the basis for this SI, concluded that several areas at

the site required further investigation. Recommendation for additional work included the following items:

- Examination of the sediment sampling data from a survey conducted by MWD.
- Collection of soil samples from beneath the floors of Building 42011, Building 42015, and Building 42038.
- Collection of soil samples from under the concrete containment area at the gasoline station.
- Collection of soil samples from beneath the aboveground storage tank area to confirm that no spills have occurred.
- Further investigation of the sumps at Building 42010, Building 42015, and Building 42038, including soil sampling, both underneath the sumps and at discharge areas.
- Collection of soil samples downslope of outfall locations BU and OF2.
- Examination of concrete oil-water separators in Building 42001 and Building 42010, and, if appropriate, collection of soil samples from near, and potentially under, these structures.
- Investigation of the sanitary sewer system using a variety of techniques to determine whether chemicals have impacted groundwater, including such potential activities as a geophysical survey near the septic tank/leach fields, and soil sampling near areas where potential releases may have occurred.

Morris Reservoir Sediment Investigation, Los Angeles, CA, Interpretive Report for County of Los Angeles Department of Public Works and Metropolitan Water District of Southern California, March 1995

A sampling program (1995) was conducted to document sediment characteristics in support of a planned sluicing program by LACDPW and to expedite transfer of the reservoir from the MWD to LACDPW. The field sampling plan designated eight areas in the reservoir and surrounding shoreline areas with a "greater than average potential for contamination in the sediments".

Sampling activities concentrated on 65 locations on the Morris Reservoir property. Figures 2-5 and 2-6 exhibit the locations for the sediment samples. The locations included 61 locations in Morris Reservoir, and four locations within the stream channel at the base of Morris Dam. A total of 225 samples were collected at the 65 locations. Samples were analyzed for the following parameters:

- Total Recoverable Petroleum Hydrocarbons (TRPH)
- VOCs
- SVOCS
- Pesticides/PCBs
- Nitrosamines

- Explosive Residues
- Metals

There were no pesticides, PCBs, nitrosamines, or explosive residues reported from laboratory analytical results during the sediment sampling program conducted by LACDPW and MWD. However, TRPH was detected in five of the 216 samples at concentrations ranging from 8 to 18 mg/kg wet weight, or 10 to 30 mg/kg dry weight. TRPH concentrations were below the detection limit in samples collected in the stream channel below Morris Dam.

VOCs were detected in six samples. Detected VOCs included toluene, acetone, and methylene chloride. SVOCs, including bis (2-ethylhexyl) phthalate, phenanthrene, pyrene, and fluoranthene, were detected in one sample.

Metals were detected in reservoir sediments. Concentrations of the metals varied considerably, but were compared with background concentrations. For most metals, the highest detected concentrations were similar to background concentrations.

The data gathered from the MWD/LACDPW sampling effort was reviewed to determine its adequacy for use in this SI. The Navy examined data reports and quality assurance/quality control sample results as part of this review. It was concluded that the data are of sufficient quality, but have not been properly validated. As a result, the Navy determined that the data could be used for qualitative comparison, but could not be used in a quantitative risk evaluation. The Navy has decided, so that this data may be used for risk calculations during later portions of evaluation, that level III data validation will be conducted on those data with sufficient backup information in the laboratory tests, and that additional samples will be collected to complete Navy requirements for Level IV data validation for the overall data set.

Miscellaneous Sampling

Miscellaneous small-scale sampling, not a part of the above-reported investigations, has occurred throughout the history of the Morris Dam R&D facility. Results of these investigations are included in the revised PA (Brown and Caldwell, 1995), and are summarized below:

- Water in the lead-lined pontoons that helped support the VAL was sampled prior to decommissioning. This water contained lead, and therefore was manifested to a disposal permitted facility.
- The slurry used during torpedo propulsion testing was analyzed to determine whether it should be considered a hazardous waste. No indication was found that the material fit the description for hazardous waste, as outlined by DTSC or EPA criteria. The results indicated that the slurry was not a hazardous waste. Additionally, a fish kill experiment was conducted using the slurry mixture. The fish kill experiment was conducted as a screening test under static conditions. The test species was fathead minnow, and 10 fish were observed in each group. The acclimation period was 14 days. The experiment was conducted with a control

group (no slurry) and groups subjected to progressively higher slurry concentrations of 250 mg/L, 500 mg/L, and 750mg/L (the concentration range for the slurry estimated to be discharged into the reservoir). Two replicates of 10 individuals each were observed in each group. The results showed a 100 percent survival rate for the control group and the group subjected to 250 mg/L slurry, and a 95 percent survival rate for groups subjected to 500 mg/L and 750 mg/L slurry, respectively. The results suggested that no acute environmental hazard was apparent, i.e., the lethal concentration of slurry where mortality is greater than 50 percent (LC50) was greater than 750 milligrams per liter (mg/L), the maximum concentration tested. Chronic exposure was not assessed by this experiment.

- Several buildings were sampled for the presence of asbestos. The asbestos identified during this sampling was removed from these buildings. Asbestos abatement was also conducted during the demolition of all buildings. Any asbestos identified was removed and disposed as required by law.
- Two above ground storage tanks were removed and destroyed. Samples were collected from the tank liquids during the removal for determination of waste characteristics.
- Concrete scrape/sludge from the drain lines was sampled prior to removal. This material was tested for a variety of constituents, including metals and lithium, total organic halogens (TOX), and oil and grease. One soil and one sludge sample exhibited high concentrations of metals. Oil and grease, TOX, and lithium also were detected in several samples.
- Oil from on site transformers was tested for PCBs as part of a routine DON inventory process to classify transformers. During sampling, no evidence of a PCB release was noted near any transformer. Results from the transformer oil analyses can be found in Appendix F to the Revised PA (Brown and Caldwell, 1995).

2.6 DEMOGRAPHYAND FUTURE SITE LAND USE

There are no permanent residents within a one half-mile radius of the Morris Dam R&D facility. At Morris Dam, a residence exists which houses a LACDPW employee. The dam is approximately 0.75 miles from the facility. The next closest permanent residences are approximately 2.0 miles from the facility.

Currently, there are no DON employees at the Morris Dam R&D facility. The Reservoir has limited access and is not used as a recreational facility. However, nearby Highway 39 is used heavily, particularly during weekends and holidays. Future land use for the site have not been determined at this time, but may include the following:

- Truck and vehicle maintenance/road maintenance materials storage
- Home(s) for LACDPW dam managers

- Recreational/park

Truck and vehicle maintenance and storage and road maintenance materials storage is considered the most likely future land use scenario. However, other uses cannot be removed from consideration at this time.

Table 2-1. Analytical Results from Site Inspection (Jacobs, 1992)

VOLATILE ORGANIC COMPOUNDS (EPA 8240)	UNITS	1-SL-1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Chloromethane	µg/kg	<10	<10	<10	<10	<10	<10	<10	<10	<11	<10	<10	7J	<10	<10	<13
2-Butanone	µg/kg	<10	<10	<10	26	100	25	7J	20	<11	22	49	<10	13	34	<13
1,1,1-Trichloroethane	µg/kg	<5	<5	<5	3J	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<6
Benzene	µg/kg	<5	<5	<5	<5	<5	1J	<5	<5	<5	<5	<5	<5	<5	<5	<6
4-Methyl-2-Pentanone	µg/kg	<10	<10	<10	4J	27	<10	<10	5J	34	4J	7J	<10	<10	<10	<13
2-Hexanone	µg/kg	<10	<10	<10	23	160	15	<10	39	<11	14	38	<10	8J	22	<13
Toluene	µg/kg	<5	<5	<5	2J	<5	2J	1J	1J	<5	<5	<5	<5	2J	<5	<6
Chlorobenzene	µg/kg	<5	<5	<5	<5	<5	1J	<5	<5	<5	<5	<5	<5	<5	<5	<6
Xylene (total)	µg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	4J	<5	<5	<5	<6

SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270)	UNITS	1-SL-1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Phenol	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	1500J	2700J
1,2-Dichlorobenzene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	2000J	540J
4-Methylphenol	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	890J
Benzoic acid	µg/kg	<3300	<3300	<3300	<3300	2200	<3300	<3300	<8200	<8200	1600J	<3300	<8200	<3300	<3300	2600J
Dimethylphthalate	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	<4200
N-Nitrosodiphenylamine(1)	µg/kg	<670	<680	<670	<680	480J	<6800	<680	<1700	1300J	540J	<6900	<1700	<670	<6800	920J
Phenanthrene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	<4200
Di-n-butylphthalate	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	<4200
Fluoranthene	µg/kg	<670	<680	<670	<680	410J	<6800	<680	<1700	2700J	1100J	<6900	<1700	<670	1200J	1100J
Pyrene	µg/kg	<670	<680	<670	<680	530J	<6800	<680	<1700	2900J	920J	740J	<1700	<670	2000J	4600
Butylbenzylphthalate	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	1700J
Benzo(a)anthracene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	1300J	<3400	<6900	<1700	<670	<6800	<4200
Chrysene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	390J	1900J	<3400	<6900	<1700	210J	<6800	<4200
bis(2-Ethylhexyl)phthalate	µg/kg	210J	<680	83J	480J	<3400	3200 B	190J	450J	5900J	<3400	9800B	200J	490J	14000	<4200
Benzo(b)fluoranthene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	1200J	<3400	<6900	<1700	<670	<6800	<4200
Benzo(k)fluoranthene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	<4200
Benzo(a)pyrene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	1500J	<3400	<6900	<1700	<670	<6800	<4200
Indeno(1,2,3-cd)pyrene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	<7100	<3400	<6900	<1700	<670	<6800	<4200
Benzo(g,h,i)perylene	µg/kg	<670	<680	<670	<680	<3400	<6800	<680	<1700	2400J	<3400	<6900	<1700	<670	<6800	<4200

PCBS AND PESTICIDES (EPA 8080)	UNITS	1-SL-1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
alpha-BHC	µg/kg	<41	<2.1	<41	<41	<10	<10	<41	<41	11	6.3JX	<10	<41	<41	13	20JX
Aldrin	µg/kg	<55	<2.8	<55	<56	<14	<14	<56	<55	31	<14	8.3JX	<55	<55	15	<34
Dieldrin	µg/kg	<27	<1.3	<27	<27	<6.7	<6.7	<27	<27	<7.0	<6.8	<6.8	<27	<27	<6.7	<16
4,4'-DDE	µg/kg	<55	<2.8	<55	<56	<14	8.4JX	<56	<55	<15	<14	<14	<55	<55	<14	<34
Endrin	µg/kg	<82	<4.1	<82	<82	<21	<21	<82	<82	40	<21	<21	<82	<82	19JX	<51
Endosulfan sulfate	µg/kg	<160	<8.2	<160	<160	<41	<41	<160	<160	100	<42	<42	<160	<160	42	<100
alpha-Chlordane	µg/kg	<67	<3.4	<67	<68	<17	<17	<68	<67	43	<17	<17	<67	<67	<17	<42
Aroclor-1254	µg/kg	<330	220	<330	<330	<82	<82	<330	<330	<86	<83	<83	1500	650	<82	<200
Aroclor-1260	µg/kg	<330	<16	1400	270JX	<82	<82	<330	570	<86	<83	<83	<330	<330	<82	<200

Table 2-1. Analytical Results from Site Inspection (Jacobs, 1992)

VOLATILE ORGANIC COMPOUNDS (EPA 8240)		1-SL- (con't)								BU-S1	OF1-S1	OF2-S1	OF3-S1
	UNITS	16	17	18	19	20	21	22	23				
Chloromethane	µg/kg	<10	<10	<11	<10	<10	<10	<10	<11	<10	<11	<10	<10
2-Butanone	µg/kg	11	<10	<11	<10	<10	<10	<10	23	<10	<11	<10	10J
1,1,1-Trichloroethane	µg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<6	<5	4J
Benzene	µg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<6	<5	<5
4-Methyl-2-Pentanone	µg/kg	<10	<10	<11	<10	<10	<10	<10	<11	<10	<11	<10	<10
2-Hexanone	µg/kg	<10	<10	<11	<10	<10	<10	<10	11	<10	<11	<10	<10
Toluene	µg/kg	<5	<5	<5	<5	<5	1J	<5	<5	<5	<6	<5	3J
Chlorobenzene	µg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<6	<5	<5
Xylene (total)	µg/kg	<5	<5	<5	<5	<5	<5	<5	<5	<5	<6	<5	<5

SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270)		1-SL- (cont'd)								BU-S1	OF1-S1	OF2-S1	OF3-S1
	UNITS	16	17	18	19	20	21	22	23				
Phenol	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	<680	<680
1,2-Dichlorobenzene	µg/kg	<670	<670	1200J	<670	<680	<690	<670	<700	<670	<760	<680	<680
4-Methylphenol	µg/kg	<670	<670	390J	<670	<680	<690	<670	<700	<670	<760	<680	<680
Benzoic acid	µg/kg	<3300	<3200	<17000	<3300	<3300	<3300	<3300	5100B	<3300	<3700	160J	<3300
Dimethylphthalate	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	570J	<680
N-Nitrosodiphenylamine(1)	µg/kg	<670	<670	2200J	<670	<680	<690	<670	<700	<670	<760	<680	<680
Phenanthrene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	250J	<680
Di-n-butylphthalate	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	380BJ	90BJ	240BJ	<680
Fluoranthene	µg/kg	<670	<670	1800J	<670	<680	<690	<670	<700	110J	<760	590J	<680
Pyrene	µg/kg	<670	<670	2500J	<670	<680	<690	<670	<700	470J	<760	400J	<680
Butylbenzylphthalate	µg/kg	<670	<670	720J	<670	<680	<690	<670	<700	<670	<760	1100	<680
Benzo(a)anthracene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	<680	<680
Chrysene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	<680	98J
bis(2-Ethylhexyl)phthalate	µg/kg	490J	83J	<3500	<670	<680	<690	<670	<700	<670	220BJ	5300B	<680
Benzo(b)fluoranthene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	150J	<760	470J	100J
Benzo(k)fluoranthene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	<670	<760	200J	<680
Benzo(a)pyrene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	1700	<760	380J	<680
Indeno(1,2,3-cd)pyrene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	1000	<760	<680	<680
Benzo(g,h,i)perylene	µg/kg	<670	<670	<3500	<670	<680	<690	<670	<700	310J	100J	<680	<680

PCBS AND PESTICIDES (EPA 8080)		1-SL- (cont'd)								BU-S1	OF1-S1	OF2-S1	OF3-S1
	UNITS	16	17	18	19	20	21	22	23				
alpha-BHC	µg/kg	<41	<40	15JX	<41	<2.1	<2.1	<2.0	<11	<10	<2.3	<21	<2.1
Aldrin	µg/kg	<55	<55	<29	<55	<2.8	<2.8	<2.8	<14	<14	< 3.1	<28	<2.8
Dieldrin	µg/kg	<27	<26	<14	<27	<1.3	<1.3	0.83J	<6.9	<6.6	<1.5	<13	<1.3
4,4'-DDE	µg/kg	<55	<55	<29	<55	< 2.8	< 2.8	< 2.8	<14	<14	<3.1	<28	<2.8
Endrin	µg/kg	<82	<81	<43	<82	<4.1	<4.1	<4.1	13JX	<20	<4.6	<41	<4.1
Endosulfan sulfate	µg/kg	<160	<160	<86	<160	<8.2	<8.2	<8.2	<43	<41	<9.2	<82	<8.2
alpha-Chlordane	µg/kg	<67	<67	<35	<67	<3.4	<3.4	<3.4	<18	<17	<3.8	<34	<3.4
Aroclor-1254	µg/kg	1100	<320	<170	<330	<16	<16	<16	<85	<82	<18	<160	<16
Aroclor-1260	µg/kg	<330	<320	<170	<330	<16	<16	<16	<85	<82	<18	<160	<16

Table 2-1. Analytical Results from Site Inspection (Jacobs, 1992)

METALS	UNITS	1-SL- 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Antimony	µg/kg	10.8B	6.7BN	4.0BN	6.3BN	6.9BN	3.9BN	5.2BN	6.3BN	8.1BN	6.9BN	3.2BN	3.9BN	5.6BN	7.0BN	1.8BN
Arsenic	µg/kg	13.8*	13.7	9.1*	9.8*	8.2	7.1*	9.4*	6.5*	7.7*	6.0	5.3*	7.4*	<2.6*	11.0*	4.5
Barium	µg/kg	393	326	233	194	307	336	251	266	219	178	370	231	266	389	377
Beryllium	µg/kg	0.73B	0.86B	0.44B	0.35B	0.87B	0.77B	0.61B	0.61B	0.60B	1.3	0.83B	0.55B	0.24B	0.93B	0.77B
Cadmium	µg/kg	1.2	2.5	2.6	2.3	0.65B	4.5	2.4	1.6	2.5	1.3	2.0	4.3	1.8	0.88B	0.58B
Chromium	µg/kg	16.6	12.8N	19.1	14.8	4.8N	32.7	20.0	14.3	8.5	16.3N	16.6	25.8	13.2	6.2	7.9N
Chromium, Hexalent	µg/kg															
Chromium, STLC	µg/kg		0.298													
Cobalt	µg/kg	15.6	14.3	12.7	7.4B	14.7	13.4	15	11.3	8.3B	13.0	11.1	12.1	6.4B	15.8	8.3B
Copper	µg/kg	25.4	48.6	37.1	45.7	17.5	103	73.2	46.2	25.7	18.3	72.7	56.2	34.2	31.4	36.7
Fluoride	µg/kg	587	118	348	462	86.1	466	600	417	357	259	398	476	366	619	205
Lead	µg/kg	63.6	86.4*	212	221	19.2*	1590	135	1660	756	227*	2130	482	1290	653	97.1*
Lead, Organic	µg/kg															
Lead, STLC	µg/kg															
Lithium	µg/kg															
Mercury	µg/kg	0.12	0.18	0.064	0.064	<0.056	0.11	0.062	<0.06	<0.06	<0.056	<0.06	<0.06	<0.06	<0.06	0.056
Molybdenum	µg/kg	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40
Nickel	µg/kg	16.9	16.0	14.0	15.9	13.8	19.0	18.2	17.2	8.6	13.8	15.5	18.2	11.1	15.5	13.8
Selenium	µg/kg	<0.16	<0.80	<0.16	<0.16	<0.80	<0.16	<0.16	<0.16	<0.16	<0.80	<0.16	<0.16	<0.16	<0.16	<0.80
Silver	µg/kg	<0.20	0.64B	<0.20	<0.20	0.27B	<0.20	<0.20	<0.20	<0.20	0.56B	<0.20	<0.20	<0.20	<0.20	0.40B
Thallium	µg/kg	<0.16	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	0.20B	<0.18
Vanadium	µg/kg	47.2	31.5	33.3	27.5	27.6	33	33.1	29.7	34.4	41.9	29.1	32.2	25.2	32.8	12.6
Zinc	µg/kg	196	325	470	261	53.9	468	389	412	425	189	730	497	387	86.4	40.4

METALS	UNITS	1-SL- (cont.d) 16	17	18	19	20	21	22	23	BU-S1	OF1-S1	OF2-S1	OF3-S1
Antimony	µg/kg	5.0BN	4.1BN	4.5BN	5.7BN	10.7B	4.0BN	11.2B	15.1N	14.2N	4.6BN	4.6BN	4.3BN
Arsenic	µg/kg	7.1*	<2.6*	<2.6	5.5*	9	10	12.0	9.9	7.3	5.9	6.0	12.4
Barium	µg/kg	311	259	232	212	324	308	307	364	144	226	116	233
Beryllium	µg/kg	0.89B	0.43B	0.54B	0.95B	1.0	0.91B	0.89B	1.2	0.40B	0.52B	0.31B	0.61B
Cadmium	µg/kg	1.5	0.63B	3.1	2.4	0.90B	0.82B	1.1	3.1	5.7	0.81B	6.7	0.98B
Chromium	µg/kg	13.8	9.1	30.7N	23.5	13.7N	13.6N	14.4N	12.6N	55.2N	19.0N	30.5N	44.8N
Chromium, Hexalent	µg/kg									<1.00			
Chromium, STLC	µg/kg									0.754		0.298	
Cobalt	µg/kg	13.7	7.6B	4.3B	10.9	13.9	14.9	14.3	13.2	12.3	11.0	11.1	14.8
Copper	µg/kg	90.9	13.5	91.1	103	71.2	19.2	35.4	39.1	61.9	26.1	111	36.0
Fluoride	µg/kg	208	519	212	499	91.6	150	108	207	151	46.4	60.3	207
Lead	µg/kg	339	8.9	5020*	539	4.5*	<3.6*	18.8*	954*	319*	17.1*	406*	14.3*
Lead, Organic	µg/kg									<0.5		8.6	
Lead, STLC	µg/kg									18.2		39.60	
Lithium	µg/kg									253			
Mercury	µg/kg	0.14	<0.06	0.056B	0.064	0.25	0.21	0.064	0.42	0.76	0.16	1.3	0.056
Molybdenum	µg/kg	<0.40	<0.40	0.66	<0.40	<0.40	<0.40	<0.40	<0.40	2.5	<0.40	1.1	<0.40
Nickel	µg/kg	18.1	9.6	10.6	15.1	15.5	16.1	17.1	15	49.1	13.2	25.7	31.5
Selenium	µg/kg	<0.16	<0.16	<0.80	<0.16	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80
Silver	µg/kg	<0.20	<0.20	0.45B	<0.20	0.29B	0.58B	0.43B	<0.40B	2.2	0.48B	1.4B	0.66B
Thallium	µg/kg	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18	<0.18
Vanadium	µg/kg	30.2	16.6	11.7	27.1	33.1	31	38.6	45.9	28.8	36.5	25.6	36.9
Zinc	µg/kg	150	51.5	717	248	65	66.7	202	323	1260	77.3	658	80.1

Table 2-2. Summary of Results from Emergency Removal Verification Sampling (Jacobs, 1993).

Location	Total Lead EPA 6010/7421 *(mg/kg)*				TRPH EPA 418.1 *(mg/kg)*				Total PCB [(a)] EPA 8080 *(mg/kg)*			
	12/30-31/93	1/22/1993	2/4/1993	2/12/1993	12/30-31/93	1/22/1993	2/4/1993	2/12/1993	12/30-31/93	1/22/1993	2/4/1993	2/12/1993
1	23.2	17.0	N/A	N/A	98	8	N/A	N/A	0.046	<0.025	N/T	N/T
2	28.3	7.8	N/A	N/A	15	16	N/A	N/A	N/A	N/A	N/T	N/T
3	46.6	34.7	N/A	N/A	51	32	N/A	N/A	N/A	<0.025	N/T	N/T
4	11.3	4.0	N/A	N/A	<1	7	N/A	N/A	N/A	N/A	N/T	N/T
5	7.2	84.8	5.5	N/A	<1	6	<1	N/A	N/A	0.232	N/T	N/T
6	106	14.3	N/A	N/A	65	87	N/A	N/A	N/A	N/A	N/T	N/T
7	126	59.1	2.1	N/A	204	950	<1	N/A	0.040	N/A	N/T	N/T
8	7.8	24	N/A	N/A	56	470	N/A	N/A	<0.025	N/A	N/T	N/T
9	209	105	8.4	N/A	360	6	76	N/A	N/A	N/A	N/T	N/T
10	220	6.2	N/A	N/A	430	120	N/A	N/A	N/A	N/A	N/T	N/T
11	69.3	43.6	<1.5	4.8	340	2500	240	250	0.029	N/A	N/T	N/T
12	26.7	816	2.8	N/A	20	4600	7	N/A	N/A	0.077	N/T	N/T
13	17.4	105	170	2.9	13	16	22	6	<0.025	N/A	N/T	N/T
14	68.4	147	113	275	14	2500	630	450	<0.025	N/A	N/T	N/T
15	66.3	41.3	1.9	N/A	16	33	2	N/A	N/A	N/A	N/T	N/T
16	27.2	1430	148	<1.5	16	2800	34	N/A	N/A	N/A	N/T	N/T
17	44	69.7	77.3	11.4	59	28	46	7	N/A	N/A	N/T	N/T
18	N/A	96.4	40.5	3.0	N/A	32	5	<1	N/A	N/A	N/T	N/T

N/A = Not Analyzed

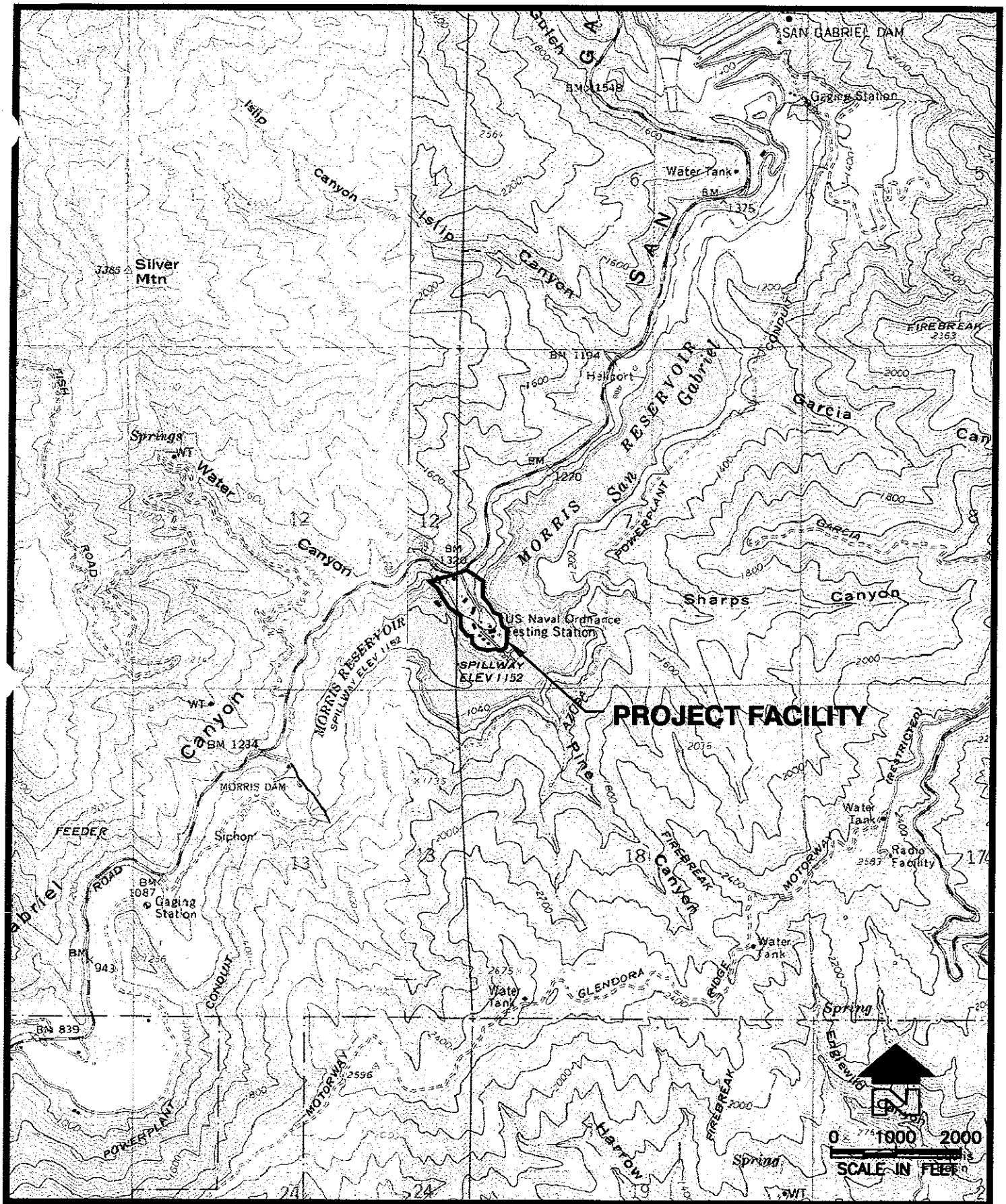
N/T = No Test

(a) = Concentration given is for Total PCB. Most concentrations are for either Arochlor 1254 or Arochlor 1260, or the total of the two isomers.

Table 2-3. Sediment Sampling Results (Law/Crandall, 1993)

Analyte Detected	Sample Location											
	1@0'	1@2'	2@0'	2@2'	3@0'	3@2'	4@0'	4@2'	5@0'	5@2'	6@0'	6@2'
VOCs (μg/kg)												
Methylene Chloride	17	13	15	18	18	16	16	18	<16	<17	15	15
Acetone	<69	<56	<59	<60	<59	<58	<58	<62	N/R	N/R	<56	<59
PAHs (μg/kg)												
benzo[ghi]perylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<140	<150	N/A	N/A
PCB (μg/kg)												
Arochlor 1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<47	<52	N/A	N/A
Metals (mg/kg)												
Arsenic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<8.6	<8.6	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	61	91	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35	48	N/A	N/A
Lead	N/A	N/A	<6.8	18	N/A	N/A	N/A	N/A	38	45	N/A	N/A
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.17	<0.12	N/A	N/A
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	39	60	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	21	40	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<1.6	<1.6	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	160	200	N/A	N/A

Analyte Detected	Sample Location											
	7@0'	7@2'	8@0'	8@2'	9@0'	9@2'	10@0'	10@2'	11@0'	11@2'	12@0'	12@2'
VOCs (μg/kg)												
Methylene Chloride	16	16	13	12	12	<12	16	<12	<13	<16	<12	13
Acetone	<66	<58	<59	<59	80	<58	<58	<59	N/R	N/R	<62	<59
PAHs (μg/kg)												
benzo[ghi]perylene	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<130	200	N/A	N/A
PCB (μg/kg)												
Arochlor 1260	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	52	68	N/A	N/A
Metals (mg/kg)												
Arsenic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<7.6	19	N/A	N/A
Chromium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	52	71	N/A	N/A
Copper	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	33	66	N/A	N/A
Lead	N/A	N/A	36	62	N/A	N/A	N/A	N/A	30	56	N/A	N/A
Mercury	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.73	1.2	N/A	N/A
Nickel	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	41	50	N/A	N/A
Selenium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<14	23	N/A	N/A
Silver	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	<1.4	2.7	N/A	N/A
Zinc	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	210	260	N/A	N/A



DATE	PROJECT NUMBER
FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

SITE VICINITY MAP

PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA		FIGURE 2-1

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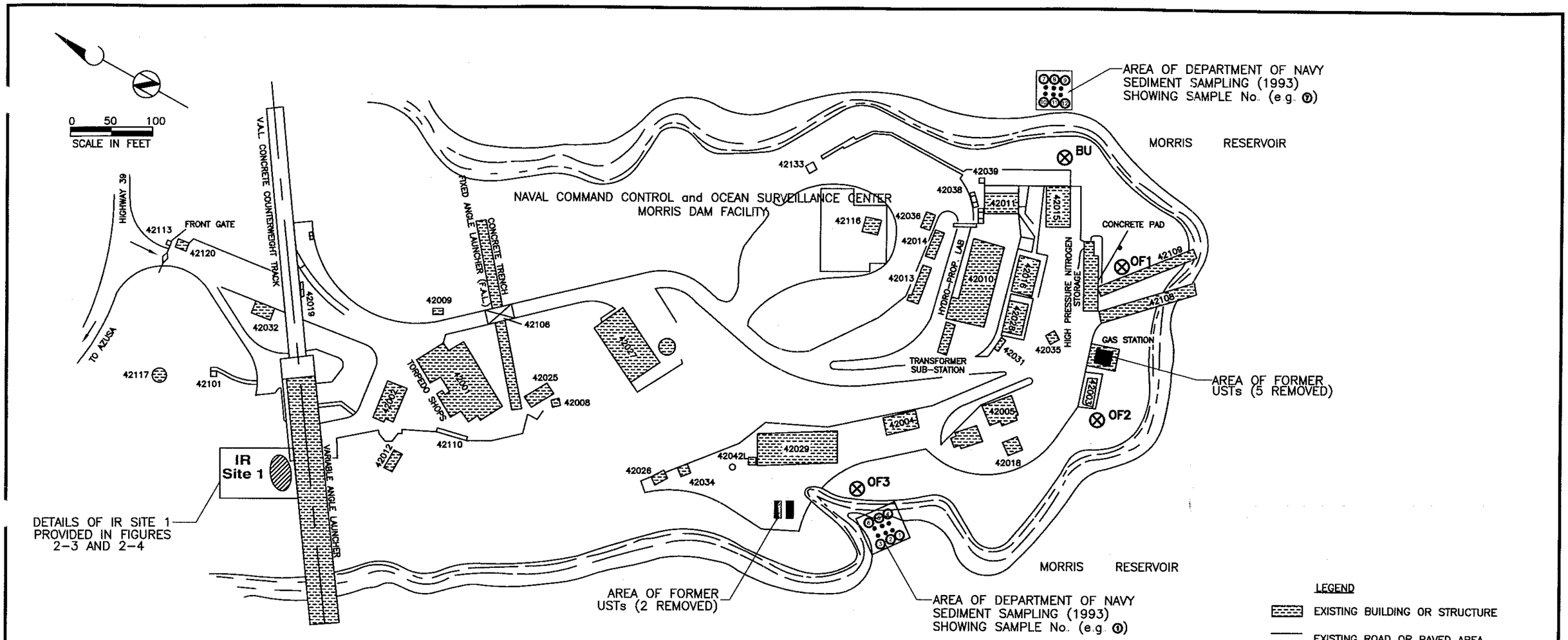

MORRIS DAM FACILITY
INDEX OF FORMER FACILITIES

STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE
42001	TORPEDO SHOP	5520	SF	42023	SIDE VIEW CAMERA STATION	63	SF	42108	TORPEDO RECOVERY PIER	–	–
42002	ADMINISTRATION BLDG.	2150	SF	42025	COMPRESSOR BLDG	528	SF	42109	TORPEDO RECOVERY RAMP	–	–
42003	PW GARAGE/WEIS SHOP	924	SF	42026	HYDROGEN PEROXIDE STORAGE	266	SF	42110	TORPEDO RECOVERY RAMP	245	SF
42004	PW CARPENTER & ELECTRIC SHOP	880	SF	42027	SHOP STORES	3200	SF	42112	VAL SIDE VIEW CAMERA BRIDGE	–	–
42005	PW MAINTENANCE SHOP	1026	SF	42028	TEST PITS 7 & 8	925	SF	42113	FLAG POLE	–	–
42008	EXPLOSIVE ASSEMBLY CAP HOUSE	100	SF	42029	TORPEDO SHOP/ELECTRONICS	4000	SF	42115	VARIABLE ANGLE LAUNCHER	–	–
42009	FAL CONTROL BLDG	35	SF	42031	MENS HEAD	144	SF	42116	SUBSTATION	2500	KV
42010	MACHINE SHOP	4000	SF	42032	VAL COMPRESSOR SHELTER	–	–	42117	WATER STORAGE TANK	20000	GA
42011	DYNAMOMETER PITS 1,2,3 & 4	1408	SF	42034	ACID STORAGE	100	SF	42120	MAIN GATE HOUSE	135	SF
42012	VAL CONTROL BLDG	336	SF	42035	WOMANS HEAD	42	SF	42126	STORAGE PLATFORM	20	SV
42013	ELECTRONIC TEST FACILITY	490	SF	42036	TURBINE TEST BLDG	231	SF	42133	CABLE WINCH HOUSING	130	SF
42014	COMPRESSOR BLDG	420	SF	42037	INCINERATION	1	SF				
42015	TURBINE TEST PITS 5 & 7	1472	SF	42038	PROP LAB WASH SHELTER	30	SF				
42016	TORPEDO BLDG/CHEM LAB	1802	SF	42039	TEST EQUIPMENT ASSEMBLY	210	SF				
42018	DIVER'S BUILDING	400	SF	42101	FUSE & DETECTOR MAGAZETTE	–	–				
42019	HEAD, MEN & WOMAN	130	SF	42102	ROCKET MAGAZETTE	–	–				
42020	SIDE VIEW CAMERA STATION	63	SF	42106	HIGHWAY BRIDGE	182	SF				
42021	SIDE VIEW CAMERA STATION	63	SF								

LEGEND

- EXISTING BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- HYDRAULIC OIL SPILL–SITE 1
- APPROXIMATE SAMPLING LOCATION–SITE INSPECTION
- DON SED SAMPLE LOCATION AND SAMPLE ID NUMBER
- FORMER UST LOCATION

FIGURE 2-2

PREVIOUS SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

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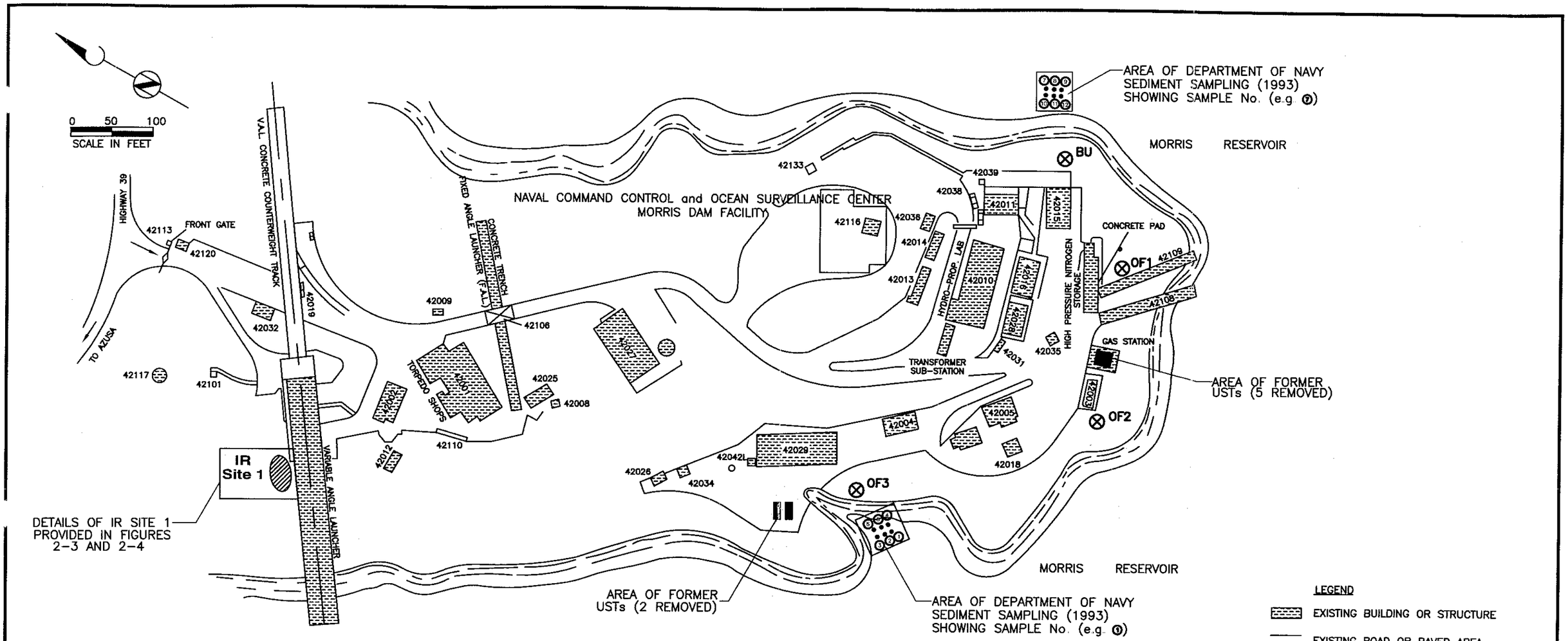
LAF/14796005.DW



MORRIS DAM FACILITY
INDEX OF FORMER FACILITIES

STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE
42001	TORPEDO SHOP	5520	SF	42023	SIDE VIEW CAMERA STATION	63	SF	42108	TORPEDO RECOVERY PIER	–	–
42002	ADMINISTRATION BLDG.	2150	SF	42025	COMPRESSOR BLDG	528	SF	42109	TORPEDO RECOVERY RAMP	–	–
42003	PW GARAGE/WEIS SHOP	924	SF	42026	HYDROGEN PEROXIDE STORAGE	266	SF	42110	TORPEDO RECOVERY RAMP	245	SF
42004	PW CARPENTER & ELECTRIC SHOP	880	SF	42027	SHOP STORES	3200	SF	42112	VAL SIDE VIEW CAMERA BRIDGE	–	–
42005	PW MAINTENANCE SHOP	1026	SF	42028	TEST PITS 7 & 8	925	SF	42113	FLAG POLE	–	–
42008	EXPLOSIVE ASSEMBLY CAP HOUSE	100	SF	42029	TORPEDO SHOP/ELECTRONICS	4000	SF	42115	VARIABLE ANGLE LAUNCHER	–	–
42009	FAL CONTROL BLDG	35	SF	42031	MENS HEAD	144	SF	42116	SUBSTATION	2500	KV
42010	MACHINE SHOP	4000	SF	42032	VAL COMPRESSOR SHELTER	–	–	42117	WATER STORAGE TANK	20000	GA
42011	DYNAMOMETER PITS 1,2,3 & 4	1408	SF	42034	ACID STORAGE	100	SF	42120	MAIN GATE HOUSE	135	SF
42012	VAL CONTROL BLDG	336	SF	42035	WOMANS HEAD	42	SF	42126	STORAGE PLATFORM	20	SV
42013	ELECTRONIC TEST FACILITY	490	SF	42036	TURBINE TEST BLDG	231	SF	42133	CABLE WINCH HOUSING	130	SF
42014	COMPRESSOR BLDG	420	SF	42037	INCINERATION	1	SF				
42015	TURBINE TEST PITS 5 & 7	1472	SF	42038	PROP LAB WASH SHELTER	30	SF				
42016	TORPEDO BLDG/CHEM LAB	1802	SF	42039	TEST EQUIPMENT ASSEMBLY	210	SF				
42018	DIVER'S BUILDING	400	SF	42101	FUSE & DETECTOR MAGAZETTE	–	–				
42019	HEAD, MEN & WOMAN	130	SF	42102	ROCKET MAGAZETTE	–	–				
42020	SIDE VIEW CAMERA STATION	63	SF	42106	HIGHWAY BRIDGE	182	SF				
42021	SIDE VIEW CAMERA STATION	63	SF								

LEGEND

- EXISTING BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- HYDRAULIC OIL SPILL–SITE 1
- APPROXIMATE SAMPLING LOCATION–SITE INSPECTION
- DON SED SAMPLE LOCATION AND SAMPLE ID NUMBER
- FORMER UST LOCATION

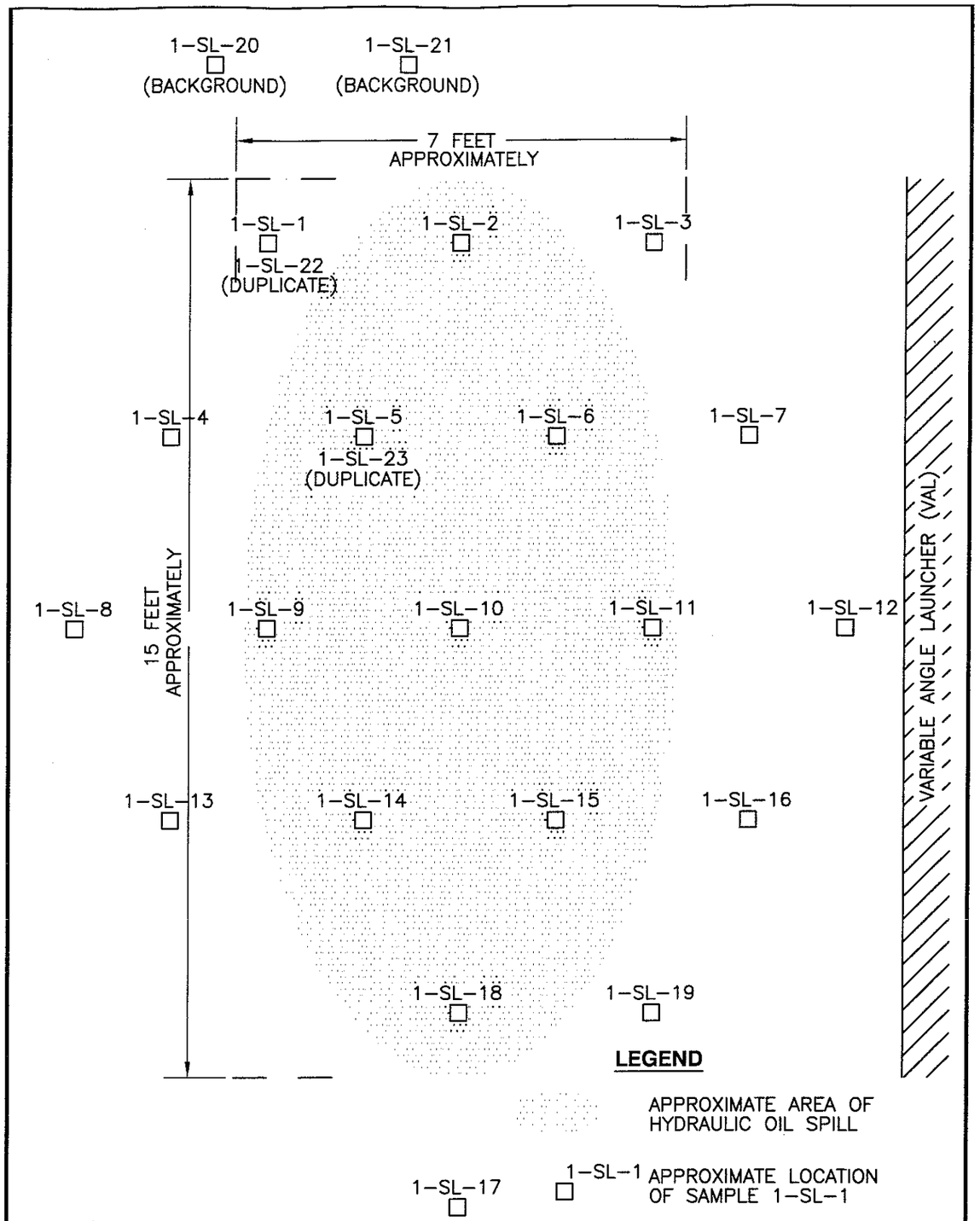
FIGURE 2-2

PREVIOUS SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF/14796005.DW



DATE	PROJECT NUMBER	
FEB. 2002	14796	**SCHEMATIC ILLUSTRATION OF SOIL SAMPLING FOR HYDRAULIC OIL SPILL AREA (IR SITE 1)**
BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	0 NO SCALE SCALE IN MILES — FIGURE **2-3**

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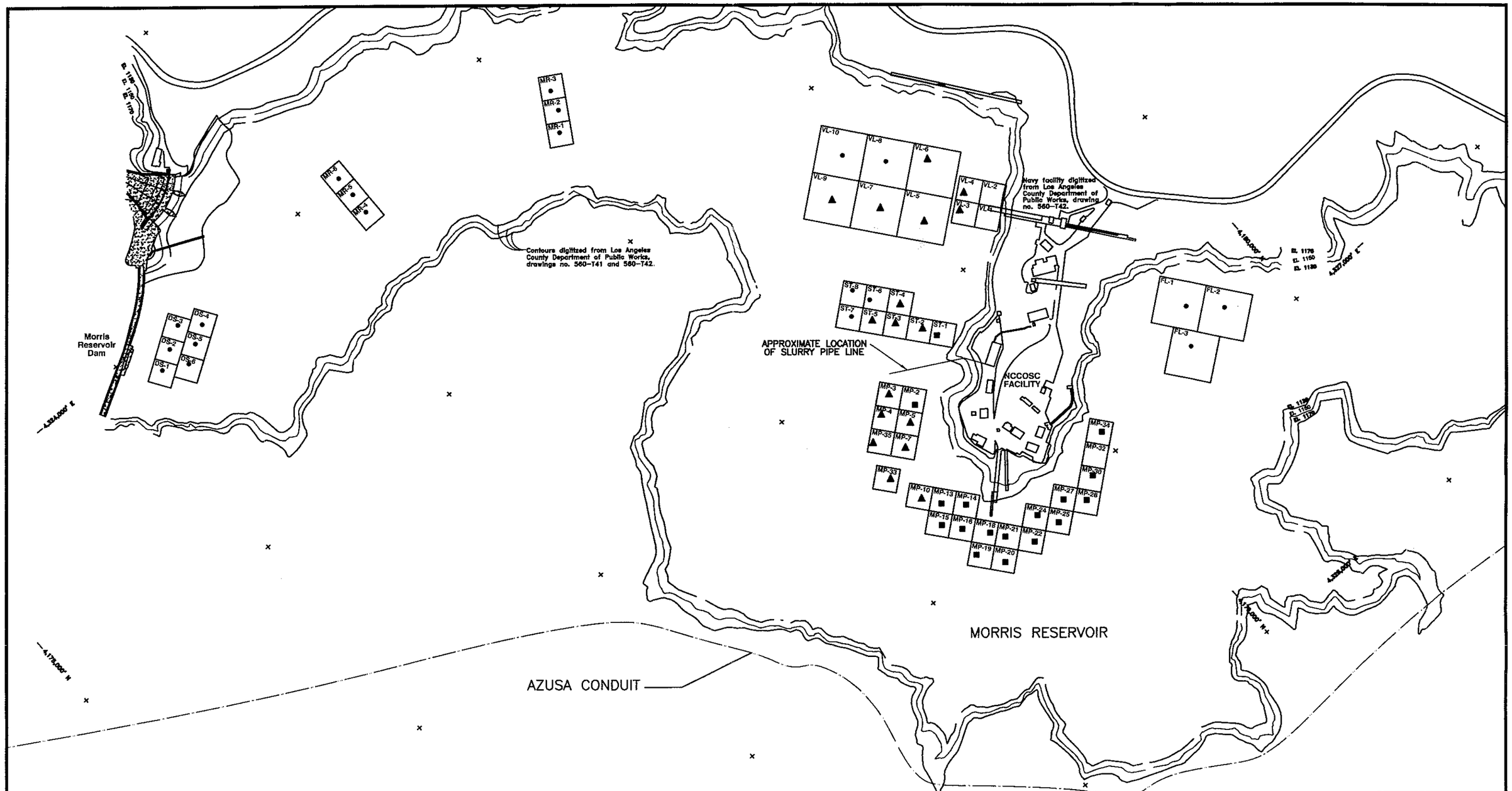

FIGURE 2-5

RESERVOIR PLAN-MWD/LACDPW SEDIMENT SAMPLING PROGRAM (1995) WEST

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

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SAN DIEGO, CALIFORNIA

LAF 14796008.DWG

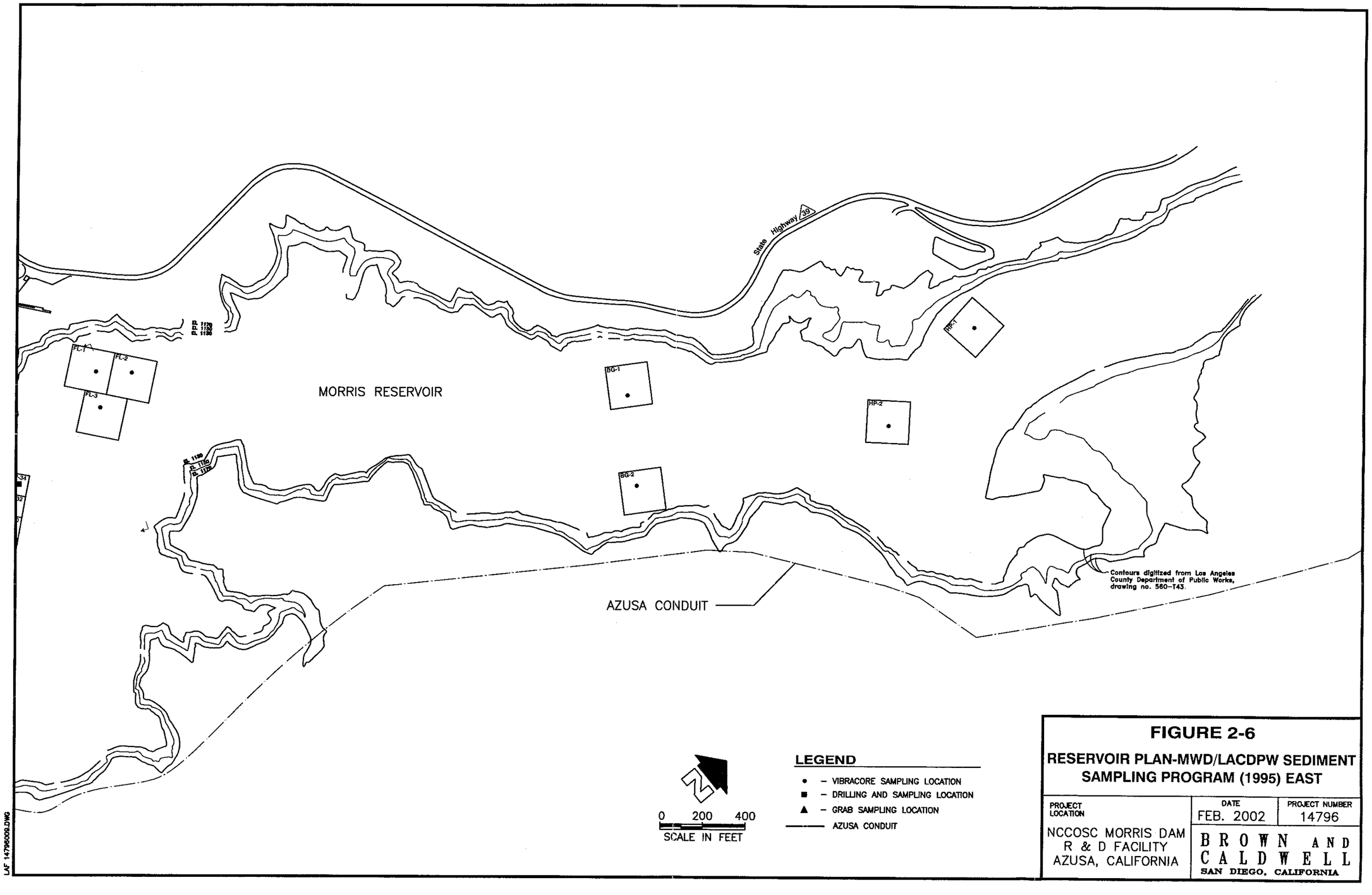


FIGURE 2-6

RESERVOIR PLAN-MWD/LACDPW SEDIMENT SAMPLING PROGRAM (1995) EAST

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

3.0
ENVIRONMENTAL SETTING

This section presents the environmental setting of the Morris Dam R&D facility, examining topography, geology, hydrology, and hydrogeology, and meteorology. All of these subjects provide for evaluating pathways by which chemicals could be transported away from the site and affect human or ecological health. In addition, this information is useful for identifying the nature of natural materials on site, which could represent background conditions.

3.1 TOPOGRAPHY

Land elevations in the San Gabriel Canyon area range from 839 to 3,260 feet above mean sea level (msl). Elevations on the Morris Reservoir peninsula that includes the project site range from (depending on surface water elevation for the Reservoir) approximately 1130 feet to over 1380 feet msl. The topography at the facility is very steep. Slope gradients slightly steeper than 1 to 1 (vertical to horizontal) are typical perpendicular to the axis of the peninsula along the banks of the Reservoir. Slope gradients are generally gentler along the axis, but can be 1 to 1 in places.

3.2 GEOLOGY, HYDROLOGY, AND HYDROGEOLOGY

This section examines the regional and local geologic and hydrogeologic settings and discuss their potential impact to site conditions. This section is particularly pertinent at the Morris Dam R & D facility, because the geological setting is thought to influence the relatively high metals concentrations observed at the site.

3.2.1 Geology

3.2.1.1 Regional Geology

The Morris Dam R&D facility is located approximately three miles northeast of the City of Azusa, California, on the southern flank of the San Gabriel Mountains. The San Gabriel Mountains are located in the central portion of the Transverse Range Province of Southern California. The Transverse Ranges extend from Point Arguello and San Miguel Island in the west, approximately 300 miles to the Pinto and Eagle Mountains, in the east (Dibblee, 1982a). The Transverse Ranges are distinct from most other mountain ranges of California because they trend transverse (east-west) to the more dominant north-south mountain trends (e.g. The Sierra Nevada Range, Coast Ranges, and Peninsular Ranges). The precise genesis of the Transverse Ranges is widely disputed. However, most researchers generally agree that the province was uplifted and rotated to its current position by the interaction of the numerous faults that surround and bisect it.

The Transverse Range Province is composed of three physiographic and tectonic segments (the Western Segment, Central Segment, and Eastern Segment) divided by the San Andreas and San Gabriel Faults (Dibblee, 1982a). The San Gabriel Mountains are located in the Central Segment of the Province and are composed of an eastward-elongated parallelogram-shaped area of primarily crystalline basement rocks (Dibblee, 1982b). The range was uplifted in Cenozoic time and currently reaches a high point of over 10,000 feet at Mount San Antonio (Mount Baldy). The range is characterized by deeply incised drainages with steep slopes. As with the province as a whole, the genesis of the San Gabriel Mountains is debatable. However, the mountains were probably uplifted primarily by the interaction of the San Andreas and related faults on it northern margin and the San Gabriel and related faults on its southern margin (Dibblee, 1982b).

The San Gabriel Mountains can be divided into several basement terraines. These include the San Gabriel, San Antonio, Tujunga, San Sevaine, Cajon, and Pelona Schist (Dibblee, 1982a). As interpreted by Ehlig (1975; 1981), the terraines may be exotic to each other having been accreted together from possibly distant areas.

3.2.1.2 Local Geology

The Morris Dam R&D facility is located in the San Gabriel basement terraine (Powell, 1982). This terraine is composed of Precambrian gneisses; Precambrian anorthosite, gabbroic rocks, schist, and syenite; Permo-Triassic Lowe Granodiorite; pre-Cretaceous amphibolitic and felsic dikes, and late mesozoic plutonic rocks (granite to diorite). Figure 3-1 shows a local geologic map from the areas near the facility.

As evident on Figure 3-1, rocks surrounding the Morris Reservoir include a sequence of dominantly cataclastic and metamorphic rocks of Cretaceous or older age (Morton, 1973). This sequence is subdivided into several mapped units. These, from north to south, include hornblende gneiss, mixed gneissic quartz diorite and gneiss, cataclastic rock, biotite gneiss, mixed biotite and/or hornblende gneiss, quartz diorite, and leucogranitic rocks. Sedimentary rocks occur locally and include mostly alluvial terrace and landslide deposits. Local conditions observed through some very limited geologic reconnaissance suggest that these general rock types extend on to the peninsula where the facility exists.

Mineralogy of rock outcrops was examined through petrography analysis as detailed in Section 4. Figure 3-2 portrays the general distribution of rock types observed at the site, and shows sampling locations of rock outcrops (descriptions of each rock type at these sample locations can be found in Table 4-19). The rock descriptions from the petrography analysis coupled with the limited field reconnaissance suggest that a slight change occurs in the general texture and mineralogy towards the west region of the area near the site and along Highway 39, with rocks being described as quartz monzonites. Field reconnaissance observations correspond with the petrography descriptions, with the rocks generally exhibiting more of a granoblastic character in this area, with less foliation and lineation of grains than that observed in rocks on site. However, some larger scale lineation of grains is observed on an outcrop-scale, which would suggest some metamorphism.

A couple rock descriptions from the petrography analysis identified several rocks that exist in natural geological dikes through the surrounding material. In several locations, both on and off site, natural geologic dike material has been identified as amphibolite. The petrography analysis identified this material at locations 13-RK-L38 and 13-RK-42D, but it was also observed during field reconnaissance in several locations. A second natural geologic dike, located in the southeast section of the peninsula east of former Building 42015 contained a material identified as peridotite or pyroxenite. This geologic dike material was not observed anywhere else on the peninsula or surrounding area during reconnaissance, and therefore is considered somewhat unusual for this area. Further discussion of this geologic dike and its potential significance will be presented in Section 4.

Most of the Morris Dam R&D facility is underlined by a Cretaceous or older chloritic schist and gneiss unit. The schist is locally massive, medium- to dark-green, and in places contains lenses and bands of yellow to pink granite, and knots of black to medium-green dioritic rock. The gneiss is locally massive and in places includes augen gneiss, banded gneiss and biotite gneiss. The unit is variably textured and locally includes granoblastic, catacalstic (fault breccia), mylonitic, semi-schistose and schistose textures. Primary minerals include quartz, feldspar, chlorite, biotite and hornblende. The general strike of the foliation in this unit is southwest-northeast. The foliation generally dips toward the northwest, typically ranging from 60° to vertical.

Occurring locally under the south and southeastern portion of the facility are alluvial terrace deposits of Pleistocene age and artificial fill. These units include mostly gravel-, sand-, and silt-sized particles that form massive- to poorly-bedded deposits. The beds or lifts are reddish-brown, poorly consolidated and moderately to slightly decomposed.

Rocks encountered during monitoring well drilling for this investigation include soils interpreted as fill material used for pads and gneisses with variable amounts of hornblende, plagioclase, potassium feldspar, quartz, biotite, and chlorite, and local schistose zones. The rock was fractured at all intervals but a general trend noted was the upper 50 to 70 feet of MW-1 and most of MW-3 were closely fractured with secondary mineralization noted in the fracture spacing. A portion of the material logged as fill may also be the alluvium described above. Background rock outcrops were analyzed for mineralogy as discussed in Section 4. In general, the rock types identified during this analysis correlate with the descriptions given above.

Differentiating between the alluvium and fill is difficult due to the often similar nature of these rocks, and the potential that both would have similar source material. It is suspected that several areas of the facility were constructed by crushing of rock material from near the Building 42029 area and using it to fill other areas at the facility. Therefore, the description of gravel at approximately 15 to 20 feet below grade in the boring log for MW-3 suggests that fill was used at least on the southeastern portion of the facility. In fact, aerial photographs of the lower portion of the peninsula around Buildings 42005, 42010, 42011, 42015, 42016, and 42028 show that site topography prior to building construction was not flat, and that fill material was used in constructing these benches.

Cross-sections A-A' and B-B' (Figures 3-3 and 3-4) portray the subsurface as logged through monitoring wells and soil borings. Note the cut and fill nature interpreted for much of the subsurface. This interpretation assumes the veracity of undocumented reports of cut material from the peninsula being used as fill during construction of other portions of the facility, especially the lowest portion (Mr. David Willis, personal communication, 1997). See the boring logs in Appendix C for additional information regarding the geology encountered during the field investigation.

3.2.1.3 Structure

The basement and sedimentary rocks exposed at the surface near the Morris Dam R&D facility structurally overlie the Vincent Thrust mylonite zone and the northwest-plunging antiformal shaped Pelona Schist (the pre-Miocene aged Vincent thrust fault displaced the crystalline rocks on top of the Pelona Schist). The Glendora block of low mountains of basement rock near the site was elevated between the eastern part of the San Gabriel fault and a series of north dipping frontal faults north of Monrovia, Glendora, and Clairmont (Dibblee, 1982b). Figure 3-5 exhibits an approximate cross section through the San Gabriel Mountains showing regional structural features.

Active and potentially active major faults bound and bisect the San Gabriel Mountains on all sides. These faults include the San Andreas, Punchbowl, Nadeau, San Jacinto, Fenner, San Francisquito, San Gabriel, Sierra Madre, South Frontal, San Antonio, Verdugo, Cucamonga, and Garlock.

The primary major structural feature near Morris Reservoir is the Sierra Madre fault zone. This east-west trending fault system is approximately 100 kilometers long and has a dominantly reverse or thrust nature of faulting (USACE, 1994). The northern part of the Sierra Madre fault zone is approximately 2.5 miles south of the facility. An unnamed fault splinter at the southern end of San Gabriel Canyon marks the northern end of this fault system. The Duarte Fault, just south of the unnamed fault also is part of this system. Figure 3-6 shows the location of these different faults. In this area, the fault contact dips between 35 and 70 degrees to the north with reverse movement along the fault producing a large fold in the Tertiary rocks. Figure 3-5 shows an approximation of this relationship.

In addition to the major fault zones, numerous smaller branch faults lace through the range. In the middle-southern part of the San Gabriel Mountains, four roughly parallel faults extend through Sawpit, San Gabriel, Big Dalton, and San Dimas canyons. Significant is the similarity between the strike of these faults and the strike of foliation in the crystalline rock. Direct evidence for Quaternary faulting is seen approximately 3.0 miles southeast of the facility where quartz monzonite is thrust over Quaternary alluvium north of Camp Aventura, Azusa. Further evidence from geophysical data, aerial photographs, and anomalous groundwater levels in the Azusa fan suggest that Holocene sediment has been faulted.

The approximate location of an unnamed fault is mapped adjacent to the Morris Dam R&D facility (Figure 3-1). The fault is mapped striking northwest-southeast at the contact between cataclastic rock and mixed quartz monzonite and gneiss. A field reconnaissance of the rocks exposed at the surface in roadcuts along Highway 39 indicated that the cataclastic rock is composed of highly sheared gneiss (possibly chloritic) and chloritic fault breccia. The mixed quartz monzonite and gneiss is highly sheared close to the fault (with local cataclastic textures) becoming significantly less sheared and more coherent to the north. Landslide deposits mantle the slopes adjacent to the site and may occur on the upper portion of the facility itself.

Due to poor outcrop exposures and the highly fractured nature of the fault zone as a whole, it is not clear if the fault extends through the peninsula or immediately to the southwest of it. Visual observations made from the site looking towards the southeast side of the reservoir suggest that this fault potentially could extend to the south-southeast where a contact exists between more massive material and cataclastic material. These observations were made from a distance and could not be verified. However, it is abundantly clear that the gneiss unit on the south side of the Morris Dam R&D facility is highly sheared with local cataclastic texture. Fracture surfaces within the cataclastic material contained visible mineralization, both possible oxide and sulfide minerals. This mineralization is extremely heterogeneous being of varying nature and amount on observed fracture surfaces. Fractures on the peninsula strike in multiple directions, however, many are perpendicular to the strike of the mapped fault zone. Similar to the highway road cuts, fracturing of the gneiss decreases significantly to the north. The gneiss outcrops on the north side of the facility are generally more massive with fracture spacing up to several feet apart instead of inches as to the south. Figure 3-2 shows the approximate location of the highly sheared and mineralized cataclastic rocks at the facility.

In summary, the Morris Dam R & D facility sits on rock that exhibits extremely variable characteristics and in some cases significant secondary mineralization. The rocks vary in outcrop so considerably that in inches one can observe a typical gneiss next to a schist, both with closely spaced fractures that have clearly undergone secondary mineralization. The mineralogical analysis done on outcrop samples clearly identifies this variable nature of the rocks and secondary mineralization. The petrography analysis also identified some dike-type rocks found at the site as amphibolites and pyroxenites/peridotites. Given the very heterogeneous nature of all these rocks, it is expected that they could contain and therefore contribute significant amounts of metals to the surrounding environment. Further discussion of the petrography analysis is discussed in Section 4.

3.2.2 Regional Surface Hydrology and Groundwater Hydrogeology

3.2.2.1 Surface Water

As previously discussed, the Morris Dam R&D facility is located on a peninsula that extends into Morris Reservoir, a man-made lake which stores water from the San Gabriel River behind Morris Dam. This dam also acts to control debris flows from San Gabriel Canyon.

As defined by the RWQCB, the site is located in the Upper Canyon Hydrologic Subarea (HSA) of the San Gabriel Hydrologic Area (HA), both of which are within the Los Angeles-San Gabriel Hydrologic Unit (405.43). The Upper Canyon HSA is bounded to the south by the Lower Canyon HSA, which is in turn bounded by the Main San Gabriel HSA (RWQCB, 1994). A two strands of the Sierra Madre Fault zone, one unnamed and one termed the Duarte Fault, respectively, define the boundaries between these hydrologic subareas.

Regional surface water in San Gabriel Canyon is sheet flow directed down the steep canyons and hillsides. Surface waters in this area arise from precipitation and snow melt. The surface water percolates directly into the hillsides and becomes part of a regional groundwater system. Alternatively, it may be discharged from numerous springs or be directed down canyons and drain overland until it encounters the San Gabriel River, which originates in the mountainous terrain and emerges from the foothills above the City of Azusa. At this point, the river follows a leveled channel through a series of drop structures to the Santa Fe Flood Control Basin (USACE, 1994). Flood control and conservation of these waters is overseen by LACDPW through a series of dams and spreading grounds. Morris Dam, the lowest of three dams, is one of the flood control structures. Figure 3-7 shows the general relationship of the surface water flow regime established in San Gabriel Canyon.

3.2.2.2 Groundwater

Although not specifically within a groundwater basin as defined by the California Department of Water Resources (DWR, 1966), the Water Quality Control Plan, Los Angeles Region, (RWQCB, 1994), groundwater at the site should be considered directly upgradient of the San Gabriel Groundwater Basin. Groundwater flows primarily in fractured crystalline rock, and has limited volumes available for use. Horizontal wells drilled into the crystalline rock typically yield 5 gallons per minute (gpm) or less during the dry season, and between 5 and 50 gpm during the wet season.

As defined by DWR, the boundary between water bearing units and the frontal area or relatively non-water bearing units extends up San Gabriel Canyon and ends just below Morris Dam. In reality, this designation likely applies only to the alluvial sediments that produce water next to the river, and not to groundwater in the bedrock units below the alluvium. Downstream of Morris Reservoir, alluvium in the upper San Gabriel Canyon provides primary water storage for the cities of Azusa and Glendora. Surface water from the San Gabriel River flows downstream and enters the Lower Canyon HSA and then the Main San Gabriel HSA. In these areas, the surface water is allowed to percolate to groundwater of the San Gabriel Basin through the spreading grounds, recharging downgradient wells in the San Gabriel Valley.

Groundwater flow between the different HSAs is impeded by the Sierra Madre fault zone, which offsets the crystalline bedrock below the alluvial sediments. In particular, an unnamed fault at the bottom of San Gabriel Canyon and the Duarte Fault further south are two faults identified in DWR (1966) as impeding groundwater flow in the crystalline bedrock. Groundwater flow in the alluvial

aquifers above the faulted bedrock is described as "cascading" into each subsequent basin, north to south.

Vogel (1988) and Jacobs (1991) mention that, at least historically, Morris Reservoir also provided potable water to the City of Azusa. Reservoir water was delivered by pipeline (the Azusa Conduit) to the Azusa Valley Water Company, which serviced 14,500 customers. This pipeline can be observed as a concrete structure exposed on the east side of the Reservoir across from the Morris Dam R&D facility. Prior to use, water from the Azusa Conduit is clarified and chlorinated.

Based on conversations with LACDPW (personal communication, Mr. Marty Moreno, 1997), the Azusa Conduit is usually filled from the outlet works at San Gabriel Dam upstream of Morris Reservoir. Hence, Morris Reservoir is considered an emergency water source and is used only when San Gabriel Reservoir has been sluiced and is empty. Sediment was sluiced from San Gabriel Reservoir to Morris Reservoir 12 times between 1942 and 1970. Since then, one sluicing event was reported in 1992. More recently, (January, 1995), water from Morris Reservoir has been used because of a broken pipeline, which normally transports water from another source.

No active water wells are located within a one-mile radius of the Morris Dam R&D facility. However, at least one well is used for livestock and irrigation on a private residence about 2.0 miles downstream. Two wells associated with the groundwater spreading grounds at the mouth of San Gabriel Canyon are located approximately 3.3 miles from the facility.

3.2.3 Site Hydrology and Hydrogeology

Surface water flow at the Morris Dam R&D facility occurs primarily as sheet flow following the local topography. In some places, it is diverted through storm runoff systems. On the eastern portion of the site, a series of storm drains and culverts intercepts the surface water flow and discharges to the Reservoir. According to LACDPW personnel (Mr. Art Diaz, personnel communication, 1997) no significant volume of water is lost to the surrounding terrain. LACDPW is required to keep accurate records of flow into and out of the Reservoir, and this information along with daily water level measurements and pan evaporation data do not show unaccounted water loss.

Depth to groundwater below the Morris Dam R&D facility varies considerably due to topographic changes. Groundwater depths in three monitoring wells installed on site vary between approximately 30 to over 160 feet below the top of the well casing (btoc). However, the actual groundwater elevation in the three wells is very similar. Figure 3-8 shows a hydrograph of groundwater and Reservoir water elevations over the investigation period. Table 3-1 details groundwater elevation measurements collected from the monitoring wells and Reservoir water elevations collected at Morris Dam. Note how the water elevation tracks closely with the Reservoir elevation, suggesting direct hydraulic connection between the Reservoir and groundwater below the peninsula.

Groundwater flow beneath the facility through fractured bedrock material is evident from the cross sections in Figure 3-3 and Figure 3-4. During drilling and installation of the monitoring wells, groundwater elevations were observed to increase from the first detected observation in drill cuttings. This increase suggests that the source of water may be from a fracture zone towards the bottom of each well rather than fractures nearer the top of the piezometric surface shown in Figure 3-3 and Figure 3-4. It is not possible to evaluate with certainty the source of water due to the long screen intervals in each well, which were set in consultation with DTSC in order to monitor groundwater elevation changes due to fluctuating reservoir levels. The closely fractured rock along the base of the peninsula collaborates this finding by suggesting that water could easily enter the subsurface below the peninsula and migrate through these fractures.

Water elevation contours from two different dates are plotted in Figure 3-9 and Figure 3-10. As evident in both of these figures, the groundwater gradient suggests flow is parallel to the axis of the reservoir, which in turn implies that the overall movement of water through the reservoir also controls groundwater movement below the peninsula. Gradients measured from the contour lines portrayed in Figure 3-9 and Figure 3-10 are 0.00033 ft/ft to 0.00035 ft/ft, respectively, indicating that the potential for horizontal movement is low, depending on the hydraulic conductivity of the fractured rock.

Since hydraulic conductivity has not been determined at the Morris Dam R&D facility, groundwater velocities cannot be determined. However, given the potential for very high hydraulic conductivity in fractured rock, the high-end estimate for groundwater velocity would be similar to the actual velocity of water through the reservoir. From data presented in the San Gabriel Canyon Sediment Management Plan (USACE, 1994), Morris Reservoir produces 250,000 acre-feet of water for the wettest 20 percent of years, while the driest 80 percent of years produce 31,000 acre-feet. During many years, negligible releases occur due to water diversion around Morris Reservoir through the Azusa Conduit. Given the range of annual flow volumes cited above and the area of Morris Reservoir (100 acres – LACDPW, 1994), the specific groundwater discharge or velocity can be calculated to range from 0 feet/year to 2,500 feet/year.

It should be mentioned that the groundwater contours shown on Figure 3-9 and Figure 3-10 may represent a transient condition that reflects water was flowing through the reservoir. At other times, when water is being released at greater rates, or during quiescent times when no water is being released, the groundwater gradient direction and magnitude may be drastically different. Additionally, contoured water level data from fracture flow in bedrock environments can often yield erroneous interpretations because preferential flow through fractures of different aperture sizes may yield significant secondary flow pathways. Hence, although water levels from the monitoring wells suggest that groundwater flow underneath the peninsula is directed downstream along the reservoir axis, this may represent a condition which can change with time due to reservoir dynamics and may not represent the current actual migration pathways through the fractured bedrock.

It should also be mentioned that although water elevation measured at Morris Dam is slightly greater than that observed in the wells on site, water is likely not flowing into both sides of the

peninsula from the reservoir. Rather this probably reflects a slight increase of water at the Dam due to surface wind, which tends to build up water levels slightly at land or other obstructions. Reservoir level data were collected at 8:00 am each morning, and therefore would reflect the minor buildup of water against the Dam due to wind currents flowing down San Gabriel canyon throughout the night (see meteorology below).

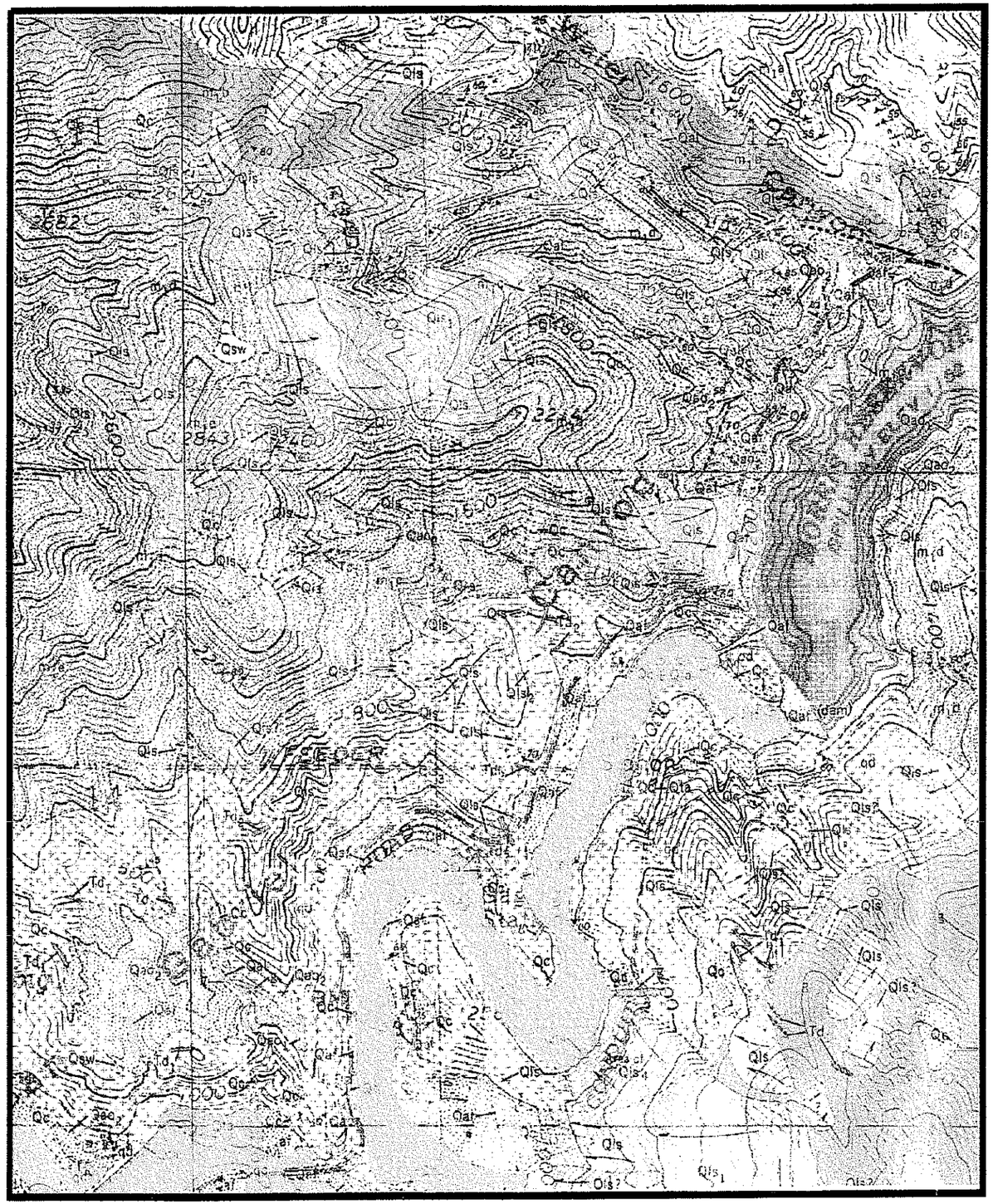
3.3 METEROLOGY

The climate of the southern flank of the San Gabriel Mountains is semi-arid to sub-humid. The average annual precipitation in the area ranges from 5 inches to nearly 40 inches, with an average 100-year rainfall of 18 inches. In general, the amount of precipitation is variable and unpredictable. For example, precipitation of 84 inches was reported at Cogswell Reservoir during the 1977-1978 season (USACE, 1994). Precipitation occurs primarily in the winter and spring months. LACDPW has implemented weather modification programs in the San Gabriel Canyon area to increase storm runoff. Approximate annual evaporation from the Reservoir surface is 54 inches per year (Vogel, 1988). Mean annual temperature at the Morris Dam R&D facility is approximately 60° F

Winds in the area are bimodal, exhibiting an onshore component from the southwest by day and a northeast component by night. This description comes from 15-year wind monitoring records at the South Coast Air Quality Management District (SCAQMD) Azusa air monitoring station (USACE, 1994). The onshore component is strongest during the summer, while the northeast component is dominant in the winter. Because San Gabriel Canyon produces a steering effect on wind direction, the wind pattern at the Morris Dam R&D is also bimodal, but peaked parallel to the river channel. Therefore, at night a thin narrow jet of cool air flows down San Gabriel Canyon, with early morning winds reaching up to 20 miles per hour within the lower portions of the Canyon. During the day, air from the San Gabriel Basin is carried up canyon into the San Gabriel Mountains. Santa Ana winds and winter storms can disturb this average behavior.

Table 3-1. Water and Reservoir Level Measurements, September through December 1997

Well ID	Date	Well Elevation ft msl	Water Level ft btoc	Water Elevation ft msl	Reservoir Water Elevation ft msl	Comments
MW-1	9/8/1997	1304.68	174.18	1130.50	1130.55	After Well Installation
MW-2	9/8/1997	1179.14	48.70	1130.44	1130.55	After Well Installation
MW-3	9/8/1997	1172.06	41.68	1130.38	1130.55	After Well Installation
MW-1	9/22/1997	1304.68	168.44	1136.24	1136.42	
MW-2	9/22/1997	1179.14	42.93	1136.21	1136.42	
MW-3	9/22/1997	1172.06	35.92	1136.14	1136.42	
MW-1	9/23/1997	1304.68	168.17	1136.51	1136.56	After Purge and Sample
MW-2	9/23/1997	1179.14	42.72	1136.42	1136.56	After Purge and Sample
MW-3	9/23/1997	1172.06	35.80	1136.26	1136.56	After Purge and Sample
MW-1	10/8/1997	1304.68	166.66	1138.02	1138.00	
MW-2	10/8/1997	1179.14	41.19	1137.95	1138.00	
MW-3	10/8/1997	1172.06	34.10	1137.96	1138.00	
MW-1	12/2/1997	1304.68	174.30	1130.38	1130.41	
MW-2	12/2/1997	1179.14	48.70	1130.44	1130.41	
MW-3	12/2/1997	1172.06	41.60	1130.46	1130.41	



(ADAPTED FROM MORTON, 1973)

LEGEND

Qls — Landslide debris

Qaf — Artificial fill

Qa — Alluvium

m_1e — Mixed biotite and/or hornblende gneiss where well layered designated ss

m_1c — Cataclastic rock

m_1c — Biotite gneiss

m_1b — Mixed gneissic quartz diorite and gneiss

m_1a — Hornblende gneiss

s — Leucogranitic rocks

qd — Quartz diorite

Unnamed fault

FIGURE 3-1

GEOLOGIC MAP FROM SURROUNDING AREA

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796035.DWG

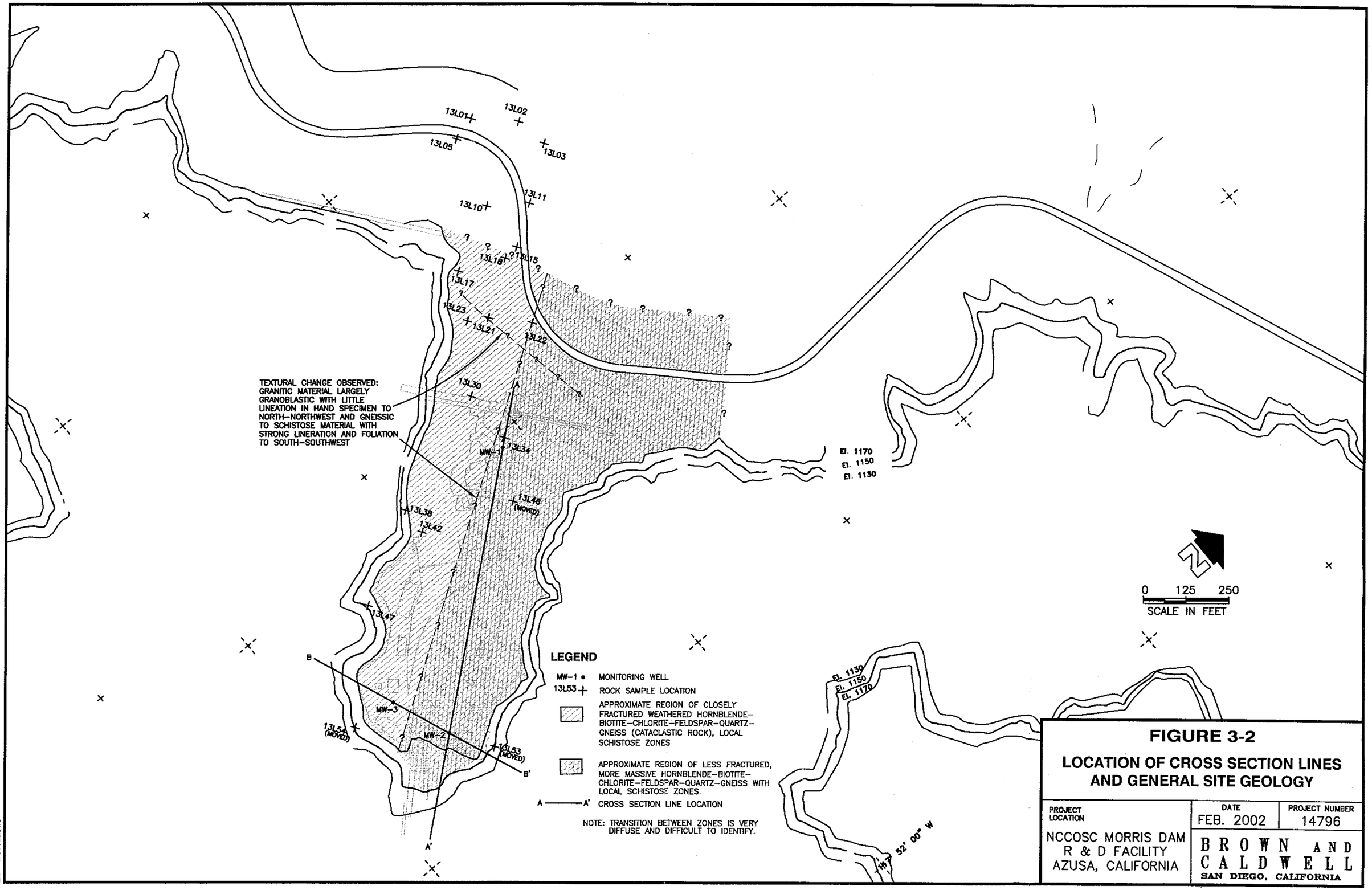


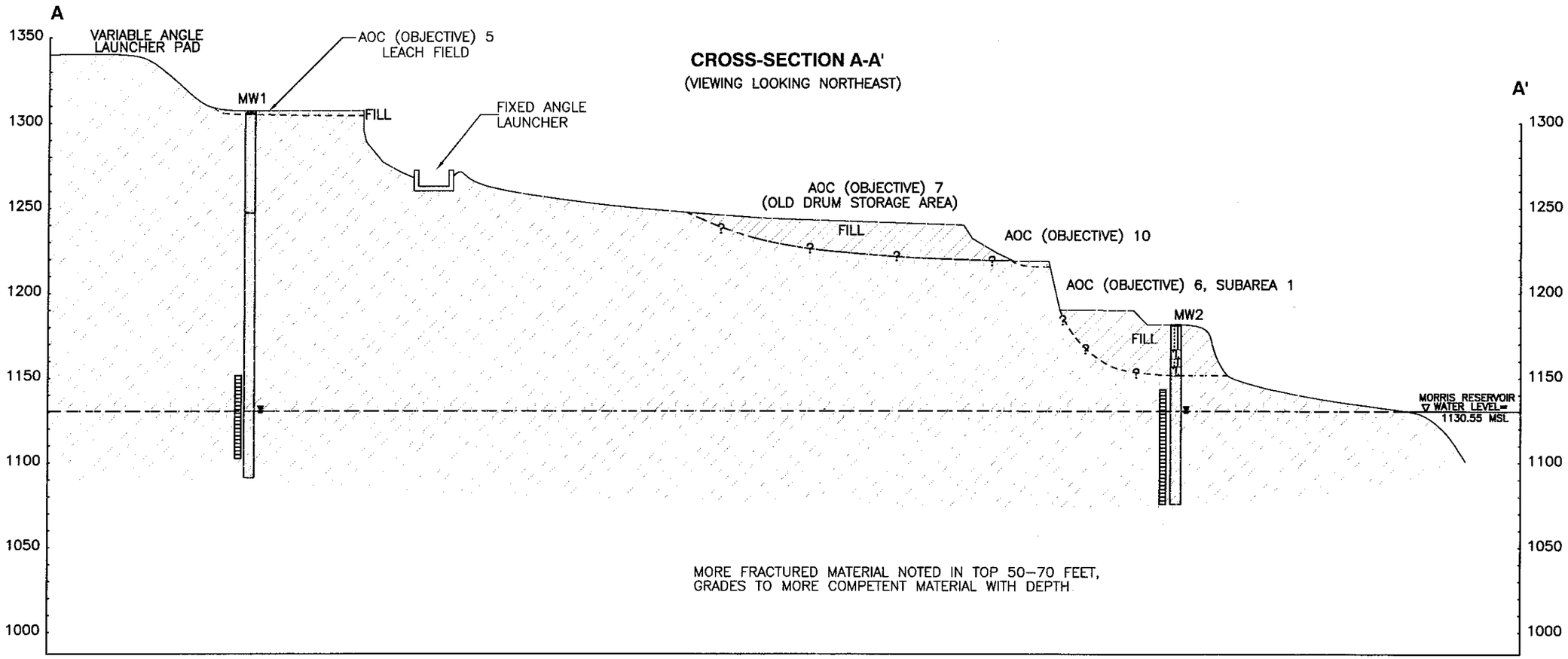
FIGURE 3-2

LOCATION OF CROSS SECTION LINES AND GENERAL SITE GEOLOGY

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796035.DWG



LEGEND

- FILL
- HORNBLENDE–BIOTITE–CHLORITE–FELDSPAR–QUARTZ–PLAGIOCLASE GNEISS, LOCAL SCHISTOSE ZONES
- MONITORING WELL SCREEN INTERVAL WITH WELL WATER LEVEL
- POTENTIOMETRIC SURFACE

AOC – AREA OF CONCERN
AOI – AREA OF INTEREST

0 50 100
HORIZONTAL SCALE IN FEET

0 33.3 66.6
VERTICAL SCALE IN FEET

FIGURE 3-3

CROSS-SECTION A-A'

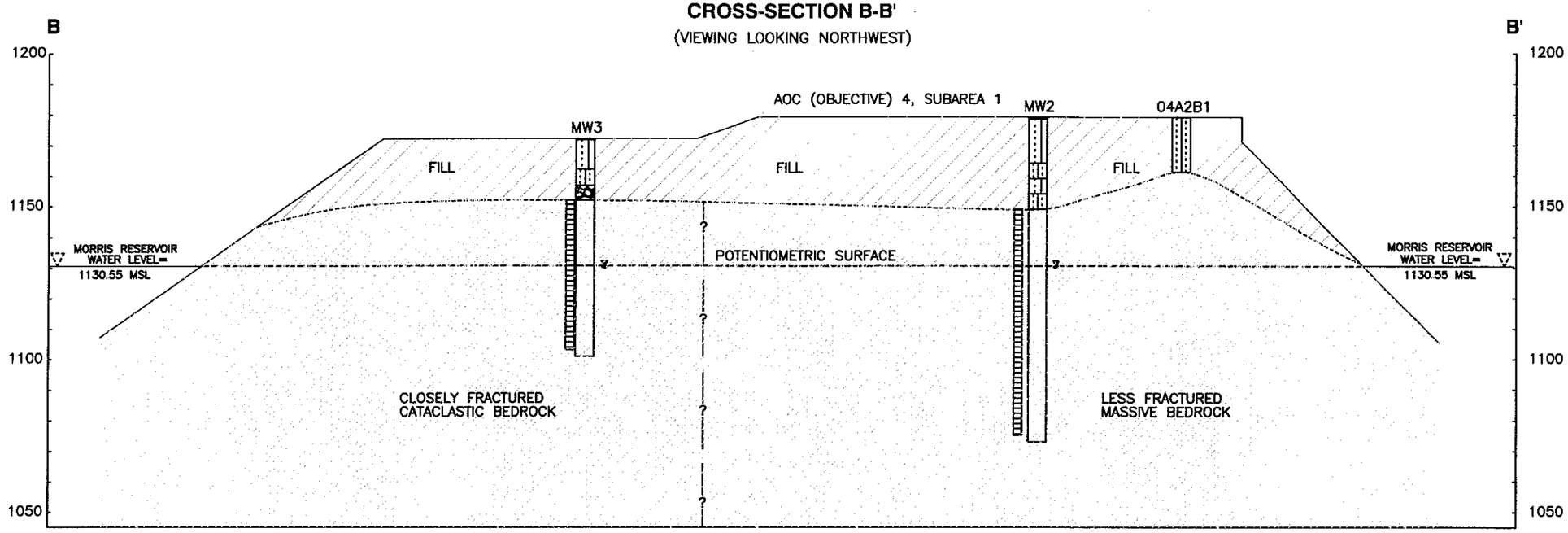
PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796019.DWG

CROSS-SECTION B-B'

(VIEWING LOOKING NORTHWEST)



LEGEND

- FILL
- HORNBLENDE BIOTITE–CHLORITE–FELDSPAR–QUARTZ–PLAGIOCLASE–GNEISS, LOCAL SCHISTOSE ZONES
- MONITORING WELL SCREEN INTERVAL WITH WELL WATER LEVEL
- TRANSITION ZONE BETWEEN TWO BEDROCK TYPES
- POTENTIOMETRIC SURFACE

AOC – AREA OF CONCERN
AOI – AREA OF INTEREST

0 30 60
HORIZONTAL SCALE IN FEET

0 20 40
VERTICAL SCALE IN FEET

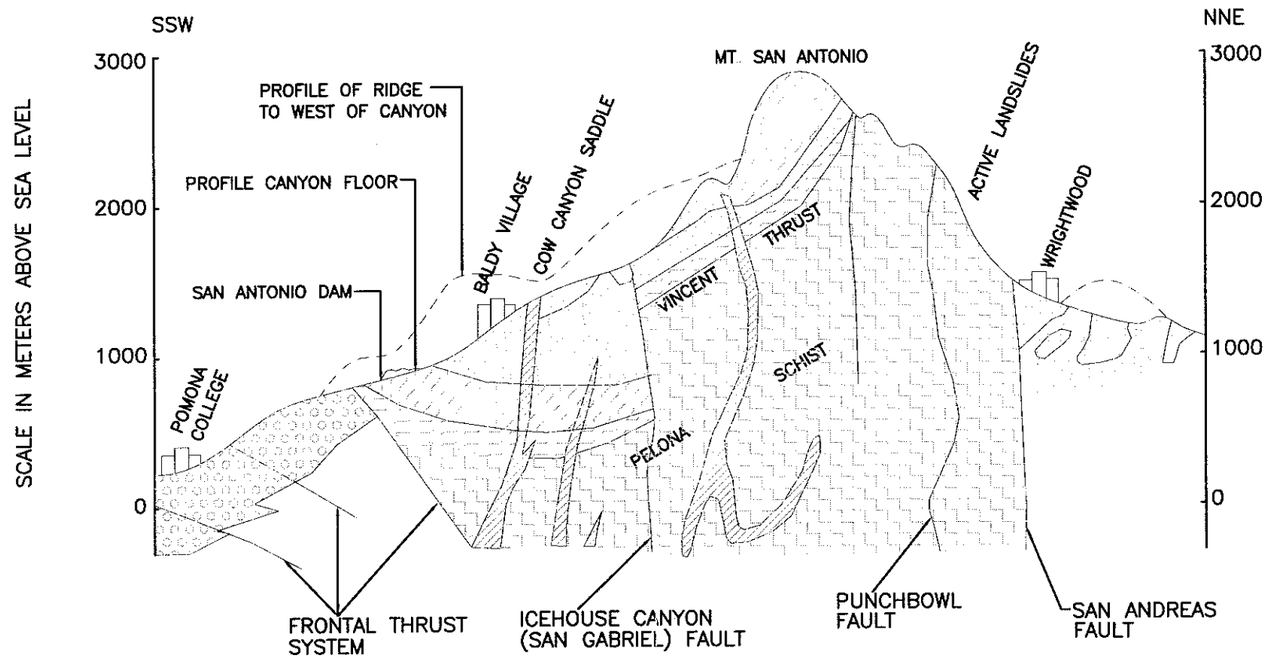
FIGURE 3-4

CROSS-SECTION B-B'

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796020.DWG



LEGEND

- ALLUVIAL FAN
- TERTIARY IGNEOUS ROCKS
- MESOZOIC INTRUSIVES
- MYLONITE
- MESOZOIC SCHIST
- PALEOZOIC METASEDIMENTS
- PRECAMBRIAN GNEISS

0 5KM
APPROXIMATE SCALE

SOURCE: POMONA COLLEGE WEB PAGE HTTP: //WWW.GEOLOGY.POMONA.EDU/IMAGES/MAP4.JPG

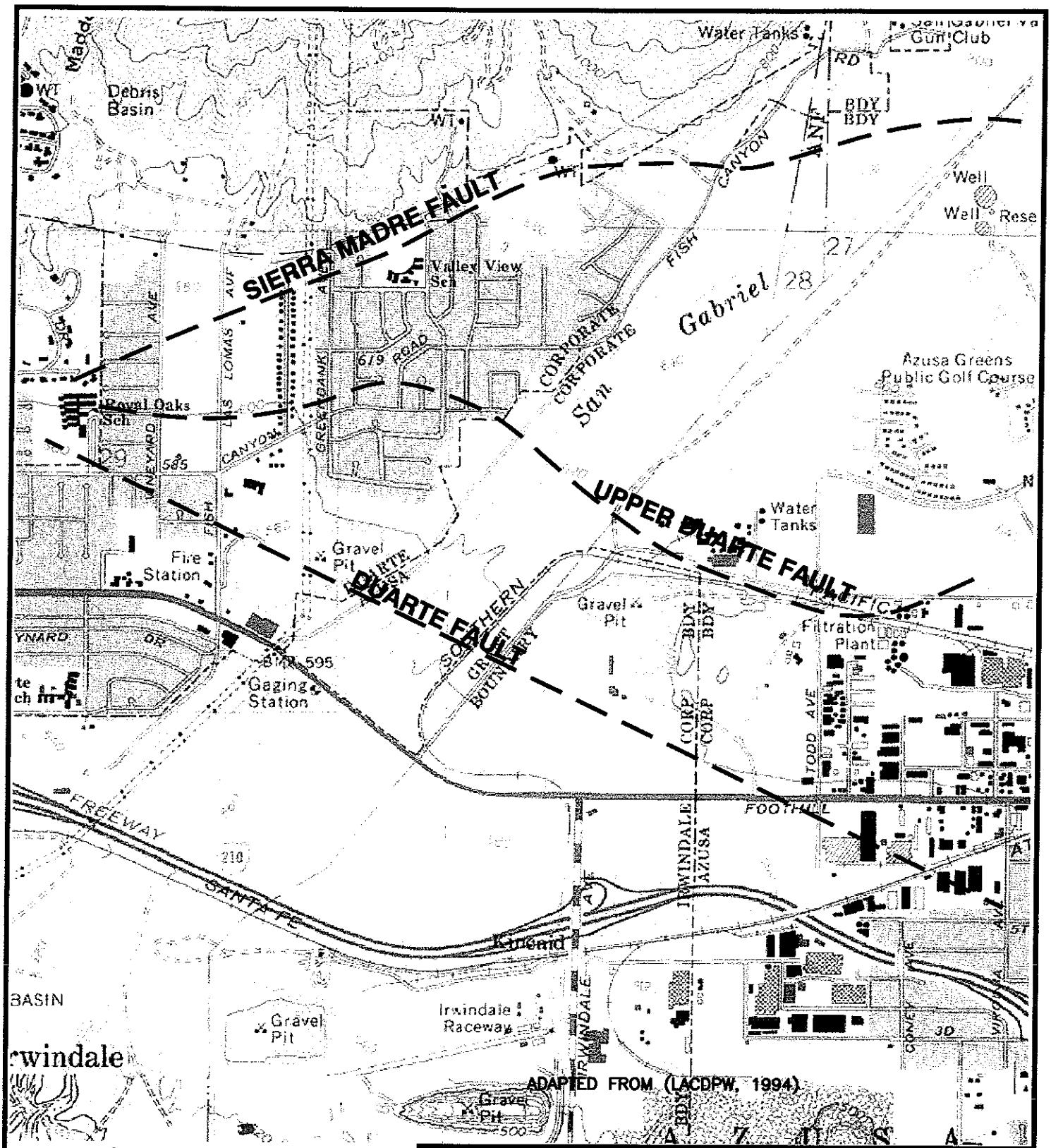
FIGURE 3-5

SCHEMATIC REGIONAL CROSS SECTION

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796021.DWG



(ADAPTED FROM LACPW, 1994)

LEGEND

— — — INFERRED FAULT LINES

N

0 750 1500

APPROXIMATE SCALE IN FEET

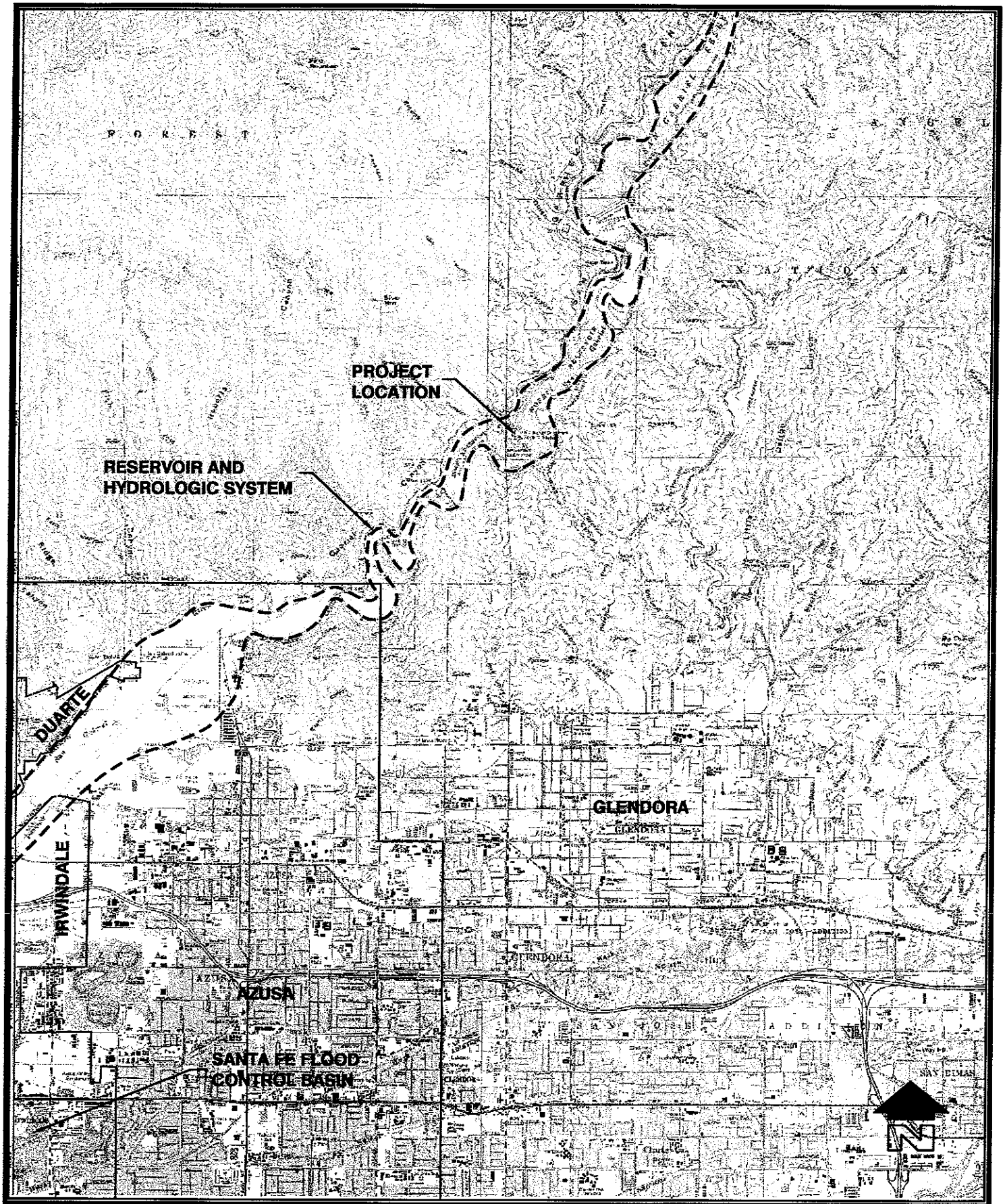
FIGURE 3-6

LOCAL FAULTS IN THE LOWER SAN GABRIEL CANYON

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796022.D.



DATE	PROJECT NUMBER
FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

GENERAL HYDROLOGIC SYSTEM

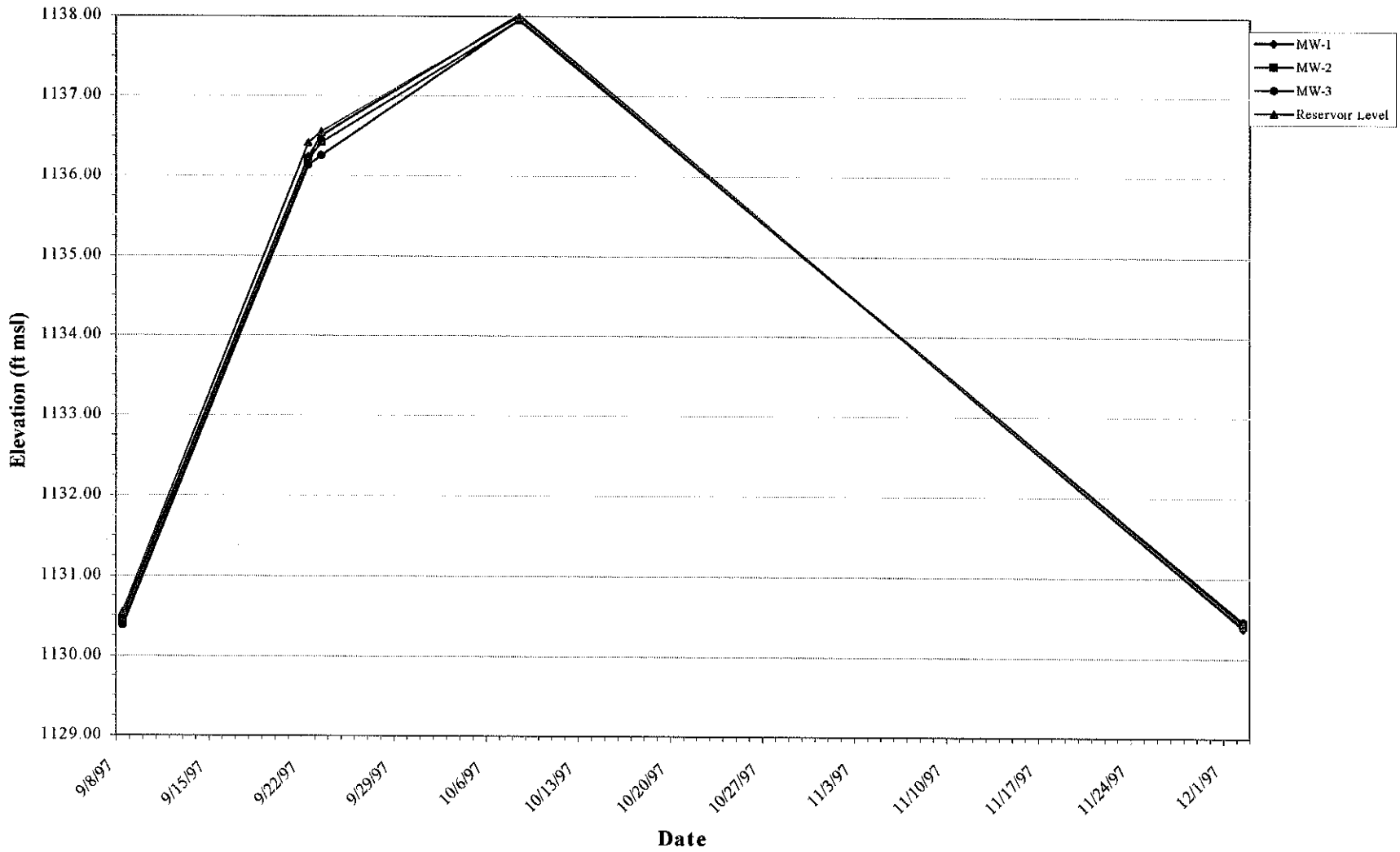
PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY, AZUSA, CALIFORNIA

0 2640 5280
SCALE IN FEET

FIGURE 3-7

LAF 14798040.DWG

Hydrograph Showing Variation in Water Elevation in Wells and Reservoir.

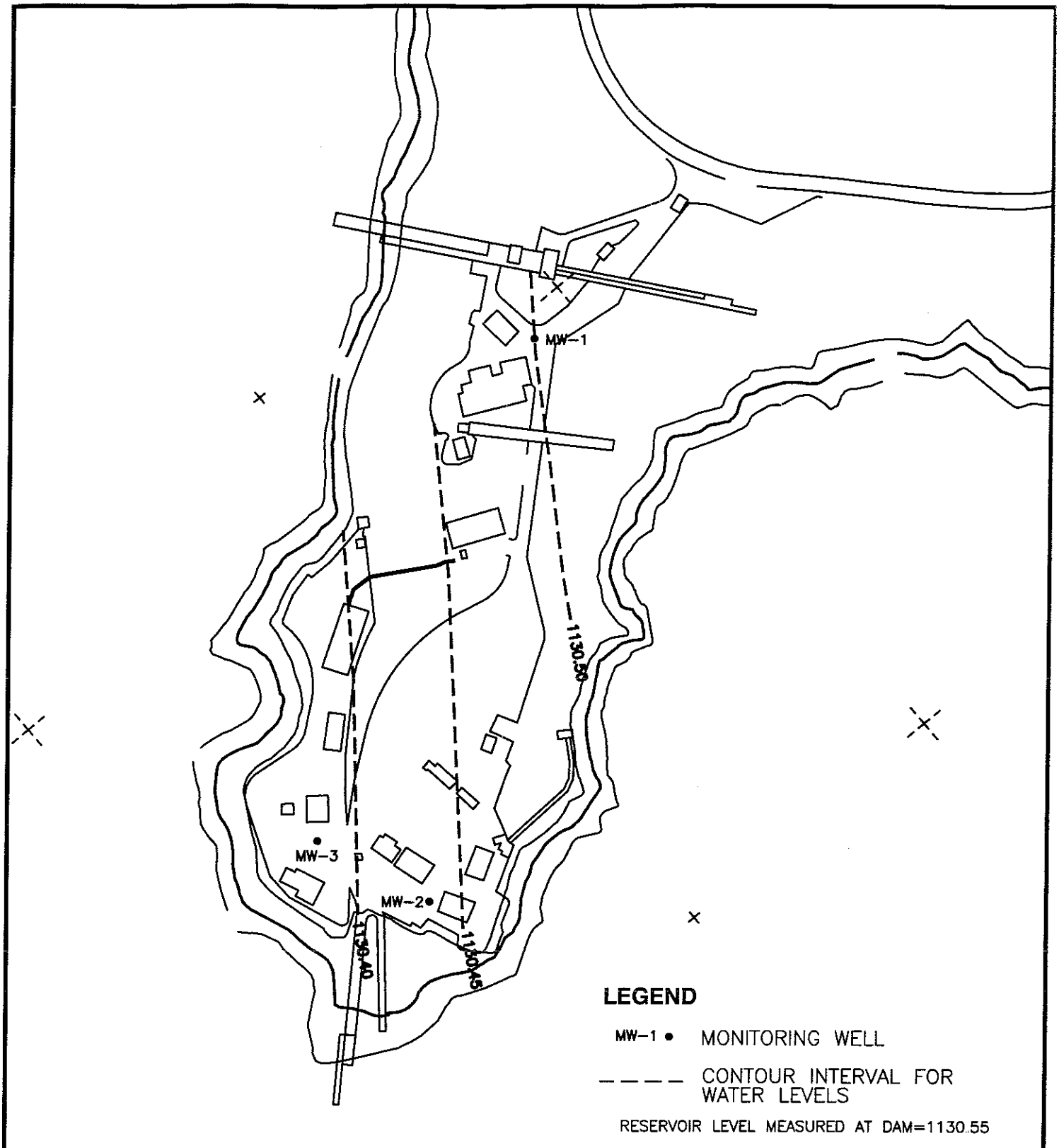


BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	0 NO SCALE SCALE IN FEET	PROJECT NUMBER 14796	DATE FEB. 2001
	PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	

FIGURE 3-8

HYDROGRAPH SHOWING WATER ELEVATIONS IN WELLS AND RESERVOIR

LAF 14796027.DWG



0 100 200
SCALE IN FEET

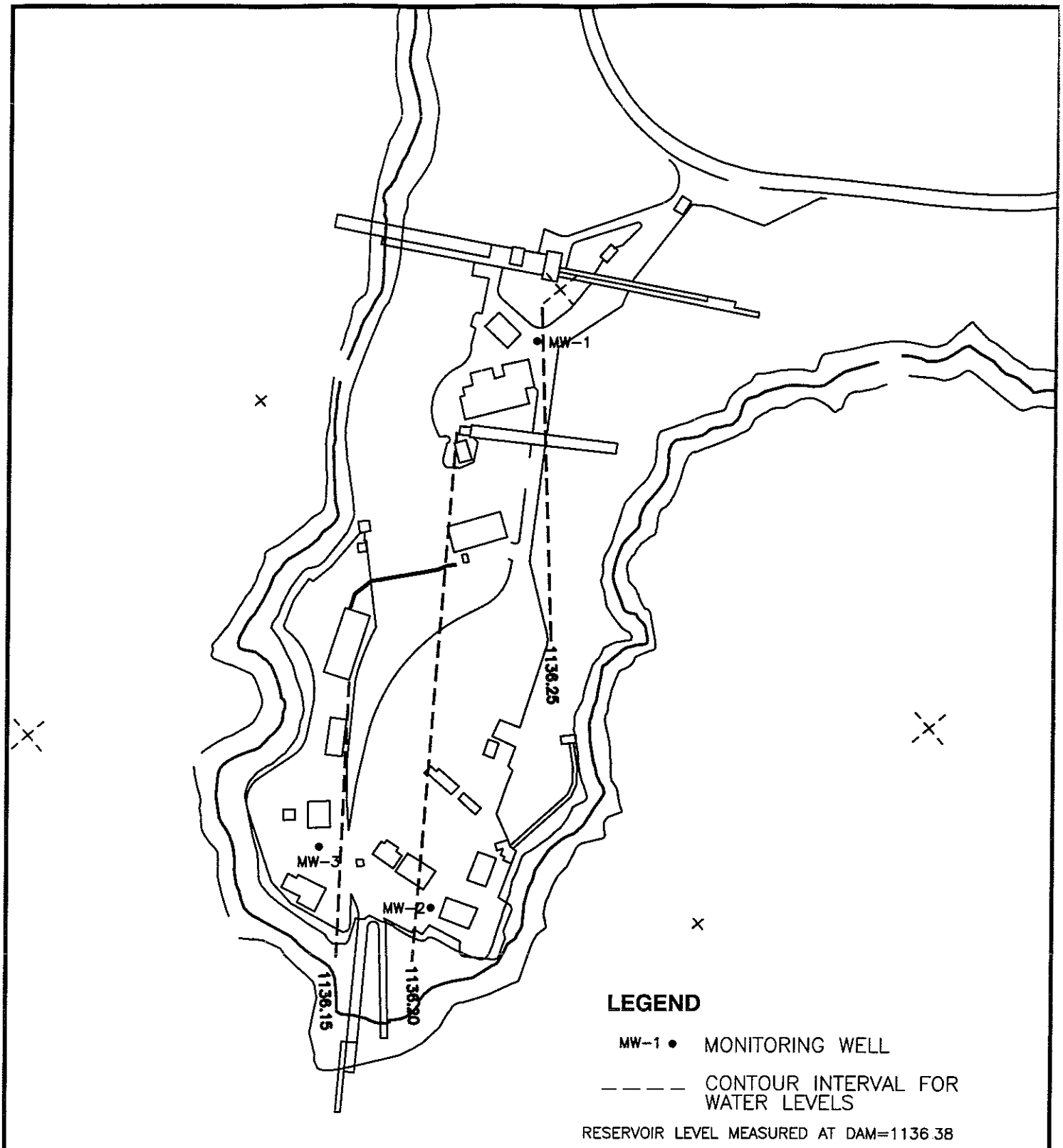
FIGURE 3-9

GROUNDWATER ELEVATIONS BELOW FACILITY 09/08/97

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796028.DWG



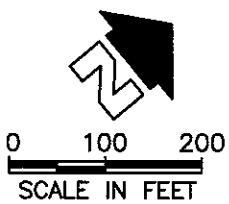


FIGURE 3-10

GROUNDWATER ELEVATIONS BELOW FACILITY 09/22/97

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796029.DWG

4.0
SITE INSPECTION FIELD ACTIVITIES AND ANALYTICAL RESULTS

This section documents field activities that occurred in 1997 and 2000 as part of the SI at the Morris Dam R&D facility It also presents and discusses analytical results, and summarizes data quality.

4.1 SITE INSPECTION FIELD ACTIVITIES

SI field activities consisted of geophysical surveying, and sampling of soil, surface loess, soil vapor, sediment, and groundwater. These activities were conducted at different "Areas of Concern" (formerly "Objectives") located throughout and near the Morris Dam R&D facility.

The SI Work Plan (Brown and Caldwell, 1997) and the SI Work Plan Addendum (Brown and Caldwell, 2000) were organized around sampling of media at "Objectives" throughout the site. The term "Objectives" was used purposefully in these plans because many activities took place in more than one area. Sampling and analysis schemes were targeted for specific constituents that may have been released as part of these activities. The definition of "Objective" then, as used in the SI Work Plan (Brown and Caldwell, 1997) and SI Work Plan Addendum (Brown and Caldwell, 2000), was a specific area or group of areas that included similar and specific sampling and analytical objectives. However, over the course of this project the distinction between different activities at some of these "Objectives" has changed. Review of the SI approach, which occurred during the preparation of this report highlighted potential confusion with use to the word "Objective." Hence, the Navy has decided to use a more conventional nomenclature and renamed each "Objective" to either "Area of Concern" or "Background Area." depending upon the focus for sampling. If an Area of Concern (AOC) has locations separated by some distance, then the AOC is further broken down into Subareas. The AOC and Subarea nomenclature will be used in this report. To avoid confusion between the Work Plans and SI Report, the numbers for each AOC will correspond to those for the Objectives outlined in the Work Plan and Work Plan Addendum. In addition, the "Objective" identifier will be provided by the site description in this SI report in parentheses to facilitate comparison between the different documents.

Eleven Areas of Concern (Objectives) and two Background Areas (Objectives 12 and 13) were identified in the Work Plan and Work Plan Addendum (Brown and Caldwell, 1997 and 1999). These Areas of Concern (Objectives) or Background Areas are as follows:

- AOC (Objective) 1: Former Gasoline Station/Drum Storage Pad.
- AOC (Objective) 2: Oil/Water Separators.
- AOC (Objective) 3: Outfall Areas.
- AOC (Objective) 4: Propulsion System Testing Area.
- AOC (Objective) 5: Sewer Septic Tank and Leach Field Lines.
- AOC (Objective) 6: Sump and Collection Lines.
- AOC (Objective) 7: Temporary Drum Staging Area.

- AOC (Objective) 8: Groundwater Investigation
- AOC (Objective) 9: Slurry Outfall Pipe
- AOC (Objective) 10: Electronic Testing Area
- AOC (Objective) 11: Propellant Magazine
- Background Area 1 (Objective 12): Background Soil Sampling
- Background Area 2 (Objective 13): Background Rock Sampling

Figure 4-1 shows the Morris Dam R&D facility with AOCs (Objectives) identified. Table 4-1 summarizes the AOCs (Objectives), the Subareas under each AOC (Objective), the activities that were conducted for each as part of the field investigation, and the analytical procedures applied for each matrix sampled. Each AOC (Objective) is described below along with a narrative summary of the field activities conducted as part of this SI. The rationale for these activities is discussed in the Work Plan (Brown and Caldwell, 1997) and the Work Plan Addendum (Brown and Caldwell, 2000). Specific discussions regarding the procedures used to collect samples are presented in Appendix B. Descriptive logs for all soil borings are included in Appendix C.

It should be noted that when field activities occurred during the SI, all of the buildings shown in Figure 4-1 had been demolished. All that existed from these structures are foundation pads and roads. Former structures such as the sump and collection lines as discussed in AOC (Objective) 6 below had been filled in with concrete at the start of field data collection.

4.1.1 Area of Concern (Objective) 1: Former Gasoline Station/Drum Storage Pad

AOC (Objective) 1 targeted the former gasoline station (Building 42003) and the former drum storage pad next to this facility. As presented in Table 4-1, two Subareas are identified in AOC (Objective) 1. Subarea 1 is the former concrete pad, and Subarea 2 is the slope soils south of the former gasoline station. Figure 4-2 shows Subareas and sampling locations for AOC (Objective) 1.

One location was sampled in Subarea 1. The boring in this location was advanced through the concrete pad. Soil samples were collected from this location from just below the cover (1-foot bg) and 3 feet bg. Three locations were sampled at Subarea 2. All borings in this Subarea were advanced through exposed soil. Samples from this location were collected from the surface (0 – 1.0 foot bg) and 3 feet bg, when this depth could be achieved. Soil samples from both Subareas were analyzed by the procedures designated in Table 4-1.

4.1.2 Area of Concern (Objective) 2: Oil/Water Separators

AOC (Objective) 2 was concerned with two oil/water separators located at different parts of the facility, as shown on Figure 4-3 and Figure 4-4. The separator in Figure 4-3 (by former Building 42001) is designated as Subarea 1. The separator in Figure 4-4 (on the northeast side of former Building 42010) is designated as Subarea 2.

One soil boring location was sampled at each Subarea, placed as close as possible to the structures. The boring in Subarea 1 was advanced through exposed soil. The boring in Subarea 2 was advanced through asphalt and concrete that surrounds the structure. The soil boring log for Subarea 1 indicates that concrete was encountered at 3.5 feet bg, suggesting that this boring went through the former oil/water separator tank. Soil samples were collected from 5 feet below grade in both locations. Samples from both Subareas were analyzed as indicated in Table 4-1.

4.1.3 Area of Concern (Objective) 3: Outfall Areas

AOC (Objective) 3 focused on outfall areas where the sump and collection lines described under AOC (Objective) 6 discharged onto soils on the side of the peninsula. Subarea 1 (Figure 4-2) is designated as the location where two discharge pipes extend out near the former gasoline station (Building 42003). Subarea 2 (Figure 4-4) is the area where the collection line discharged near former Building 42015.

In Subarea 1, borings were advanced through exposed soil below each of two discharge pipes that extended from the slope face. Boring 1 was located below a rusted 3-inch steel line that extends toward the west from former Building 42003. The drainage area that fed this line is not known, although drainage grates in the flat-lying area northwest of former Building 42003 may have been connected to it. This line is likely not part of the sump and collection line system described in AOC (Objective) 6. However, a previous soil sample was collected in this area (OF2), so this location was placed as closely as could be determined to this general vicinity to verify the results from the previous boring. The second boring in Subarea 1 was placed below a 1-foot diameter steel corrugated line that is thought to be an outfall from the sump and collection lines described in AOC (Objective) 6. Boring 1 was advanced to 3 feet with soil samples being collected from the surface (0 – 0.5 feet bg) and at 3 feet bg. Boring 2 was only advanced to 1 foot due to refusal. One soil sample was collected from this boring from 0 – 0.5 feet bg.

In Subarea 2, one boring was advanced to 3 feet bg through exposed soil. Two soil samples were collected from this boring, one at 0 – 0.5 feet bg, and one at 3 feet bg. Samples from both Subareas were analyzed using the procedures designated in Table 4-1.

4.1.4 Area of Concern (Objective) 4: Propulsion System Testing Area.

AOC (Objective) 4 targeted 5 Subareas, all of which were associated with propulsion system testing. These Subareas are summarized in Table 4-1, and shown on Figure 4-4. Subarea 1 is directly below the former above ground storage tank (AST) pad located west of former Building 42015. Subarea 2 is the concrete pad directly east of former Building 42015. Subarea 3 is the slope face southeast and south of former Building 42015. Subarea 4 is directly below former Building 42028. Subarea 5 is directly below former Building 42039.

One soil boring was advanced in Subarea 1, and one sample was collected from this boring from 0 – 1.0 foot bg. The boring was advanced directly into the exposed soil surface.

Two soil borings were located in Subarea 2 and advanced through the concrete pad. These borings were advanced to 15 and 20 feet bg, respectively, until the bedrock face was encountered. Soil samples were collected from 5 feet, 10 feet, 15 feet, and 16 feet bg in Boring 1, and 5 feet, 10 feet, 15 feet, and 20 feet bg in Boring 2. The deepest soil samples from these two locations were collected directly at the interface with bedrock.

Four boring locations were placed in Subarea 3 to cover an area that appeared stained in a historical photograph. Borings 1, 2, and 3 were advanced through gunite, which covers the slope. Boring 4 was advanced directly into the soil surface. Two soil samples were collected from each boring, one directly below the gunite surface (0.25 – 1.0 foot bg), and the other at 3 feet bg.

Two borings were located in Subarea 4. One was placed directly below the pad in a room in which propulsion experiments were conducted, and the other was placed along a collection drain line downstream of the room. Both borings were advanced through the concrete pad, and sampled directly below the pad (1 foot bg) and at 3 feet bg.

Two boring locations were advanced in Subarea 5. The borings were placed at opposite sides of former Building 42039, directly below the pad in a room in which components from propulsion system experiments were cleaned. These borings were advanced through the concrete pad, and were sampled at two intervals, directly below the pad (1 foot bg) and at 3 feet bg.

Samples from all Subareas in AOC (Objective) 4 were analyzed by the procedures designated in Table 4-1.

4.1.5 Area of Concern (Objective) 5: Sewer Septic Tank and Leach Fields.

AOC (Objective) 5 consists of the septic tank where sanitary wastes were collected and a leach field line where these fluids were allowed to infiltrate to the subsurface. Figure 4-2 and Figure 4-3 show the location of the septic tank and the leach field lines. The septic tank is located directly west of former Building 42005 (Figure 4-2). Three leach field lines have been identified at the Morris Dam R&D facility (Figure 4-3). The older system originates near the entrance gate and extends south down hill to the location of the former VAL. The younger system originates near former Building 42001 and extends towards the northeast, ending on the road that extended toward the VAL counterweight track. An intermediate system, probably part of the older system exists under the former VAL location.

A geophysical survey was conducted over the areas shown on Figure 4-4 to locate the former leach field lines and associated piping. The report from this survey is included in Appendix D, and the results are summarized in Section 4.2.5.1 below.

Subarea 1 surrounds the leach lines. Five borings were advanced through exposed soil in this area as shown on Figure 4-3. Each boring was advanced to 3 feet bg with the exception of Boring 4, which encountered concrete at 1.5 – 3 feet bg. Soil samples were collected from two depths in

each of these borings at 1 and 3 feet bg. In Boring 4, only one sample was collected from 1 foot bg.

One soil boring was advanced in Subarea 2, adjacent to the southwest corner of the septic tank (Figure 4-2). Two soil samples were collected from this boring, from 5 and 10 feet bg.

Samples from both Subareas in AOC (Objective) 5 were analyzed as indicated in Table 4-1.

4.1.6 Area of Concern (Objective) 6: Sump and Collection Lines and Sludge Sampling

AOC (Objective) 6 contains two Subareas. The first includes the sump and collection lines which surround and run through former Buildings 42010, 42011, 42015, 42016, 42028, and 42039. These were used to route utilities between buildings, transport fluids from activities within the buildings to the reservoir, and convey rainfall collected from areas near the buildings. As previously discussed under AOC (Objective) 3, these lines discharged at two areas. The sump and collection lines were filled with concrete during the demolition in 1997.

As shown on Figure 4-5, 11 soil borings were advanced within Subarea 1. These were located along the sump and collection lines either at areas of visible staining on the surface in former Building 42010, or along areas where structural cracks were visible in the concrete lines or adjacent surface concrete. Reconnaissance was done prior to any demolition at this site to evaluate cracks or other features that could have been responsible for a release through these features. Borings were placed at any areas where obvious cracks existed. Additionally, Boring 9 was located adjacent to a drain grate located in former Building 42016 that was connected to the collection line system. All of these borings were advanced through concrete pads. Three samples were collected from each boring, one directly below the concrete surface (1 foot bg), one at 3 feet bg, and one at 5 feet bg.

Subarea 2 is nearby former Building 42029, as shown on Figure 4-6. These locations, which were set in the field after consultation with DTSC, were placed to investigate a surface release of sludge that was noted during a site visit. Three samples were located in this Subarea, and advanced below an asphalt surface to 1-foot bg.

Samples from both Subareas in AOC (Objective) 6 were analyzed for the parameters designated in Table 4-1.

4.1.7 Area of Concern (Objective) 7: Temporary Drum Storage Area

AOC (Objective) 7 includes the entire flat area adjacent to former Building, 42116, which contained electrical transformers. This AOC (Objective) also was a temporary drum storage area based on historical photographs showing drums on the pad. The exact location of the drums was difficult to discern in the photographs, so the investigation used a tiered approach to define boring locations as described in the following paragraphs.

The AOC (Objective) consists of two Subareas (Figure 4-7) Subarea 1 is a low bermed area where wind and surface water can carry surface sediment or "loess" particles towards a drainage berm that directs flow towards the northeastern side of the peninsula. Surface sediment or loess, collects along this berm. Three samples of the loess were collected and submitted for the analyses indicated on Table 4-1. Figure 4-7 shows the location of these samples.

A soil vapor survey also was conducted in this area to determine if any VOCs had been released, and to help guide soil boring placement. The survey grid is shown on Figure 4-7. Soil vapor was collected from passive samplers placed directly below the asphalt surface. Results from this survey were used to aid with placing borings in Subarea 2, and are discussed below in Section 4.2.7.1.

Subarea 2 as defined by the passive soil vapor results includes the northwest corner of the soil vapor grid and another location just north and northwest of former Building 42116. Five borings were advanced in this Subarea, including three on the northwest corner of the soil vapor grid, and two adjacent to former Building 42116. The borings were advanced to 5 feet bg, and soil samples were collected from just below the asphalt surface (0.25 to 1.0 foot bg), 3 feet bg and 5 feet bg.

Samples from both Subarea 1 and 2 and the soil vapor survey samples were analyzed using the procedures designated in Table 4-1.

4.1.8 Area of Concern (Objective) 8: Groundwater Investigation

AOC (Objective) 8 consists of a groundwater investigation involving placement and sampling of three monitoring wells located across the Morris Dam R&D facility. Three wells were installed and completed with surface protective boxes. Specific descriptions of drilling and well installation procedures are presented in Appendix B Boring logs and well completion diagrams are included in Appendix C.

Monitoring well MW-1 was placed near the leach field lines described under AOC (Objective) 5 (Figure 4-3). This well was drilled to 215 feet bg, and completed with a well screen from 155 to 204 feet bg. Groundwater was first encountered during drilling at 195 feet bg. A second well, designated MW-2, was located near areas where propulsion system testing occurred on the southeastern side of the peninsula, between former Buildings 42015 and 42016 (Figure 4-5). MW-2 was drilled to 105 feet and completed with a well screen from 30 to 104 feet bg. Water was first encountered during drilling at 95 feet bg. The third well, designated MW-3, was placed between the former gasoline station (former Building 42003) and the septic tank by former Building 42005 (Figure 4-2). MW-3 was drilled to 70 feet bg and completed with a well screen from 20 to 69 feet bg. Water was first encountered during drilling at 55 to 60 feet bg. After well completion, water rose in MW-1, MW-2, and MW-3 to depths of 177 feet bg, 50 feet bg, and 43 feet bg, respectively. Monitoring well locations and screen depths were determined in the field in consultation with DTSC.

One groundwater sample was obtained from each monitoring well. The wells were purged using a submersible pump in which the pumping rate was reduced as low as possible for sampling. The samples were analyzed for the parameters as given in Table 4-1. Field measurements were also collected from probes in a flow-through cell during purging and sampling, and the final values for these parameters are given in Table 4-2.

4.1.9 Area of Concern (Objective) 9: Slurry Outfall Pipe

AOC (Objective) 9 is located offshore in an area surrounding the former slurry outfall pipe discharge. The objective of the sampling effort was to document any area-specific sediment anomalies around the outfall terminus and to determine whether sediment quality or characteristics were affected by operations at the Morris Dam R&D facility.

Sediment sample locations are shown on Figure 4-8. These locations were selected by evaluating photographs of the pipeline installation and considering possible flow directions away from the discharge point. Although no flow measurements have been taken as part of this SI, the predominant current direction at Morris Reservoir is inferred to be to the southwest, or toward the dam. Hence, the area downcurrent of the discharge would be expected to exhibit a pattern of higher outfall-related compounds in sediments, if prior releases of such constituents were continuing to impact the reservoir.

Seven of the selected sediment sample locations were sampled in triplicate. Six of these locations were randomly placed in a grid superimposed over the outfall area. One location was determined as a background location, southeast and cross-stream from the peninsula. The duplicate sediment samples at each location were analyzed for the parameters indicated in Table 4-1. The Work Plan (Brown and Caldwell, 1997) specified that a water sample be collected from inside the outfall pipe. During demolition, and prior to the SI field effort, the slurry pipeline was removed, so no water sample was collected.

4.1.10 Area of Concern (Objective) 10: Electronic Test Area

AOC (Objective) 10 is designated as the electronic test area. Three soil borings were advanced through the concrete pad for former Building 42013, as shown in Figure 4-7. Soil samples from these borings were collected directly below the concrete pad (1 foot bg) and analyzed using the procedures designated in Table 4-1.

4.1.11 Area of Concern (Objective) 11: Propellant Magazine

AOC (Objective) 11 consists of the area surrounding former Building 42026, the propellant magazine (Figure 4-6). Three soil borings were advanced at this AOC (Objective) to 1 foot bg. Two of the locations were set on the slope below the building pad and advanced through exposed soil. The third boring was advanced through the concrete pad just west of the former building. These locations were determined in the field in consultation with DTSC. Samples from this area were analyzed as indicated in Table 4-1.

4.1.12 Background Area 1 (Objective 12): Background Soil Samples

Background Area 1 (Objective 12) consists of three Subareas located throughout the Morris Dam R&D facility and offsite, as shown on Figure 4-3, Figure 4-7, and Figure 4-9. Subarea 1 surrounds the water tower located at the northwest side of the peninsula (Figure 4-3). Subarea 2 is found near the central portion of the facility along an exposed rock outcrop thought to not have been affected by any releases of hazardous constituents during faulty operation (Figure 4-7). Subarea 3 is located approximately 0.25 mile east on Highway 39, along exposed soils approximately 30 to 100 feet from the road (Figure 4-9). These Subareas were located through field visits and discussions with DTSC personnel.

Five soil borings were advanced in each Subarea. Soil samples were collected from the surface (0 - 0.5 foot bg). Samples from these Subareas were analyzed by the procedures designated in Table 4-1.

4.1.13 Background Area 2 (Objective 13): Background Rock Samples

Background Area 2 (Objective 13) consists of one area located on the south and southwest portion of the peninsula and along Highway 39 west of the former facility. The area encompassing Background Area 2 (Objective 13) is shown as the grid on Figure 4-9.

Sampling design for Background Area 2 is described in the Work Plan Addendum (Brown and Caldwell, 2000). In summary, a data quality objectives process was followed to determine an appropriate number of sample locations, and a numbered grid pattern was placed over the general area where rock outcrops of interest were located. The grid was established as a 100 by 100 foot pattern and sample locations as outlined in the work plan were selected through use of a random number generator using grid location numbers. A few of the actual rock outcrop sample locations were modified through a field reconnaissance meeting in conjunction with DTSC and LACDPW personnel. Each location is discussed in Appendix J, which presents what was decided in the field meeting by all personnel present and what occurred during sampling.

At each location, samples were collected by attempting to pry or hammer loose rock out of fractured outcrops. Prior to sample collection, loose weathered rock was pried off the outcrop to expose relatively fresh material. All attempts were made to obtain samples from approximately 6-inches to 1-foot below the original surface material. Before and after photographs of each sampling location are provided in Appendix J. Samples were submitted for the analyses outlined in Table 4-1.

4.2 RESULTS

This section presents the SI results by AOC or Background Area. The discussion includes geophysical survey results as well as analytical results from soil vapor, soil, sediment, and groundwater sampling, if applicable. Table 4-3 summarizes the number of detected values and

the range of detected concentrations for each chemical by AOC (Objective). Data summary tables, including only detected analytes and appropriate qualifiers, are subsequently referenced for each AOC (Objective). Appendix E contains tables exhibiting the condensed results from all analyses, including detection limits reported by the laboratory and data qualifiers assigned in the laboratory and the data validation process. Appendix L contains the complete analytical packages organized by Sample Delivery Group (SDG).

The following subsections also present some discussion of the results. Generally discussion is limited to those compounds or analytes that are detected and may have some significance with respect to a release at the particular AOC (Objective) being discussed. In general, organic compounds or parameters such as total petroleum hydrocarbons are discussed if detected. Metals are discussed in the context of their relationship to ambient concentrations calculated or found from soil and rock data.

One other way of evaluating whether a particular sample contains higher or "enriched" concentrations of a particular metal, is to discuss a calculated "enrichment ratio" or define a metal as enriched in a particular sample. Metals often exist in relatively uniform ratios with respect to each other or nutrient type metals known as major cations (e.g., magnesium, iron, calcium). The enrichment ratio technique normalizes a sample result for a particular metal with respect to the ratio between the element in question and an appropriate cation in the ambient results. Typically, an appropriate cation would be one that exhibits a significant correlation with the metal. Theoretically, if the ratio between the metal and cation is the same in the AOC (Objective) sample and the ambient concentrations, then the value in an "non-enriched" sample will be 1, while enriched samples well have ratios greater than 1. Typically some natural variation exists with the data such that a perfect value of 1 is unrealistic; hence in this report we have used a value of 3 for a calculated enrichment ratio to define if a metal is enriched in a sample. Enrichment rations are an established procedure for evaluating many physical phenomena and have been used to evaluate metals during environmental analysis (Zdanwicz, 1991; USGS, 2000). More complete discussions of the ambient concentrations and enrichment of metals are presented in Appendix A.

The following sections are brief discussions, presenting the detected analytes and their concentration ranges. The significance and any trends in the detected data is discussed in a general sense. Further evaluation of detected analytes with respect to human or ecological health are presented in Sections 5 and 6.

4.2.1 Area of Concern (Objective) 1: Former Gasoline Station/Drum Storage Pad

4.2.1.1 Analytical Results

Table 4-4 presents the summarized soil sample data from AOC (Objective) 1 at the locations shown on Figure 4-2. Figure 4-13 shows data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A. No VOCs or SVOCs were detected in any samples submitted for these

analyses. TRPH and gasoline range total petroleum hydrocarbon (TPHg) were detected at concentrations ranging from 18 to 100 milligrams/kilogram (mg/kg) and 0.11 to 0.28 mg/kg, respectively. No diesel range petroleum hydrocarbon (TPHd) or Otto Fuel was detected.

Most metals were detected at varying concentrations in all samples. Metals not detected in any sample included antimony, selenium, silver, and thallium. Organic lead, which can be associated with gasoline, was not detected in soil samples.

4.2.1.2 Discussion

The organic parameters TRPH and TPHg suggest that some release of gasoline may have occurred in the past. However, current concentrations are low and do not indicate widespread soil contamination since all concentrations are below 100 mg/kg. TRPH does appear to increase slightly with depth, although TPHg does not. The lack of any VOC or SVOCs suggests that any fuel release, if it occurred, has undergone significant weathering and probably does not present an environmental concern.

No metals exceeded the ambient concentration limits as discussed in Appendix A. Further evaluation with respect to defining Contaminants of Potential Concern (COPCs) or risk to human health is discussed in Sections 5 and 6.

4.2.2 Area of Concern (Objective) 2: Oil/Water Separators

4.2.2.1 Analytical Results

Table 4-5 presents summarized results from AOC (Objective) 2. Figure 4-3 and Figure 4-4 show the sampling locations for this AOC (Objective) in Subareas 1 and 2, respectively. Figures 4-14 and 4-15 show data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A. It is important to note that the two oil/water separators (Subareas 1 and 2) represented by this AOC (Objective) are separated by approximately 800 feet, and hence the results for each are specific to those locations. No VOCs or SVOCs were detected in any of the soil samples. TRPH was detected and ranged from 26 to 49 mg/kg.

Most metals were detected at varying concentrations in all samples. Metals not detected in any sample included antimony, cadmium, lead, mercury, selenium, silver, and thallium. Arsenic, chromium, chromium (VI), cobalt, copper, and nickel were all detected at concentrations above their respective ambient concentration limits as defined in Appendix A. As presented in Table A-7 of Appendix A, arsenic, chromium, chromium (VI), cobalt, copper, and nickel also are all considered enriched with respect to cations in the sample from Subarea 2. Organic lead was detected at concentrations near the detection limit in samples from both Subarea 1 and 2.

4.2.2.2 Discussion

Since no VOCs or SVOCs were detected, and TRPH values at these sites are low (less than 100 mg/kg), a widespread release of organic compounds is unlikely. Arsenic, chromium, chromium VI, cobalt, copper, and nickel were detected above their respective statistically-derived ambient concentration limits and are considered enriched in the sample from the oil/water separator in Subarea 2. As discussed in Appendix A, chromium, cobalt, copper, and nickel have been found in rock samples from Background Area 2 (Objective 13) at concentrations similar to those observed in the AOC (Objective) 2 soils. These concentrations in some cases exceed the ambient concentration limit, yet still are naturally occurring in the rocks as evident through mineral analysis that corroborates that the metals could be present due to mineralization. These rocks are the source for soils at the site, both through natural soil formation and reportedly as fill material for some of the pads. Hence, it appears that chromium, cobalt, copper, and nickel may be found above the ambient concentration limits due to natural conditions. However, arsenic was not detected at higher concentrations in the rock samples from Background Area 2 (Objective 13), and is found at concentrations above the ambient concentration limit in Subarea 2. This suggests arsenic may be present due to anthropogenic sources and not naturally occurring. The detection of chromium (VI) is unusual in that it is rare for chromium to exist in this oxidation state under natural conditions. It is possible that detection of this constituent is due to false positives during laboratory analysis. However, without other compelling evidence, the data are interpreted as reported and included in ambient calculations and risk analysis. See further discussion regarding metals in this region of the facility in the discussion for AOC (Objective) 6, since Subarea 2 is directly adjacent to AOC 6, Subarea 1.

4.2.3 Area of Concern (Objective) 3: Outfall Areas

4.2.3.1 Analytical Results

Table 4-6 presents summarized results from AOC (Objective) 3. Figure 4-2 and Figure 4-4 show the sampling locations. Figures 4-13 and 4-15 show data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A.

Several SVOCs were detected in soil samples from this AOC (Objective). Dibutylphthalate was detected in one sample. However, as presented in Appendix F, the data validation reports indicate that other phthalate esters were detected in associated blanks, suggesting that this compound could have been introduced during laboratory processing.

Two polynuclear aromatic hydrocarbons also were detected. A hydrocarbon matrix was reported as a tentatively identified compound (TIC). Fluoranthene and pyrene were detected in one sample from Subarea 1 (Boring 1, 0–0.5 foot bg), at 2.6 and 2.4 mg/kg, respectively. Hydrocarbon matrix was reported for all four samples at concentrations ranging from 30 to 400 mg/kg. TRPH was also reported, with the highest results associated with those samples with Hydrocarbon matrix reported as a TIC.

Most metals were detected at varying concentrations in all samples. Metals not detected in any sample include antimony, molybdenum, selenium, silver, and thallium. No tributyltin or organic lead compounds were detected in any of the samples. As presented in Table A-7 of Appendix A, lead and zinc are slightly enriched with respect to cations in one sample from Subarea 1 (Boring 1, 0-0.5 foot bg).

4.2.3.2 Discussion

As discussed above, several organic compounds were detected in the results from the AOC (Objective) 3 samples. The SVOCs fluoranthene and pyrene were detected in the surface sample from Subarea 1 where the sump and collection line outfall emptied on the slope. TRPH was also detected, and was highest in the same sample in which the fluoranthene and pyrene were detected. Asphalt chips were noted in the surface soil samples collected from the location where these detection were reported, which suggests this material is related to the detection of these compounds.

Results at the other two outfalls suggest the presence of hydrocarbons as well. However, TRPH concentration was lower in both borings (Subarea 1, Boring 1, and Subarea 2, Boring 1) and no SVOCs were detected. No asphalt chips were noted in the either of these borings. Given that the detected SVOCs at AOC (Objective) 3 were found associated with asphalt chips, no environmental concern is suggested by this data.

Metals data indicate that cadmium, copper, lead, mercury, and zinc exceeded their respective ambient concentration limits in the soil sample from Subarea 1, Boring 2. Lithium and zinc exceeded ambient concentration limits in the surface and at depth in Subarea 2, Boring 1. Antimony, mercury, silver, and thallium all had samples with non detection values that are equal to the ambient concentration limit and therefore are not considered environmental contaminants. The highest concentrations of these metals (cadmium, copper, lead, lithium, mercury, and zinc) may suggest a release of constituents from these two outfalls since they are detected above ambient concentration limits. As discussed in Appendix A, zinc is enriched with respect to cations in Subarea 1, Boring 1 (1 foot), and could be associated with the asphalt chips found in this sample. Other borings (Subarea 1 – Boring 2,and Subarea 2 – Boring 1) were enriched with lithium, zinc, and lead (Subarea 1 – Boring only). Lithium, copper and zinc were found in rock samples from Background Area 2 (Objective 13) at concentrations above their respective ambient concentration limits and therefore could be present naturally. However, the presence of cadmium, lead, and mercury, which were not found at elevated concentrations in rock samples from Background Area 2 (Objective 13), suggests that these metals may be present due to anthropogenic sources.

4.2.4 Area of Concern (Objective) 4: Propulsion System Testing Area.

4.2.4.1 Analytical Results

Table 4-7 presents summarized results from AOC (Objective) 4 and Figure 4-4 shows the sampling locations. Figure 4-15 shows data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A. No SVOCs were detected in any soil samples, although tetrachloroethane was quantified as a SVOC tentatively identified compound (TIC) in one sample (0.6 mg/kg, Subarea 2, Boring 2 at 20 feet bg). Detections of TRPH ranged from 12 to 220 mg/kg. The highest TRPH concentration (220 mg/kg) was found in a sample from the eastern slope below former Building 42015, but the deeper sample in this boring exhibited a significantly decreased concentration. Neither TPHd nor Otto fuel were detected in those samples submitted the analysis. Most metals were detected at varying concentrations in all samples. Metals not detected in any sample include antimony, silver, and thallium. Barium, chromium, chromium (VI), cobalt, copper, lithium, mercury, nickel, and zinc were detected above their respective ambient concentration limits in at least one sample. Not all of these metals were detected in every sample and some were only detected in one. Silver and mercury were also detected above their respective ambient concentration limits in samples from Subarea 3.

As presented in Table A-7 of Appendix A, several samples exhibit enrichment of metals with respect to cations. One sample from Subarea 2 (Boring 2, 20 feet bg) was enriched for chromium and nickel, and three samples from Subarea 5, Borings 1 and 2 were enriched for arsenic, chromium, chromium (VI), cobalt, nickel, or lithium. Organic lead was detected in all samples submitted for this analysis at concentrations ranging from 3.2 to 6.4 mg/kg.

4.2.4.2 Discussion

The detection of a low concentration (0.6 mg/kg) of tetrachloroethane in one boring (Subarea 2, Boring 2) as a TIC correlates with reports of staining on the eastern bedrock face prior to construction of the concrete pad in front of former Building 42015. However, no other samples in this or the adjacent boring (Subarea 2, Boring 1) exhibit any detected amounts of this compound. Because this compound was identified as a TIC in a single SVOC analysis and its presence was not confirmed in nearby samples, suggest that this reported detection may be an erroneous laboratory result. Associated samples from this location for TRPH and TPHd did not suggest petroleum contamination, in that all results are below 100 mg/kg. However, one TRPH detection in Subarea 3 does suggest some hydrocarbon release may have occurred against the slope.

Organic lead was detected in all deeper (10-20 feet bg) samples from Subarea 2, which correlates with staining reported on the bedrock face. No metals were detected above ambient concentration limits in this location. However, the enriched metals, chromium and nickel, in Subarea 2, Boring 2, may be associated with this staining.

No other AOC (Objective) 4 samples exhibited detection of SVOCs or TPHd. TRPH was detected in most other samples, although concentrations were less than 100 mg/kg.

Metals were detected above ambient concentration limits in Subarea 3 and Subarea 5. In Subarea 3, Boring 1, on slopes southeast of former Building 42015, cadmium exceeded the ambient concentration limit by less than a factor of two, while in Boring 2, both mercury and silver exceeded the ambient concentration limit, and may be related to a potential release in Subarea 3. Neither of these metals or associated minerals were detected in rock samples from Background Area 2 (Objective 13), further suggesting their presence is due to anthropogenic sources such as site activities.

Metals were also detected in Subarea 5, Borings 1 and 2 just below former Building 42039. Although many barely exceed the ambient concentration limits, several were detected at concentrations greater than twice the ambient concentration limits. These metals include arsenic, barium, chromium, cobalt, lithium, molybdenum, nickel, and silver. As discussed above, chromium and nickel are also enriched with respect to cations such as iron and manganese in this same location, and several samples from this AOC (Objective) were also eliminated as outliers during statistical ambient determination due to their relatively high concentrations. The clustering of these metals in one area, even though some may exist naturally at higher concentrations in rock outcrops sampled at the site, suggests that a release of these metals may have occurred in this area. This Subarea's proximity to AOC (Objective) 6 suggests that these metals may due to anthropogenic activities in this area. See further discussion below under AOC (Objective) 6 results and discussion.

4.2.5 Area of Concern (Objective) 5: Sewer Septic Tank and Leach Fields

4.2.5.1 Geophysical Survey

Results from the geophysical survey are presented in Appendix D. Based on the geophysical results the general limits of the leach field and location of some of the associated piping were delineated. Figure 4-10 summarizes the survey results.

4.2.5.2 Analytical Results

Table 4-8 presents summarized results from AOC (Objective) 5. Figure 4-2 and Figure 4-3 show the sampling locations. Figures 4-13 and 4-14 show data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A. No VOCs or SVOCs were detected in any of the samples. TRPH was detected and ranged from 12 to 420 mg/kg. Most metals were detected at varying concentrations in all samples. Metals not detected in any sample include cadmium, molybdenum, silver, and thallium. Barium and arsenic are enriched with respect to cations in three samples: barium in Subarea 1, Boring 2 (1 foot bg), and arsenic in Subarea 1, Boring 5 (1 and 3 feet bg).

4.2.5.3 Discussion

Organic compounds were not detected in any samples, although the TRPH concentrations from two of the twelve samples could suggest a release has occurred from the leach fields. One sample, Subarea 1, Boring 2 (near the older leach field), contained TRPH of 140 mg/kg, while another from Subarea 1, Boring 4 (near the newer leach field), contained 420 mg/kg. Results from Subarea 2 do not suggest a release has occurred in the area as all TRPH values were low (less than 100 mg/kg).

Metals results indicate that antimony, arsenic, mercury and selenium exhibit concentrations exceeding their respective ambient concentration limits. Cadmium was not detected but had some reported detection limits above the calculated ambient concentration limit. Mercury and selenium were detected at concentrations barely above the ambient concentration limit, which suggest they could be naturally occurring. Arsenic exceeded the statistical background concentration in Subarea 1, Boring 5, at 1 foot bg and 3 feet bg. Arsenic was enriched in three samples from Subarea 1, suggesting that there could have been a release in this area. No other metals data suggest a release has occurred near the leach fields or sewer septic tank.

4.2.6 Area of Concern (Objective) 6: Sump and Collection Lines and Sludge Sampling

4.2.6.1 Analytical Results

Table 4-9 presents summarized results from AOC (Objective) 6. Figure 4-5 and Figure 4-6 show the sampling locations. Figures 4-16 and 4-17 show data posted at each sampling location. Posted data included detected organic compounds and metals that exceed their respective ambient concentration limits as defined in Appendix A. Several SVOCs were detected in soils from AOC (Objective) 6, including diethylphthalate (1.3 mg/kg in Subarea 1, Boring 10, 1 foot bg), bis(2-ethylhexyl)phthalate (0.92 mg/kg in Subarea 1, Boring 7, 3 feet bg), and fluoranthene at 0.22 mg/kg in Subarea 2, Boring 2, 1 foot bg. One PCB, Arochlor 1260, was detected in one sample at 0.21 mg/kg. TRPH was detected in most samples in concentrations ranging from 11 to 54 mg/kg. Most metals were detected at varying concentrations in all samples. Metals not detected in any sample include cadmium, molybdenum, silver, and thallium. As presented in Appendix A, multiple samples from this AOC exhibit enriched metals. These enriched metals appear to be concentrated in samples from Borings 2, 3, 4, 5, 8, 9, 10 and 11.

4.2.6.2 Discussion

The phthalate esters are reported at low concentrations, and are most likely contaminants introduced by either field or laboratory procedures. Therefore, they are not considered further. Fluoranthere was detected, but at a low concentration, and hence probably does not represent a significant release. The detection of Arochlor 1260 suggests a release has occurred in this area. All the TRPH results are below 100 mg/kg, and do not suggest a significant release has occurred.

Metals were detected in many samples from AOC (Objective) 6. Most detected metals were associated with Subarea 1 borings. Many of these metals exceed their respective ambient concentration limits. Exceptions include barium, chromium, nickel, and thallium, which were detected in Subarea 2 borings. The metals detected in Subarea 2 did not exceed twice their respective ambient concentration limits.

Metals exceeding ambient concentration limits were found in almost all borings in Subarea 1. Those metals exceeding twice the ambient concentration limit in several samples include arsenic, chromium, hexavalent chromium, cobalt, lithium, mercury, nickel, and selenium. While these metals were found in many samples, two clusters are worth noting: Subarea 1, Boring 8, and Subarea 1, Boring 10 appear to contain the majority of these metals that exceeded twice the ambient concentration limit. These borings also tended to contain enriched and statistical outlier values for arsenic chromium, cobalt, and nickel. These instances could signify a release even through many are also found in rock samples from Background Area 2 (Objective 13). Of additional interest is that a natural feature, an igneous dike of very different geologic material (peridotite/pyroxenite) is observed on the slope northeast of former Building 42015. This material is mentioned because significant concentrations of some metals were noted in this dike. If this dike extends under the building pads it is possible that some elevated metals concentration could be from that material. However, without further evidence, we are assuming that the presence of these metals are due to anthropogenic site activities. It should be noted that AOCs (Objectives) 2, Subarea 2, and AOC 4 overlap in the area covered by AOC (Objective) 6, Subarea 1 and exhibit similar results for metals. Hence, further work in this area should probably incorporate results from all these AOCs as part of overall planning.

4.2.7 Area of Concern (Objective) 7: Temporary Drum Storage Area

4.2.7.1 Analytical Results

Figures 4-11 and 4-12 show the detected soil vapor concentrations from AOC (Objective) 7 and Background Area 1 (Objective 12), the background location near the water tower. Several compounds were detected in the soil vapor, including benzene, toluene, total xylenes, trichloroethene (TCE) and PCE. Unknown aliphatic hydrocarbons were reported in all samples as TICs. Toluene was detected at low concentration in many of the samples, including those from the background area. Toluene and the TICs are suspected of being present due to the poor air quality in the Los Angeles area. Benzene was detected in one background sample only and could have been present due to the proximity of this sample to the road. TCE and PCE may be present due to site activities. In general, TCE and PCE soil vapor concentrations were less than 1 nanogram per liter or part per trillion, but may suggest that a release of these compounds has occurred. These data were used to place the AOC (Objective) 7 soil borings as shown on Figure 4-7. The borings were located in areas that indicated the TCE and PCE in soil vapor.

Table 4-11 presents a summary of soil sampling results from AOC (Objective) 7. Figure 4-18 shows data posted at each sampling location. Posted data included detected organic compounds and metals that exceed the ambient concentration limits as defined in Appendix A. One SVOC

(benzo(a)pyrene) and one PCB (Arochlor 1242), were detected in the surface loess samples. Hydrocarbon matrix was reported in three of the samples as a TIC and TRPH was detected in most samples ranging from 12 to 910 mg/kg. Most metals were detected at varying concentrations in all samples. Metals not detected in any sample include cadmium, molybdenum, silver, and thallium. As presented in Table A-7 of Appendix A, several samples exhibit enriched metals, including the three surface loess samples and one sample from Boring 2. Borings 3 and 4 each contained one sample that has low enrichment for arsenic and manganese, respectively.

4.2.7.2 Discussion

The highest detected contaminant concentrations occurred in the three loess samples (Subarea 1). No SVOCs or PCBs were detected in the subsurface soil samples. Although TRPH was detected in the soil borings, the concentrations were less than 100 mg/kg. Asphalt chips were observed in these samples during collection, which may explain the petroleum hydrocarbon and benzo(a)pyrene. However, the PCB is likely associated with the transformers located at former Building 42116.

Antimony, arsenic, cadmium, chromium (VI), copper, lead, molybdenum, silver, thallium, vanadium, and zinc exceeded their respective ambient concentration limits. The cadmium, chromium (VI), lead, molybdenum, and zinc concentrations, that were found above ambient concentration limits and calculated as enriched, were primarily associated with the surface loess samples, except as noted below. Antimony, copper, lead, and zinc also exceed the ambient concentration limit in one sample (Subarea 2, Boring 2, 1 foot bg) and were also enriched in this sample. Lead was detected above the ambient concentration limit in one deeper sample (5 feet bg) within the same boring. Cadmium and molybdenum were not detected in any subsurface samples. Chromium (VI) was detected at concentrations below the ambient concentration limit in all subsurface samples.

It is possible that some of these metals could be naturally occurring given the results observed in the background rock samples from Background Area 2 (Objective 13). However, arsenic and lead were not found at higher concentrations in the rock samples from Background Area 2 (Objective 13), and therefore are potentially present due to a release from site activities. Since many of the borings had metals clustered together, it is possible that these other metals are present from site activities as well. The relatively high chromium (VI) results in the loess samples could be due to matrix interferences in with these samples, however, the data validation process did not indicate any serious problems with the analysis, and so the data are treated as if they are detections.

4.2.8 Area of Concern (Objective) 8: Groundwater Investigation

4.2.8.1 Analytical Results

Table 4-12 presents summarized groundwater investigation results from AOC (Objective) 8. Figures 4-2, 4-3, and 4-5 show the monitoring well locations. Figures 4-13, 4-14, and 4-16 show

data posted at each of the monitoring wells. Posted data include only detected organic compounds.

Several VOCs were detected in the groundwater samples, including acetone, toluene, and TCE. Acetone and toluene were detected in one sample each (acetone in MW-1, toluene in MW-2) at 12 and 0.58 µg/L, respectively. TCE was detected in all three wells ranging from 2.0 to 2.6 µg/L. Several VOCs were quantified as TICs in MW-3, but not in the duplicate samples from the same well. These include 1,3-dichloropropane (0.55 µg/L), 1,2,3-trichloropropane (2.3 µg/L), 1,2-dibromo-3-chloropropane (3.6 µg/L), 1,2-dibromomethane (0.55 µg/L), methyl-*tert*-butyl ether (MTBE) (3.2 µg/L), and naphthalene (1.3 µg/L). No SVOCs or PCBs were detected in any of the wells.

Metals were detected in both the total and dissolved groundwater samples including common cations such as calcium, iron, magnesium, potassium, and sodium, as well as barium, manganese, molybdenum, and zinc.

4.2.8.2 Discussion

Detection of VOCs indicates that a release has occurred to groundwater at the Morris Dam R&D facility. However, location of the TCE source area is unclear, since the general groundwater gradient is through the peninsula along the reservoir axis and this compound was found in all wells at approximately the same concentration. Toluene, MTBE, and naphthalene could be from a gasoline release, although it is not clear what source could be responsible for the other TICs reported. TCE, MTBE, and naphthalene concentrations were below drinking water standards. Because TCE was reported at similar concentration in all three site wells, it is not clear if TCE is absolutely from the site. Another plausible explanation would be an upstream source (fish kills can release low concentrations of TCE). However, given the potential for fracture flow, and the age of activities at the facility, a release from the facility is possible, and the most plausible explanation.

None of the cation or metals concentrations appear to be anomalous since metals can be present in groundwater. Molybdenum and zinc were only detected in one sample each (molybdenum in MW-1 and zinc in MW-3). Iron and manganese were detected at low concentrations in most of the wells, and may reflect slightly reducing conditions in groundwater. For all metals, concentrations were consistent between both the total and dissolved samples, a reflection of the low turbidity in the groundwater samples. In general, the metals data do not suggest a release has occurred to groundwater.

4.2.9 Area of Concern (Objective) 9: Slurry Outfall Pipe

4.2.9.1 Results

It is important to note that the AOC (Objective) 9 sampling campaign was designed as a screening mechanism to determine whether torpedo slurry or other outfall–related contamination

is obvious in existing sediments. In addition, samples selected as background indicators were collected from a distant location inferred to be outside the influence of the torpedo slurry outfall. These background samples are not assumed to be absolute indicators of an environmentally "clean" sediment habitat, but rather an environment not affected by torpedo slurry activities. Therefore, concentrations presented as background or reference levels are relative indicators of whether environmental contamination is currently observable in the vicinity of the torpedo slurry outfall.

Sediment Grain Size

Grain size distribution analysis (Table 4-13) showed that sediment in the outfall area is predominantly fine-grained consistency of clay and silt-sized components. Stations B2 and C2 showed a higher percentage of sediment fines, while Stations A2 and BKG (background) had the least amount of fine-grained sediments and more sand-size material (Figure 4-19). Station B3 also displays fewer sediment fines, as measured at A2 and BKG, but less fine sand. Overall grain size distribution at Station A2 was very similar to that at the background station (BKG).

The distribution of fines ranged from 49.9 percent at A2 to 92.3 percent at B2, fine sand ranged from 7.7 percent at B2 to 44 percent at A2, and medium sand ranged from zero at B2 to 6.2 percent at A2. No coarse-grained sand or gravel was found in any samples collected.

Sediment samples taken from the reservoir's bottom (all except A2 and BKG) were generally comprised of consolidated grayish-brown clay overlain with a light coating of brown organic algae-like material. Coarser sediments at Stations A2 and BKG typified the steeper, rocky slopes encountered at shallower depths along the Reservoir perimeter. See Appendix E for analytical data. Detailed grain-size analysis results can be referenced in Appendix I.

Organic Compounds in Sediment

Chemical measurements in sediments involved analysis of VOCs, SVOCs, total organic carbon, and sulfides.

From this suite of analyses, there were no detectable concentrations of SVOCs or sulfides in any samples (refer to Table 4-13). Detectable VOCs were limited to low levels of acetone and methylene chloride (common laboratory contaminants). Acetone ranged from 0.14 mg/dry kg (or parts per million [ppm]) at Station C3 (replicate 1) to 0.2 ppm at Station C2 (replicate 3). Methylene chloride ranged from 0.0057 ppm (Station C3, rep 2) to 0.0079 ppm (Station B3, rep 1). The concentration and sporadic occurrence of acetone and methylene chloride suggests laboratory cross-contamination from these common analytical solvents. Their presence has therefore have been dismissed as laboratory contamination.

Total organic carbon values were typical of a highly organic benthic environment, and ranged from 6,400 ppm at Station B2 (replicate 1) to 31,000 ppm at Station B3 (replicate 2).

Metals in Sediment

Analytical results for sediments show no detected antimony, mercury, molybdenum, selenium, silver, or thallium. Metals results in reservoir sediments are presented in Table 4-13. Summarized and statistical results for metals in sediments are shown in Table 4-14. Bold values in Table 4-14 represent maximum mean values among all stations, while italicized values indicate the lowest mean values found.

Figures 4-20 and 4-21 graphically illustrate the data presented in Tables 4-13 and 4-14. The following sections discuss distributions of each metal within AOC (Objective) 9.

Aluminum. Mean levels of sediment aluminum were highest at B2 (16,333 ppm), while other stations along the center transect grid (A2, C2) and C3 were also slightly higher than other stations. Stations B2, C2, and C3 were slightly higher in aluminum than that found at the background location (BKG). Mean aluminum concentrations were lowest at downcurrent station B3 (10,233 ppm).

Arsenic. Mean arsenic concentrations were very uniform among all stations. Arsenic was greatest at A2 (11.3 ppm) and lowest at C2 (8.8 ppm). Compared to the mean background arsenic level, A2 was 17 percent higher, while, B3, and C3 were only 5 percent and 3 percent higher, respectively. Arsenic was highest in the vicinity of the outfall terminus (A2), but was not substantially greater than other data.

Barium. Average barium levels were highest at C3 (170 ppm) and lowest at A2 (136.7 ppm). Relative to background, barium at C3 was 9 percent higher. Mean barium levels at all other stations were equal to or less than that found at the background location.

Beryllium. Values of mean beryllium were very consistent among all stations measured. The highest mean concentration occurred at C2 (0.56 ppm), the lowest at B3 (0.42 ppm). All mean values for beryllium were slightly higher than background (0.41 ppm), with the highest (C2) being 35 percent over the background concentration.

Cadmium. Average sediment concentrations of cadmium ranged from 0.05 ppm (C2) to 0.14 ppm (A2). All mean cadmium values were less than background, except for A2, which measured 14 percent higher.

Chromium. Total chromium was detected at fairly uniform concentrations at all stations. Mean concentrations ranged from 16 ppm (B3) to 24.7 ppm (A2). Chromium levels were similar among most stations, with a slight pattern of higher concentration along the center transect (A2-B2-C2).

Cobalt. Mean cobalt values were relatively uniform for all stations. The cobalt concentration was highest at the background station (11.7 ppm), while other station means ranged between 8.1 ppm (B3) and 11.3 ppm (C2).

Copper. As with cobalt concentrations, mean copper levels were also highest at BKG (background), measuring 37 ppm. Non-background levels of copper ranged from 29.0 ppm to 34.7 ppm (B3 and A2/C2, respectively).

Iron. Mean iron concentrations of sediment samples ranged from 18,333 ppm (B3) to 24,666 ppm (C2). There were no large variations in iron concentration between stations, and statistical testing found no significant differences among the data. Concentrations are representative of the mountainous area, where iron oxides are common.

Lead. The distribution of lead was generally uniform throughout the stations sampled in the outfall area, and was slightly lower at the background location. Mean lead values ranged from 13.7 ppm at BKG to 20.3 ppm at A2.

Lithium. Mean lithium levels in sediments ranged from 7.9 ppm (B3) to 12.0 ppm (B2). The background lithium concentration was 9.7 ppm. Lithium values among all stations were statistically similar. A minor B2-C2-C3 gradient was discernible in the data (offshore-downcurrent).

Magnesium. Levels of magnesium were found to be highest at BKG (7,367 ppm) and lowest at B3 (4,600 ppm). Magnesium was slightly higher at B2 and C2 in the outfall area, but was very similar to levels measured at BKG.

Manganese. Mean values of manganese in reservoir sediment ranged from 333 ppm (BKG) to 627 ppm (B3 and C3). Manganese concentrations showed a bimodal pattern with slightly higher concentrations at B3 and C3.

Nickel. Average nickel concentrations ranged from 15.3 ppm (B3) to 21.7 ppm (A2, B2, and C2). Sediment nickel concentrations in replicates taken at A2, B2, and C2 were very consistent as shown by the low standard deviations. A centerline (outfall parallel) trend was observable in the data along A2-B2-C2, but nickel concentrations were comparable to BKG values.

Vanadium. Mean vanadium values ranged from 31.7 ppm at Station B3 to 48.3 ppm at BKG. Apart from A2 and BKG, data variations were too small to discern trends associated with the torpedo slurry outfall in the raw vanadium values.

Zinc. Mean zinc concentrations were highest at A2 (73 ppm) and lowest at B3 (43 ppm). Aside from the zinc level at A2, all other values, including BKG, were essentially similar.

4.2.9.2 Discussion

When data from each station are normalized using average data from station BKG, the sediment chemistry indicates relatively uncontaminated environment. Although the normalized sediment data exceeded station BKG data by as much as 88 percent (B3/C3 manganese), concentrations were generally low. Most of the normalized data are within ±10 percent of background values.

Moreover, BKG had higher concentrations of cobalt, copper, magnesium, and vanadium than did samples from the outfall area. From these data, sediment contamination in the vicinity of the torpedo slurry outfall is not evident. However, some minor trends are discernible in the data.

Another manner of normalizing of sediment data can be accomplished through calculating the average of all outfall station concentrations (i.e., dividing the station average concentration by the average concentration of all non-background stations for each metal), which can help in observing the deviations in concentrations at individual stations through visual examination. Additional normalizing with respect to grain size was also performed during this calculation. As shown in Figure 4-22, radar plots of each station relative to the average within the outfall vicinity (i.e., excluding BKG) are generally round with a few exceptions. The rounder the radar diagram, the more uniform that station is to the rest of the data set.

Figure 4-22 shows that A2 had a notable reduction in relative percent fines, and higher than average cadmium and zinc concentrations. Station B1 was generally uniform relative to other outfall stations, while B2 had higher percent fines, aluminum, lithium, magnesium, and slightly less lead. Station B3 was generally lower in all constituents than other stations in the outfall area. Cadmium was notably reduced at C2, with slightly higher percent fines and perhaps higher lithium and magnesium as well. Sediment chemistry at C3 showed average values for all parameters measured around the outfall area, while the background station was notably different. Station BKG has less percent fines, beryllium, chromium, lead, and manganese along with greater cadmium, cobalt, copper, magnesium, and vanadium.

Overall, Figure 4-22 shows that no single station was grossly different than another. Levels falling below 0.5 or above 1.5 would indicate a significant deviation from the norm, which no station clearly displays. In view of the low concentrations of metals obtained during sediment testing and the relative similarity of metals levels compared to the background station, there appears to be no obvious pattern of environmental contamination associated with AOC (Objective) 9.

4.2.10 Area of Concern (Objective) 10: Electronic Test Area

4.2.10.1 Analytical Results

Table 4-15 presents summarized results from AOC (Objective) 10. Figure 4-7 shows the sampling locations. No explosive compounds, or Otto Fuel were detected in any samples. Lithium was detected in one sample at 17 mg/kg, and chromium (VI) was detected in all samples ranging from 0.083 to 0.67 mg/kg. No other metals were targeted for analysis at this AOC (Objective).

4.2.10.2 Discussion

No anthropogenic release is interpreted from this data given that no explosives or Otto Fuel were detected and that lithium and chromium (VI) concentrations were below their respective ambient concentration limits.

4.2.11 Area of Concern (Objective) 11: Propellant Magazine

4.2.11.1 Analytical Results

Table 4-16 presents summarized results from AOC (Objective) 11 and Figure 4-6 shows the sampling locations. No SVOCs or Otto Fuel were detected in the soil samples. Lithium was detected in all three samples ranging from 12 to 17 mg/kg. No other metals were targeted for analysis at this AOC (Objective).

4.2.11.2 Discussion

No anthropogenic release is interpreted from this data given that no SVOCs or Otto Fuel were detected and that lithium concentrations were below the background concentration.

4.2.12 Background Area 1 (Objective 12) Subareas 1, 2, and 3: Background Soil Samples

4.2.12.1 Analytical Results

Table 4-17 presents summarized results from Background Area 1 (Objective 12). Figures 4-2, 4-7, and 4-9 show the sampling locations. Most metals were detected at varying concentrations in all samples. Metals not detected in any background sample include antimony, silver, and thallium.

4.2.12.2 Discussion

The metals data collected from Background Area 1 (Objective 12) provide part of the basis for metal ambient concentration limits. Interestingly, several metals, including barium, (three samples Subarea 3, Borings 3, 4, and 5), cadmium (one sample, Subarea 2, Boring 1), iron (two samples, Subarea 1, Boring 2, and Subarea 3, Boring 3), lead (three samples, Subarea 3, Borings 1, 4, and 5), manganese (one sample, Subarea 3, Boring 3), molybdenum (one sample, Subarea 3, Boring 4), and vanadium (six samples, Subarea 2, Borings 4 and 5, and Subarea 3, Borings 2, 3, 4, and 5), were detected at concentrations above their statistically-derived ambient concentration limit. These data highlight the difficulty with using statistical techniques to define "thresholds" or "concentration limits" as screening for ambient conditions. By definition, the statistical approach as used in this SI excludes higher concentrations, which are nevertheless part of the same background data set. Some segment of a population will be naturally occurring and yet exceed the calculated "thresholds." As presented in Table A-7 of Appendix A, several metals

were calculated as enriched in Subarea 2, and lead was calculated as enriched in one sample in Subarea 3.

4.2.13 Background Area 2 (Objective 13): Background Rock Samples

4.2.13.1 Analytical Data

Tables 4-18 and 4-19 presents summarized results from Background Area 2 (Objective 13) analytical and mineralogical analysis. Figures 4-2, 4-7, and 4-9 show the sampling locations. Most metals were detected at varying concentrations in all samples. Many different minerals were found at varying concentrations as outlined in Table 4-19.

4.2.13.2 Discussion

Most of the rock samples from Background Area 2 (Objective 13) exhibited metals which have concentrations within the general ranges found on site. In many cases, one to several of the rock samples exhibited concentrations well above the general range. These higher concentrations represent natural conditions of these rocks (as is corroborated through the mineralogical analysis discussed below). Rock sample analysis does not necessarily correspond directly to soils results because many processes affect the rock as it is being weathered to form soil. However, given that the site is located directly in bedrock terrain with outcrops visible all over the site (versus an alluvial basin downstream), it is much more likely that metals that are found in the rock will be also found at higher concentrations in surrounding soils. Chromium, cobalt, copper, lithium, nickel, selenium, and zinc were found in some rock samples at concentrations above their respective ambient concentration limits as calculated in Appendix A. See Appendix A for more discussion regarding the distribution of metals as found in different samples.

As observed in Table 4-19, many of the rock samples from Background Area 2 (Objective 13) contain minerals that include metals as part of their main chemical structure. The most common minerals identified in rock samples on site that contain metals as part of their main chemical structure include chalcopyrite (CuS), galena (PbS), sphalerite (ZnS) illmenite ($FeTiO_3$), millerite (NiS), pentlandite (Fe, Ni, $Co)_9O_8$, zircon ($ZrSiO_4$), titanium dioxides (TiO_2), covellite (CuS), malachite ($Cu_2CO_3OH_2$), heazlewoodite (Ni_3S_2), and chromite ($FeCr_2O_4$). These minerals are not found in every sample, nor are some of them found very commonly. However, given the overall sampling approach (i.e., 20 samples collected in a metamorphosed, very heterogeneous region), the fact that many of these metals were detected in the rock suggests that they could have contributed to overall higher than expected ambient metals concentrations.

In many cases biotite was found in most of the rock samples from Background Area 2 (Objective 13) varying from less than 1 percent to 87 percent of the rock matrix. Most rocks varied between 1 and 20 percent biotite. Electron microprobe analysis identified that chromium and nickel are part of biotite structure, possible as replacement metals for iron or magnesium. Hence, the rock found near and on site could provide a source of chromium and nickel.

Corresponding total metals analysis through EPA methods 6010/7000 in split samples corroborates the presence of these metals. Hence, we interpret this corroboration to mean that many of the metals detected in the site soils are a direct reflection of the mineralogy of the surround rocks. It is significant to note that arsenic rich minerals were not in general detected, and total metals analysis corroborates with this finding as well – very little arsenic was detected in the rock samples. Two samples either did have a mineral that contained arsenic (13-RK-15) or the microprobe identified as having arsenic as a percentage by weight in the chemical structure (13-RK-53) of a mineral (pentlandite). However, the associated total metals analysis (EPA 6010/7000) did not report higher arsenic concentrations. Alternatively, many of the rock samples had minerals that contain chromium and nickel as part of their main chemical structure or had chromium and nickel added through replacement. The total metals analysis (EPA 6010/7000) from these rocks did have correspondingly higher chromium and nickel concentrations.

For most metals found in the rock samples from Background Area 2 (Objective 13), except arsenic and lead, the results show that some of the concentrations were well above the statistically-derived ambient concentration limit. In the statistical analysis procedure, many of these high values were identified as outliers when in fact they are naturally occurring in the rock. Therefore, the Navy believes that this fact indicates that the statistically-derived ambient concentration limit does not adequately characterize the potential range of concentrations that can occur naturally.

4.3 DATA QUALITY SUMMARY

This section briefly summarizes the data QA/QC assessment process implemented for this investigation. Refer to Appendix F for a more detailed description of this process.

All analyses conducted under this site inspection were performed using accepted laboratory procedures in accordance with specified analytical protocols as outlined in the Work Plan (Brown and Caldwell, 1997) and Work Addendum (Brown and Caldwell, 2000). Prior to determining the presence or absence of environmental contamination, laboratory reports were assessed and the data validated for overall accuracy, precision, representativeness and completeness to establish data quality and usability. Additionally, reporting detection limits (RDLs) were checked against EPA method criteria in accordance with the project Quality Assurance Project Plan (QAPP).

All laboratory data were verified and independently validated by Laboratory Data Consultants, Inc. (LDC). Validation was performed in accordance with requirements specified in the NAVFACENGCOM Southwest Division Environmental Quality Assurance Requirements (SWDIV, 1997). SWDIV and BC personnel determined that EPA Level III criteria for 90 percent of the data and EPA Level IV criteria for 10 percent of the data was an appropriate level of quality assurance for this project. Level IV criteria were performed for additional defensibility of the data. In the verification and validation process, field and laboratory data were assessed for compliance with the requirements specified in the QAPP and data were validated following the

SWDIV Policy Memoranda No. 13 (SWDIV, 1996). The purpose of the data verification and validation was to assure that:

- Data collected during this investigation meet the Data Quality Objectives (DQOs) outlined in Section 1 of the Work Plan, and
- Data can be used as a basis for additional site evaluation and/or removal action decisions at the Morris Dam facility.

In general, laboratory QA/QC criteria were met. Environmental sample results associated with QA/QC measurements that did not meet the validation criteria were qualified during the validation process. The following data qualifiers were applied to the data based on the validation findings:

U - Indicates the compound or analyte was analyzed for but not detected at or above the associated detection limit. Also, samples associated with contaminated blanks were qualified with an "U" if sample results were positive but less than five times (ten times if it was a common laboratory contaminant) blank result.

J - The associated value is an estimated quantity. Data accuracy, precision, or surrogate spike recovery did not meet the laboratory criteria.

UJ - Indicates the compound or analyte was analyzed for but was not detected. The associated detected limit is an estimate value.

R - Quality control indicates the result is not usable

As a result of this process, the following data usability issues have been identified:

- Sample results for various analytes have been qualified as estimated quantities because measured QA/QC parameters did not meet the validation criteria. Table G-1 in Appendix G lists the specific criteria applied to each qualifier assigned.
- A total of 11 Otto fuel sample results were qualified as estimated quantities due to the absence of Otto fuel standard (the standard degraded extremely quickly during the analysis and more was not available) at the time these analyses were performed. Chromatograms associated with these samples were carefully reviewed and compared to previous chromatograms from fresh Otto fuel standard. Therefore, although the laboratory reported these results as TPH-d because calibration was performed with respect to diesel, in this report they are presented as Otto fuel because evaluation with respect to Otto fuel was requested originally, and prior chromatograms were consulted to determine that no Otto fuel signature was observed in the sample.

- Data for two volatile compounds (Acrolein and Acrylonitrile) have been rejected due to poor chromatogram calibration relative response factors (RRFs). Therefore, these results are considered unusable.
- Data for two other volatile compounds (1,4-dioxane and vinyl acetate) were rejected by the data validation process but have been accepted and included with raised detection limits and UJ's applied because detectable MS/MSD results were observed. Detection limits were raised to twice the amounts indicated as spikes during MS/MSD. The human health screening criteria are well above the increased detection limits for these compounds.
- Reporting detection limits (RDLs) for several analytes were greater than the limit specified in the QAPP.

With the exception of the rejected values for Acrolein and Acrylonitrile, all environmental sample results presented in this report are considered valid and usable as indicated by their specific qualifier.

4.4 RESULTS SUMMARY

In summary, a variety of organic compounds and metals were detected in several AOCs (Objectives). TRPH was detected in most samples, but generally below 100 mg/kg. We interpret this result to suggest that no widespread release of petroleum based products were evident in the samples collected. Several samples did exhibit concentrations above 100 mg/kg, which might signify some release of hydrocarbons in localized areas as discussed below. TRPH was reported in some samples at concentrations near or at 100 mg/kg near the former gasoline station (AOC (Objective) 1). Some concentrations of gasoline range hydrocarbons were found near the former gasoline station, but the concentrations were not such that suggested a widespread significant surface release of these hydrocarbons. Two samples from below the outfalls in AOC (Objective) 3, Subarea 1 exhibited TRPH concentrations above 100 mg/kg, which may suggest a release at these two locations, although in one location the detection is likely associated with asphalt chips noted in the sample. Two samples near each of the leach fields in AOC (Objective) 5 exhibited TRPH above 100 mg/kg, as did one sample in AOC (Objective) 4 from the slope directly east of former Building 42015. Higher TRPH concentrations were also associated with the surface loess samples in AOC (Objective) 7, and are likely due to the asphalt chips noted in these samples during collection.

Otto Fuel was not detected in any samples submitted for this analysis. We suspect that this result is because of the inherent instability and almost immediate breakdown of Otto Fuel in the environment as evident by the quick breakdown of the standard for laboratory analysis.

Passive soil vapor sampling at AOC (Objective) 7 did suggest that PCE and TCE could have been released at the site. Acetone, benzene, toluene, and xylenes were also detected, but their presence was attributed to ambient conditions due to their corresponding presence in a background sample as well. The concentrations for all constituents were below 1 part per trillion.

Organic compounds that were detected in the soil include PNAs and PCBs. The PCBs were detected in the surface loess samples at AOC (Objective) 7, as were some of the PNAs. A transformer building did exist within the region of AOC (Objective) 7, which would explain the PCB. The loess samples were filled with asphalt chips from the surrounding pavement, which may explain the PNAs. Several other locations did exhibit PNAs including AOC (Objective) 3, one outfall location, but again asphalt chips were noted in the collected sample. AOC (Objective) 6 exhibited some SVOCs including some phthalate esters and a PNA. We believe the phthalate esters are probably due to laboratory cross-contamination. The PNA (fluoranthene) may be related to a release at the site.

Organic lead was detected in several samples. This compound is not present naturally, and may signify a release where it was detected. The most significant detections were found at depth in AOC (Objective) 4, below the pad of former Building 42015. Organic lead was also detected in samples from AOC (Objective) 2, and may suggest a release near the two oil/water separators.

Many metals were detected in all of the site samples. Most of the metals were found at varying concentrations. As discussed in Appendix A, metals can exist naturally in the rocks and soil at concentrations ranging over several orders of magnitude. Hence defining whether a metal is present due to anthropogenic (human induced) reasons or is present naturally is requires several approaches for interpretation. At the Morris Dam R & D facility the difficulty of defining a range of naturally occurring metals concentrations is exacerbated by the very heterogeneous nature of the metamorphic geologic material below and surrounding the facility. The discussion presented in Appendix A attempts to address this difficult question through several different lines of reasoning and calculation. The quantitative analysis consists of statistical analysis of soil and rock data that ultimately yields an "ambient" concentration limit. Metals concentrations that are below this threshold are not considered to be due to a release at the site. However other lines of evidence, from geochemical relationships and mineralogical results suggest that even some metals that are found in concentrations well above these calculated limits may be naturally occurring. Hence, the Navy believes that the statistically-derived ambient concentration limits may not adequately define ambient concentration ranges for most metals.

Given all that is presented in Appendix A and above, the following general interpretation is given for metals detected at the site.

- Statistical analysis results in an ambient concentration limit for each metal. However, metals results from rock samples collected in Background Area 2 indicate that some metals may naturally exist at concentrations exceeding these limits. Decision making with respect to these metals needs to carefully consider such information.
- In general, aluminum, barium, beryllium, chromium, cobalt, manganese, nickel, and vanadium exhibit clear geochemical correlation with iron. In addition, these metals, plus selenium were found at concentrations in rock samples from Background Area 2 (Objective 13) that were similar or higher than the highest

found in site soils. Both of these observations suggest that the concentrations are naturally occurring and unrelated to any anthropogenic activities that may have occurred at the facility

- Several metals, including copper, lithium, molybdenum, and zinc are detected in a few soil samples on site at higher concentrations than in the rock samples from Background Area 2 (Objective 13). However, most site soil samples were well below the highest rock concentration. For these metals, those locations that were significantly greater than the rock sample maximum concentrations could signify a release, or represent higher ends of the statistical population. To be conservative, they are assumed to represent potential releases in this report. These metals do not contribute appreciably to human health risk at any AOC, but may be important later in ecological risk assessment.

- Three metals, antimony, cadmium, and thallium, were detected infrequently, and did not provide a good basis for statistical calculation. High concentrations of these metals were not observed at any location, and we have interpreted that, where detected, they are unrelated to site activities.

- Arsenic and lead generally were not found at higher concentrations in rock samples from Background Area 2 (Objective 13) than soil samples. No minerals were found that corroborate a natural occurrence. Hence their presence at concentrations that exceed the statistically calculated ambient concentration limit may indicate a release due to anthropogenic activities.

- Chromium (VI) was detected in many on site samples and also rock samples from Background Area 2 (Objective 13). The detection of this metal is suspicious due to its unstable nature. Chromium exists in the +6 oxidation state only under the most oxidizing conditions, and is not normally present under natural conditions. It is possible that the listed detections are actually due to false positives from laboratory analysis. The detected concentrations are carried through a complete ambient calculation and risk analysis, but should be used with caution when making decisions.

- Silver was detected sporadically in site soils, and was not detected in rock samples from Background Area 2 (Objective 13). In general, where silver was detected, the concentrations suggest its presence could be attributed to a release from site activities.

- Mercury was not detected in many of the samples on site, or was within the range represented by the maximum rock background result from Background Area 2 (Objective 13). However, mercury was found in approximately 14 samples at concentrations greater than the maximum concentration found in rock. In these cases, it may be related to site activities.

At several of the AOCs (Objectives), metal concentrations were relatively high compared with the ambient concentration limits, were associated with outliers that were removed from the data

set, and were identified as enriched with respect to cations. The most common metals exhibiting all these characteristics were arsenic, chromium, chromium (VI), and nickel. Other metals such as copper, lead, mercury, and silver were detected in only a couple samples at concentrations above the ambient concentration limits and as enriched, and therefore may signify releases in those particular locations as well. While background rock samples have shown higher concentrations of chromium and nickel are possible, they generally did not exhibit high arsenic. Since arsenic was high and enriched in these areas, it is possible that a release has occurred in these areas.

Some of the metals detected at higher concentrations can be summarized into three general "clustered" areas. First metals appear to be clustered with relatively high concentrations and enrichment ratios near and below pads for former Buildings 42010, 42011, 42015, 42016, 42038, and 42039, which encompass parts of AOC (Objective) 2 (Subarea 2 only), AOC (Objective) 4, and AOC (Objective) 6. AOC (Objective) 6 in particular was used for much of the machining and propulsion testing, and the clustered metals in this area may signify a release due to these activities. It is important to note, that an extremely mafic dike, exhibiting high concentrations in chromium and nickel was observed and sampled below the pad of former Building 42015. The extent of this dike is unknown and may extend under the areas above. This observation is significant because the rock sample from this location is the only identified sample which had some arsenic identified with a mineral. The total metals analysis did not quantify arsenic in the rock. However, these facts should all be taken into account when planning further action in this area.

Second, arsenic (1 sample only), chromium (VI), copper, lead, and zinc were detected at concentrations above their respective ambient concentration limits in AOC (Objective) 7 loess and soil samples. Finally, several sporadic detections of metals such as copper, lead, mercury, and zinc were detected near outfall pipes. These pipes were fed from the sump and collection lines targeted in AOC (Objective) 6. Silver was detected in one sample from the slope adjacent to Building 42015.

TCE was detected in groundwater at concentrations below the drinking water standards. Given the fractured nature of the bedrock into which the wells were completed, coupled with the low passive soil vapor concentrations obtained at AOC (Objective) 7, the presence of TCE certainly could be due to a release at the site. However, any further examination of this issue should address water upstream and downstream of the peninsula. The detection of TCE at low concentrations may not present a significant problem if the concentrations do not vary over time. This because the groundwater below the peninsula, while hydraulically connected with the reservoir water, would dilute considerably when mixing with the reservoir water followed by migration away from the peninsula. In addition, water from Morris Reservoir is directed through a turbulent stream channel downstream and then allowed to infiltrate through spreading centers in the San Gabriel basin, which would likely result in TCE being significantly diluted and volatilized as it transports this relatively long distance (several miles) and then infiltrates. Several TICs also were identified in groundwater including MTBE, toluene, and naphthalene. These compounds could be present due to the former USTs. Several other compounds were

identified as TICs and also could be site related. Verification sampling should occur to confirm all compounds and concentrations.

Results from sediment sampling at AOC (Objective) 9 did exhibit some detection of VOCs including acetone and methylene chloride. The concentrations of these constituents were relatively low and likely due to laboratory cross-contamination during analysis. Results for metals did not yield any unusual samples that would suggest a release had occurred.

Table 4 –1. SI Sampling Summary

AOC/BA (Objective) No.	Objective Identification	Description	Activity	No. of Sample Locations	Sample Depths (ft bgs)	Analysis	Analytic Method	Comments
1	Former Gasoline Station/Drum Storage Pad	Concrete Pad (Subarea 1)	Soil Sampling	1	1/3	VOC (incl 1,4-dioxane) SVOC/PAH TRPH TPH (total) Metals Organic Pb	EPA 8260 EPA 8270/8310(c) EPA 418.1 EPA 8015 Mod EPA 6010/7000 (a)	Sample soil below concrete pad which is overlying stained area.
		Slope Soils (Subarea 2)	Soil Sampling	3	1/3	VOC (incl 1,4-dioxane) SVOC/PAH TRPH TPH (total) Metals Organic Pb	EPA 8260 EPA 8270/8310(c) EPA 418.1 EPA 8015 Mod EPA 6010/7000 (a)	Sample soil in stained sloped area above the reservoir, below Building 42003.
2	Oil-Water Separators	Building 42001 (Subarea 1)	Soil Sampling	1	5	VOC (incl 1,4-dioxane) SVOC/PAH TRPH Metals (incl. Li) Tributyltin	EPA 8260 EPA 8270/8310(c) EPA 418.1 EPA 6010/7000 (b)	Soil sample collected near oil-water separator near Building 42001.
		Building 42010 (Subarea 2)	Soil Sampling	1	5			Soil sample collected near oil-water separator near Building 42001.
3	Outfall Areas	OF2/Outfall Area (Subarea 1)	Soil Sampling	2	1/3	SVOC/PAH TRPH Metals (incl Li) Organic lead Tributyltin	EPA 8270/8310(c) EPA 418.1 EPA 6010/7000 (a) (b)	Soil sample collected near outfall area sampled during previous investigations (OF2), and sample near outfall from collection lines.
	Outfall Areas	BU Area (Subarea 2)	Soil Sampling	1	1/3	SVOC/PAH TRPH Metals (incl.Li) Organic Lead Tributyltin	EPA 8270/8310(c) EPA 418.1 EPA 6010/7000 (a) (b)	Soil sample collected near outfall area sampled during previous investigations (BU).

Table 4 –1. SI Sampling Summary

AOC/BA (Objective) No.	Objective Identification	Description	Activity	No. of Sample Locations	Sample Depths (ft bgs)	Analysis	Analytic Method	Comments
4	Propulsion System Testing Area	AST - southwest side of Building 42015 (Subarea 1)	Soil Sampling	1	1	SVOC/PAH TRPH (total) Metals (incl Li)	EPA 8270/8310(c) EPA 418.1 EPA 6010/7000	Sample soil under previous location of AST.
		Concrete Pad in Front of Buildings 42011 and 42015 (Subarea 2)	Soil Sampling	2	5/10/15	SVOC/PAH TRPH (total) Otto Fuel Metals (incl Li) Organic Lead	EPA 8270/8310(c) EPA 418.1 EPA 8015M EPA 6010/7000 (a)	Sample soil under concrete pad where reported Otto fuel spills occurred. Borings to 10 feet bgs to assess stained soils prior to fill.
		Slope Soils (Subarea 3)	Soil Sampling	4	1/3	SVOC/PAH TRPH TPH (Otto fuel) Metals (incl Li)	EPA 8270/8310(c) EPA 418.1 EPA EPA 8015 Mod EPA 6010/7000	Sample surface soils on slope below propulsion testing area to assess stained areas.
		Building 42028 (Subarea 4)	Soil Sampling	2	1/3	SVOC TRPH Metals (inc Li)	EPA 8270/8310(c) EPA 8015 Mod EPA 6010/7000	Sample soil near drainage collection lines in Building 42028.
		Building 42039 (Subarea 5)	Soil Sampling	2	1/3			Sample soil below Building 42039.
5	Sewer Septic Tank and Leach Field Lines	Area of former and present leach lines. Grid area located from the front gate to Buildings 42001 and 42002. Septic Tank by Building 42005.	Geophysical Survey	1	N/A	N/A	EM/GPR	Attempt to locate leach field lines.
			Soil Sampling Subarea 1 (leach lines) Subarea 2 (septic tank)	1 and 5	1/3 and 5/10	VOC (incl 1,4-Dioxane) SVOC/PAH TRPH Metals(a)	EPA 8260 EPA 8270/8310(c) EPA 418.1 EPA 6010/7000	Sample soil (5 samples) near leach field to assess whether release occurred. One sample to 10 ft bgs near sewer septic tank (outside Bldg 42005).
6	Sump and Collection Lines	Buildings 42010, 42011, 42015 (Subarea 1)	Soil Sampling	11	1/3/5	VOC (incl 1,4-Dioxane) SVOC TRPH PCB Metals(a)	EPA 8260 EPA 8270/8310(c) EPA 418.1 EPA EPA 8080 EPA 6010/7000	Sample soil gas adjacent to collection lines. (Sample locations dependent on visual inspection of collection lines.)

Table 4 –1. SI Sampling Summary

AOC/BA (Objective) No.	Objective Identification	Description	Activity	No. of Sample Locations	Sample Depths (ft bgs)	Analysis	Analytic Method	Comments
6 (cont'd)	Sludge Sampling	Building 42029 (Subarea 2)	Soil Sampling	3	1	VOC SVOC PCB Metals	EPA 8260 EPA 8270/8310(c) EPA 8080 EPA 6010/7000	Sample green sludge observed after demolition.
7	Temporary Drum Staging Area	Area surrounding Building 42116	Passive Soil Gas Sampling	25	Surface	VOC	EPA 8260	Sample soil gas in a predetermined grid pattern.
			Soil Sampling (Subarea 2)	5	1/3/5	SVOC PCB TRPH Metals(a)	EPA 8270/8310(c) EPA 8080 EPA 418.1 EPA EPA 6010/7000	Sample soil in area below and around former temporary drum staging area.
	Temporary Drum Staging Area	Area surrounding Building 42116 (Subarea 1)	Loess	3	Surface	SVOC PCB TRPH Metals	EPA 8270 EPA 8080 EPA 418.1 EPA EPA 6010/7000	Sample sediment in drainage areas that receive discharge from temporary drum staging area.
8	Groundwater Investigation	Monitoring Well Installation	Groundwater Sampling	3	-180	VOC (incl 1,4-Dioxane) SVOC/PAH PCB Metals	EPA 8260 EPA 8270/8310(c) EPA 8080 EPA 6010/7000	Proposed location adjacent to concrete pad, near Outfall OF2
9	Slurry Outfall Pipe	Sample near outfall	Sediment	5	NA	VOC SVOC/PAH PCB Metals	EPA 8260 EPA 8270/8310(c) EPA 8080 EPA 6010/7000	Sample sediment to investigate slurry pipe outfall area. Sample reservoir water inside outfall pipe.
10	Electronic Test Area	Building 42013	Soil Sampling	3	1	TPH (Otto fuel) Explosives Lithium	EPA 8015 EPA 8330 EPA 6010/7000	Sample in area marked with Ordnance label.
11	Propellant Magazine	Building 4026	Soil Sampling	3	1	SVOC TPH (Otto fuel) Lithium	EPA 8270/8310(c) EPA 8015 EPA 6010/7000	Sample below building floor.
1/(12)	Background Soil Sampling	Three general areas with distinct soil types (Subareas 1, 2, 3))	Soil Sampling	10	1	Metals (including Li)	EPA 6010/7000	Sample soil to establish background concentrations for metals.

Table 4 –1. SI Sampling Summary

AOC/BA (Objective) No.	Objective Identification	Description	Activity	No. of Sample Locations	Sample Depths (ft bgs)	Analysis	Analytic Method	Comments
2/(13)	Background Rock Sampling	Rock outcrops sampled over southwestern part of peninsula and by Highway 39	Rock Sampling	22	Fresh rock below surface	Metals Mineralogical	EPA 6010/7000 Transmitted and reflected light microscopy Electron microprobe	Sample rock to define background presence of metals, minerals that support presence.

a = Organic lead by DHS Method, Title 22
b = Tributyl tin by pentyl derivation of butyltin
c = Method to be performed on 10 percent of samples using gas chromatograph with Flume Photometric Detector (FPD)
VOCs = Volatile Organic Compounds
SVOC = Semivolatile Organic Compounds
TPH = Total Petroleum Hydrocarbons (volatile and semi-volatile range)
TRPH (total) = Total Recoverable Petroleum Hydrocarbons
PCB = Polychlorinated Biphenyls
Li = Lithium
AOC = Area of Concern
BA = Background Area

Table 4-2. Results from Monitoring Well Purging and Sampling

Well ID	Date	One Well Casing Volume (gal)	Volume Purged (gal)	Purge Rate (gpm)	Maximum Drawdown (ft)	Final Water Quality Parameter Measures					
						Specific Conductivity (m.mhos/cm)	Temperature (°C)	pH	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTU)
MW-1	9/22/1997	33.7	225	1.0	1.43	0.497	22.7	7.91	85	4.0	3.4
MW-2	9/22/1997	40.9	140	1.0	25.65	1.35	22.0	7.32	96	4.9	2.0
MW-3	9/23/1997	22.5	110	1.5	4.56	1.09	21.0	6.89	88	2.2	1.0

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 1 - Former Gasoline Station/ Drum Storage Pad	*Volatile Organic Compounds (EPA 8260)*	0 / 6	ND
	Semivolatile Organic Compounds (EPA 8270)	0 / 9	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 2	0 04 U
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	7 / 8	10 U - 73
	Total Petroleum Hydrocarbons (EPA 8015M)		
	Gasoline	4 / 5	0.05 U - 0.28
	Diesel	0 / 6	10 U
	Otto Fuel	0 / 2	10 U
	Metals (Method Listed by Each Metal)		
	Aluminum	9 / 9	8300 - 13000
	Antimony	0 / 9	10 U
	Arsenic	9 / 9	2.2 - 12
	Barium	9 / 9	130 - 210
	Beryllium	9 / 9	0.46 - 0.63
	Cadmium	4 / 9	0 1 U - 0.27
	Calcium	9 / 9	2400 - 21000
	Chromium	9 / 9	15 - 32
	Cobalt	9 / 9	8 6 - 16
	Copper	9 / 9	31 - 62
	Iron	9 / 9	20000 - 30000
	Lead	9 / 9	5 9 - 19
	Lithium	5 / 9	5 U - 8.2
	Magnesium	9 / 9	5200 - 7800
	Manganese	9 / 9	300 - 470
	Mercury	3 / 9	0.1 U - 0 14
	Molybdenum	9 / 9	2 U
	Nickel	9 / 9	15 - 25
	Potassium	9 / 9	2200 - 3500
	Selenium	0 / 9	0.4 U
	Silver	0 / 9	1 U
	Sodium	9 / 9	160 - 330
	Thallium	0 / 9	0.3 U
	Vanadium	9 / 9	30 - 47
	Zinc	9 / 9	66 - 100
	Chromium(VI)	9 / 9	0 1 - 0 24
	Organic Lead (CA DHS Method)	0 / 7	3 U

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 2 - Oil-Water Separators	*Volatile Organic Compounds (EPA 8260)*	0 / 3	ND
	Semivolatile Organic Compounds (EPA 8270)	0 / 3	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 1	0.008 U
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	3 / 3	30 - 49
	Metals (Method Listed by Each Metal)		
	Aluminum	3 / 3	2600 - 6400
	Antimony	0 / 3	10 U
	Arsenic	3 / 3	18 - 79
	Barium	3 / 3	19 - 38
	Beryllium	3 / 3	0.14 - 0.29
	Cadmium	0 / 3	1 U
	Calcium	3 / 3	550 - 2100
	Chromium	3 / 3	4.6 - 150
	Cobalt	3 / 3	4.7 - 100
	Copper	3 / 3	6.1 - 140
	Iron	3 / 3	10000 - 20000
	Lead	0 / 3	5 U
	Lithium	0 / 2	5 U - 6.8
	Magnesium	3 / 3	4000 - 7000
	Manganese	3 / 3	340 - 520
	Mercury	0 / 2	0.1 U
	Molybdenum	2 / 3	2 - 3
	Nickel	3 / 3	6.9 - 390
	Potassium	1 / 3	50 U - 630
	Selenium	0 / 3	10 U
	Silver	0 / 3	1 U
	Sodium	1 / 3	50 U - 290
	Thallium	0 / 2	0.3 U
	Vanadium	3 / 3	13 - 16
	Zinc	3 / 3	20 - 59
	Chromium(VI)	2 / 2	0.052 - 0.95
	Organic Lead	3/3	1

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 3 - **Outfall Areas**	***Semivolatile Organic Compounds (EPA 8270)***		
	Dibutylphthalate	1 / 5	0.52 - 2 U
	Fluoranthene	1 / 5	0 2 U - 2 6
	Pyrene	1 / 5	0 2 U - 2 4
	Metals (Method Listed by Each Metal)		
	Aluminum	5 / 5	7200 - 10000
	Antimony	0 / 5	10 U
	Arsenic	5 / 5	8.2 - 26
	Barium	5 / 5	100 - 200
	Beryllium	5 / 5	0 3 U - 0.56 U
	Cadmium	1 / 5	0 1 U - 0.92
	Calcium	5 / 5	3100 - 6000
	Chromium	5 / 5	14 - 34
	Cobalt	5 / 5	7.9 - 12
	Copper	5 / 5	32 - 420
	Iron	5 / 5	18000 - 22000
	Lead	5 / 5	14 - 110
	Lithium	5 / 5	6 3 - 40
	Magnesium	5 / 5	4600 - 7300
	Manganese	5 / 5	230 - 450
	Mercury	2 / 5	0.1 U - 1 4
	Molybdenum	0 / 5	2 U
	Nickel	5 / 5	15 - 23
	Potassium	5 / 5	1400 - 2400
	Selenium	0 / 5	0.4 U - 10 U
	Silver	0 / 5	1 U
	Sodium	5 / 5	120 - 230
	Thallium	0 / 5	0 3 U
	Vanadium	5 / 5	25 - 46
	Zinc	5 / 5	68 - 340
	Chromium(VI)	3 / 5	0 052 U - 0 18
	Organic Lead (CA DHS Method)		
	Organic Lead	0 / 5	3 U
	Tributyltin (Flame Photoionization Detector)		
	Tributyltin	0 / 5	0 001 U

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 4 - Propulsion System Testing Area	*Semivolatile Organic Compounds (EPA 8270)*	0 / 27	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 3	ND
	Benzo(a)pyrene	0 / 3	0.04 - 0.04
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	21 / 27	10 U - 220
	Total Petroleum Hydrocarbons (EPA 8015M)		
	Otto Fuel	0 / 24	10 U - 20 U
	Metals (Method Listed by Each Metal)		
	Aluminum	27 / 27	3800 - 16000
	Antimony	1 / 27	10 U - 30
	Arsenic	21 / 27	2.4 - 84
	Barium	27 / 27	59 - 450
	Beryllium	26 / 27	0.1 U - 1.1
	Cadmium	7 / 27	0.1 - 0.74
	Calcium	27 / 27	690 - 13000
	Chromium	27 / 27	14 - 440
	Cobalt	27 / 27	7 - 100
	Copper	27 / 27	17 - 64
	Iron	27 / 27	15000 - 46000
	Lead	22 / 22	1.3 - 30
	Lithium	21 / 27	5.8 - 250
	Magnesium	27 / 27	4300 - 4600
	Manganese	27 / 27	210 - 760
	Mercury	11 / 27	0.1 - 7.6
	Molybdenum	3 / 27	2 U - 20
	Nickel	27 / 27	11 - 930
	Potassium	27 / 27	120 - 6900
	Selenium	6 / 27	0.4 U - 42
	Silver	2 / 27	1 U - 270
	Sodium	27 / 27	150 - 930
	Thallium	2 / 27	0.3 U - 0.38
	Vanadium	27 / 27	23 - 96
	Zinc	27 / 27	28 - 140
	Chromium(VI)	27 / 27	0.035 - 1.19
	Organic Lead (CA DHS Method)		
	Organic Lead	5 / 5	3.2 - 6.4

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines	*Volatile Organic Compounds (EPA 8260)*	0 / 12	ND
	Semivolatile Organic Compounds (EPA 8270)	0 / 12	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 2	ND
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	12/12	12 - 420
	Metals (Method Listed by Each Metal)		
	Aluminum	12 / 12	3600 - 21000
	Antimony	1 / 12	10 U - 30
	Arsenic	10 / 12	5 U - 130
	Barium	12 / 12	39 - 240
	Beryllium	12 / 12	0.48 - 1.2
	Cadmium	0/12	0.1 U - 1 U
	Calcium	12 / 12	1500 - 21000
	Chromium	12 / 12	4 2 - 39
	Cobalt	12 / 12	6 5 - 16
	Copper	12 / 12	5.2 - 52
	Iron	12 / 12	9700 - 37000
	Lead	11 / 12	5 U - 15
	Lithium	2 / 3	5 U - 8
	Magnesium	12 / 12	2300 - 9700
	Manganese	12 / 12	350 - 640
	Mercury	2 / 12	0.1 U - 0 2
	Molybdenum	0 / 12	2 U
	Nickel	12 / 12	7.1 - 30
	Potassium	12 / 12	260 - 2100
	Selenium	5 / 12	10 U - 35
	Silver	0 / 12	1 U
	Sodium	12 / 12	59 - 340
	Thallium	0 / 12	0 3 U
	Vanadium	12 / 12	12 - 77
	Zinc	12 / 12	24 - 97
	Chromium(VI)	12 / 12	0.022 - 0 21

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 6 - Sump and Collection Lines and Sludge Sampling	*Volatile Organic Compounds (EPA 8260)*	0 / 39	ND
	Semivolatile Organic Compounds (EPA 8270)	0 / 40	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 3	0 04 U
	Polychlorinated Biphenyl - PCB (EPA 8080)		
	Aroclor 1260	1 / 39	0 03 U - 0 21
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	29/37	10 U - 54
	Metals (Method Listed by Each Metal)		
	Aluminum	40 / 40	950 - 43000
	Antimony	3 / 40	10 U - 21
	Arsenic	40 / 40	9 - 270
	Barium	40 / 40	10 - 370
	Beryllium	40 / 40	0.11 - 1 5
	Cadmium	2 / 40	0.1 U - 1 U
	Calcium	40 / 40	180 - 4500
	Chromium	40 / 40	2.7 - 750
	Cobalt	36 / 40	4 U - 60
	Copper	40 / 40	11 - 170
	Iron	40 / 40	5900 - 63000
	Lead	40 / 40	3.9 - 52
	Lithium	11 / 14	0.5 U - 130
	Magnesium	40 / 40	280 - 52000
	Manganese	40 / 40	93 - 1300
	Mercury	10 / 40	0.1 U - 2
	Molybdenum	1 / 40	2 U - 2.1
	Nickel	19 / 40	4 U - 370
	Potassium	40 / 40	340 - 940
	Selenium	20 / 40	0.4 U - 57
	Silver	2 / 40	1 U - 47
	Sodium	40 / 40	71 - 1300
	Thallium	2 / 40	0.3 U - 0 44
	Vanadium	37 / 40	4 U - 110
	Zinc	40 / 40	5.5 - 280
	Chromium(VI)	40 / 40	0 049 - 2 2

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 7 - **Temporary Drum Storage Area**	***Semivolatile Organic Compounds (EPA 8270)***		
	Hydrocarbon Matrix	3 / 18	200 - 300
	Semivolatile Organic Compounds (EPA 8270 SIM)		
	Benzo(a)pyrene	1 / 2	0 008 U - 0 046
	Polychlorinated Biphenyl - PCB (EPA 8080)		
	Aroclor 1242	2 / 19	0 03 U - 0 78
	Total Recoverabe Petroleum Hydrocarbons (EPA 418.1)	17/18	10 U 910
	Metals (Method Listed by Each Metal)		
	Aluminum	18 / 18	3600 - 14000
	Antimony	3 / 18	10 U - 36
	Arsenic	18 / 18	5 8 - 110
	Barium	18 / 18	42 - 160
	Beryllium	18 / 18	0 17 - 0.79
	Cadmium	3 / 18	1 U - 2.9
	Calcium	18 / 18	670 - 2900
	Chromium	18 / 18	2 - 38
	Cobalt	16 / 18	4 - 12
	Copper	18 / 18	6.5 - 840
	Iron	18 / 18	12000 - 39000
	Lead	7 / 18	5 U - 2800
	Magnesium	18 / 18	2200 - 7600
	Manganese	18 / 18	160 - 680
	Mercury	1 / 18	0.1 U - 0.17
	Molybdenum	2 / 18	2 U - 2 8
	Nickel	16 / 18	4 - 24
	Potassium	18 / 18	640 - 5900
	Selenium	2 / 18	0.4 U - 40
	Silver	1 / 18	1 U - 14
	Sodium	5 / 18	50 U - 430
	Thallium	2 / 18	0.3 U - 0.42
	Vanadium	18 / 18	14 - 66
	Zinc	18 / 18	30 - 1100
	Chromium(VI)	18 / 18	0 033 - 8.11

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 8 - Groundwater Investigation			
	Volatile Organic Compounds (EPA 8260)		
	Acetone	1 / 4	12
	Chloroform	1 / 4	0.5 U - 2.1
	Toluene	1 / 4	0.5 U - 0.58
	Trichloroethene	4 / 4	2 - 2.6
	Semivolatile Organic Compounds (EPA 8270)		
	Nitrobenzene	4 / 4	35.9 - 42.9
	Polynuclear Aromatic Hydrocarbons (EPA 8310)	0 / 4	ND
	Polychlorinated Biphenyl - PCB (EPA 8080)	0 / 4	1 U
	Total Metals (Method Listed by Each Metal)		(mg/L) (mg/L)
	Aluminum	0 / 4	0.1 U
	Antimony	0 / 4	0.005 U
	Arsenic	3 / 4	0.002 U - 0.0054
	Barium	4 / 4	0.035 - 0.11
	Beryllium	0 / 4	0.001 U
	Cadmium	0 / 4	0.001 U
	Calcium	4 / 4	46 - 75
	Chromium	0 / 4	0.005 U
	Cobalt	0 / 4	0.04 U
	Copper	0 / 4	0.02 U
	Iron	4 / 4	0.1 - 0.14
	Lead	0 / 4	0.002 U
	Magnesium	4 / 4	13 - 71
	Manganese	3 / 4	0.01 U - 0.016
	Mercury	0 / 4	0.0002 U
	Molybdenum	1 / 4	0.02 U - 0.097
	Nickel	0 / 4	0.04 U
	Potassium	4 / 4	4.7 - 18
	Selenium	0 / 4	0.004 U
	Silver	0 / 4	0.01 U
	Sodium	4 / 4	23 - 140
	Thallium	0 / 4	0.003 U
	Vanadium	0 / 4	0.04 U
	Zinc	2 / 4	0.01 U - 0.013
	Chromium(VI)	0 / 4	0.01 U
	Dissolved Metals (Method Listed by Each Metal)		(mg/L) (mg/L)
	Aluminum	0 / 4	0.1 U
	Antimony	0 / 4	0.005 U
	Arsenic	1 / 4	0.002 U - 0.0064
	Barium	4 / 4	0.034 - 0.11
	Beryllium	0 / 4	0.001 U
	Cadmium	0 / 4	0.001 U
	Calcium	4 / 4	44 - 75
	Chromium	0 / 4	0.005 U
	Cobalt	0 / 4	0.04 U
	Copper	0 / 4	0.02 U
	Iron	4 / 4	0.069 - 0.11
	Lead	0 / 4	0.002 U
	Magnesium	4 / 4	14 - 68
	Manganese	3 / 4	0.01 U - 0.017
	Mercury	0 / 4	0.0002 U
	Molybdenum	1 / 4	0.02 U - 0.1
	Nickel	0 / 4	0.04 U
	Potassium	4 / 4	4.6 - 17
	Selenium	0 / 4	0.004 U
	Silver	0 / 4	0.01 U
	Sodium	4 / 4	25 - 130
	Thallium	0 / 4	0.003 U
	Vanadium	0 / 4	0.04 U
	Zinc	0 / 4	0.01 U
	Chromium(VI)	0 / 4	0.01 U

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 9 - Slurry Outfall Pipe	*Volatile Organic Compounds (EPA 8260)*		
	Acetone	2 / 21	0.14 - 0.2
	Methylene chloride	4 / 21	0 005 U - 0 0079
	Semivolatile Organic Compounds (EPA 8270)	0 / 21	ND
	Polychlorinated Biphenyl - PCB (EPA 8080)	0 / 21	ND
	Metals (Method Listed by Each Metal)		
	Aluminum	21 / 21	8700 - 17000
	Antimony	0 / 21	10 U
	Arsenic	21 / 21	7.8 - 13
	Barium	21 / 21	120 - 200
	Beryllium	21 / 21	0.34 - 0 58
	Cadmium	14 / 21	0 1 U - 0.19
	Calcium	21 / 21	8300 - 15000
	Chromium	21 / 21	13 - 27
	Cobalt	21 / 21	6 5 - 12
	Copper	21 / 21	25 - 40
	Iron	21 / 21	15000 - 26000
	Lead	21 / 21	13 - 25
	Lithium	21 / 21	5.4 - 13
	Magnesium	21 / 21	3700 - 7600
	Manganese	21 / 21	320 - 710
	Mercury	0 / 21	0.1 U
	Molybdenum	0 / 21	2 U
	Nickel	21 / 21	13 - 28
	Potassium	21 / 21	1400 - 3500
	Selenium	0 / 21	0.4 U
	Silver	0 / 21	1 U - 10 U
	Sodium	21 / 21	120 - 250
	Thallium	0 / 21	0.3 U
	Vanadium	21 / 21	26 - 50
	Zinc	21 / 21	36 - 87
	Chromium(VI)	0 / 0	NR
	Total Organic Carbon (EPA 410.1 M)	21 / 21	6400 - 94000
	Sulfides (EPA 376.2)	0 / 21	0.1 U
	Moisture Conten, % (ASTM D2216)	21 / 21	37 - 61

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Area of Concern (Objective) 10 - **Electronic Test Area**	***Total Petroleum Hydrocarbons (EPA 8015 M)***		
	Otto Fuel	0/4	10 U
	Explosives (EPA 8330)	0/4	ND
	Metals (Method Listed by Each Metal)		
	Lithium	1 / 4	5 U - 17
	Chromium(VI)	4 / 4	0 083 - 0 67
Area of Concern (Objective) 11 - **Propellant Magazine**	***Semivolatile Organic Compounds (EPA 8270)***	0 / 4	ND
	Semivolatile Organic Compounds (EPA 8270 SIM)	0 / 1	ND
	Total Petroleum Hydrocarbons (EPA 8015 M)		
	Otto Fuel	0/4	20 U
	Metals (Method Listed by Each Metal)		
	Lithium	4 / 4	12 - 17
Background Area 1 (Objective 12) - **Background Soil Sampling**	***Metals (Method Listed by Each Metal)***		
	Aluminum	15 / 15	4900 - 23000
	Antimony	0 / 15	10 U
	Arsenic	15 / 15	1.4 - 25
	Barium	15 / 15	79 - 290
	Beryllium	15 / 15	0.39 - 1.1
	Cadmium	7 / 15	0.1 U - 0.41
	Calcium	15 / 15	470 - 6000
	Chromium	15 / 15	8 9 - 42
	Cobalt	15 / 15	8 5 - 21
	Copper	15 / 15	11 - 51
	Iron	15 / 15	13000 - 63000
	Lead	15 / 15	5.6 - 65
	Lithium	11 / 15	5 U - 22
	Magnesium	15 / 15	1500 - 12000
	Manganese	15 / 15	120 - 870
	Mercury	1 / 15	0.1 U - 0 1
	Molybdenum	1 / 15	2 U - 3 2
	Nickel	15 / 15	9.5 - 44
	Potassium	15 / 15	900 - 8000
	Selenium	4 / 15	0.4 U - 33
	Silver	0 / 15	1 U
	Sodium	15 / 15	91 - 730
	Thallium	0 / 15	0 3 U
	Vanadium	15 / 15	19 - 95
	Zinc	15 / 15	23 - 110
	Chromium(VI)	15 / 15	0 02 - 0 94

Table 4-3. Frequency of Detection for Analytes per Area of Concern/Background Area

Area of Concern/Background Area	Chemical	No. of Detected Values/No. of Total Analyses	Range of Concentrations mg/kg soil; µg/L water
Background Area 2 (Objective 13) - **Background Rock Sampling**	*Metals (Method Listed by Each Metal)*		
	Aluminum	22/22	2700 - 41400
	Antimony	12/22	3.76 J - 10 U
	Arsenic	22/22	0.909 J - 14.7 J
	Barium	22/22	33.4 J - 1770
	Beryllium	21/22	0.051 U - 1.43 J
	Cadmium	0/22	0.501 U - 0.502 U
	Calcium	22/22	806 J - 146000 J
	Chromium	22/22	90.9 J - 967 J
	Cobalt	22/22	5.86 J - 94.6 J
	Copper	22/22	2.54 - 263
	Iron	22/22	16000 J - 56600 J
	Lead	21/22	4.05 J - 24.8
	Lithium	22/22	6.94 - 84.5 J
	Magnesium	22/22	6320 J - 133000 J
	Manganese	22/22	108 J - 1760 J
	Mercury	2/22	0.1 U - 0.166
	Molybdenum	19/22	0.96 J - 11.4
	Nickel	22/22	14 J - 820 J
	Potassium	21/22	422 J - 16000
	Selenium	19/22	31.9 - 105
	Silver	0/22	2 U - 2.01 U
	Sodium	22/22	46 J - 602
	Thallium	0/22	0.6 U - 2.01 U
	Vanadium	22/22	9.85 J - 94 J
	Zinc	22/22	29.6 J - 252 J
	Chromium(VI)	15/22	0.2 U - 0.721

Table 4-4. Summary of Results from Area of Concern (Objective) 1

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0101SO01 01A1B1 1 i i	Valid Qual	0101SO02 01A1B1 1 1 2	Valid Qual	0102ASO01 01A2B1 2 1 i	Valid Qual	0102ASO03 01A2B1 2 i 3	Valid Qual	0102B3SO01 01A2B2 2 2 i	Valid Qual
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		N/A		N/A		N/A	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		ND		N/A		N/A		N/A		ND	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	10	U	18		73		NR		34	
Petroleum Hydrocarbons (EPA 8015M)														
TPH (Diesel Range)		—	N/C	mg/kg	10	U	10	U	NR		NR		10	U
TPH (Gasoline Range)		—	N/C	mg/kg	0.28		0.19		NR		NR		0.13	
OTTO Fuel		—	N/C	mg/kg	N/A		N/A		10	UJ	10	UJ	N/A	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	9500		10000		9000	J	8300	J	9800	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	6.4		5.4		6.7		2.2		8.5	
Barium	EPA 6010	5400	263	mg/kg	150		180		170		130		200	
Beryllium	EPA 6010	150	1.3	mg/kg	0.46		0.58		0.52		0.47		0.58	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.16		0.1	U	0.19	
Calcium	EPA 6010	—	N/C	mg/kg	2600		2800		21000	J	2700	J	3500	J
Chromium	EPA 6010	210	46	mg/kg	19		28		17		15		19	
Cobalt	EPA 6010	4700	23	mg/kg	9.1		16		8.7		8.6		11	
Copper	EPA 6010	2900	55	mg/kg	31		44		54		50		42	
Iron	EPA 6010	—	N/C	mg/kg	23000	J	26000	J	20000	J	20000	J	27000	J
Lead	EPA 6010	150	64	mg/kg	6		9.2		13	J	5.9	J	17	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		6.8		5	U	8.2	
Magnesium	EPA 6010	—	N/C	mg/kg	6300		6700		5900	J	5200	J	6400	J
Manganese	EPA 6010	1800	1172	mg/kg	390		400		320	J	300	J	360	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	UJ	0.1	UJ	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	19		24		15		16		23	
Potassium	EPA 6010	—	N/C	mg/kg	2500		2600		2000	J	2200	J	2700	J
Selenium	EPA 7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	U	0.4	U	0.4	U
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	230	J	270	J	190		160		200	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	35		40		30		33		42	
Zinc	EPA 6010	23000	125	mg/kg	71	J	80	J	95	J	66	J	69	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.18	J	0.11	J	0.19	J	0.11	UJ	0.11	UJ
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	3	U	3	U	N/A		N/A		3	U

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-4. Summary of Results from Area of Concern (Objective) 1

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0102SO01 01A2B3 2 3 i	Valid Qual	0102SO02 01A2B3 2 3 2	Valid Qual	0102SO01A 01A2B4 2 4 i	Valid Qual	0102SO03A 01A2B4 2 4 3	Valid Qual
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)												
TRPH		---	N/C	mg/kg	10	U	41		86		100	
Petroleum Hydrocarbons (EPA 8015M)												
TPH (Diesel Range)		---	N/C	mg/kg	10	U	10	U	10	U	10	U
TPH (Gasoline Range)		---	N/C	mg/kg	0.11		0.05	U	N/A		N/A	
OTTO Fuel		---	N/C	mg/kg	N/A		N/A		N/A		N/A	
Metals (Method Listed by Each Metal)												
Aluminum	EPA 6010	76000	22729	mg/kg	11000		13000		9700	J	9100	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	8.2		12		9.9		11	
Barium	EPA 6010	5400	263	mg/kg	170		200		180		210	
Beryllium	EPA 6010	150	1.3	mg/kg	0.59		0.63		0.63		0.5	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.27		0.16		0.26	
Calcium	EPA 6010	---	N/C	mg/kg	2400		3200		3700	J	4800	J
Chromium	EPA 6010	210	46	mg/kg	22		32		31		19	
Cobalt	EPA 6010	4700	23	mg/kg	11		12		12		10	
Copper	EPA 6010	2900	55	mg/kg	62		51		35		33	
Iron	EPA 6010	---	N/C	mg/kg	26000	J	30000	J	22000	J	23000	J
Lead	EPA 6010	150	64	mg/kg	9.1		16		19		16	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		5.8		5.7	
Magnesium	EPA 6010	---	N/C	mg/kg	6800		7800		6100	J	6100	J
Manganese	EPA 6010	1800	1172	mg/kg	390		470		320	J	320	J
Mercury	EPA 7471	23	0.1	mg/kg	0.14	J	0.1	UJ	0.1		0.13	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	20		25		25		19	
Potassium	EPA 6010	---	N/C	mg/kg	2500		3500		2700	J	3300	J
Selenium	EPA 7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	U	0.4	U
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	260	J	330	J	230		180	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	42		47		41		41	
Zinc	EPA 6010	23000	125	mg/kg	71	J	100	J	84	J	70	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.1	J	0.24	J	0.18	J	0.09	UJ
Organic Lead (CA DHS Method)												
Organic Lead	CA DHS	0.0061	N/C	mg/kg	3	U	3	U	3	U	3	U

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-5. Summary of Results from Area of Concern (Objective) 2

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0201AS005 02A1B1 i 1 5	Valid Qual	0202AS005 02A2B1 2 1 5	Valid Qual	0202AS005 02A2B1 2 i 5 Dup	Valid Qual
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		ND		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)										
TRPH		---	N/C	mg/kg	49	J	30	J	26	J
Petroleum Hydrocarbons (EPA 8015M)					N/A		N/A		N/A	
Metals (Method Listed by Each Metal)										
Aluminum	EPA 6010	76000	22729	mg/kg	6400		2400		2600	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	18	J	44	J	79	J
Barium	EPA 6010	5400	263	mg/kg	38		16		19	
Beryllium	EPA 6010	150	1.3	mg/kg	0.29		0.14		0.13	
Cadmium	EPA 6010	9	0.41	mg/kg	1	U	1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	2100		550	J	570	
Chromium	EPA 6010	210	46	mg/kg	4.6		120		150	
Cobalt	EPA 6010	4700	23	mg/kg	4.7		67		100	
Copper	EPA 6010	2900	55	mg/kg	6.1		110		140	
Iron	EPA 6010	---	N/C	mg/kg	20000	J	10000	J	17000	J
Lead	EPA 6010	150	64	mg/kg	5	U	5	U	5	U
Lithium	EPA 7430	1600	22	mg/kg	6.8		5	U	5	U
Magnesium	EPA 6010	---	N/C	mg/kg	4000	J	5900	J	7000	J
Manganese	EPA 6010	1800	1172	mg/kg	340	J	370	J	520	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	3		2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	6.9		260		390	
Potassium	EPA 6010	---	N/C	mg/kg	630	J	50	R	50	R
Selenium	EPA 6010	390	33	mg/kg	10	UJ	10	UJ	10	UJ
Silver	EPA 6010	390	1	mg/kg	1	UJ	1	UJ	1	UJ
Sodium	EPA 6010	---	N/C	mg/kg	290		50	U	50	U
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	13		11		16	
Zinc	EPA 6010	23000	125	mg/kg	59		15		20	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.052	UJ	0.73		0.95	J
Organic Lead (CA DHS Method)										
Organic Lead	CA DHS	0.0061	N/C	mg/kg	1		1		1	
Tributyltin (Flame Photoionization Detector)										
Tributyltin	FPD	2	N/C	mg/kg	<1		<1		<1	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-6. Summary of Results from Area of Concern (Objective) 3

Analyte			Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0301SO01a 03A1B1 i i 0 - 0.5	Valid Qual	0301SO03a 03A1B1 i i 3	Valid Qual	0301BS001 03A1B2 i 2 0 - 0.5	Valid Qual	0302S001 03A2B1 2 1 0 - 0.5	Valid Qual	0302S002 03A2B1 2 1 2	Valid Qual
Semivolatile Organic Compounds (EPA 8270)															
Dibutylphthalate			6100	N/C	mg/kg	1	U	0.52		2	U	0.2	U	0.2	U
Fluoranthene			2300	N/C		1	U	0.2	U	2.6		0.2	U	0.2	U
Pyrene			2300	N/C		1	U	0.2	U	2.4		0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)				N/C		N/A		N/A		N/A					
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH			---	N/C	mg/kg	190		46		760		49		66	
Metals (Method Listed by Each Metal)															
Aluminum	EPA	6010	76000	22729	mg/kg	7200	J	10000	J	7300		10000		9800	
Antimony	EPA	6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA	6010	0.39	32	mg/kg	8.2		12		16		18		26	
Barium	EPA	6010	5400	263	mg/kg	100		200		120		120		120	
Beryllium	EPA	6010	150	1.3	mg/kg	0.41		0.47		0.3	U	0.56	U	0.55	U
Cadmium	EPA	6010/7131	9.0	0.41	mg/kg	0.92		0.1	U	1	UJ	1	UJ	1	UJ
Calcium	EPA	6010	---	N/C	mg/kg	3600	J	4800	J	6000		3500		3100	
Chromium	EPA	6010	210	46	mg/kg	14		17		34		17		17	
Cobalt	EPA	6010	4700	23	mg/kg	8.1		12		7.9		8.9		9.1	
Copper	EPA	6010	2900	55	mg/kg	43		60		420		36		32	
Iron	EPA	6010	---	N/C	mg/kg	18000	J	22000	J	20000	J	22000	J	22000	J
Lead	EPA	6010	150	64	mg/kg	27		21		110		14		15	
Lithium	EPA	7430	1600	22	mg/kg	6.3		12		8.1		40		31	
Magnesium	EPA	6010	---	N/C	mg/kg	4800	J	7300	J	4600		5400		4700	
Manganese	EPA	6010	1800	1172	mg/kg	240	J	310	J	230	J	350	J	450	J
Mercury	EPA	7471	23	0.1	mg/kg	0.1	U	0.1	U	1.4		0.2		0.1	U
Molybdenum	EPA	6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA	6010	150	63	mg/kg	19		20		23		15		17	
Potassium	EPA	6010	---	N/C	mg/kg	2300	J	2400	J	2300		1400		2300	
Selenium	EPA	6010/7740	390	33	mg/kg	0.4	U	0.4	U	10	U	10	U	10	U
Silver	EPA	6010	390	i	mg/kg	1	U	1	U	1	R	1	R	1	R
Sodium	EPA	6010	—	N/C	mg/kg	160		230		120		190		120	
Thallium	EPA	7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA	6010	550	122	mg/kg	29		46		25		44		44	
Zinc	EPA	6010	23000	125	mg/kg	140	J	68	J	270		340		200	
Chromium(VI)	EPA	7199	0.2	0.74	mg/kg	0.18	J	0.09	UJ	0.052	UJ	0.061	UJ	0.063	UJ
Organic Lead (CA DHS Method)															
Organic Lead	CA	DHS	0.0061	N/C	mg/kg	3	U	3	U	3	U	3	U	3	U
Tributyltin (Flame Photoionization Detector)															
Tributyltin		FPD	2	N/C	mg/kg	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Sample ID Boring ID Area Number Boring Number Depth	Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0401SO01 04A1B1 1 i i	Valid Qual	0402ASO05 04A2B1 2 1 5	Valid Qual	0402ASO10 04A2B1 2 i 10	Valid Qual	0402ASO15 04A2B1 2 1 15	Valid Qual	0402ASO16 04A2B1 2 1 16	Valid Qual
Semivolatile Organic Compounds (EPA 8270)				N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)				N/C		ND		N/A		N/A		ND		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH			---	N/C	mg/kg	91		10	U	27	J	25	J	30	J
Petroleum Hydrocarbons (EPA 8015M)															
TPH (Diesel Range)			---	N/C	mg/kg	N/A		10	U	10	U	10	U	10	U
OTTO Fuel			---	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	
Metals (Method Listed by Each Metal)															
Aluminum	EPA	6010	76000	22729	mg/kg	9300	J	16000		12000		8800		7700	
Antimony	EPA	6010	31	10	mg/kg	10	U	30		10	U	10	U	10	U
Arsenic	EPA	6010	0.39	32	mg/kg	2.4	U	5	U	5	U	5	U	5	U
Barium	EPA	6010	5400	263	mg/kg	120		180		140		97		110	
Beryllium	EPA	6010	150	1.3	mg/kg	0.46		0.85		0.78		0.43		0.36	
Cadmium	EPA	7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Calcium	EPA	6010	---	N/C	mg/kg	3000	J	3500		1800		1800		3800	
Chromium	EPA	6010	210	46	mg/kg	16		26		24		16		14	
Cobalt	EPA	6010	4700	23	mg/kg	9.4		14		12		8		11	
Copper	EPA	6010	2900	55	mg/kg	22		45		22		18		19	
Iron	EPA	6010	---	N/C	mg/kg	20000		40000	J	30000	J	20000	J	20000	J
Lead	EPA	6010	150	64	mg/kg	8.8		8.9		8.3		3.2		3.6	
Lithium	EPA	7430	1600	22	mg/kg	5.8	J	8.6		5	U	5	U	6.1	
Magnesium	EPA	6010	---	N/C	mg/kg	4800	J	8300		5100		4300	J	4900	
Manganese	EPA	6010	1800	1172	mg/kg	270	J	440	J	420	J	380		300	J
Mercury	EPA	7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA	6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA	6010	150	63	mg/kg	14		21		17		14		11	
Potassium	EPA	6010	---	N/C	mg/kg	2200	J	3300		2100		1500		2100	
Selenium	EPA	7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ
Silver	EPA	6010	390	i	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA	6010	---	N/C	mg/kg	220		210		150		150		180	
Thallium	EPA	7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA	6010	550	122	mg/kg	33		55		44		32		29	
Zinc	EPA	6010	23000	125	mg/kg	49	J	84		46		36		42	
Chromium (VI)	EPA	7199	0.2	0.74	mg/kg	N/A		0.07	J	0.035	UJ	0.13	J	0.17	J
Organic Lead (CA DHS Method)															
Organic Lead	CA	DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		3.2		3.6	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0402BSO05 04A2B2 2 2 5	Valid Qual	0402BSO10 04A2B2 2 2 10	Valid Qual	0402BSO15 04A2B2 2 2 15	Valid Qual	0402BSO20 04A2B2 2 2 20	Valid Qual	0403ASO01 04A3B1 3 1 1	Valid Qual
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	37	J	39	J	10	U	12	J	91	
Petroleum Hydrocarbons (EPA 8015M)														
TPH (Diesel Range)		—	N/C	mg/kg	10	U	10	U	10	U	10	U	N/A	
OTTO Fuel		—	N/C	mg/kg	N/A		N/A		N/A		N/A		10	UJ
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	16000		14000		7700		6200		8700	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	5	U	9.6		5	U	12		3.2	
Barium	EPA 6010	5400	263	mg/kg	140		150		94		59		140	
Beryllium	EPA 6010	150	1.3	mg/kg	0.89		0.8		0.33		0.24		0.49	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.74	
Calcium	EPA 6010	—	N/C	mg/kg	3000		2600		2200		2600		13000	
Chromium	EPA 6010	210	46	mg/kg	26		37		24		59		20	
Cobalt	EPA 6010	4700	23	mg/kg	14		19		7		11		10	
Copper	EPA 6010	2900	55	mg/kg	32		28		17		20		31	
Iron	EPA 6010	—	N/C	mg/kg	34000	J	32000	J	19000	J	15000	J	24000	
Lead	EPA 6010	150	64	mg/kg	12		6.4		3.9		3.4		11	
Lithium	EPA 7430	1600	22	mg/kg	7.9		5.7		5	U	5	U	9.1	
Magnesium	EPA 6010	—	N/C	mg/kg	6600		6100		4300		6700		6000	
Manganese	EPA 6010	1800	1172	mg/kg	390	J	450	J	270	J	210		340	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.7	U	1.5	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2.1		2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	21		22		33		78		18	
Potassium	EPA 6010	—	N/C	mg/kg	2600		2200		1900		1200		2300	J
Selenium	EPA 7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ	0.4	U
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	270	
Sodium	EPA 6010	—	N/C	mg/kg	240		190		550		250		600	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	J	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	52		47		29		23		35	
Zinc	EPA 6010	23000	125	mg/kg	64		54		36		28		140	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.081	J	0.26	J	0.3		0.23	J	0.3	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		6.4		3.9		3.4		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Sample ID Boring ID Area Number Boring Number Depth	Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0403BS001 04A3B2 3 2 1	Valid Qual	0403BSOD01 04A3B2 3 2 1 Duplicate	Valid Qual	0403BSO03 04A3B2 3 2 3	Valid Qual	0403BSOD03 04A3B2 3 2 3 Duplicate	Valid Qual	0403CSO01 04A3B3 3 3 1	Valid Qual
Semivolatile Organic Compounds (EPA 8270)				N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)				N/C		ND		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH			---	N/C	mg/kg	43		28		44		30		30	
Petroleum Hydrocarbons (EPA 8015M)															
TPH (Diesel Range)			---	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	
OTTO Fuel			---	N/C	mg/kg	10	UJ	10	UJ	10	UJ	10	UJ	10	UJ
Metals (Method Listed by Each Metal)															
Aluminum	EPA	6010	76000	22729	mg/kg	7700	J	6900	J	8800	J	7700	J	12000	J
Antimony	EPA	6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA	6010	0.39	32	mg/kg	5.4		6.4		6.5		10		15	
Barium	EPA	6010	5400	263	mg/kg	120		110		130		120		180	
Beryllium	EPA	6010	150	1.3	mg/kg	0.41		0.38		0.5		0.44		0.76	
Cadmium	EPA	7131	9.0	0.41	mg/kg	0.14		0.1	U	0.31		0.15		0.1	U
Calcium	EPA	6010	---	N/C	mg/kg	2600	J	2500	J	3100	J	2600	J	4200	J
Chromium	EPA	6010	210	46	mg/kg	24		16		18		19		23	
Cobalt	EPA	6010	4700	23	mg/kg	8.5		7.4		9.1		8.2		13	
Copper	EPA	6010	2900	55	mg/kg	30		26		34		32		64	
Iron	EPA	6010	---	N/C	mg/kg	20000	J	19000	J	23000	J	21000	J	40000	J
Lead	EPA	6010	150	64	mg/kg	9.6	J	13	J	18	J	18	J	14	
Lithium	EPA	7430	1600	22	mg/kg	7.3		7.3		8.5		9.9		15	
Magnesium	EPA	6010	—	N/C	mg/kg	5200	J	4400	J	5500	J	4800	J	7400	
Manganese	EPA	6010	1800	1172	mg/kg	260	J	210	J	260	J	220	J	460	J
Mercury	EPA	7471	23	0.1	mg/kg	2.2		7.6		2.6		3		0.1	U
Molybdenum	EPA	6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA	6010	150	63	mg/kg	17		14		17		16		21	
Potassium	EPA	6010	—	N/C	mg/kg	2100	J	2100	J	3200	J	2400	J	3000	J
Selenium	EPA	7740	390	33	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Silver	EPA	6010	390	i	mg/kg	1	U	1	U	1	U	35		1	U
Sodium	EPA	6010	---	N/C	mg/kg	180		170		190		180		640	
Thallium	EPA	7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA	6010	550	122	mg/kg	31		28		36		32		56	
Zinc	EPA	6010	23000	125	mg/kg	69	J	70	J	90	J	91	J	93	J
Chromium (VI)	EPA	7199	0.2	0.74	mg/kg	0.1	UJ	0.13	UJ	0.09	UJ	0.15	UJ	0.13	UJ
Organic Lead (CA DHS Method)															
Organic Lead	CA	DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0403CSO03	Valid Qual	0403CSOD03	Valid Qual	0403DSO01	Valid Qual	0403DSO02	Valid Qual	0404ASO01	Valid Qual
Sample ID					0403CSO03		0403CSOD03		0403DSO01		0403DSO02		0404ASO01	
Boring ID					04A3B3		04A3B3		04A3B4		04A3B4		04A4B1	
Area Number					3		3		3		3		4	
Boring Number					3		3		4		4		1	
Depth					3		3 Duplicate		1		2		1	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	49		50		220		47		25	U
Petroleum Hydrocarbons (EPA 8015M)														
TPH (Diesel Range)		—	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	
OTTO Fuel		—	N/C	mg/kg	10	UJ	10	U	20	U	20	U	20	U
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	13000	J	14000	J	14000	J	13000	J	9800	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	19		15		10		11		8.7	
Barium	EPA 6010	5400	263	mg/kg	160		190		160		190		87	
Beryllium	EPA 6010	150	1.3	mg/kg	0.94		0.8		0.72		0.72		0.72	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.14		0.1	U	0.1	U
Calcium	EPA 6010	—	N/C	mg/kg	4700	J	6000	J	2800	J	3100	J	1400	J
Chromium	EPA 6010	210	46	mg/kg	37		37		23		29		19	
Cobalt	EPA 6010	4700	23	mg/kg	14		13		12		10		14	
Copper	EPA 6010	2900	55	mg/kg	46		52		36		36		20	
Iron	EPA 6010	—	N/C	mg/kg	43000	J	46000	J	31000		32000		24000	
Lead	EPA 6010	150	64	mg/kg	15		13		15		10		7.8	
Lithium	EPA 7430	1600	22	mg/kg	26		16		10	J	12	J	5.7	J
Magnesium	EPA 6010	—	N/C	mg/kg	6900		8300		5900	J	7500	J	5700	J
Manganese	EPA 6010	1800	1172	mg/kg	420	J	470	J	390	J	390	J	360	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.13	U	0.38		0.25		0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	26		29		20		30		14	
Potassium	EPA 6010	—	N/C	mg/kg	2600	J	3300	J	2500	J	3000	J	1800	J
Selenium	EPA 7740	390	33	mg/kg	0.4	U	0.4	U	0.4	UJ	19		0.4	UJ
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	390		500		260		550		330	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	64		62		46		53		44	
Zinc	EPA 6010	23000	125	mg/kg	77	J	100	J	73	J	82	J	49	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.18	J	0.16	J	0.1	UJ	0.1	UJ	0.13	UJ
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0404ASO03 04A4B1 4 1 3	Valid Qual	0404BSO01 04A4B2 4 2 1	Valid Qual	0404BSO03 04A4B2 4 2 3	Valid Qual	0405SO01 04A5B1 5 i i	Valid Qual	0405SO03 04A5B1 5 i 3	Valid Qual
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	10	U	22		33		18		19	
Petroleum Hydrocarbons (EPA 8015M)														
TPH (Diesel Range)		—	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	
OTTO Fuel		—	N/C	mg/kg	20	U	10	U	10	U	N/A		N/A	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	11000	J	9600	J	8700	J	15000	J	15000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	10		11		9.9		9.9		17	
Barium	EPA 6010	5400	263	mg/kg	120		110		110		200		450	
Beryllium	EPA 6010	150	1.3	mg/kg	0.84		0.74		0.72		0.92		1.1	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Calcium	EPA 6010	—	N/C	mg/kg	1200	J	1300	J	1400	J	3000	J	4000	J
Chromium	EPA 6010	210	46	mg/kg	24		18		20		60		150	
Cobalt	EPA 6010	4700	23	mg/kg	14		11		11		11		21	
Copper	EPA 6010	2900	55	mg/kg	23		25		24		24		57	
Iron	EPA 6010	—	N/C	mg/kg	29000		24000	J	23000	J	38000	J	60000	J
Lead	EPA 6010	150	64	mg/kg	9.4	U	6.6		6.3		9.2		13	
Lithium	EPA 7430	1600	22	mg/kg	6.3	J	5	U	5	U	25		120	
Magnesium	EPA 6010	—	N/C	mg/kg	5800	J	5600	J	5800	J	9400		18000	
Manganese	EPA 6010	1800	1172	mg/kg	440	J	320	J	250	J	570	J	570	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	6.9		20	
Nickel	EPA 6010	150	63	mg/kg	17		14		15		73		110	
Potassium	EPA 6010	—	N/C	mg/kg	2500	J	1700	J	1600	J	3400	J	6900	J
Selenium	EPA 7740	390	33	mg/kg	13		0.4	U	0.4	U	22		42	
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	240		230		230		750		350	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.38		0.3	U
Vanadium	EPA 6010	550	122	mg/kg	48		41		40		52		96	
Zinc	EPA 6010	23000	125	mg/kg	52	J	52	J	52	J	89	J	130	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.15	UJ	0.14	UJ	0.12	UJ	1.19	J	0.6	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-7. Summary of Results from Area of Concern (Objective) 4

Analyte		Sample ID Boring ID Area Number Boring Number Depth			0405ASO01 04A5B2 5 2 i	Valid Qual.	0405ASO03 04A5B2 5 2 3	Valid Qual
		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units				
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)								
TRPH		---	N/C	mg/kg	25	U	32	
Petroleum Hydrocarbons (EPA 8015M)								
TPH (Diesel Range)		---	N/C	mg/kg	N/A		N/A	
OTTO Fuel		---	N/C	mg/kg	20	U	20	U
Metals (Method Listed by Each Metal)								
Aluminum	EPA 6010	76000	22729	mg/kg	14000	J	3800	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	84		24	
Barium	EPA 6010	5400	263	mg/kg	110		62	
Beryllium	EPA 6010	150	1.3	mg/kg	0.75		0.1	U
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.37		0.1	U
Calcium	EPA 6010	---	N/C	mg/kg	1900	J	690	J
Chromium	EPA 6010	210	46	mg/kg	440		260	
Cobalt	EPA 6010	4700	23	mg/kg	47		100	
Copper	EPA 6010	2900	55	mg/kg	54		37	
Iron	EPA 6010	---	N/C	mg/kg	37000		46000	
Lead	EPA 6010	150	64	mg/kg	30		1.3	
Lithium	EPA 7430	1600	22	mg/kg	170	J	250	J
Magnesium	EPA 6010	---	N/C	mg/kg	28000	J	46000	J
Manganese	EPA 6010	1800	1172	mg/kg	730	J	760	J
Mercury	EPA 7471	23	0.1	mg/kg	0.18		0.13	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	400		930	
Potassium	EPA 6010	---	N/C	mg/kg	1100	J	120	J
Selenium	EPA 7740	390	33	mg/kg	10		32	
Silver	EPA 6010	390	i	mg/kg	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	640		930	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.33	
Vanadium	EPA 6010	550	122	mg/kg	32		25	
Zinc	EPA 6010	23000	125	mg/kg	71	J	36	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	1.1	J	0.72	J
Organic Lead (CA DHS Method)								
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-8. Summary of Results from Area of Concern (Objective) 5

Analyte		Sample ID Boring ID Area Number Boring Number Depth	Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0501AS001 05A1B1 i i i	Valid Qual	0501AS003 05A1B1 i i 3	Valid Qual	0501BS001 05A1B2 i 2 i	Valid Qual	0501BS003 05A1B2 i 2 3	Valid Qual
Volatile Organic Compounds (EPA 8260)				N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)				N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)				N/C		ND		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)													
TRPH			---	N/C	mg/kg	12	J	17	J	140	J	18	J
Metals (Method Listed by Each Metal)													
Aluminum	EPA	6010	76000	22729	mg/kg	11000	J	9400		7300		9000	
Antimony	EPA	6010	31	10	mg/kg	10	U	10	U	10	U	10	U
Arsenic	EPA	6010	0.39	32	mg/kg	22	J	18		18		19	
Barium	EPA	6010	5400	263	mg/kg	120		100		160		120	
Beryllium	EPA	6010	150	1.3	mg/kg	0.74		0.58		0.54		0.59	
Cadmium	EPA	6010	9	0.41	mg/kg	1	U	1	U	1	U	1	U
Calcium	EPA	6010	---	N/C	mg/kg	7100		5100		21000		4200	
Chromium	EPA	6010	210	46	mg/kg	14		16		10		15	
Cobalt	EPA	6010	4700	23	mg/kg	16		15		8.3		13	
Copper	EPA	6010	2900	55	mg/kg	10		5.2		16		16	
Iron	EPA	6010	---	N/C	mg/kg	19000		16000		17000		20000	
Lead	EPA	6010	150	64	mg/kg	5.7		6		10		5.8	
Lithium	EPA	7430	1600	22	mg/kg	N/A		N/A		N/A		N/A	
Magnesium	EPA	6010	---	N/C	mg/kg	9400	J	9100		6100		7600	
Manganese	EPA	6010	1800	1172	mg/kg	440	J	420		350		490	
Mercury	EPA	7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA	6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U
Nickel	EPA	6010	150	63	mg/kg	16		15		11		14	
Potassium	EPA	6010	---	N/C	mg/kg	340		260		1300		880	
Selenium	EPA	6010	390	33	mg/kg	10	UJ	10	U	10	U	10	U
Silver	EPA	6010	390	1	mg/kg	1	UJ	1	U	1	U	1	U
Sodium	EPA	6010	---	N/C	mg/kg	180		140		100		150	
Thallium	EPA	7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA	6010	550	122	mg/kg	39		33		23		31	
Zinc	EPA	6010	23000	125	mg/kg	57	J	58		44		57	
Chromium(VI)	EPA	7199	0.2	0.74	mg/kg	0.063	UJ	0.05	UJ	0.16	J	0.027	UJ

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-8. Summary of Results from Area of Concern (Objective) 5

Analyte		Sample ID Boring ID Area Number Boring Number Depth			0501CS001 05A1B3 i 3 1	Valid Qual	0501CS003 05A1B3 i 3 3	Valid Qual	0501DS001 05A1B4 i 4 i	Valid Qual	0501ES001 05A1B5 1 5 i	Valid Qual
		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units								
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)												
TRPH		—	N/C	mg/kg	31	J	13	J	420	J	69	J
Metals (Method Listed by Each Metal)												
Aluminum	EPA 6010	76000	22729	mg/kg	3600		8300		9700		16000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	8.1		19		23		130	J
Barium	EPA 6010	5400	263	mg/kg	240		210		140		59	
Beryllium	EPA 6010	150	1.3	mg/kg	0.48		0.76		0.56		0.93	
Cadmium	EPA 6010	9	0.41	mg/kg	1	U	1	U	1	U	0.3	
Calcium	EPA 6010	—	N/C	mg/kg	21000		17000		20000		7100	
Chromium	EPA 6010	210	46	mg/kg	4.2		11		39		6.2	
Cobalt	EPA 6010	4700	23	mg/kg	6.5		10		8.7		8.9	
Copper	EPA 6010	2900	55	mg/kg	15		30		45		52	
Iron	EPA 6010	—	N/C	mg/kg	9700		20000		25000		34000	
Lead	EPA 6010	150	64	mg/kg	5	U	6.3		11		13	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	—	N/C	mg/kg	2300		5700		8300		13000	J
Manganese	EPA 6010	1800	1172	mg/kg	380		440		380		590	J
Mercury	EPA 7471	23	0.1	mg/kg	0.2		0.15		0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	7.1		13		25		25	
Potassium	EPA 6010	—	N/C	mg/kg	920		1400		1800		1300	J
Selenium	EPA 6010	390	33	mg/kg	10	U	10	U	10	U	22	J
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	UJ
Sodium	EPA 6010	—	N/C	mg/kg	59		96		150		290	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	12		27		32		77	
Zinc	EPA 6010	23000	125	mg/kg	24		48		56		97	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.04	UJ	0.055		0.12		0.034	UJ

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-8. Summary of Results from Area of Concern (Objective) 5

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0501ES003 05A1B5 i 5 3	Valid Qual	0502ASO05 05A2B1 2 i 5	Valid Qual	0502ASO10 05A2B1 2 i 10	Valid Qual	0502ASOD05 05A2B1 2 i 5 Duplicate	Valid Qual
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		ND		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)												
TRPH		—	N/C	mg/kg	11	J	24	J	24	J	16	J
Metals (Method Listed by Each Metal)												
Aluminum	EPA 6010	76000	22729	mg/kg	21000	J	19000		21000		7600	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	30	
Arsenic	EPA 6010	0.39	32	mg/kg	76	J	5	U	5	U	47	
Barium	EPA 6010	5400	263	mg/kg	39		150		140		140	
Beryllium	EPA 6010	150	1.3	mg/kg	1.2		0.96		1.1		0.7	
Cadmium	EPA 6010	9	0.41	mg/kg	1	U	0.1	U	0.1	U	0.1	UJ
Calcium	EPA 6010	—	N/C	mg/kg	12000		1500		1700		1600	J
Chromium	EPA 6010	210	46	mg/kg	6.7		24		24		18	
Cobalt	EPA 6010	4700	23	mg/kg	11		16		12		11	
Copper	EPA 6010	2900	55	mg/kg	37		24		27		15	
Iron	EPA 6010	—	N/C	mg/kg	32000		33000	J	37000	J	25000	
Lead	EPA 6010	150	64	mg/kg	15		8.6		9.3		6	
Lithium	EPA 7430	1600	22	mg/kg	N/A		5.8		8		5	U
Magnesium	EPA 6010	—	N/C	mg/kg	9700	J	5700		7000		4400	J
Manganese	EPA 6010	1800	1172	mg/kg	500	J	640	J	480	J	450	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	14		21		30		11	
Potassium	EPA 6010	—	N/C	mg/kg	640	J	2100		1400		790	J
Selenium	EPA 6010	390	33	mg/kg	12	J	18	J	35	J	20	J
Silver	EPA 6010	390	i	mg/kg	1	UJ	1	U	1	U	1	R
Sodium	EPA 6010	—	N/C	mg/kg	340		120		160		80	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	J	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	40		58		74		45	
Zinc	EPA 6010	23000	125	mg/kg	74	J	45		53		30	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.022	UJ	0.14	J	0.21	J	0.19	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601ASO01 06A1B1	Valid Qual	0601ASO03 06A1B1	Valid Qual	0601ASO05 06A1B1	Valid Qual	0601BSO01 06A1B2	Valid Qual	0601BSO03 06A1B2	Valid Qual
Sample ID					0601ASO01		0601ASO03		0601ASO05		0601BSO01		0601BSO03	
Boring ID					06A1B1		06A1B1		06A1B1		06A1B2		06A1B2	
Area Number					i		i		i		i		i	
Boring Number					i		i		i		2		2	
Depth					i		3		5		i		3	
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	U	0.03	U	0.03	U	0.03	U	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	26		21		15	J	35		10	J
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	11000	J	9500	J	11000	J	18000	J	8800	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	12		11		64		21		56	
Barium	EPA 6010	5400	263	mg/kg	160		120		170		140		110	
Beryllium	EPA 6010	150	1.3	mg/kg	0.62		0.73		0.55		1.1		0.73	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.1	UJ	0.1	U	0.1	UJ
Calcium	EPA 6010	---	N/C	mg/kg	2900	J	1500	J	2900	J	1800	J	1300	J
Chromium	EPA 6010	210	46	mg/kg	15		20		14		58		29	
Cobalt	EPA 6010	4700	23	mg/kg	7.8		13		6.3		15		14	
Copper	EPA 6010	2900	55	mg/kg	37		23		36		51		22	
Iron	EPA 6010	---	N/C	mg/kg	29000	J	26000	J	35000		48000	J	27000	
Lead	EPA 6010	150	64	mg/kg	8	J	8.2	J	6.3		14		9.8	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		17		N/A		5	
Magnesium	EPA 6010	---	N/C	mg/kg	6100	J	5300	J	6700	J	6100		4100	J
Manganese	EPA 6010	1800	1172	mg/kg	350	J	350	J	380	J	590	J	460	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	19		22		21		50		18	
Potassium	EPA 6010	---	N/C	mg/kg	2500	J	2200	J	2100	J	4300	J	2300	J
Selenium	EPA 6010	390	33	mg/kg	0.8	U	0.4	U	20	J	48		0.4	R
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	R	1	U	1	R
Sodium	EPA 6010	---	N/C	mg/kg	520		210		620		580		580	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.35		0.3	U
Vanadium	EPA 6010	550	122	mg/kg	43		41		42		83		44	
Zinc	EPA 6010	23000	125	mg/kg	79	J	54	J	84		66	J	34	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.07	UJ	0.1	UJ	0.049	UJ	0.23	J	0.31	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		3	U	N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601BSO05 06A1B2 i 2 5	Valid. Qual.	0601CSO01 06A1B3 i 3 i	Valid. Qual.	0601CSO03 06A1B3 i 3 3	Valid. Qual.	0601CSO05 06A1B3 i 3 5	Valid. Qual.	0601DSO01 06A1B4 i 4 i	Valid. Qual.
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		ND	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	UJ	0.03	U	0.03	U	0.03	UJ	0.03	U
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	10	U	34		11		10	U	27	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	6200	J	17000	J	19000	J	10000	J	16000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	38		24		27		64		150	
Barium	EPA 6010	5400	263	mg/kg	65		160		160		110		180	
Beryllium	EPA 6010	150	1.3	mg/kg	0.37		1.1		1.1		0.74		0.85	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	UJ	0.1	U	0.1	U	0.1	UJ	0.1	U
Calcium	EPA 6010	—	N/C	mg/kg	980	J	1600	J	2000	J	1200	J	1300	J
Chromium	EPA 6010	210	46	mg/kg	16		58		63		30		60	
Cobalt	EPA 6010	4700	23	mg/kg	6.8		14		17		13		22	
Copper	EPA 6010	2900	55	mg/kg	11		49		55		24		170	
Iron	EPA 6010	—	N/C	mg/kg	16000		53000	J	54000	J	33000		43000	J
Lead	EPA 6010	150	64	mg/kg	8.5		17		15		6.1		29	
Lithium	EPA 7430	1600	22	mg/kg	5.9		N/A		N/A		5	U	N/A	
Magnesium	EPA 6010	—	N/C	mg/kg	4200	J	6200		6800		5200	J	6200	
Manganese	EPA 6010	1800	1172	mg/kg	210	J	550	J	600	J	450	J	370	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.21	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2.1	
Nickel	EPA 6010	150	63	mg/kg	11		48		50		19		41	
Potassium	EPA 6010	—	N/C	mg/kg	1600	J	4800	J	4700	J	2500		4100	J
Selenium	EPA 6010	390	33	mg/kg	0.4	R	49		46		0.4	R	18	
Silver	EPA 6010	390	i	mg/kg	1	R	1	U	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	79		450		350		140		400	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	25		88		85		45		45	
Zinc	EPA 6010	23000	125	mg/kg	33	J	70	J	81	J	44	J	120	U
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.2	J	0.33	J	0.5	J	0.16	J	0.56	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		3	U	3	U	N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601DSO03 06A1B4	Valid Qual	0601DSO05 06A1B4	Valid Qual	0601ESO01 06A1B5	Valid Qual	0601ESO03 06A1B5	Valid Qual	0601ESO05 06A1B5	Valid Qual
Sample ID					0601DSO03		0601DSO05		0601ESO01		0601ESO03		0601ESO05	
Boring ID					06A1B4		06A1B4		06A1B5		06A1B5		06A1B5	
Area Number					i		i		i		i		i	
Boring Number					4		4		5		5		5	
Depth					3		5		i		3		5	
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	UJ	0.03	UJ	0.03	U	0.03	U	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		—	N/C	mg/kg	21		22		24		22		16	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	43000	J	16000	J	19000	J	17000	J	4900	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	29		97		25		23		31	
Barium	EPA 6010	5400	263	mg/kg	280		220		160		150		75	
Beryllium	EPA 6010	150	1.3	mg/kg	1.1		0.77		1		0.99		0.33	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	UJ	0.1	U	0.1	U	0.1	UJ
Calcium	EPA 6010	—	N/C	mg/kg	1400	J	1600	J	1500	J	1300	J	520	J
Chromium	EPA 6010	210	46	mg/kg	97		54		100		130		28	
Cobalt	EPA 6010	4700	23	mg/kg	17		13		21		18		6.5	
Copper	EPA 6010	2900	55	mg/kg	31		16		92		48		17	
Iron	EPA 6010	—	N/C	mg/kg	62000	J	36000		43000	J	47000	J	12000	
Lead	EPA 6010	150	64	mg/kg	16		9.5		14		15		8.7	
Lithium	EPA 7430	1600	22	mg/kg	N/A		12		N/A		N/A		5	U
Magnesium	EPA 6010	—	N/C	mg/kg	15000		13000	J	7700		7800		3100	J
Manganese	EPA 6010	1800	1172	mg/kg	370	J	320	J	670	J	600	J	240	J
Mercury	EPA 7471	23	0.1	mg/kg	0.57		0.31		0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	65		43		57		69		15	
Potassium	EPA 6010	—	N/C	mg/kg	8700	J	2100	J	3400	J	3300	J	1200	J
Selenium	EPA 6010	390	33	mg/kg	57		31	J	22		18		0.4	R
Silver	EPA 6010	390	i	mg/kg	1	U	1	R	1	U	1	U	1	R
Sodium	EPA 6010	—	N/C	mg/kg	920		910		400		360		110	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.44		0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	110		72		59		60		19	
Zinc	EPA 6010	23000	125	mg/kg	110	J	62	J	96	J	78	J	23	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.41	J	0.18	J	0.29	J	0.38	J	0.22	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601FSO01 06A1B6 i 6 i	Valid. Qual.	0601FSO03 06A1B6 i 6 3	Valid. Qual	0601FSO05 06A1B6 i 6 5	Valid. Qual	0601GSO01 06A1B7 i 7 i	Valid. Qual	0601GSO03 06A1B7 i 7 3	Valid. Qual.
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.92	
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	U	0.03	UJ	0.03	UJ	0.03	U	0.03	U
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	25		10	U	14	J	19		22	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	12000	J	13000	J	8800	J	18000	J	14000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	21		17		54		25		24	
Barium	EPA 6010	5400	263	mg/kg	130		96		100		150		160	
Beryllium	EPA 6010	150	1.3	mg/kg	1.1		0.94		0.73		1.3		1.2	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	U	0.1	UJ	0.1	U	0.1	U
Calcium	EPA 6010	---	N/C	mg/kg	3600	J	1900	J	1300	J	3500	J	1800	J
Chromium	EPA 6010	210	46	mg/kg	30		27		18		30		29	
Cobalt	EPA 6010	4700	23	mg/kg	13		15		15		18		10	
Copper	EPA 6010	2900	55	mg/kg	46		44		18		56		57	
Iron	EPA 6010	---	N/C	mg/kg	44000	J	38000	J	28000		50000	J	48000	J
Lead	EPA 6010	150	64	mg/kg	17		12		8.1		15		15	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		5.6		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	5500		5900		5900	J	6100		5900	
Manganese	EPA 6010	1800	1172	mg/kg	340	J	320	J	410	J	520	J	430	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	29		20		15		34		32	
Potassium	EPA 6010	---	N/C	mg/kg	2800	J	1700	J	1500	J	2000	J	3100	J
Selenium	EPA 6010	390	33	mg/kg	21		12		0.4	R	46		42	
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	700		240		130		270		560	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	75		66		40		86		76	
Zinc	EPA 6010	23000	125	mg/kg	83		65	J	46	J	92	J	70	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.22	J	0.16	J	0.093	J	0.12	UJ	0.07	UJ
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601GS005 06A1B7 i 7 5	Valid. Qual	0601GS005 06A1B7 1 7 5 Dup	Valid. Qual	0601HSO01 06A1B8 i 8 i	Valid. Qual	0601HSO02 06A1B8 i 8 2	Valid. Qual	0601HSO05 06A1B8 i 8 5	Valid. Qual.
	Sample ID				0601GS005		0601GS005		0601HSO01		0601HSO02		0601HSO05	
	Boring ID				06A1B7		06A1B7		06A1B8		06A1B8		06A1B8	
	Area Number				i		1		i		i		i	
	Boring Number				7		7		8		8		8	
	Depth				5		5 Dup		i		2		5	
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	UJ
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	UJ
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	U	0.03	U	0.03	UJ	0.03	UJ	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	20	J	36	J	32		24	U	10	J
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	8000		11000		12000	J	12000	J	13000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	22		28		22		23		140	
Barium	EPA 6010	5400	263	mg/kg	130		130		130		120		89	
Beryllium	EPA 6010	150	1.3	mg/kg	0.68		0.89		0.61		0.57		0.99	
Cadmium	EPA 7131	9.0	0.41	mg/kg	1	U	1	U	0.47		0.51		0.1	UJ
Calcium	EPA 6010	---	N/C	mg/kg	1600		1700		4500	J	4200	J	2400	J
Chromium	EPA 6010	210	46	mg/kg	15		20		140		130		300	
Cobalt	EPA 6010	4700	23	mg/kg	13		14		27		28		32	
Copper	EPA 6010	2900	55	mg/kg	16		22		65		54		60	
Iron	EPA 6010	---	N/C	mg/kg	21000		27000		34000		29000		45000	
Lead	EPA 6010	150	64	mg/kg	6.5		8.1		30		26		50	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A		22	
Magnesium	EPA 6010	---	N/C	mg/kg	5600		5500		8300	J	8800	J	14000	J
Manganese	EPA 6010	1800	1172	mg/kg	380		390		500	J	520	J	1300	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.16		1		0.18	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	12		16		150		140		330	
Potassium	EPA 6010	---	N/C	mg/kg	1400		1900		2400	J	2400	J	1200	J
Selenium	EPA 6010	390	33	mg/kg	10	U	10	U	0.4	UJ	0.4	UJ	16	J
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	1	R
Sodium	EPA 6010	---	N/C	mg/kg	230		570		410		490		1300	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	32		41		37		34		41	
Zinc	EPA 6010	23000	125	mg/kg	47		54		280	J	220	J	63	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.085	J	0.086		0.45	J	0.9	J	1.4	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601SO01 06A1B9 i 9 i	Valid. Qual.	0601SO03 06A1B9 1 9 3	Valid. Qual.	0601SO05 06A1B9 i 9 5	Valid. Qual.	0601ISO01 06A1B10 i 10 i	Valid. Qual.	0601ISO03 06A1B10 i 10 3	Valid. Qual.
Volatile Organic Compounds (EPA 8260)			N/C		N/A		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	1.3		0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		ND		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	N/A		0.03	UJ	0.03	UJ	0.03	UJ	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	18		12	J	19	J	10	U	10	U
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	9000	J	9600	J	7000	J	15000	J	37000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	20		10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	13		60		42		97		170	
Barium	EPA 6010	5400	263	mg/kg	97		130		140		130		130	
Beryllium	EPA 6010	150	1.3	mg/kg	0.71		0.75		0.53		0.92		1.4	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ
Calcium	EPA 6010	---	N/C	mg/kg	1200	J	1400	J	1400	J	2300	J	3100	J
Chromium	EPA 6010	210	46	mg/kg	16		18		14		21		750	
Cobalt	EPA 6010	4700	23	mg/kg	11		15		12		8.5		30	
Copper	EPA 6010	2900	55	mg/kg	19		20		15		18		11	
Iron	EPA 6010	---	N/C	mg/kg	22000	J	32000		21000		40000		54000	
Lead	EPA 6010	150	64	mg/kg	3.9	J	7.9		6.3		7.6		22	
Lithium	EPA 7430	1600	22	mg/kg	0.5	U	6.5		5.8		24		110	
Magnesium	EPA 6010	---	N/C	mg/kg	5400	J	5800	J	5100	J	9800	J	50000	J
Manganese	EPA 6010	1800	1172	mg/kg	250	J	490	J	350	J	330	J	650	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	2		1.4	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	13		14		13		37		250	
Potassium	EPA 6010	---	N/C	mg/kg	1300	J	1600	J	1200	J	2200	J	640	J
Selenium	EPA 6010	390	33	mg/kg	0.4	U	0.4	R	0.4	R	0.4	R	34	J
Silver	EPA 6010	390	i	mg/kg	1	U	1	R	1	R	2.7	J	47	
Sodium	EPA 6010	---	N/C	mg/kg	350		380		200		150		310	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	39		41		28		41		75	
Zinc	EPA 6010	23000	125	mg/kg	48	J	49	J	44	J	58	J	160	
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.06	UJ	0.048	UJ	0.05	UJ	0.092	J	0.17	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601ISO05 06A1B10 i 10 5	Valid Qual	0601JS001 06A1B11 i 11 i	Valid Qual	0601JS001 06A1B11 i 11 i Dup	Valid Qual	0601JS003 06A1B11 i 11 3	Valid Qual	0601JS003 06A1B11 i 11 3 Dup	Valid Qual
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	U	0.03	U	0.03	U	0.03	U	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	31	J	26	J	32	J	54	J	26	J
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	38000	J	950		1000		3700		4000	
Antimony	EPA 6010	31	10	mg/kg	20		10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	270		15		10		29		29	
Barium	EPA 6010	5400	263	mg/kg	110		12		10		41		41	
Beryllium	EPA 6010	150	1.3	mg/kg	1.5		0.17		0.11		0.26		0.23	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	UJ	1	U	1	U	1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	3100	J	180		200		230		240	
Chromium	EPA 6010	210	46	mg/kg	290		2.7		3.2		8.8		10	
Cobalt	EPA 6010	4700	23	mg/kg	60		4	U	4	U	4	U	4	U
Copper	EPA 6010	2900	55	mg/kg	52		14		12		45		52	
Iron	EPA 6010	---	N/C	mg/kg	63000		3300		2700		9100		9400	
Lead	EPA 6010	150	64	mg/kg	45		28		22		22		25	
Lithium	EPA 7430	1600	22	mg/kg	130		N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	52000	J	280		310		1600		1600	
Manganese	EPA 6010	1800	1172	mg/kg	1100	J	130		93		110		120	
Mercury	EPA 7471	23	0.1	mg/kg	0.43		0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	370		4	U	4	U	6.1		6.9	
Potassium	EPA 6010	---	N/C	mg/kg	410	J	440		400		610		750	
Selenium	EPA 6010	390	33	mg/kg	25	J	10	U	10	U	10	U	30	
Silver	EPA 6010	390	1	mg/kg	1	R	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	380		50	U	76		110		170	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	64		4	U	4	U	7.3		7.7	
Zinc	EPA 6010	23000	125	mg/kg	160		5.5		11		18		18	
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.47	J	0.098	J	0.082		0.23	J	0.092	
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-9. Summary of Results from Area of Concern (Objective) 6

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	0601JS005 06A1B11 i 11 5	Valid. Qual.	0601JS005 06A1B11 i 11 5 Dup	Valid. Qual.	0602SO01 06A2B1 2 i i	Valid. Qual.	0602SO02 06A2B2 2 2 1	Valid. Qual.	0602SO03 06A2B3 2 3 i	Valid. Qual.
Volatile Organic Compounds (EPA 8260)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270)														
Bis(2-ethylhexyl)phthalate		35	N/C	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Diethylphthalate		49000	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.2	U	0.2	U
Fluoranthene		2300	N/C	mg/kg	0.2	U	0.2	U	0.2	U	0.22		0.2	U
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		ND		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1260		0.066	N/C	mg/kg	0.03	U	0.03	UJ	0.21	J	0.03	UJ	0.03	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	10	U	41	J	N/A		N/A		N/A	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	1400		2400	J	15000		15000		20000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	21		10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	19		29	J	9		10		11	
Barium	EPA 6010	5400	263	mg/kg	24		27		290		270		370	
Beryllium	EPA 6010	150	1.3	mg/kg	0.13		0.14		0.68		0.55		0.57	
Cadmium	EPA 7131	9.0	0.41	mg/kg	1	U	1	U	0.1	U	0.1	U	0.1	U
Calcium	EPA 6010	—	N/C	mg/kg	190		210		3600		2600		4200	J
Chromium	EPA 6010	210	46	mg/kg	3.8		5.9		52		64		90	
Cobalt	EPA 6010	4700	23	mg/kg	6.2		7.3		14		14		14	
Copper	EPA 6010	2900	55	mg/kg	29		59		40		63		67	
Iron	EPA 6010	—	N/C	mg/kg	3100		5900		38000	J	37000		50000	
Lead	EPA 6010	150	64	mg/kg	46		52		15		15		12	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	690		990	J	8900		8600		13000	J
Manganese	EPA 6010	1800	1172	mg/kg	110		150	J	290		350		400	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.11		0.1	UJ	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	4	U	5.3		37		38		58	
Potassium	EPA 6010	—	N/C	mg/kg	340		570	J	4500		4700		9400	J
Selenium	EPA 6010	390	33	mg/kg	20		10	UJ	0.4	UJ	12		35	
Silver	EPA 6010	390	i	mg/kg	1	U	1	UJ	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	71		130		370	J	300		980	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	4	U	4.2		51		45		81	U
Zinc	EPA 6010	23000	125	mg/kg	9.5		16	J	76	J	79		110	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	2.2		0.12		0.18	J	0.13	UJ	0.28	J
Organic Lead (CA DHS Method)														
Organic Lead	CA DHS	0.0061	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-10. Summary of Results from Area of Concern (Objective) 7

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	0701SD01	Valid Qual	0701SD02	Valid Qual	0701SD03	Valid Qual	0702AS001	Valid Qual	0702AS003	Valid Qual
Sample ID					0701SD01		0701SD02		0701SD03		0702AS001		0702AS003	
Boring ID					07A1B1		07A1B2		07A1B3		07A2B1		07A2B1	
Area Number					1		1		1		2		2	
Boring Number					i		2		3		i		1	
Depth					Surface		Surface		Surface		1		3	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)														
Benzo(a)pyrene		0.062	N/C	mg/kg	N/A		N/A		0.046		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	270		260		910		25	J	29	J
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1242		0.22	N/C	mg/kg	0.06	U	0.39		0.78		0.03	U	0.03	U
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	4000		4200		3600		5500		8600	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	6.1		8.2		5.8		15	J	20	J
Barium	EPA 6010	5400	263	mg/kg	140		88		75		65		110	
Beryllium	EPA 6010	150	1.3	mg/kg	0.2		0.19		0.17		0.48		0.42	
Cadmium	EPA 6010	9.0	0.41	mg/kg	2.1		2.9		0.85		1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	1400		1700		1500		1100	J	2100	J
Chromium	EPA 6010	210	46	mg/kg	28		32		38		9.8		5.5	
Cobalt	EPA 6010	4700	23	mg/kg	5.4		5.5		4.8		6.3		7.6	
Copper	EPA 6010	2900	55	mg/kg	57		60		57		19		25	
Iron	EPA 6010	---	N/C	mg/kg	19000	J	21000	J	15000	J	16000	J	26000	J
Lead	EPA 6010	150	64	mg/kg	200		200		200		6.7		6.5	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	2600		2600		2200		3500	J	6300	J
Manganese	EPA 6010	1800	1172	mg/kg	330		190		160		230	J	400	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	UJ	0.1	UJ	0.1	UJ	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2.4		2.8		2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	20		24		14		8.2		7.2	
Potassium	EPA 6010	---	N/C	mg/kg	1400		1400		1100		640	J	3200	J
Selenium	EPA 6010	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	UJ	10	UJ	10	UJ
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	UJ	1	UJ
Sodium	EPA 6010	---	N/C	mg/kg	200	J	210	J	180	J	61		71	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	20		21		16		27		33	
Zinc	EPA 6010	23000	125	mg/kg	1100	J	360	J	260	J	30		47	
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	8.11	J	3.08	J	4.61	J	0.069	UJ	0.033	UJ

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-10. Summary of Results from Area of Concern (Objective) 7

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	0702AS005	Valid Qual	0702BS001	Valid Qual	0702BS003	Valid Qual	0702BS005	Valid Qual	0702CS001	Valid Qual
Sample ID					0702AS005		0702BS001		0702BS003		0702BS005		0702CS001	
Boring ID					07A2B1		07A2B2		07A2B2		07A2B2		07A2B3	
Area Number					2		2		2		2		2	
Boring Number					1		2		2		2		3	
Depth					5		1		3		5		1	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)														
Benzo(a)pyrene		0.062	N/C	mg/kg	N/A		N/A		N/A		N/A		0.008	UJ
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	12	J	65	J	54	J	19	J	43	J
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1242		0.22	N/C	mg/kg	0.03	U	0.03	U	0.03	U	0.03	U	0.03	U
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	6500		4500		5200		7600		9300	
Antimony	EPA 6010	31	10	mg/kg	10	U	36		10	U	20		10	U
Arsenic	EPA 6010	0.39	32	mg/kg	17	J	12	J	10	J	17	J	25	J
Barium	EPA 6010	5400	263	mg/kg	72		130		42		68		110	
Beryllium	EPA 6010	150	1.3	mg/kg	0.47		0.34		0.37		0.52		0.7	
Cadmium	EPA 6010	9.0	0.41	mg/kg	1	U	1	U	1	U	1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	1900	J	1000	J	670	J	860	J	1500	J
Chromium	EPA 6010	210	46	mg/kg	10		4.1		2		6.3		15	
Cobalt	EPA 6010	4700	23	mg/kg	8.8		4	U	4	U	4.3		6.6	
Copper	EPA 6010	2900	55	mg/kg	15		840		6.5		29		20	
Iron	EPA 6010	---	N/C	mg/kg	18000	J	14000	J	12000	J	18000	J	29000	J
Lead	EPA 6010	150	64	mg/kg	5.4		2800		7.1		110		10	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	4800	J	2500	J	2500	J	3400	J	4300	J
Manganese	EPA 6010	1800	1172	mg/kg	270	J	320	J	320	J	330	J	230	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.17		0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	9.1		4	U	4	U	5		9.2	
Potassium	EPA 6010	---	N/C	mg/kg	980	J	2200	J	2200	J	2100	J	1400	J
Selenium	EPA 6010	390	33	mg/kg	10	UJ	10	UJ	10	UJ	40	J	10	UJ
Silver	EPA 6010	390	i	mg/kg	1	UJ	14	UJ	1	UJ	1	UJ	1	UJ
Sodium	EPA 6010	---	N/C	mg/kg	130		50	U	50	U	50	U	60	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.38		0.3	U
Vanadium	EPA 6010	550	122	mg/kg	34		15		14		25		49	
Zinc	EPA 6010	23000	125	mg/kg	34		270		33		53		32	
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.037	UJ	0.1	U	0.18	J	0.13	J	0.086	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-10. Summary of Results from Area of Concern (Objective) 7

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	0702CS003	Valid Qual	0702CS005	Valid Qual	0702DS001	Valid Qual	0702DS003	Valid Qual	0702DS005	Valid Qual
Sample ID					0702CS003		0702CS005		0702DS001		0702DS003		0702DS005	
Boring ID					07A2B3		07A2B3		07A2B4		07A2B4		07A2B4	
Area Number					2		2		2		2		2	
Boring Number					3		3		4		4		4	
Depth					3		5		1		3		5	
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)														
Benzo(a)pyrene		0.062	N/C	mg/kg	N/A		N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)														
TRPH		---	N/C	mg/kg	64	J	72	J	42	J	10	U	31	J
Polychlorinated Biphenyl - PCB (EPA 8080)														
Aroclor 1242		0.22	N/C	mg/kg	0.03	UJ	0.03	U	0.03	U	0.03	U	0.03	U
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	14000		12000		4900		6000		5400	J
Antimony	EPA 6010	31	10	mg/kg	10	U	20		10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	110	J	26	J	13	J	16	J	11	J
Barium	EPA 6010	5400	263	mg/kg	160		120		80		77		95	
Beryllium	EPA 6010	150	1.3	mg/kg	0.79		0.68		0.36		0.43		0.37	
Cadmium	EPA 6010	9.0	0.41	mg/kg	1	U	1	U	1	U	1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	1200	J	1600	J	1700	J	2400	J	1500	
Chromium	EPA 6010	210	46	mg/kg	28		8.1		6.6		5.9		9.4	
Cobalt	EPA 6010	4700	23	mg/kg	8.3		8.4		6.3		7.8		6.8	
Copper	EPA 6010	2900	55	mg/kg	8.5		15		14		36		22	
Iron	EPA 6010	---	N/C	mg/kg	39000	J	26000	J	15000	J	19000	J	13000	
Lead	EPA 6010	150	64	mg/kg	8.6		7.5		5.1		5	U	8.6	
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	7600	J	5400	J	3700	J	4000	J	4200	J
Manganese	EPA 6010	1800	1172	mg/kg	680	J	280	J	190	J	310	J	680	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	22		7.5		5.7		7.3		11	
Potassium	EPA 6010	---	N/C	mg/kg	5900	J	2700	J	1100	J	1500	J	1000	J
Selenium	EPA 6010	390	33	mg/kg	31	J	10	UJ	10	UJ	10	UJ	10	UJ
Silver	EPA 6010	390	1	mg/kg	1	UJ	1	UJ	1	UJ	1	UJ	1	UJ
Sodium	EPA 6010	---	N/C	mg/kg	65		120		67		83		74	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.42		0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	66		44		19		26		26	
Zinc	EPA 6010	23000	125	mg/kg	65		37		32		35		31	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.035	UJ	0.21	UJ	0.084	J	0.088	J	0.11	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-10. Summary of Results from Area of Concern (Objective) 7

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	0702ES001	Valid Qual	0702ES001	Valid Qual	0702ES003	Valid Qual	0702ES005	Valid Qual
Sample ID					0702ES001		0702ES001		0702ES003		0702ES005	
Boring ID					07A2B5		07A2B5		07A2B5		07A2B5	
Area Number					2		2		2		2	
Boring Number					5		5		5		5	
Depth					1		1		3		5	
							Dup					
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		N/A		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)												
Benzo(a)pyrene		0.062	N/C	mg/kg	N/A		N/A		N/A		N/A	
Total Petroleum Hydrocarbons (EPA 418.1)												
TRPH		---	N/C	mg/kg	11	J	N/A		27	J	17	J
Polychlorinated Biphenyl - PCB (EPA 8080)												
Aroclor 1242		0.22	N/C	mg/kg	0.03	U	0.03	U	0.03	U	0.03	U
Metals (Method Listed by Each Metal)												
Aluminum	EPA 6010	76000	22729	mg/kg	7600	J	N/A		9000	J	5400	J
Antimony	EPA 6010	31	10	mg/kg	10	U	N/A		10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	15	J	N/A		17	J	11	J
Barium	EPA 6010	5400	263	mg/kg	89		N/A		140		70	
Beryllium	EPA 6010	150	1.3	mg/kg	0.47		N/A		0.51		0.37	
Cadmium	EPA 6010	9.0	0.41	mg/kg	1	U	N/A		1	U	1	U
Calcium	EPA 6010	---	N/C	mg/kg	1500		N/A		2900		1500	
Chromium	EPA 6010	210	46	mg/kg	12		N/A		8.8		9.9	
Cobalt	EPA 6010	4700	23	mg/kg	8.9		N/A		12		5.1	
Copper	EPA 6010	2900	55	mg/kg	19		N/A		21		14	
Iron	EPA 6010	---	N/C	mg/kg	16000		N/A		19000		12000	
Lead	EPA 6010	150	64	mg/kg	5.1		N/A		6.6		5	U
Lithium	EPA 7430	1600	22	mg/kg	N/A		N/A		N/A		N/A	
Magnesium	EPA 6010	---	N/C	mg/kg	5400	J	N/A		5900	J	4200	J
Manganese	EPA 6010	1800	1172	mg/kg	250	J	N/A		270	J	200	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	N/A		0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	N/A		2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	11		N/A		13		9.1	
Potassium	EPA 6010	---	N/C	mg/kg	1200	J	N/A		1300	J	1100	J
Selenium	EPA 6010	390	33	mg/kg	10	UJ	N/A		10	UJ	10	UJ
Silver	EPA 6010	390	1	mg/kg	1	UJ	N/A		1	UJ	1	UJ
Sodium	EPA 6010	---	N/C	mg/kg	200		N/A		430		300	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	U	N/A		0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	31		N/A		32		20	
Zinc	EPA 6010	23000	125	mg/kg	38	J	N/A		40	J	31	J
Chromium (VI)	EPA 7199	0.2	0.74	mg/kg	0.045	UJ	N/A		0.049	UJ	0.085	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-11. Summary of Results from Area of Concern (Objective) 8

Analyte		Sample ID Location Number		0801AQ01 MW-1	Q Valid	0802AQ01 MW-2	Q Valid	0803AQ01 MW-3	Q Valid	0803AQ02 MW-3 Duplicate	Q Valid
		PRG	Units								
Volatile Organic Compounds (EPA 8260)											
Acetone		610	µg/L	10	R	10	R	12	J	10	R
Toluene		720	µg/L	0.5	U	0.58		0.5	U	0.5	U
Trichloroethene		1.6	µg/L	2.4		2		2.6		2	
Semivolatile Organic Compounds (EPA 8270)				ND		ND		ND		ND	
Polynuclear Aromatic Hydrocarbons (EPA 8310)				ND		ND		ND		ND	
Polychlorinated Biphenyl - PCB (EPA 8080)				ND		ND		ND		ND	
Total Metals (Method Listed by Each Metal)											
Aluminum	EPA 6010	36	mg/L	0.1	U	0.1	U	0.1	U	0.1	U
Antimony	EPA 7041	0.015	mg/L	0.005	U	0.005	U	0.005	U	0.005	U
Arsenic	EPA 7060	0.000045	mg/L	0.0054	U	0.0052	U	0.002	U	0.0025	U
Barium	EPA 6010	2.6	mg/L	0.039		0.035		0.11		0.1	
Beryllium	EPA 6010	0.073	mg/L	0.001	U	0.001	U	0.001	U	0.001	U
Cadmium	EPA 7131	0.018	mg/L	0.001	U	0.001	U	0.001	U	0.001	U
Calcium	EPA 6010	---	mg/L	51		46		75		72	
Chromium	EPA 7191	55	mg/L	0.005	U	0.005	U	0.005	U	0.005	U
Cobalt	EPA 6010	2.2	mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Copper	EPA 6010	1.4	mg/L	0.02	U	0.02	U	0.02	U	0.02	U
Iron	EPA 6010	---	mg/L	0.1		0.12		0.14		0.11	
Lead	EPA 7421	---	mg/L	0.002	U	0.002	U	0.002	U	0.002	U
Magnesium	EPA 6010	---	mg/L	13		71		58		55	
Manganese	EPA 6010	0.88	mg/L	0.016		0.01	U	0.015		0.015	
Mercury	EPA 7470	0.011	mg/L	0.0002	U	0.0002	U	0.0002	U	0.0002	U
Molybdenum	EPA 6010	0.18	mg/L	0.097		0.02	U	0.02	U	0.02	U
Nickel	EPA 6010	0.73	mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Potassium	EPA 6010	---	mg/L	5.8		18		5		4.7	
Selenium	EPA 7740	0.18	mg/L	0.004	U	0.004	U	0.004	U	0.004	U
Silver	EPA 6010	0.18	mg/L	0.01	U	0.01	U	0.01	U	0.01	U
Sodium	EPA 6010	---	mg/L	23		140		68		65	
Thallium	EPA 7841	0.0024	mg/L	0.003	U	0.003	U	0.003	U	0.003	U
Vanadium	EPA 6010	0.26	mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Zinc	EPA 6010	11	mg/L	0.01	U	0.01	U	0.013		0.011	
Chromium(VI)	EPA 7196	0.00016	mg/L	0.01	U	0.01	U	0.01	U	0.01	U

Table 4-11. Summary of Results from Area of Concern (Objective) 8

Analyte		Sample ID Location Number		0801AQ01 MW-1	Q Valid	0802AQ01 MW-2	Q Valid	0803AQ01 MW-3	Q Valid	0803AQ02 MW-3 Duplicate	Q Valid
		PRG	Units								
Dissolved Metals (Method Listed by Each Metal)											
Aluminum	EPA 6010		mg/L	0.1	U	0.1	U	0.1	U	0.1	U
Antimony	EPA 7041		mg/L	0.005	U	0.005	U	0.005	U	0.005	U
Arsenic	EPA 7060		mg/L	0.002	U	0.0064	U	0.002	U	0.002	U
Barium	EPA 6010		mg/L	0.042		0.034		0.1		0.11	
Beryllium	EPA 6010		mg/L	0.001	U	0.001	U	0.001	U	0.001	U
Cadmium	EPA 7131		mg/L	0.001	U	0.001	U	0.001	U	0.001	U
Calcium	EPA 6010		mg/L	53		44		73		75	
Chromium	EPA 7191		mg/L	0.005	U	0.005	U	0.005	U	0.005	U
Cobalt	EPA 6010		mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Copper	EPA 6010		mg/L	0.02	U	0.02	U	0.02	U	0.02	U
Iron	EPA 6010		mg/L	0.069		0.1		0.11		0.11	
Lead	EPA 7421		mg/L	0.002	U	0.002	U	0.002	U	0.002	U
Magnesium	EPA 6010		mg/L	14		68		56		58	
Manganese	EPA 6010		mg/L	0.017		0.01	U	0.014		0.015	
Mercury	EPA 7470		mg/L	0.0002	U	0.0002	U	0.0002	U	0.0002	U
Molybdenum	EPA 6010		mg/L	0.1		0.02	U	0.02	U	0.02	U
Nickel	EPA 6010		mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Potassium	EPA 6010		mg/L	6.2		17		4.6		5	
Selenium	EPA 7740		mg/L	0.004	U	0.004	U	0.004	U	0.004	U
Silver	EPA 6010		mg/L	0.01	U	0.01	U	0.01	U	0.01	U
Sodium	EPA 6010		mg/L	25		130		65		69	
Thallium	EPA 7841		mg/L	0.003	U	0.003	U	0.003	U	0.003	U
Vanadium	EPA 6010		mg/L	0.04	U	0.04	U	0.04	U	0.04	U
Zinc	EPA 6010		mg/L	0.01	U	0.01	U	0.01	U	0.01	U
Chromium(VI)	EPA 7196		mg/L	0.01	U	0.01	U	0.01	U	0.01	U

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-12. Summary of Sediment Grain Size Distribution from Area of Concern (Objective) 9.

Station	Fines (clay+silt) (%)	F.Sand (%)	M.Sand (%)	C.Sand (%)	Gravel (%)	Total (%)
A2	49.87	43.95	6.18	0.00	0.00	100.00
B1	79.04	18.06	2.91	0.00	0.00	100.00
B2	92.33	7.67	0.00	0.00	0.00	100.00
B3	58.18	34.42	7.40	0.00	0.00	100.00
C2	88.63	11.35	0.01	0.00	0.00	100.00
C3	78.06	18.60	3.33	0.00	0.00	100.00
BKG	52.77	41.59	5.64	0.00	0.00	100.00

Table 4-13. Summary of Results from Area of Concern (Objective) 9

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	A2-1	Valid Qual	A2-2	Valid Qual	A2-3	Valid Qual	B1-1	Valid Qual	B1-2	Valid Qual	B1-3	Valid Qual	B2-1	Valid Qual	B2-2	Valid Qual
Sample ID					A2-1		A2-2		A2-3		B1-1		B1-2		B1-3		B2-1		B2-2	
Boring ID					A2		A2		A2		B1		B1		B1		B2		B2	
Location Number					1		2		3		1		2		3		1		2	
Replicate Number																				
Depth					0 - 0.5		0 - 0.5		0 - 0.5		0 - 0.5		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25	
Volatile Organic Compounds (EPA 8260)																				
Acetone		1600	N/C	mg/kg	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R
Methylene chloride		8.9	N/C	mg/kg	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U	0.005	U
Semivolatile Organic Compounds (EPA 8270)			N/C		ND*		ND*		ND*		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)					N/D		N/D		N/D		N/D		N/D		N/D		N/D		N/D	
Metals (Method Listed by Each Metal)																				
Aluminum	EPA 6010	76000	22729	mg/kg	17000	J	12000	J	12000	J	10000	J	10000	J	15000	J	16000	J	17000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	11		13		10		8.6		7.8		11		9.5		7.9	
Barium	EPA 6010	5400	263	mg/kg	150		140		120		120		120		180		140		140	
Beryllium	EPA 6010	150	1.3	mg/kg	0.58		0.53		0.47		0.38		0.36		0.55		0.52		0.53	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.13	U	0.13	U	0.16	U	0.19	U	0.1	U	0.11	U	0.1	U	0.12	U
Calcium	EPA 6010	---	N/C	mg/kg	11000	J	12000	J	11000	J	14000	J	10000	J	9800	J	10000	J	10000	J
Chromium	EPA 6010	210	46	mg/kg	27		23		24		15		15		24		23		24	
Cobalt	EPA 6010	4700	23	mg/kg	12		9.5		9.2		7.3		7.4		12		11		11	
Copper	EPA 6010	2900	55	mg/kg	38		33		33		27		25		36		32		33	
Iron	EPA 6010	---	N/C	mg/kg	26000	J	20000	J	20000	J	18000	J	17000	J	25000	J	24000	J	25000	J
Lead	EPA 6010	150	64	mg/kg	19		21		21		18		15		19		15		14	
Lithium	EPA 7430	1600	22	mg/kg	11	J	5.4	J	8.1	J	7.4	J	7.1	J	12	J	11	J	13	J
Magnesium	EPA 6010	---	N/C	mg/kg	6800		5000		5000		4300		4400		7600		7100		7500	
Manganese	EPA 6010	1800	1172	mg/kg	570	J	560	J	410	J	610	J	520	J	540	J	510	J	510	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	24		20		21		14		14		23		21		23	
Potassium	EPA 6010	---	N/C	mg/kg	2600	J	2200	J	2300	J	1600	J	1600	J	2600	J	2500	J	2700	J
Selenium	EPA 7740	390	33	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	250		180		140		120		130		230		240		220	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ
Vanadium	EPA 6010	550	122	mg/kg	43		35		33		29		27		45		41		42	
Zinc	EPA 6010	23000	125	mg/kg	66	J	66		87	J	42	J	39	J	54	J	51	J	54	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	NR		NR		NR		NR		NR		NR		NR		NR	
Total Organic Carbon (EPA 410.1M)			N/C																	
TOC					13000	J	14000	J	19000	J	12000	J	7500	J	94000	J	6400	J	7900	J
Sulfides (EPA 376.2)			N/C		N/D		N/D		N/D		N/D		N/D		N/D		N/D		N/D	
Moisture Content (ASTM D2216)			N/C																	
Moisture (percent)					45		47		47		57		51		43		41		40	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-13. Summary of Results from Area of Concern (Objective) 9

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	B2-3	Valid Qual	B3-1	Valid Qual	B3-2	Valid Qual	B3-3	Valid Qual	C2-1	Valid Qual	C2-2	Valid Qual	C2-3	Valid Qual	C3-1	Valid Qual
Sample ID					B2-3		B3-1		B3-2		B3-3		C2-1		C2-2		C2-3		C3-1	
Boring ID					B2		B3		B3		B3		C2		C2		C2		C3	
Location Number					3		1		2		3		1		2		3		1	
Replicate Number																				
Depth					0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25	
Volatile Organic Compounds (EPA 8260)																				
Acetone		1600	N/C	mg/kg	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R	0.1	R	0.2	J	0.14	J
Methylene chloride		8.9	N/C	mg/kg	0.005	U	0.0079	J	0.005	U	0.005	U	0.005	UJ	0.0073	J	0.0071	J	0.0058	J
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND		ND		ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)					N/D		N/D		N/D		N/D		N/D		N/D		N/D		N/D	
Metals (Method Listed by Each Metal)																				
Aluminum	EPA 6010	76000	22729	mg/kg	16000	J	12000	J	10000	J	8700	J	13000	J	16000	J	15000	J	16000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	10		12		9.2		9.2		7.8		8.5		10		7.9	
Barium	EPA 6010	5400	263	mg/kg	140		190		150		130		140		150		160		180	
Beryllium	EPA 6010	150	1.3	mg/kg	0.51		0.48		0.43		0.34		0.55		0.55		0.58		0.53	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.12	U	0.11	U	0.1	U	0.14	U	0.1	U	0.1	U	0.1	U	0.12	U
Calcium	EPA 6010	---	N/C	mg/kg	9900	J	11000	J	15000	J	12000	J	9600	J	11000	J	11000	J	12000	J
Chromium	EPA 6010	210	46	mg/kg	23		19		16		13		22		25		24		22	
Cobalt	EPA 6010	4700	23	mg/kg	11		9.8		7.9		6.5		11		12		11		11	
Copper	EPA 6010	2900	55	mg/kg	34		33		29		25		35		36		33		36	
Iron	EPA 6010	---	N/C	mg/kg	24000	J	22000	J	18000	J	15000	J	23000	J	26000	J	25000	J	24000	J
Lead	EPA 6010	150	64	mg/kg	16		20		19		18		17		16		18		21	
Lithium	EPA 7430	1600	22	mg/kg	12	J	8.9	J	8	J	6.7	J	10	J	12	J	12	J	12	J
Magnesium	EPA 6010	---	N/C	mg/kg	6900		5500		4600		3700		6600		7400		6900		6900	
Manganese	EPA 6010	1800	1172	mg/kg	530	J	710	J	630	J	540	J	550	J	620	J	610	J	650	J
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	21		18		15		13		21		22		22		21	
Potassium	EPA 6010	---	N/C	mg/kg	2400	J	2200	J	1700	J	1400	J	2300	J	2400	J	2500	J	2400	J
Selenium	EPA 7740	390	33	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U	10	U	1	U	1	U	1	J
Sodium	EPA 6010	---	N/C	mg/kg	220		140		130		97		190		220		240		190	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ
Vanadium	EPA 6010	550	122	mg/kg	40		38		31		26		37		41		41		42	
Zinc	EPA 6010	23000	125	mg/kg	51	J	51	J	42	J	36	J	50	J	54	J	53	J	55	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	NR		NR		NR		NR		NR		NR		NR		NR	
Total Organic Carbon (EPA 410.1M)			N/C																	
TOC					9900	J	15000	J	31000	J	14000	J	8000	J	9600	J	7800	J	13000	J
Sulfides (EPA 376.2)			N/C		N/D		N/D		N/D		N/D		N/D		N/D		N/D		N/D	
Moisture Content (ASTM D2216)			N/C																	
Moisture (percent)					40		51		61		61		43		43		41		47	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-13. Summary of Results from Area of Concern (Objective) 9

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	C3-2	Valid Qual	C3-3	Valid Qual	BKG-1	Valid Qual	BKG-2	Valid Qual	BKG-3	Valid Qual
Sample ID					C3-2		C3-3		BKG-1		BKG-2		BKG-3	
Boring ID					C3		C3		Background		Background		Background	
Location Number					2		3		i		2		3	
Replicate Number														
Depth					0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25		0 - 0.25	
Volatile Organic Compounds (EPA 8260)														
Acetone		1600	N/C	mg/kg	0.1	R	0.1	R	0.1	U	0.1	U	0.1	R
Methylene chloride		8.9	N/C	mg/kg	0.0057		0.0065	J	0.005	U	0.005	U	0.005	U
Semivolatile Organic Compounds (EPA 8270)			N/C		ND		ND		ND*		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C		N/A		N/A		N/A		N/A		N/A	
Polychlorinated Biphenyl - PCB (EPA 8080)					N/D		N/D		N/D		N/D		N/D	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	13000	J	13000	J	14000	J	13000	J	14000	J
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	11		11		8.4		11		9.6	
Barium	EPA 6010	5400	263	mg/kg	200		130		160		150		160	
Beryllium	EPA 6010	150	1.3	mg/kg	0.51		0.46		0.44		0.41		0.39	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.1	U	0.13	U	0.14	U	0.12	U	0.11	U
Calcium	EPA 6010	—	N/C	mg/kg	14000	J	8300	J	12000	J	10000	J	8700	
Chromium	EPA 6010	210	46	mg/kg	20		19		17		16		18	
Cobalt	EPA 6010	4700	23	mg/kg	9.7		8.8		12		11		12	
Copper	EPA 6010	2900	55	mg/kg	37		30		40		35		36	
Iron	EPA 6010	—	N/C	mg/kg	21000	J	19000	J	24000	J	23000	J	24000	J
Lead	EPA 6010	150	64	mg/kg	25		14		14		13		14	
Lithium	EPA 7430	1600	22	mg/kg	11	J	8.7	J	10	J	9.9	J	9.3	J
Magnesium	EPA 6010	—	N/C	mg/kg	5800		5500		7600		6900		7600	
Manganese	EPA 6010	1800	1172	mg/kg	700	J	530	J	330	J	320	J	350	
Mercury	EPA 7471	23	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	18		18		19		17		28	
Potassium	EPA 6010	—	N/C	mg/kg	2300	J	2100	J	3500	J	3200	J	3400	
Selenium	EPA 7740	390	33	mg/kg	0.4	U	0.4	U	0.4	U	0.4	U	0.4	U
Silver	EPA 6010	390	i	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	—	N/C	mg/kg	180		210		210		190		210	
Thallium	EPA 7841	5.2	0.3	mg/kg	0.3	UJ	0.3	UJ	0.3	UJ	0.3	UJ	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	40		34		50		48		47	
Zinc	EPA 6010	23000	125	mg/kg	54	J	43	J	57	J	51	J	55	
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	NR		NR		NR		NR		NR	
Total Organic Carbon (EPA 410.1M)			N/C											
TOC					12000	J	7800	J	15000	J	12000	J	11000	J
Sulfides (EPA 376.2)			N/C		N/D		N/D		N/D		N/D		N/D	
Moisture Content (ASTM D2216)			N/C											
Moisture (percent)					54		45		37		42		39	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-14. Sediment Metals Comparison and Statistics for Slurry Outfall Pipe.

Station		Aluminum	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper
A2	Mean	13667	11.3	*137*	0.53	0.14	24.7	10.2	34.7
	Maximum	17000	13	150	0.58	0.16	27	12	38
	Minimum	12000	10	120	0.47	0.13	23	9.2	33
	Standard Deviation	2887	1.53	15.3	0.06	0.02	2.08	1.54	2.89
	Sample mean/BKG mean (%)	100%	117% *	87%	127% *	114% *	145% *	88%	94%
B1	Mean	11667	9.13	140	0.43	0.12	18.0	8.90	29.3
	Maximum	15000	11	180	0.55	0.19	24	12	36
	Minimum	10000	7.8	120	0.36	0.05	15	7.3	25
	Standard Deviation	2887	1.67	34.6	0.10	0.07	5.20	2.69	5.86
	Sample mean/BKG mean (%)	85%	94%	89%	104% *	95%	106% *	76%	79%
B2	Mean	16333	9.13	140	0.52	0.10	23.3	11.0	33.0
	Maximum	17000	10	140	0.53	0.12	24	11	34
	Minimum	16000	7.9	140	0.51	0.05	23	11	32
	Standard Deviation	577	1.10	0.00	0.01	0.04	0.58	0.00	1.00
	Sample mean/BKG mean (%)	120% *	94%	89%	126% *	78%	137% *	94%	89%
B3	Mean	*10233*	10.1	157	0.42	0.10	*16.0*	*8.07*	*29.0*
	Maximum	12000	12	190	0.48	0.14	19	9.8	33
	Minimum	8700	9.2	130	0.34	0.05	13	6.5	25
	Standard Deviation	1662	1.62	30.6	0.07	0.05	3.00	1.66	4.00
	Sample mean/BKG mean (%)	75%	105% *	100%	101% *	81%	94%	69%	78%
C2	Mean	14667	*8.77*	150	0.56	*0.05*	23.7	11.3	34.7
	Maximum	16000	10	160	0.58	0.05	25	12	36
	Minimum	13000	7.8	140	0.55	0.05	22	11	33
	Standard Deviation	1528	1.12	10.0	0.02	0.00	1.53	0.58	1.53
	Sample mean/BKG mean (%)	107% *	91%	96%	135% *	41%	139% *	97%	94%
C3	Mean	14000	9.97	170	0.50	0.10	20.3	9.83	34.3
	Maximum	16000	11	200	-0.53	0.13	22	11	37
	Minimum	13000	7.9	130	0.46	0.05	19	8.8	30
	Standard Deviation	1732	1.79	36.1	0.04	0.04	1.53	1.11	3.79
	Sample mean/BKG mean (%)	102% *	103% *	109% *	121% *	81%	120% *	84%	93%
BKG	Mean	13667	9.67	157	*0.41*	0.12	17.0	11.7	37.0
	Maximum	14000	11	160	0.44	0.14	18	12	40
	Minimum	13000	8.4	150	0.39	0.11	16	11	35
	Standard Deviation	577	1.30	5.77	0.03	0.02	1.00	0.58	2.65

Note: Bold values = maximum; Italics = minimum; * = Exceeds background concentration.

Table 4-14. Sediment Metals Comparison and Statistics for Slurry Outfall Pipe.

Station		Iron	Lead	Lithium	Magnesium	Manganese	Nickel	Vanadium	Zinc
A2	Mean	22000	20.3	8.17	5600	513	21.7	37.0	73.0
	Maximum	26000	21	11	6800	570	24	43	87
	Minimum	20000	19	5.4	5000	410	20	33	66
	Standard Deviation	3464	1.2	2.8	1039	90	2.1	5.3	12.1
	Sample mean/BKG mean (%)	93%	149% *	84%	76%	154% *	102% *	77%	134% *
B1	Mean	20000	17.3	8.83	5433	557	17.0	33.7	45.0
	Maximum	25000	19	12	7600	610	23	45	54
	Minimum	17000	15	7.1	4300	520	14	27	39
	Standard Deviation	4359	2.1	2.7	1877	47	5.2	9.9	7.9
	Sample mean/BKG mean (%)	85%	127% *	91%	74%	167% *	80%	70%	83%
B2	Mean	24333	15.0	12.0	7167	517	21.7	41.0	52.0
	Maximum	25000	16	13	7500	530	23	42	54
	Minimum	24000	14	11	6900	510	21	40	51
	Standard Deviation	577	1.0	1.0	306	12	1.2	1.0	1.7
	Sample mean/BKG mean (%)	103% *	110% *	123% *	97%	155% *	102% *	85%	96%
B3	Mean	*18333*	19.0	*7.87*	*4600*	627	*15.3*	*31.7*	*43.0*
	Maximum	22000	20	8.9	5500	710	18	38	51
	Minimum	15000	18	6.7	3700	540	13	26	36
	Standard Deviation	3512	1.0	1.1	900	85	2.5	6.0	7.5
	Sample mean/BKG mean (%)	77%	139% *	81%	62%	188% *	72%	66%	79%
C2	Mean	24667	17.0	11.3	6967	593	21.7	39.7	52.3
	Maximum	26000	18	12	7400	620	22	41	54
	Minimum	23000	16	10	6600	550	21	37	50
	Standard Deviation	1528	1.0	1.2	404	38	0.58	2.3	2.1
	Sample mean/BKG mean (%)	104% *	124% *	116% *	95%	178% *	102% *	82%	96%
C3	Mean	21333	20.0	10.6	6067	627	19.0	38.7	50.7
	Maximum	24000	25	12	6900	700	21	42	55
	Minimum	19000	14	8.7	5500	530	18	34	43
	Standard Deviation	2517	5.6	1.7	737	87	1.7	4.2	6.7
	Sample mean/BKG mean (%)	90%	146% *	109% *	82%	188% *	89%	80%	93%
BKG	Mean	23667	*13.7*	9.73	7367	*333*	21.3	48.3	54.3
	Maximum	24000	14	10	7600	350	28	50	57
	Minimum	23000	13	9.3	6900	320	17	47	51
	Standard Deviation	577	0.58	0.38	404	15	5.9	1.5	3.1

Note: Bold values = maximum; italics = minimum; * = Exceeds background concentration.

Table 4-15. Summary of Results from Area of Concern (Objective) 10 - Electronic Test Area Sampling.

Analyte			Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	1001AS001 10A10B1 10 1 1	Valid Qual	1001AS001 10A10B1 10 1 i Dup	Valid Qual	1001BS001 10A10B2 10 2 1	Valid Qual	1001CS001 10A10B3 10 3 i	Valid Qual
Petroleum Hydrocarbons (EPA 8015M)													
OTTO Fuel			---	N/C	mg/kg	10	U	10	U	10	U	10	U
Metals (Method Listed by Each Metal)													
Lithium	EPA	7430	1600	22	mg/kg	5	U	5	U	17		5	U
Chromium(VI)	EPA	7199	0.2	0.74	mg/kg	0.083	J	0.11	J	0.33	J	0.67	J
Explosives (EPA 8330)			---	N/C		ND		ND		ND		ND	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-16. Summary of Results from Area of Concern (Objective) 11

Analyte		PRG (mg/kg)	Background (mg/kg)	Units	1101SO01 11A1B1 1 1 0 - 0.5'	Valid Qual	1101SO03 11A1B1 1 1 0 - 0.5' Duplicate	Valid Qual	1101SO02 11A1B2 1 2 0 - 0.5'	Valid Qual	1102SO01 11A1B3 1 3 0 - 0.5'	Valid Qual
Semivolatile Organic Compounds (EPA 8270)			N/C	mg/kg	ND		ND		ND		ND	
Semivolatile Organic Compounds (EPA 8270 SIM)			N/C	mg/kg	ND		N/A		N/A		N/A	
Petroleum Hydrocarbons (EPA 8015M)												
OTTO Fuel		----	N/C	mg/kg	20	U	20	U	20	U	20	U
Metals (Method Listed by Each Metal)												
Lithium	EPA 7430	1600	22	mg/kg	17	J	15	J	16	J	12	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-17. Summary of Results from Background Area 1 (Objective 12)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	1201SO01 12A1B1 1 1 1	Valid Qual	1201SO02 12A1B2 1 2 1	Valid Qual	1201SO03 12A1B3 1 3 1	Valid Qual	1201SO04 12A1B4 1 4 1	Valid Qual	1201SO05 12A1B5 1 5 1	Valid Qual
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	12000		13000		12000		9300		10000	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	7.4		9		11		12		25	
Barium	EPA 6010	5400	263	mg/kg	140		150		140		150		140	
Beryllium	EPA 6010	150	1.3	mg/kg	0.85		0.87		0.82		0.82		0.81	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.19		0.1	U	0.15	U	0.1	U	0.16	
Calcium	EPA 6010	---	N/C	mg/kg	3500		3500		2600		2300		6000	
Chromium	EPA 6010	210	46	mg/kg	18		19		18		13		16	
Cobalt	EPA 6010	4700	23	mg/kg	13		13		12		11		11	
Copper	EPA 6010	2900	55	mg/kg	26		27		27		19		31	
Iron	EPA 6010	---	N/C	mg/kg	25000	J	63000	J	42000	J	37000	J	35000	J
Lead	EPA 6010	400	64	mg/kg	8.4		13		14		14		32	
Lithium	EPA 7430	1600	22	mg/kg	8.6		11		9.9		5	U	9.3	
Magnesium	EPA 6010	---	N/C	mg/kg	6300		7200		6100		4800		6400	
Manganese	EPA 6010	1800	1172	mg/kg	590		540		540		490		500	
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	18		18		20		13		15	
Potassium	EPA 6010	---	N/C	mg/kg	2800		2500		2900		2300		1900	
Selenium	EPA 7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ	0.4	UJ
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	290	J	290	J	260	J	220	J	220	J
Thallium	EPA 7841	5.5	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	42		46		44		38		36	
Zinc	EPA 6010	23000	125	mg/kg	63	J	66	J	73	J	58	J	76	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.15	J	0.12	J	0.21	J	0.14	J	0.21	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-17. Summary of Results from Background Area 1 (Objective 12)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	1202SO01 12A2B1	Valid Qual	1202SO02 12A2B2	Valid Qual	1202SO03 12A2B3	Valid Qual	1202SO04 12A2B4	Valid Qual	1202SO05 12A2B5	Valid Qual
Sample ID					1202SO01		1202SO02		1202SO03		1202SO04		1202SO05	
Boring ID					12A2B1		12A2B2		12A2B3		12A2B4		12A2B5	
Area Number					2		2		2		2		2	
Boring Number					i		2		3		4		5	
Depth					i		1		1		1		i	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	4900		8000		5400		16000		13000	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	5.9		11		1.4		9.2		7.2	
Barium	EPA 6010	5400	263	mg/kg	79		130		84		160		190	
Beryllium	EPA 6010	150	1.3	mg/kg	0.48		0.59		0.39		1.1		0.95	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.41		0.24		0.1	U	0.1	U	0.1	U
Calcium	EPA 6010	---	N/C	mg/kg	1000		1200		470		1000		1100	
Chromium	EPA 6010	210	46	mg/kg	8.9		26		13		42		32	
Cobalt	EPA 6010	4700	23	mg/kg	21		8.7		8.5		10		13	
Copper	EPA 6010	2900	55	mg/kg	16		29		11		31		27	
Iron	EPA 6010	---	N/C	mg/kg	14000	J	23000	J	13000	J	40000	J	32000	J
Lead	EPA 6010	400	64	mg/kg	4.1		21		5.6		11		12	
Lithium	EPA 7430	1600	22	mg/kg	5	U	5	U	5	U	6.6		6.9	
Magnesium	EPA 6010	---	N/C	mg/kg	1500		2900		2100		5800		4900	
Manganese	EPA 6010	1800	1172	mg/kg	120		200		220		310		400	
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ	0.1	UJ
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	2	U	2	U
Nickel	EPA 6010	150	63	mg/kg	11		21		9.8		35		29	
Potassium	EPA 6010	---	N/C	mg/kg	900		1700		1800		5000		4300	
Selenium	EPA 7740	390	33	mg/kg	0.4	UJ	0.4	UJ	0.4	UJ	33	J	29	J
Silver	EPA 6010	390	1	mg/kg	1	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	190	J	230	J	160	J	730	J	640	J
Thallium	EPA 7841	5.5	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	19		29		23		81		67	
Zinc	EPA 6010	23000	125	mg/kg	24	J	44	J	23	J	52	J	46	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.26	J	0.94	J	0.52	J	0.46	J	0.63	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-17. Summary of Results from Background Area 1 (Objective 12)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	1203SO01 12A3B1 3 1 1	Valid Qual	1203SO02 12A3B2 3 2 i	Valid Qual	1203SO03 12A3B3 3 3 1	Valid Qual	1203SO04 12A3B4 3 4 i	Valid Qual	1203SO05 12A3B5 3 5 i	Valid Qual
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	17000	J	18000	J	23000	J	18000	J	19000	J
Antimony	EPA 6010	31	10	mg/kg	10	UJ	10	UJ	10	U	10	U	10	UJ
Arsenic	EPA 6010	0.39	32	mg/kg	16		18		7.8		7.9		6.8	
Barium	EPA 6010	5400	263	mg/kg	180		200		230		250		290	
Beryllium	EPA 6010	150	1.3	mg/kg	0.59		0.68		0.89		0.81		0.68	
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.14	J	0.1	UJ	0.1	UJ	0.1	UJ	0.22	J
Calcium	EPA 6010	---	N/C	mg/kg	3900		5300		4500		5500		4000	
Chromium	EPA 6010	210	46	mg/kg	17		23		14		18		23	
Cobalt	EPA 6010	4700	23	mg/kg	13		17		18		12		17	
Copper	EPA 6010	2900	55	mg/kg	36		43		43		44		51	
Iron	EPA 6010	---	N/C	mg/kg	30000	J	39000	J	48000	J	36000	J	34000	J
Lead	EPA 6010	400	64	mg/kg	44		28		21		40		65	
Lithium	EPA 7430	1600	22	mg/kg	8.9		17		22		17		12	
Magnesium	EPA 6010	---	N/C	mg/kg	7700		10000		12000		9600		7300	
Manganese	EPA 6010	1800	1172	mg/kg	530		590		870		670		590	
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	
Molybdenum	EPA 6010	390	3.2	mg/kg	2	U	2	U	2	U	3.2		2	U
Nickel	EPA 6010	150	63	mg/kg	22		30		44		43		25	
Potassium	EPA 6010	---	N/C	mg/kg	4600		5500		8000		7300		4300	
Selenium	EPA 7740	390	33	mg/kg	0.4	U	0.4	U	28		25		0.4	U
Silver	EPA 6010	390	1	mg/kg	10	U	1	U	1	U	1	U	1	U
Sodium	EPA 6010	---	N/C	mg/kg	120		110		91		110		140	
Thallium	EPA 7841	5.5	0.3	mg/kg	0.3	U	0.3	U	0.3	U	0.3	U	0.3	U
Vanadium	EPA 6010	550	122	mg/kg	59		76		95		72		73	
Zinc	EPA 6010	23000	125	mg/kg	80		79		91		110		91	
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.034	UJ	0.02	UJ	0.043	UJ	0.071	J	0.115	J

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-18. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-01-RK-01 13L01	Valid Qual	13-02-RK-01 13L02	Valid Qual	13-03-RK-01 13L03	Valid Qual	13-05-RK-01 13L05	Valid Qual	13-10-RK-01 13L10	Valid Qual
Sample ID					13-01-RK-01		13-02-RK-01		13-03-RK-01		13-05-RK-01		13-10-RK-01	
Boring ID					13L01		13L02		13L03		13L05		13L10	
Boring Number					1		2		3		5		10	
Depth					1		1		1		1		1	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	16700	J	17500		8480		12900		13900	
Antimony	EPA 6010	31	10	mg/kg	6.46	J	3.76	J	4.86	J	10	U	6.21	J
Arsenic	EPA 6010	0.39	32	mg/kg	6.06	J	12.3	J	2.63	J	3.73	J	4.52	J
Barium	EPA 6010	5400	263	mg/kg	134	J	112	J	83.2	J	72.1	J	33.4	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.774	J	0.755	J	0.708	J	0.561	J	0.838	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.502	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	19600	J	27100	J	12100	J	19100	J	17100	J
Chromium	EPA 6010	210	46	mg/kg	449	J	377	J	442	J	186	J	244	J
Cobalt	EPA 6010	4700	23	mg/kg	16.9	J	20.3	J	7.61	J	15.6	J	16.2	J
Copper	EPA 6010	2900	55	mg/kg	7.13		249		150		8.61		7.39	
Iron	EPA 6010	—	N/C	mg/kg	32200	J	28400	J	16000	J	24700	J	24300	J
Lead	EPA 6010	400	64	mg/kg	9.47	J	5.86	J	5.17	J	5.17	J	7.53	J
Lithium	EPA 7430	1600	22	mg/kg	28.3		52.1		11.9		26		22.4	
Magnesium	EPA 6010	—	N/C	mg/kg	16700	J	18700	J	7010	J	13600	J	15800	J
Manganese	EPA 6010	1800	1172	mg/kg	527	J	794	J	283	J	465	J	529	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.166	
Molybdenum	EPA 6010	390	3.2	mg/kg	4.46	J	3.98	J	5.45	J	0.96	J	2.42	J
Nickel	EPA 6010	150	63	mg/kg	27.3	J	26.7	J	16.3	J	21.4	J	23.4	J
Potassium	EPA 6010	—	N/C	mg/kg	1440		1240		961		1230		953	
Selenium	EPA 7740	390	33	mg/kg	55.3	U	55.9		31.9		49.6		45.1	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2	U	2.01	U	2	U
Sodium	EPA 6010	—	N/C	mg/kg	184	J	199		77.5	J	92.6	J	184	
Thallium	EPA 7841	5.5	0.3	mg/kg	1.09	U	0.965	U	0.6	U	0.691	U	1.45	U
Vanadium	EPA 6010	550	122	mg/kg	55.2	J	42	J	18.8	J	44.8	J	43.4	J
Zinc	EPA 6010	23000	125	mg/kg	87.9	J	89.3	J	35.3	J	73.2	J	79.5	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.2	U	0.2	U	0.721		0.675		0.451	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-18. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-11D-RK-01	Valid Qual	13-11-RK-01	Valid Qual	13-15-RK-01	Valid Qual	13-17-RK-01	Valid Qual	13-18-RK-01	Valid Qual
Sample ID					13-11D-RK-01		13-11-RK-01		13-15-RK-01		13-17-RK-01		13-18-RK-01	
Boring ID					13L11D		13L11		13L15		13L17		13L18	
Boring Number					11		11		15		17		18	
Depth					1		1		1		2		1	
					Duplicate									
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	10800		7030		16200		27000		15800	
Antimony	EPA 6010	31	10	mg/kg	4.32	J	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	5.7	J	14.7	J	3.17	J	1.18	J	3.36	J
Barium	EPA 6010	5400	263	mg/kg	639	J	1770	J	99.4	J	245	J	54.8	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.744	J	0.536	J	0.624	J	0.365	J	0.697	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	85200	J	146000	J	21400	J	806	J	16800	J
Chromium	EPA 6010	210	46	mg/kg	167	J	203	J	90.9	J	259	J	137	J
Cobalt	EPA 6010	4700	23	mg/kg	11.5	J	11.5	J	15.2	J	21.3	J	15.4	J
Copper	EPA 6010	2900	55	mg/kg	24.5		50.6		3.95		192		4.6	
Iron	EPA 6010	---	N/C	mg/kg	24800	J	25000	J	28500	J	51800	J	28200	J
Lead	EPA 6010	400	64	mg/kg	8.54	J	11.2		4.05	J	9.12	J	11.8	
Lithium	EPA 7430	1600	22	mg/kg	20.9		12.1		22.7		21.1		22.4	
Magnesium	EPA 6010	---	N/C	mg/kg	8130	J	12400	J	13500	J	17700	J	14900	J
Manganese	EPA 6010	1800	1172	mg/kg	1160	J	1760	J	545	J	754	J	525	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.137		0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	1.52	J	1.44	J	1.13	J	10	U	0.968	J
Nickel	EPA 6010	150	63	mg/kg	15.8	J	14	J	20.2	J	52.5	J	20.2	J
Potassium	EPA 6010	---	N/C	mg/kg	1810		1440		1260		16000		1010	
Selenium	EPA 7740	390	33	mg/kg	40		46.3		48.6		105		49.2	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2	U	2	U	2	U
Sodium	EPA 6010	---	N/C	mg/kg	139		92.5	J	151		213		139	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	0.915	U	0.76	U	2	U
Vanadium	EPA 6010	550	122	mg/kg	31.1	J	24.1	J	43.1	J	85.9	J	47	J
Zinc	EPA 6010	23000	125	mg/kg	67.9	J	64.1	J	84.3	J	252	J	92.6	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.406		0.2	U	0.2	U	0.2	U	0.36	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-18. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-21-RK-01	Valid Qual	13-22-RK-01	Valid Qual	13-23-RK-01	Valid Qual	13-30-RK-01	Valid Qual	13-34-RK-01	Valid Qual
Sample ID					13-21-RK-01		13-22-RK-01		13-23-RK-01		13-30-RK-01		13-34-RK-01	
Boring ID					13L21		13L22		13L23		13L30		13L34	
Boring Number					21		22		23		30		34	
Depth					1		1		1		1		1	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	13700		14600		17800		11400		41400	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	3.91	J	9.31	J	9.53	J
Arsenic	EPA 6010	0.39	32	mg/kg	9.44	J	2.8	J	4.72	J	2.28	J	2	J
Barium	EPA 6010	5400	263	mg/kg	52.7	J	110	J	98.3	J	90.5	J	107	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.641	J	0.971	J	1.04	J	0.387	J	1.43	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.502	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	6430	J	25800	J	13900	J	4990	J	58500	J
Chromium	EPA 6010	210	46	mg/kg	177	J	144	J	174	J	967	J	525	J
Cobalt	EPA 6010	4700	23	mg/kg	17.5	J	17.5	J	17.1	J	5.86	J	40.1	J
Copper	EPA 6010	2900	55	mg/kg	7.57		4.89		8.09		21.1		10	
Iron	EPA 6010	—	N/C	mg/kg	24100	J	29100	J	30800	J	20800	J	56600	J
Lead	EPA 6010	400	64	mg/kg	4.82	J	9.72	J	4.6	J	7.15	J	9.01	J
Lithium	EPA 7430	1600	22	mg/kg	30.1		27.4		28.6		26		84.5	J
Magnesium	EPA 6010	—	N/C	mg/kg	15600	J	8370	J	15900	J	14900	J	53900	J
Manganese	EPA 6010	1800	1172	mg/kg	490	J	375	J	465	J	316	J	1420	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	1.22	J	10	U	1.22	J	11.4		10	U
Nickel	EPA 6010	150	63	mg/kg	22.6	J	22.5	J	20.9	J	18.2	J	237	J
Potassium	EPA 6010	—	N/C	mg/kg	617		1820		958		4930		3900	
Selenium	EPA 7740	390	33	mg/kg	45.6		51.7		55.8		35.6		95.3	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2.01	U	2	U	2	U
Sodium	EPA 6010	—	N/C	mg/kg	183		92.4	J	139		139		118	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	2.01	U	2	U	0.814	U
Vanadium	EPA 6010	550	122	mg/kg	52.5	J	32	J	44.6	J	18.9	J	94	J
Zinc	EPA 6010	23000	125	mg/kg	81.3	J	87.9	J	92.3	J	49.3	J	145	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.36		0.36		0.452		0.629		0.36	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-18. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-38-RK-01	Valid Qual	13-42D-RK-01	Valid Qual	13-42-RK-01	Valid Qual	13-46-RK-01	Valid Qual	13-47-RK-01	Valid Qual
Sample ID					13-38-RK-01		13-42D-RK-01		13-42-RK-01		13-46-RK-01		13-47-RK-01	
Boring ID					13L38		13L42D		13L42		13L46		13L47	
Boring Number					38		42		42		46		47	
Depth					1		i		i		i		1	
							Duplicate							
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	14100		9730		17100		9740		23400	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	5.88	J	10	U	6.47	J
Arsenic	EPA 6010	0.39	32	mg/kg	1.2	J	2.74	J	1.5	J	3.26	J	0.909	J
Barium	EPA 6010	5400	263	mg/kg	42.4	J	66.5	J	51.6	J	52.1	J	293	J
Beryllium	EPA 6010	150	1.0	mg/kg	0.0964	U	0.445	J	0.345	J	0.267	J	0.507	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	6280	J	13100	J	1360	J	1230	J	1440	J
Chromium	EPA 6010	210	46	mg/kg	139	J	136	J	664	J	351	J	178	J
Cobalt	EPA 6010	4700	23	mg/kg	16.8	J	19.5	J	12.3	J	6.17	J	15	J
Copper	EPA 6010	2900	55	mg/kg	2.54		263		10.1		6.1		38.6	
Iron	EPA 6010	—	N/C	mg/kg	18400	J	27700	J	34900	J	22200	J	37900	J
Lead	EPA 6010	400	64	mg/kg	6.77	J	10	U	4.07	J	24.8		6.41	J
Lithium	EPA 7430	1600	22	mg/kg	9.36		8.72		12.3		13.1		14.8	
Magnesium	EPA 6010	—	N/C	mg/kg	12600	J	6320	J	12900	J	7200	J	11100	J
Manganese	EPA 6010	1800	1172	mg/kg	108	J	224	J	222	J	275	J	267	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	10	U	2.38	J	7.83	J	5.25	J	1.43	J
Nickel	EPA 6010	150	63	mg/kg	72.5	J	21.7	J	34.6	J	15.1	J	36.3	J
Potassium	EPA 6010	—	N/C	mg/kg	2640		422	J	3130		3640		7370	
Selenium	EPA 7740	390	33	mg/kg	41.1		53.6		60.7		47.1		64	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2	U	2	U	2	U
Sodium	EPA 6010	—	N/C	mg/kg	508		602		149		138		209	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	1.24	U	0.822	U	1.13	U
Vanadium	EPA 6010	550	122	mg/kg	16.3	J	68	J	35	J	21.6	J	57.2	J
Zinc	EPA 6010	23000	125	mg/kg	29.6	J	35	J	52.6	J	97.9	J	80.9	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.2	U	0.2	U	0.539		0.494		0.587	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-18. Summary of Results from Background Area 2 (Objective 13)

Analyte		Sample ID Boring ID Boring Number Depth			13-53-RK-01 13L53 53 1	Valid Qual	13-57-RK-01 13L57 57 1	Valid Qual
		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units				
Metals (Method Listed by Each Metal)								
Aluminum	EPA 6010	76000	22729	mg/kg	2700		18700	
Antimony	EPA 6010	31	10	mg/kg	7.61	J	7.53	J
Arsenic	EPA 6010	0.39	32	mg/kg	7.7	J	1.6	J
Barium	EPA 6010	5400	263	mg/kg	56.1	J	139	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.051	U	0.681	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U
Calcium	EPA 6010	---	N/C	mg/kg	1190	J	1410	J
Chromium	EPA 6010	210	46	mg/kg	230	J	292	J
Cobalt	EPA 6010	4700	23	mg/kg	94.6	J	13.1	J
Copper	EPA 6010	2900	55	mg/kg	22.9		21.4	
Iron	EPA 6010	---	N/C	mg/kg	44400	J	36300	J
Lead	EPA 6010	400	64	mg/kg	6.41	J	20	
Lithium	EPA 7430	1600	22	mg/kg	6.94		19	
Magnesium	EPA 6010	---	N/C	mg/kg	133000	J	8510	J
Manganese	EPA 6010	1800	1172	mg/kg	946	J	328	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	1.36	J	3.71	J
Nickel	EPA 6010	150	63	mg/kg	820	J	29	J
Potassium	EPA 6010	---	N/C	mg/kg	501	U	5340	
Selenium	EPA 7740	390	33	mg/kg	76.3		73.8	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U
Sodium	EPA 6010	---	N/C	mg/kg	46	J	138	
Thallium	EPA 7841	5.5	0.3	mg/kg	1.43	U	2	U
Vanadium	EPA 6010	550	122	mg/kg	9.85	J	34.7	J
Zinc	EPA 6010	23000	125	mg/kg	53	J	83.5	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.361		0.68	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-01	Quartz Monzonite	Nonopaque Minerals Plagioclase (30%) Potassium Feldspar (24%) Quartz (12%) Epidote (8%) Chlorite (7%) Calcite (5%) Biotite (5%) Muscovite/sericite (3%) Pyroxene (2%) Clay (2%) Zircon (<1%) Apatite (<1%) Sausserite (<1%)	Opaque Minerals Pyrite (1%) Titanium dioxides (<1%) Ilmenite (<1%) Chalcopyrite (<1%) Millerite (<1%) Iron Oxides (<1%) Pentlandite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Evidence of tectonic stress and mineralogical alteration due to magnetic alteration.
13-RK-02	Quartz Monzonite	Nonopaque Minerals K-feldspar (30%) Plagioclase (25%) Chlorite (15%) Quartz (12%) Biotite (5%) Calcite (5%) Muscovite/sericite (2%) Epidote (1%) Adularia (1%) Clay (<1%) Fluorite (<1%) Zircon (<1%) Apatite (<1%) Xenotime (<1%)	Opaque Minerals Hematite (2%) Pyrite (1%) Ilmenite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Evidence of moderate tectonic(?) stress and late magmatic hydrothermal(?) alteration.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-03	Granite	<u>Nonopaque Minerals</u> Quartz (42%) K-feldspar (40%) Plagioclase (10%) Chlorite (15%) Calcite (5%) Chlorite (2%) Adularia (<1%) Apatite (<<1%) Fluorite (<1%)	<u>Opaque Minerals</u> Iron Oxides (<1%) Titanium Dioxides (<1%) Pyrite (<1%) Chalcopyrite (<<1%) Ilmenite (<<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Metamorphosed subject to relatively intense tectonic stress. Fractured and hydrothermally altered (primary along fractures). Opaque minerals have been oxidized.
13-RK-05	Quartz Monzonite	<u>Nonopaque Minerals</u> K-feldspar (40%) Plagioclase (24%) Quartz (10%) Chlorite (5%) Clay (5%) Muscovite/sericite (5%) Epidote (3%) Calcite (2%) Biotite (1%) Hornblende (1%) Pyroxene (1%) Albite (1%) Apatite (<1%) Zircon (<1%)	<u>Opaque Minerals</u> Iron Oxides (1%) Pyrite (<1%) Ilmenite (<1%) Ti-magnetite (<1%) Pentlandite (<1%) Titanium Dioxides (<1%)	One oxidized ilmenite grain was analyzed and found to have 0.03 wt. percent Cr. One chlorite grain was analyzed and found to have 0.02 wt. percent Ni and no Cr.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Metamorphosed subject to relatively intense tectonic stress. Fractured and hydrothermally altered (primary along fractures). Opaque minerals have been oxidized. Propyllitically altered; very weathered; almost gneiss.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-10	Quartz Monzonite	Nonopaque Minerals Plagioclase (30%) K-feldspar (23%) Quartz (20%) Chlorite (10%) Calcite (5%) Hornblende (3%) Epidote (3%) Pyroxene (2%) Muscovite/sericite (2%) Clay (1%) Albite (<1%) Sausserite (<1%) Biotite (<1%) Apatite (<1%) Corundum (<1%) Sphene (<1%) Fluorite (<1%) Xenotime (<1%)	Opaque Minerals Pyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%) Ilmenite (<1%)	A typical chlorite grain from this sample was analyzed and found to contain 0.04 wt. percent Ni and no Cr.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone mild hydrothermal alteration.
13-RK-11	Granodiorite	Nonopaque Minerals Plagioclase (34%) K-feldspar (20%) Biotite (25%) Quartz (5%) Chlorite (4%) Kaolinite (2%) Muscovite/sericite (2%) Apatite (<1%) Epidote (<1%) Sausserite (<1%) Fluorite (<1%) Rutile (<1%)	Opaque Minerals Pyrite (<1%) Ilmenite (<1%) Chalcopyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%) Magnetite (<1%) Pentlandite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone minor alteration. Faint schistose texture.
13-RK-11D	Granodiorite	Nonopaque Minerals Plagioclase (40%) Quartz and polycrystalline quartz (20%) K-feldspar (17%) Biotite (12%)	Opaque Minerals Iron Oxides (2%) Titanium Dioxides (<1%) Ilmenite (<1%) Pyrite (<1%) Pentlandite (<1%)	Three typical opaque grains were analyzed and found to be iron oxides with varying amounts	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
		Hornblende (5%) Chlorite (2%) Clay (1%) Pyroxene (<1%) Apatite (<1%) Zircon (<1%) Muscovite/sericite (<1%) Adularia (<1%) Calcite (<1%) Albite (<1%)		of iron.	metamorphorphism and therefore a more appropriate name as gneiss. Schistose texture present and abundant fractures indicate regional metamorphism. Argillized, chloritized, silicified, and oxidized
13-RK-15	Quartz Monzonite	<u>Nonopaque Minerals</u> Plagioclase (30%) K-feldspar (25%) Quartz (20%) Chlorite (10%) Clay (2%) Honblende (<1%) Biotite (<1%) Saussurite (<1%) Epidote (<1%) Sphene (<1%) Apatite (<1%) Zircon (<1%) Calcite (<1%) Muscovite/sericite (1%)	<u>Opaque Minerals</u> Iron Oxides (1%) Manganese oxide mineral (<1%) Arsenic-rich pyrite (<1%) Ilmenite (<1%) Pentlandite (<1%) Ti-magnetite (<1%) Titanium Dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone mild hydrothermal alteration, possible metamorphism. Possible arsenic replacement of iron in pyrite.
13-RK-17	Biotite Gneiss	<u>Nonopaque Minerals</u> Quartz (30%) Biotite (32%) K-feldspar (25%) Plagioclase (10%) Muscovite/sericite (1%) Talc (<1%) Pyroxene (<1%) Zircon (<1%) Epidote (<1%) Calcite (7%) Clay (<1%)	<u>Opaque Minerals</u> Iron Oxides (1%) Sphalerite (<1%) Galena (<1%) Chalcopyrite (<1%) Ilmenite (<1%) Pyrite(<1%)	Not Analyzed	Regionally metamorphosed; argillized and hydrothermally altered.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-18	Quartz Monzonite	Nonopaque Minerals Plagioclase (40%) K-feldspar (28%) Quartz (15%) Clay (5%) Chlorite (5%) Muscovite/sericite (3%) Calcite (2%) Epidote (1%) Biotite (<1%) Pyroxene (<1%) Hornblende (<1%) Zircon (<1%) Apatite (<1%) Albite (<1%)	Opaque Minerals Pyrite (<1%) Chalcopyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Minor argillic alteration and chloritization of biotite and calcite veining. Relatively fresh.
13-RK-21	Cataclastic Quartz Monzonite	Nonopaque Minerals K-feldspar (35%) Plagioclase (25%) Quartz (22%) Epidote (7%) Illite (%) Chlorite (3%) Muscovite/sericite (2%) Apatite (<1%)	Opaque Minerals Iron Oxides (<1%) Ilmenite (<1%) Pyrite (<1%) Gold (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Highly fractured, subject to intense tectonic stress late magmatic and hydrothermal alteration. Argillization, chloritization, and sericitization observed.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-22	Quartz Monzonite	**Nonopaque Minerals** Plagioclase (30%) K-feldspar (25%) Chlorite (20%) Quartz (15%) Muscovite/sericite (3%) Calcite (2%) Biotite (1%) Apatite (<1%) Zircon (<1%) Albite (<1%)	**Opaque Minerals** Iron Oxides (3%) Ilmenite (<1%) Pentlandite (<1%) Pyrite (<1%) Titanium dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Faint gneissic textures. Regionally metamorphosed. Fractured and hydrothermally altered.
13-RK-23	Quartz Monzonite	**Nonopaque Minerals** Quartz (30%) Plagioclase (27%) K-feldspar (20%) Chlorite (12%) Clay (3%) Muscovite/sericite (1%) Calcite (1%) Epidote (1%) Fluorite (<1%) Apatite (<1%) Rutile (<1%)	**Opaque Minerals** Iron Oxides (4%)	Not Analyzed.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Loose, numerous wide (1mm) fractures. Undergone strong tectonic stress (faulting?). also slightly metamorphosed. Fractures filled with chlorite opaque minerals, epidote, and calcite.
13-RK-30	Biotite Schist	**Nonopaque Minerals** Quartz (28%) K-feldspar (27%) Plagioclase (25%) Biotite (20%)	**Opaque Minerals** Chalcopyrite (<1%) Titanium Dioxides (<1%) Iron Oxides (<1%)	Seven of eight biotite grains analyzed contained trace amounts of Cr and Ni. Cr	Fresh metamorphosed rock. Very little fractures. Regionally metamorphosed plutonic rock (granulate grade).

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

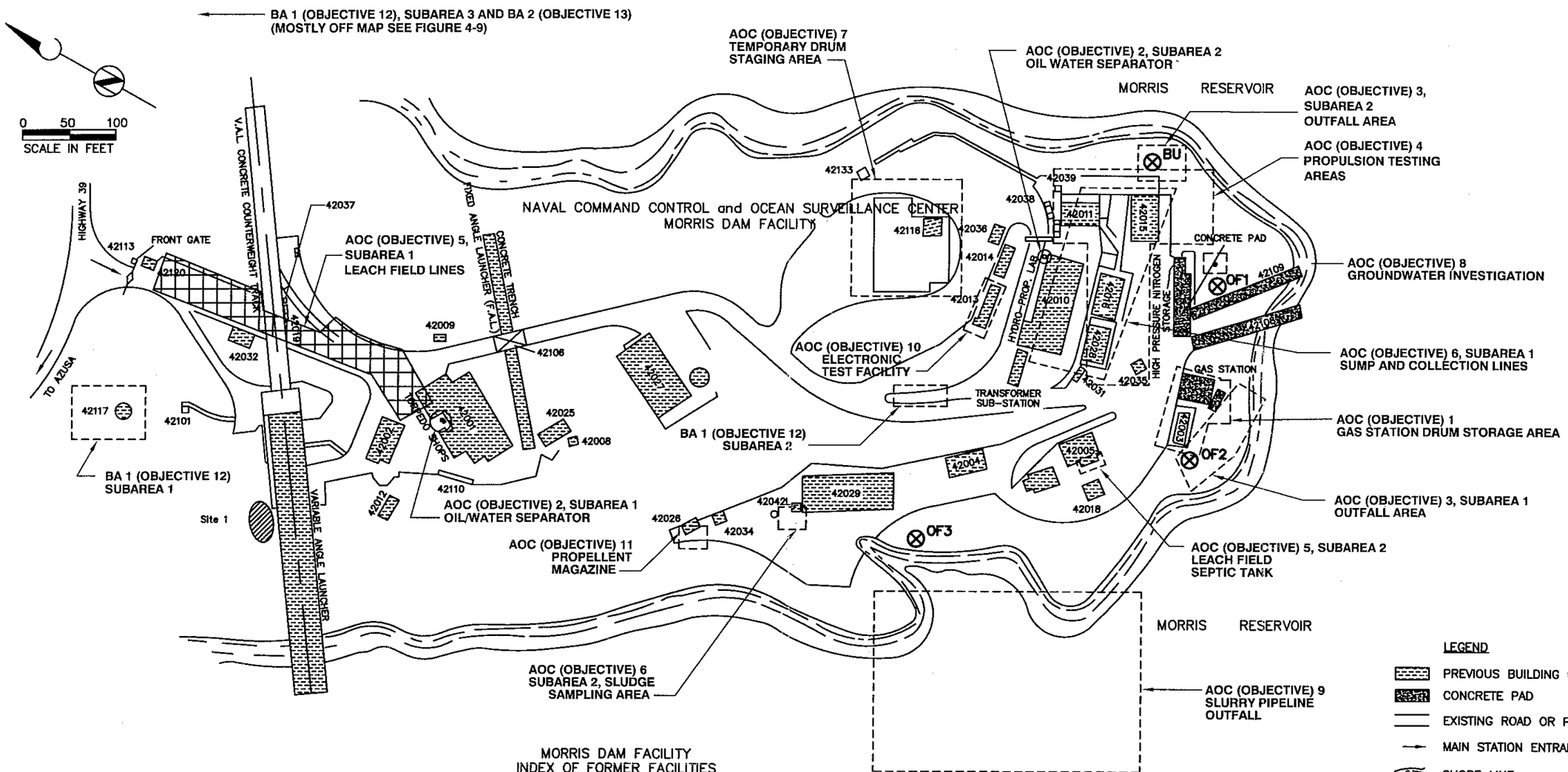
Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
		Calcite (<1%) Chlorite (<1%) Sausserite (<1%) Clay (<1%) Zircon (<1%) Apatite (<1%) Epidote (<1%) Fluorite (<1%)		varied from 0.02 to 0.07 wt. percent; Ni varied from 0 to 0.05 wt. percent. Cobalt was present in three grains up to 0.02 wt. percent. Muscovite grains analyzed had no Cr, Ni or Co.	
13-RK-34	Chlorite Schist	<u>Nonopaque Minerals</u> Calcite (48%) Chlorite (25%) K-feldspar (8%) Plagioclase (8%) Quartz (5%) Adularia (2%) Muscovite/sericite (2%) Biotite (1%) Fluorite (<1%) Hornblende (<1%) Apatite (<1%) Talc (<1%)	<u>Opaque Minerals</u> Pyrite (<1%) Chalcocite Covellite (<1%) Iron Oxides (<1%)	Three typical opaque grains analyzed were found to be iron oxide. Chlorite grains analyzed were found not to contain Cr or Ni.	Almost total alteration to chlorite and calcite. Hydrothermally altered and metamorphosed.
13-RK-38	Amphibolite	<u>Nonopaque Minerals</u> Hornblende (66%) Biotite (18%) Plagioclase (8%) Muscovite/sericite(3%) Chlorite (3%) Quartz (1%) Apatite (<1%) Sphene (<1%)	<u>Opaque Minerals</u> Ilmenite (<1%) Heazlewoodite (<<1%) Chromite (<1%) Magnetite (<1%) Pyrite (<<1%) Leucoxene (<<1%)	Not Analyzed	Relatively fresh; heazlewoodite possibly introduced through hydrothermal alteration.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-42	Mica Schist	Nonopaque Minerals Quartz (34%) Biotite (20%) Chlorite (14%) Muscovite (10%) K-feldspar (10%) Plagioclase (5%) Talc (3%) Calcite (2%) Adularia (1%) Corundum (<1%) Zircon (<1%) Sausserite (<1%) Fluorite (<1%) Rutile (<1%)	Opaque Minerals Iron oxides (<1%) Magnetite (<1%) Pyrite (<1%) Chalcopyrite (<1%) Covellite (<1%) Malachite (<<1%)	Three muscovite grains analyzed were found to contain from 0 to 0.02 wt. percent Cr and from 0 to 0.02 wt. percent Ni. Four chlorite grains analyzed were found to contain from 0 to 0.02 wt. percent Cr and from 0 to 0.01 wt. percent Ni.	Small fractures stained with iron oxides cut across grains but not porphyroblasts copper introduced along fractures along hydrothermal alteration.
13-RK-42D	Amphibolite	Nonopaque Minerals Hornblende (70%) Quartz (8%) Epidote (5%) Carbonate (3%) Plagioclase (1%) Actinolite (1%) Muscovite/sericite(<1%) Sausserite (<1%) Pyroxene (<1%) Apatite (<1%) Zircon (<1%)	Opaque Minerals Ilmenite (8%) Pyrite (3%) Chalcopyrite (<1%) Covellite (<1%) Iron oxides (<1%) Titanium dioxides (<1%)	Not Analyzed	Nickel may have been introduced through hydrothermal alteration along fractures.
13-RK-46	Gneiss	Nonopaque Minerals Quartz (40%) Plagioclase (24%) K-feldspar (20%) Biotite (5%) Clay (5%) Muscovite/sericite(3%) Chlorite (2%) Zircon (<1%) Epidote (<1%) Albite (<1%)	Opaque Minerals Iron oxides (<1%) Titanium dioxides (<1%)	Not Analyzed	Fresh small amounts of alteration, chloritization of biotite.

Table 4-19. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-47	Cataclastic Granite	**Nonopaque Minerals** Quartz (40%) K-feldspar (28%) Chlorite (10%) Biotite (10%) Plagioclase (5%) Clay (2%) Muscovite/sericite (1%) Fluorite (1%) Zircon (<1%) Amphibole (<1%) Adularia (<1%) Corundum (<1%) Epidote (<1%)	**Opaque Minerals** Iron and manganese oxides (3%) Titanium dioxides (<1%) Pyrite (<1%) Gold (<1%)	Not Analyzed	Totally broken up by fractures; fractures filled with chlorite and iron oxides. Undergone intense tectonic stress and hydrothermal alteration.
13-RK-53	Peridotite or Pyroxenite	**Nonopaque Minerals** Serpentine (55%) Clinopyroxene (augite) (17%) Olivine (8%) Chlorite (5%) Orthopyroxene (2%) Quartz (<1%) Biotite (<1%) Rutile (<1%)	**Opaque Minerals** Iron Oxides (5%) Fe-rich spinel (5%) Pentlandite (2%) Pyrrhotite (<1%) Chromite (<1%) Picotite (<1%) Chalcopyrite (<1%) Heazlewoodite (<1%) Iron, nickel sulfite (<1%)	Twelve typical opaque grains were analyzed. Cr ranged from 0 to 12.18 wt. percent. Ni ranged from 0.10 to 32.85 wt. percent. As ranged from 0 to 0.03 wt. percent.	Highly fractured grains of clinopyroxene and olivine replaced by serpentine. ophiolite complex. Extensive serpentinization. Very high in chromium and nickel.
13-RK-54	Mica Schist	**Nonopaque Minerals** Quartz (35%) K-feldspar (20%) Plagioclase (10%) Phlogopite (10%) Biotite (87%) Clay (5%) Muscovite/sericite (5%) Chlorite (1%) Andalusite (<1%) Apatite (<1%) Adularia (<1%) Zircon (<1%)	**Opaque Minerals** Iron and manganese oxides (5%)	Not Analyzed	Strong schistocity, relatively fresh, but weathered on surface. Iron and manganese oxides along cleavage planes. Little evidence of hydrothermal alteration.



MORRIS DAM FACILITY
INDEX OF FORMER FACILITIES

STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE	STRUCTURE NO.	DESCRIPTIVE TITLE (FORMER USE)	QTY. OR CAPACITY	UNIT OF MEASURE
42001	TORPEDO SHOP	5520	SF	42023	SIDE VIEW CAMERA STATION	63	SF	42108	TORPEDO RECOVERY PIER	–	–
42002	ADMINISTRATION BLDG.	2150	SF	42025	COMPRESSOR BLDG	528	SF	42109	TORPEDO RECOVERY RAMP	–	–
42003	PW GARAGE/WEIS SHOP	924	SF	42026	HYDROGEN PEROXIDE STORAGE	266	SF	42110	TORPEDO RECOVERY RAMP	245	SF
42004	PW CARPENTER & ELECTRIC SHOP	880	SF	42027	SHOP STORES	3200	SF	42112	VAL SIDE VIEW CAMERA BRIDGE	–	–
42005	PW MAINTENANCE SHOP	1026	SF	42028	TEST PITS 7 & 8	925	SF	42113	FLAG POLE	–	–
42008	EXPLOSIVE ASSEMBLY CAP HOUSE	100	SF	42029	TORPEDO SHOP/ELECTRONICS	4000	SF	42115	VARIABLE ANGLE LAUNCHER	–	–
42009	FAL CONTROL BLDG	35	SF	42031	MENS HEAD	144	SF	42116	SUBSTATION	2500	KV
42010	MACHINE SHOP	4000	SF	42032	VAL COMPRESSOR SHELTER	–	–	42117	WATER STORAGE TANK	20000	GA
42011	DYNAMOMETER PITS 1,2,3 & 4	1408	SF	42034	ACID STORAGE	100	SF	42120	MAIN GATE HOUSE	135	SF
42012	VAL CONTROL BLDG	336	SF	42035	WOMANS HEAD	42	SF	42126	STORAGE PLATFORM	20	SV
42013	ELECTRONIC TEST FACILITY	490	SF	42036	TURBINE TEST BLDG	231	SF	42133	CABLE WINCH HOUSING	130	SF
42014	COMPRESSOR BLDG	420	SF	42037	INCINERATION	1	SF				
42015	TURBINE TEST PITS 5 & 7	1472	SF	42038	PROP LAB WASH SHELTER	30	SF				
42016	TORPEDO BLDG/CHEM LAB	1802	SF	42039	TEST EQUIPMENT ASSEMBLY	210	SF				
42018	DIVER'S BUILDING	400	SF	42101	FUSE & DETECTOR MAGAZETTE	–	–				
42019	HEAD, MEN & WOMAN	130	SF	42102	ROCKET MAGAZETTE	–	–				
42020	SIDE VIEW CAMERA STATION	63	SF	42106	HIGHWAY BRIDGE	182	SF				
42021	SIDE VIEW CAMERA STATION	63	SF								

LEGEND

- PREVIOUS BUILDING OR STRUCTURE
- CONCRETE PAD
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- HYDRAULIC OIL SPILL
- APPROXIMATE SAMPLING LOCATION (JACOBS, 1993)

AOC – AREA OF CONCERN
BA – BACKGROUND AREA

FIGURE 4-1

SITE PLAN

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

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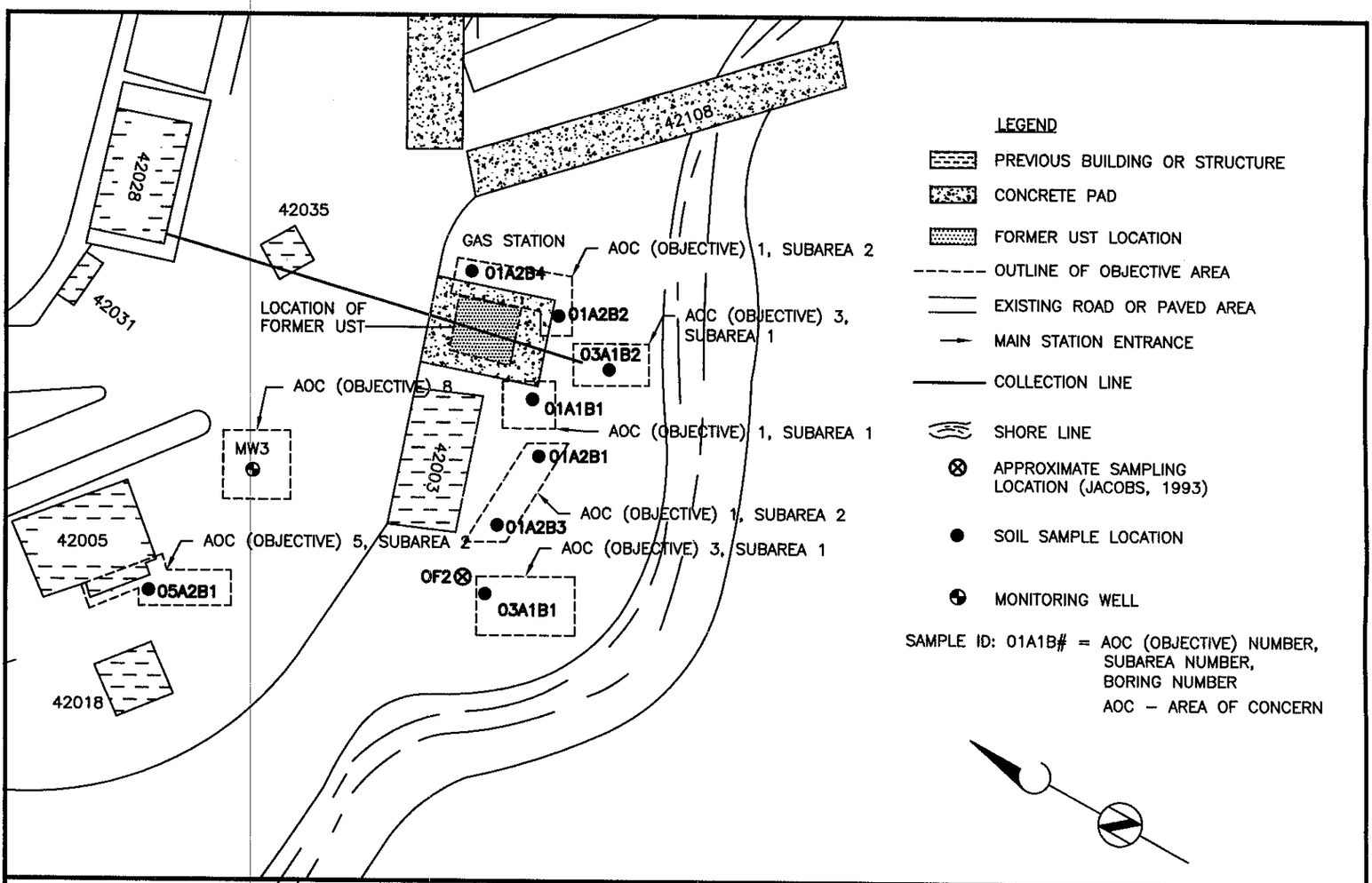

BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	0 40 80 SCALE IN FEET	PROJECT NUMBER 14796	DATE FEB. 2002
	PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	

FIGURE 4-2

AREA OF CONCERN (OBJECTIVES) 1, 3 (SUBAREA 1), 5 (SUBAREA 2), AND 8 SAMPLING LOCATIONS

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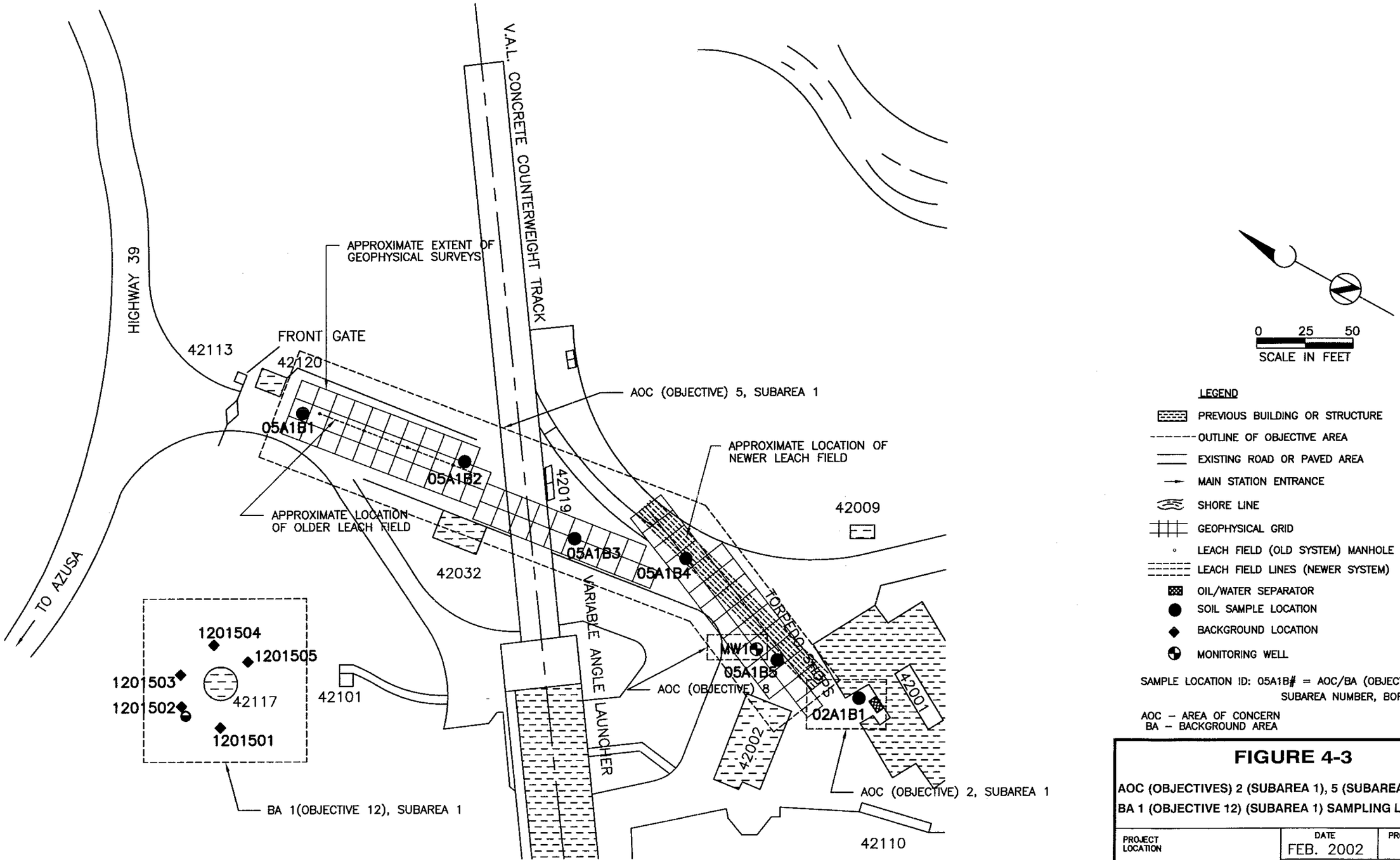

FIGURE 4-3

AOC (OBJECTIVES) 2 (SUBAREA 1), 5 (SUBAREA 1), 8, AND BA 1 (OBJECTIVE 12) (SUBAREA 1) SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

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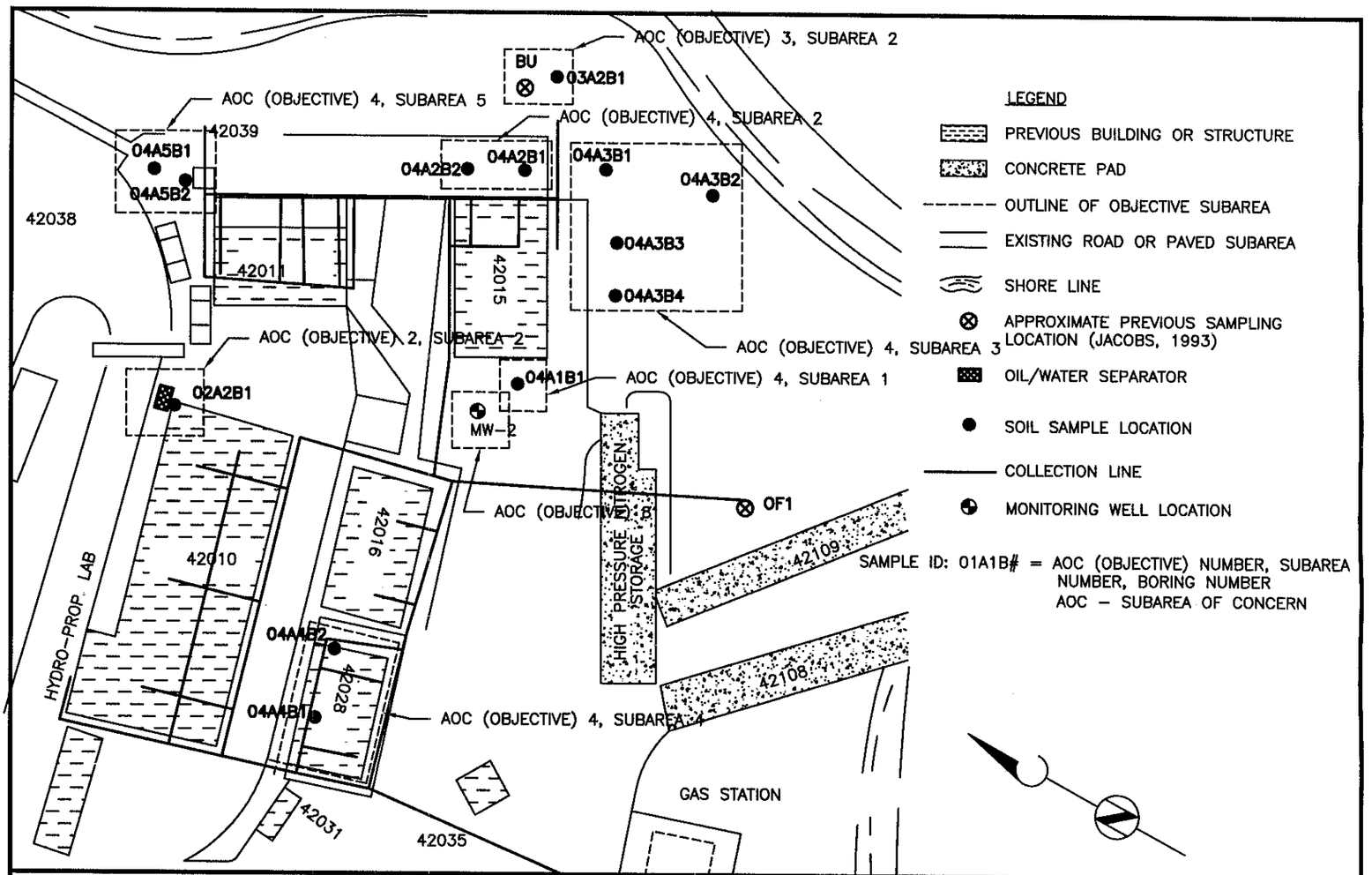

BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	0 40 80 SCALE IN FEET	PROJECT NUMBER 14796	DATE FEB. 2002
	PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	

FIGURE 4-4

AOC (OBJECTIVES) 2 (SUBAREA 2), 3 (SUBAREA 2), 4, AND 8 SAMPLING LOCATIONS

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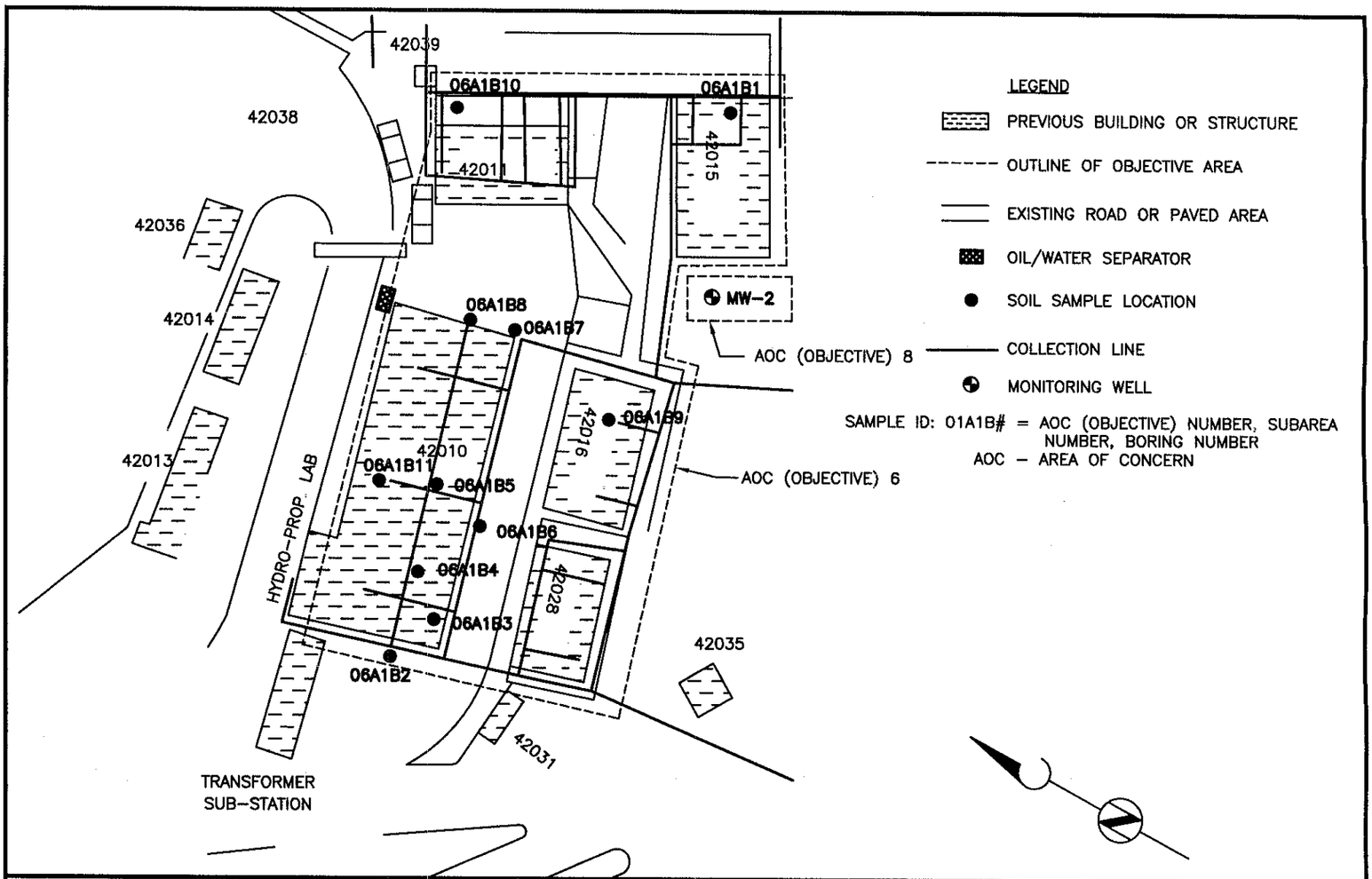
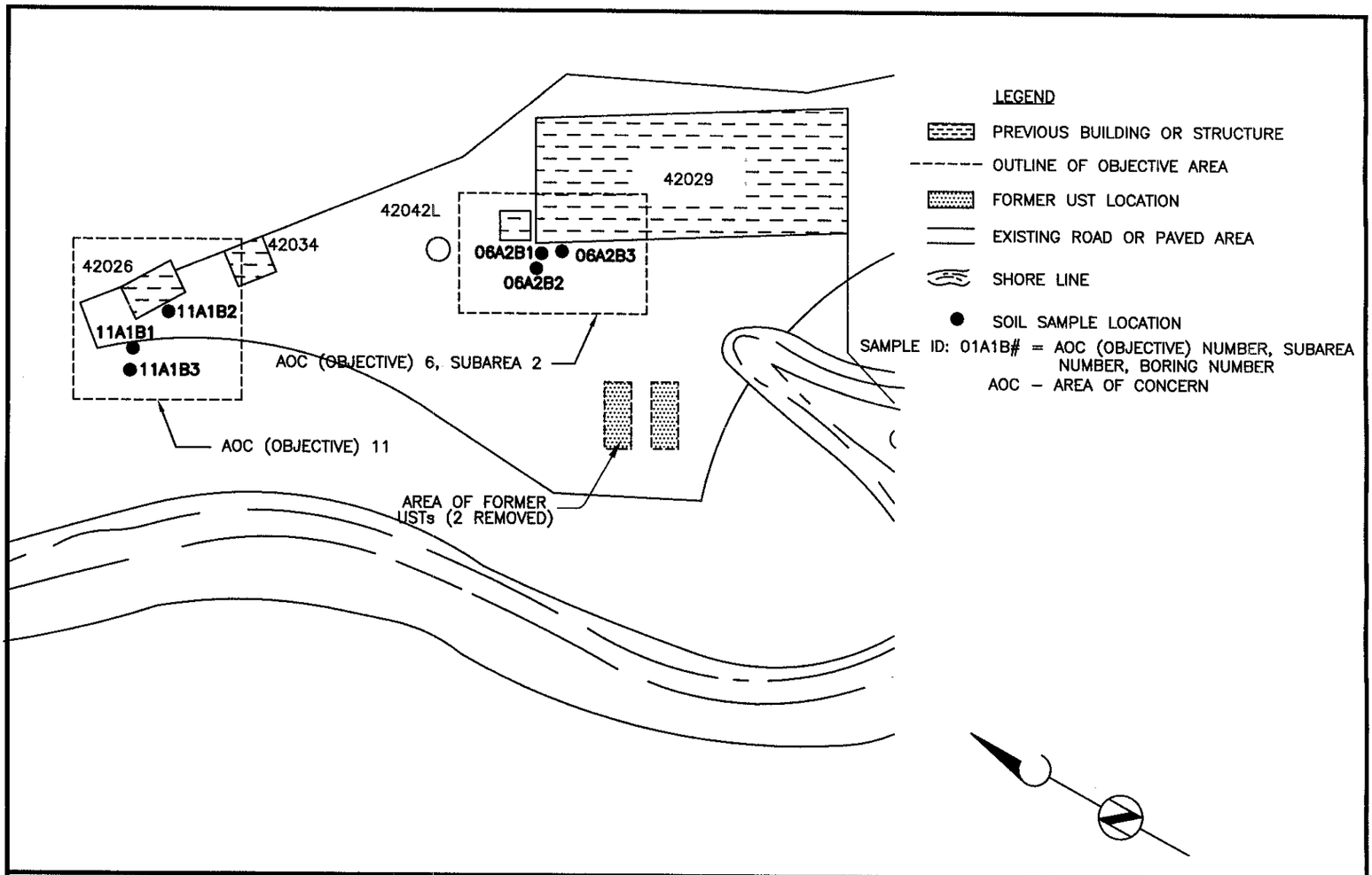


BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	0 40 80 SCALE IN FEET	PROJECT NUMBER 14796	DATE FEB. 2002
	PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	

FIGURE 4-5

AOC (OBJECTIVES) 6 (SUBAREA 1) , AND 8 SAMPLING LOCATIONS

LAF 14796032.DWG



BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

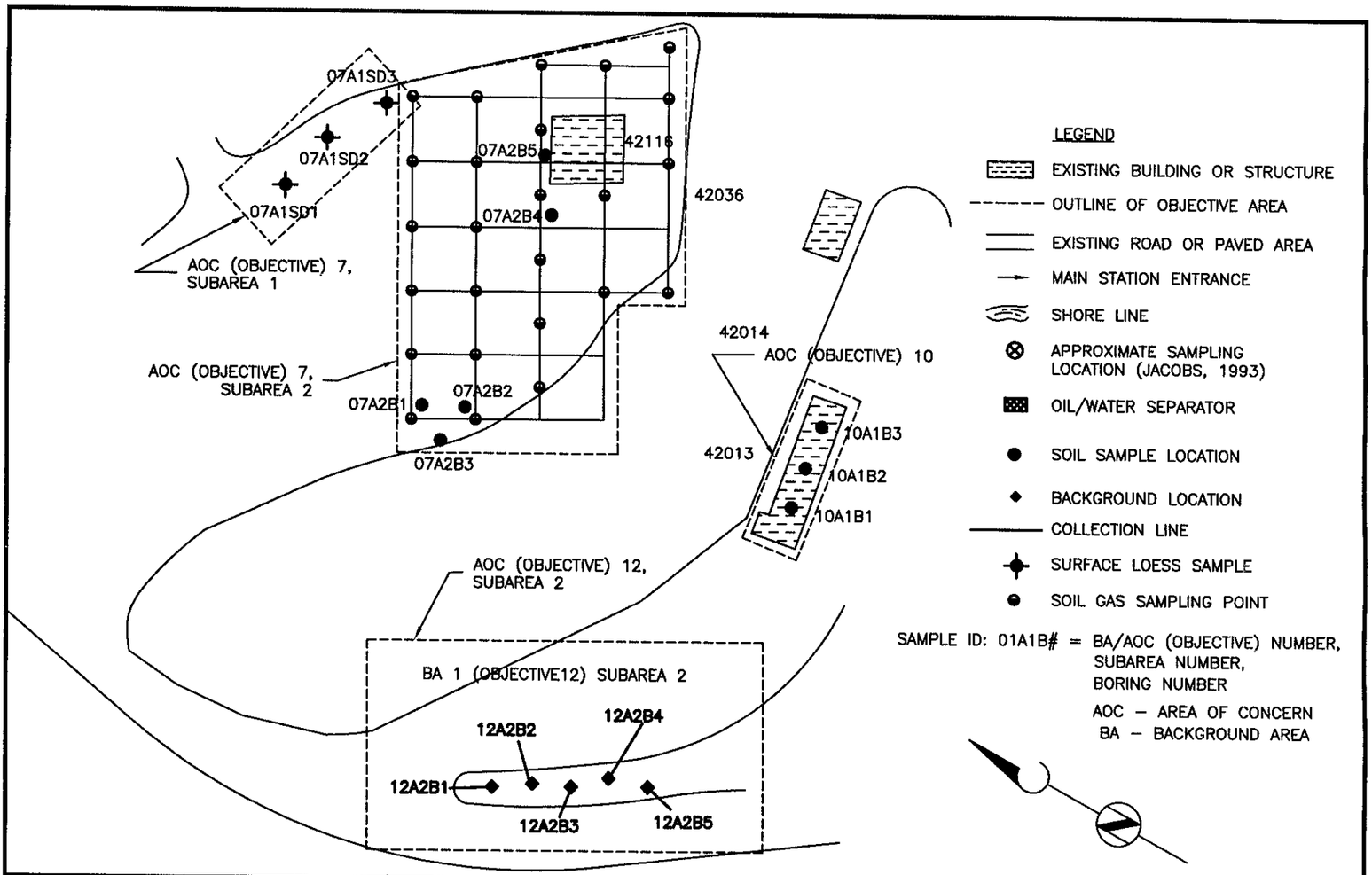
PROJECT NUMBER	DATE
14796	FEB. 2002

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-6

AOC (OBJECTIVES) 6 (SUBAREA 2), AND 11 SAMPLING LOCATIONS

LAF 14796033.DWG



BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

PROJECT NUMBER	DATE
14796	FEB. 2002

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-7

AOC (OBJECTIVES) 7, 10 AND BA 1 (OBJECTIVE 12) SUBAREA 2 SAMPLING LOCATIONS

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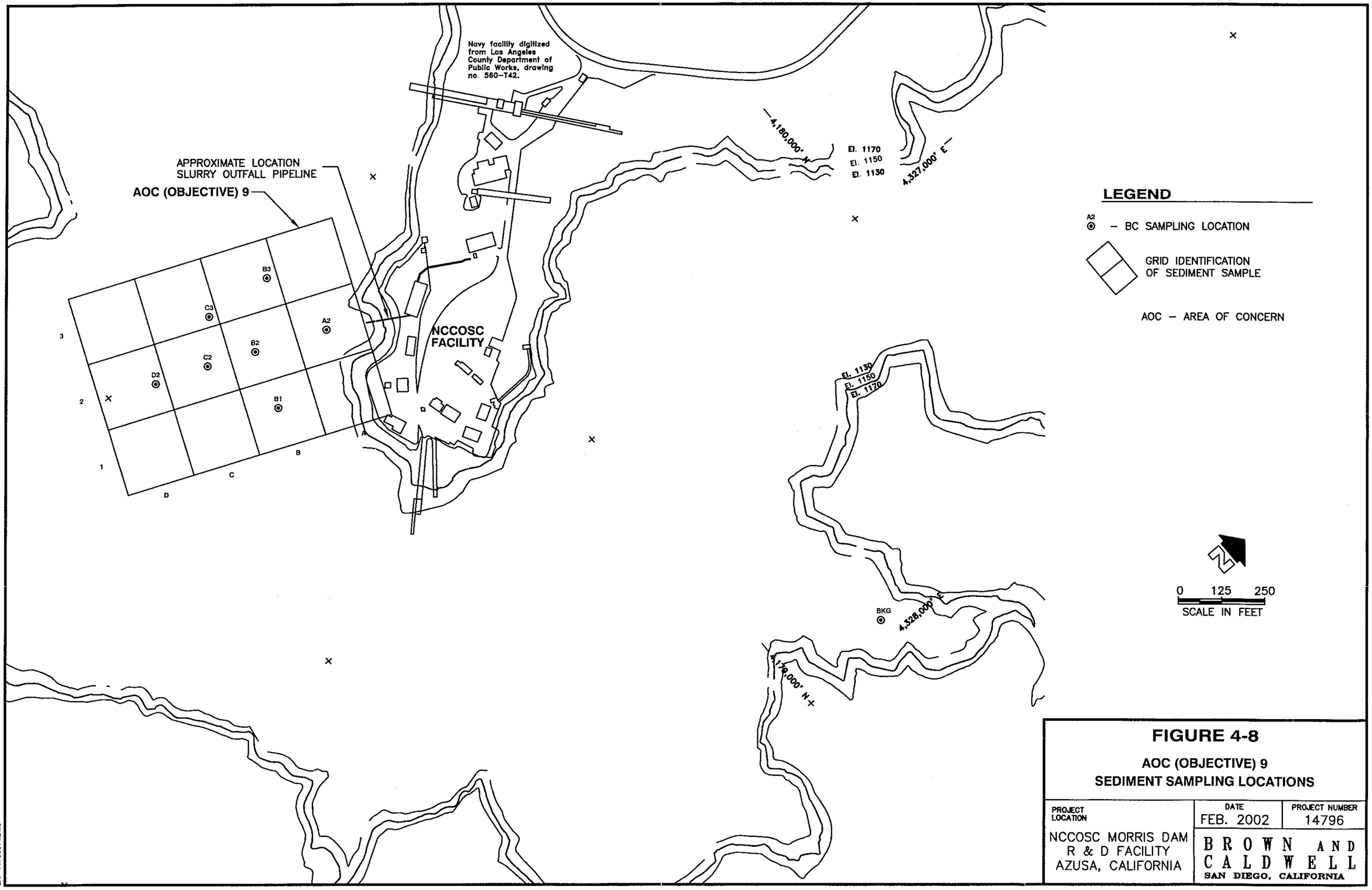

FIGURE 4-8

AOC (OBJECTIVE) 9
SEDIMENT SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

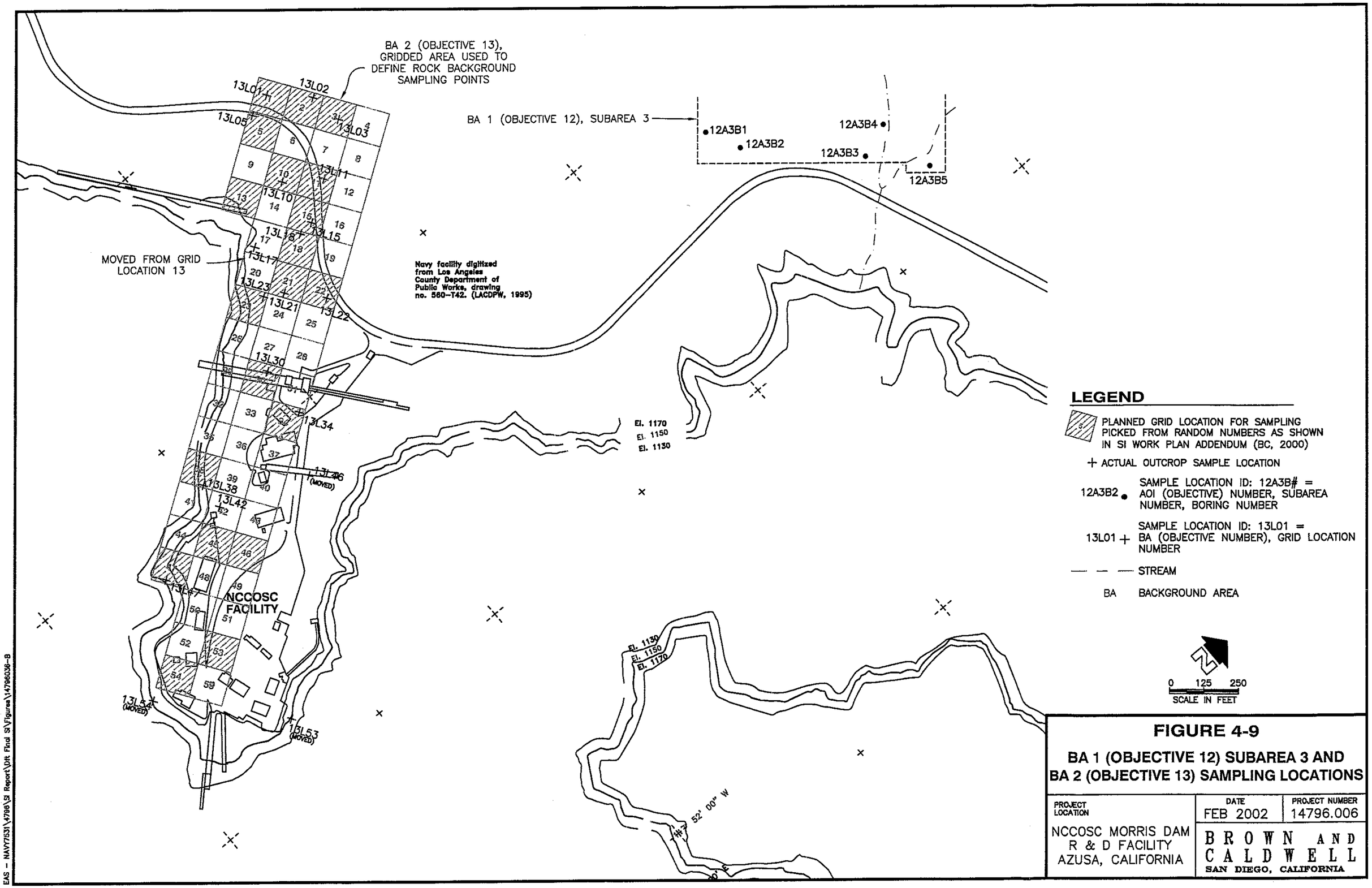

FIGURE 4-9

BA 1 (OBJECTIVE 12) SUBAREA 3 AND BA 2 (OBJECTIVE 13) SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB 2002	14796.006

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

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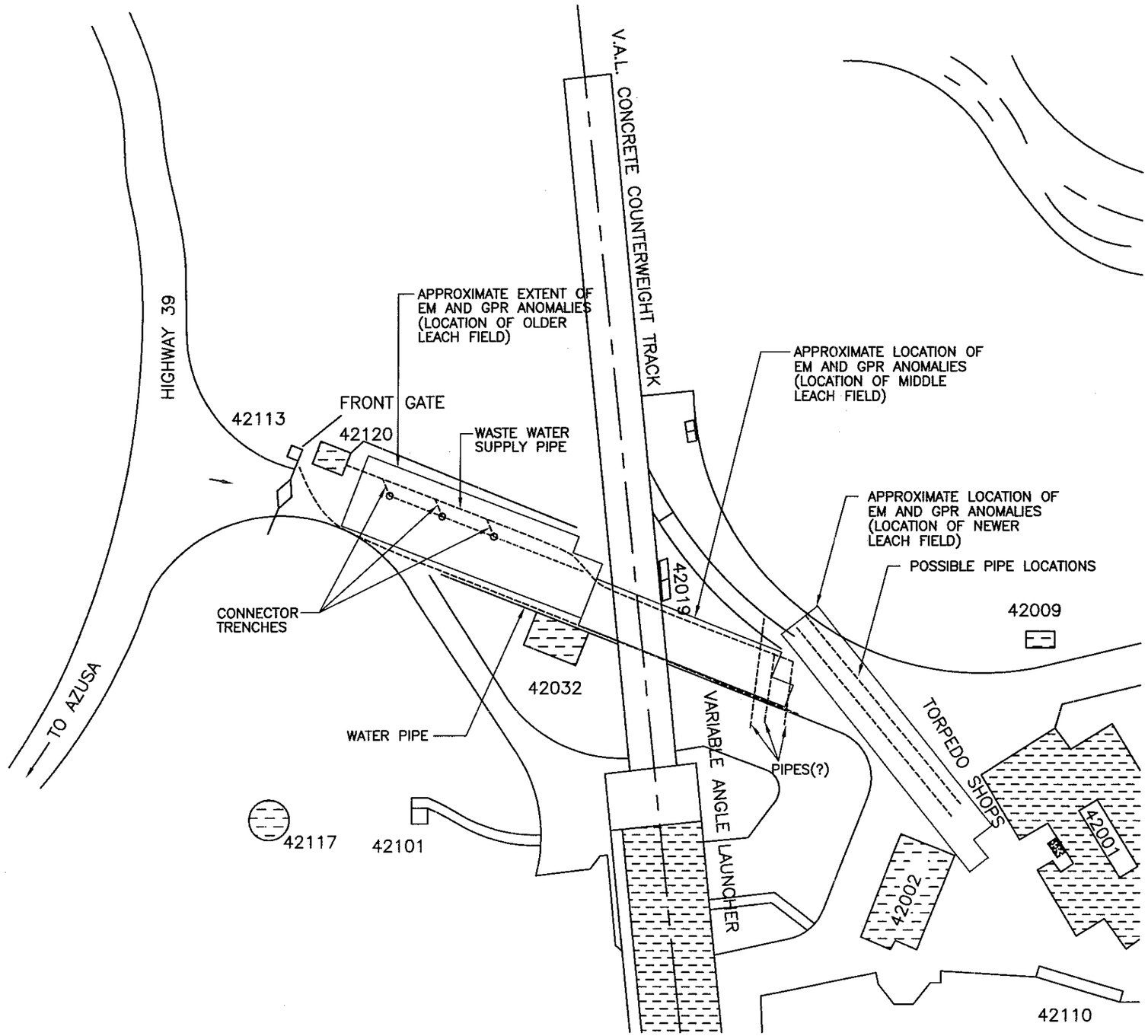
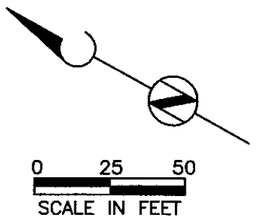




LEGEND

- PREVIOUS BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- LEACH FIELD (OLDER SYSTEM) MANHOLE
- LEACH FIELD LINES (NEWER SYSTEM)
- OIL/WATER SEPARATOR
- AOC – AREA OF CONCERN

FIGURE 4-10

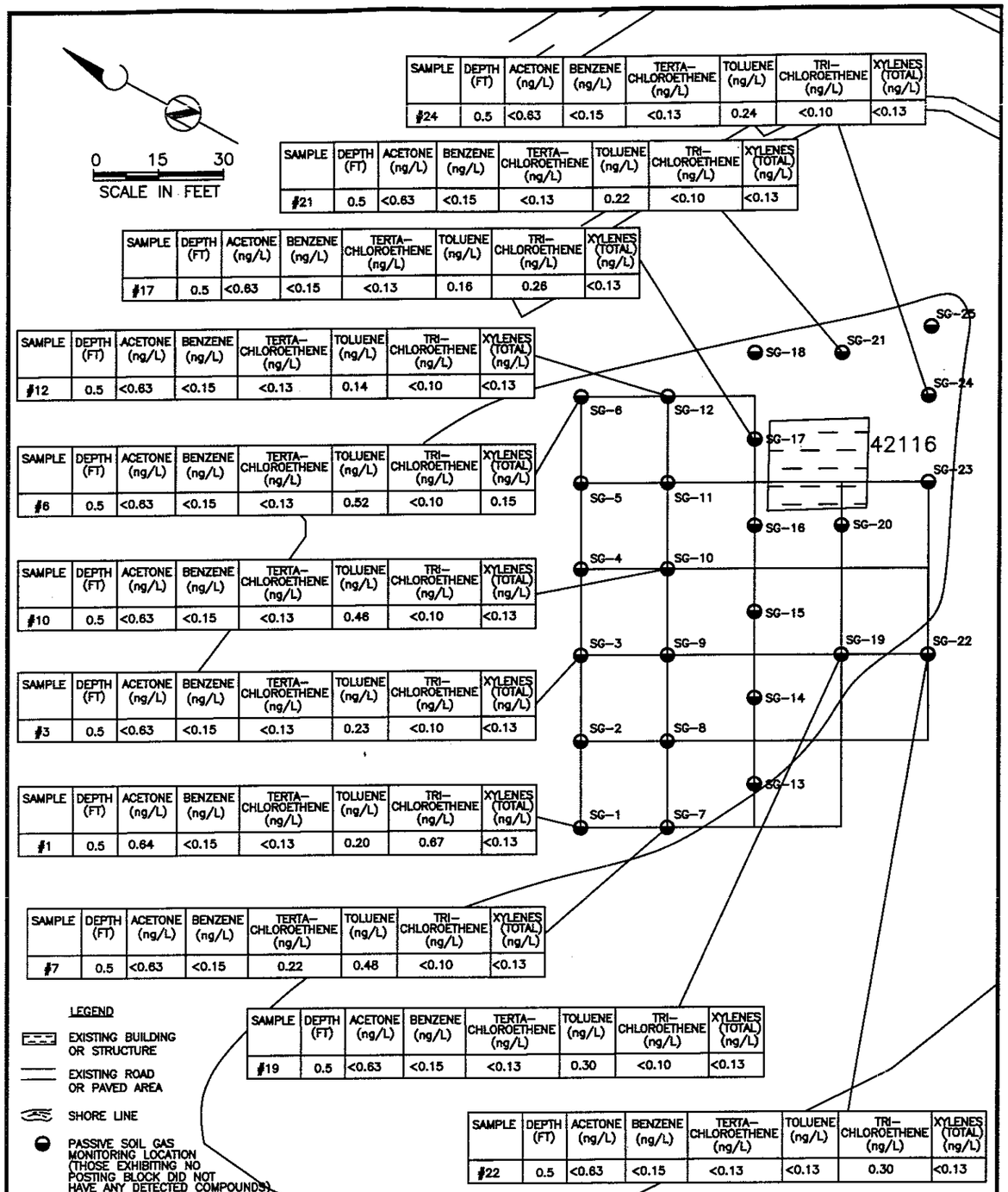
AOC (OBJECTIVE) 5

SUMMARY OF GEOPHYSICAL SURVEY

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF/14796013.DWG



SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#24	0.5	<0.63	<0.15	<0.13	0.24	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#21	0.5	<0.63	<0.15	<0.13	0.22	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#17	0.5	<0.63	<0.15	<0.13	0.16	0.28	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#12	0.5	<0.63	<0.15	<0.13	0.14	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#6	0.5	<0.63	<0.15	<0.13	0.52	<0.10	0.15

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#10	0.5	<0.63	<0.15	<0.13	0.46	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#3	0.5	<0.63	<0.15	<0.13	0.23	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#1	0.5	0.64	<0.15	<0.13	0.20	0.67	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#7	0.5	<0.63	<0.15	0.22	0.48	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#19	0.5	<0.63	<0.15	<0.13	0.30	<0.10	<0.13

SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#22	0.5	<0.63	<0.15	<0.13	<0.13	0.30	<0.13

DATE	PROJECT NUMBER
FEB. 2002	14796

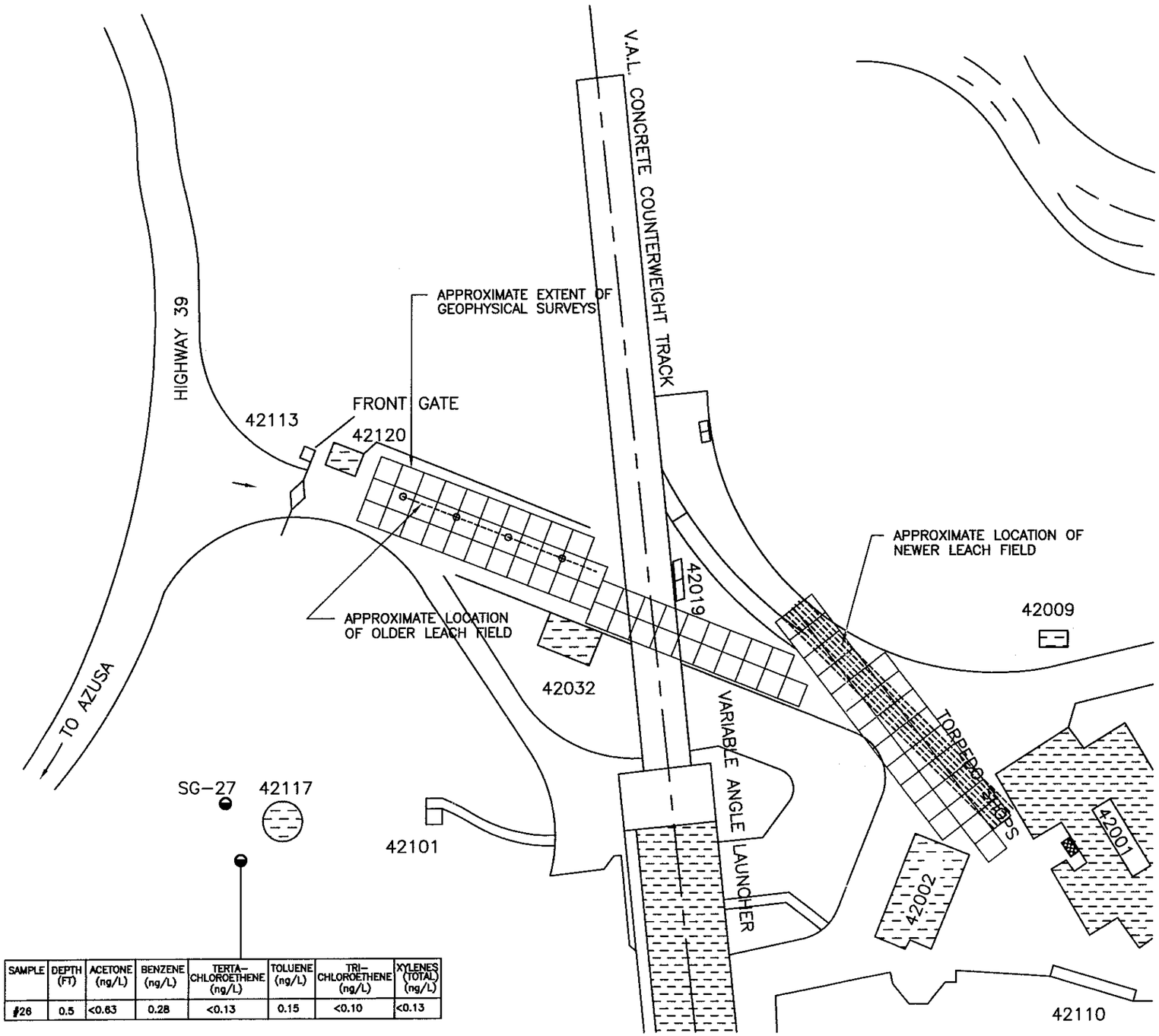
BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

AOC (OBJECTIVE) 7
SOIL VAPOR SAMPLE LOCATIONS AND RESULTS

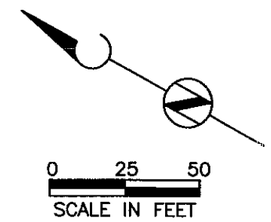
PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-11

LAF 14796012.DWG



SAMPLE	DEPTH (FT)	ACETONE (ng/L)	BENZENE (ng/L)	TERTA-CHLOROETHENE (ng/L)	TOLUENE (ng/L)	TRI-CHLOROETHENE (ng/L)	XYLENES (TOTAL) (ng/L)
#26	0.5	<0.63	0.28	<0.13	0.15	<0.10	<0.13



LEGEND

- PREVIOUS BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- GEOPHYSICAL GRID
- LEACH FIELD (OLDER SYSTEM) MANHOLE
- LEACH FIELD LINES (NEWER SYSTEM)
- OIL/WATER SEPARATOR
- PASSIVE SOIL GAS MONITORING LOCATION (THOSE EXHIBITING NO POSTING BLOCK DID NOT HAVE ANY DETECTED COMPOUNDS)
- BA – BACKGROUND AREA

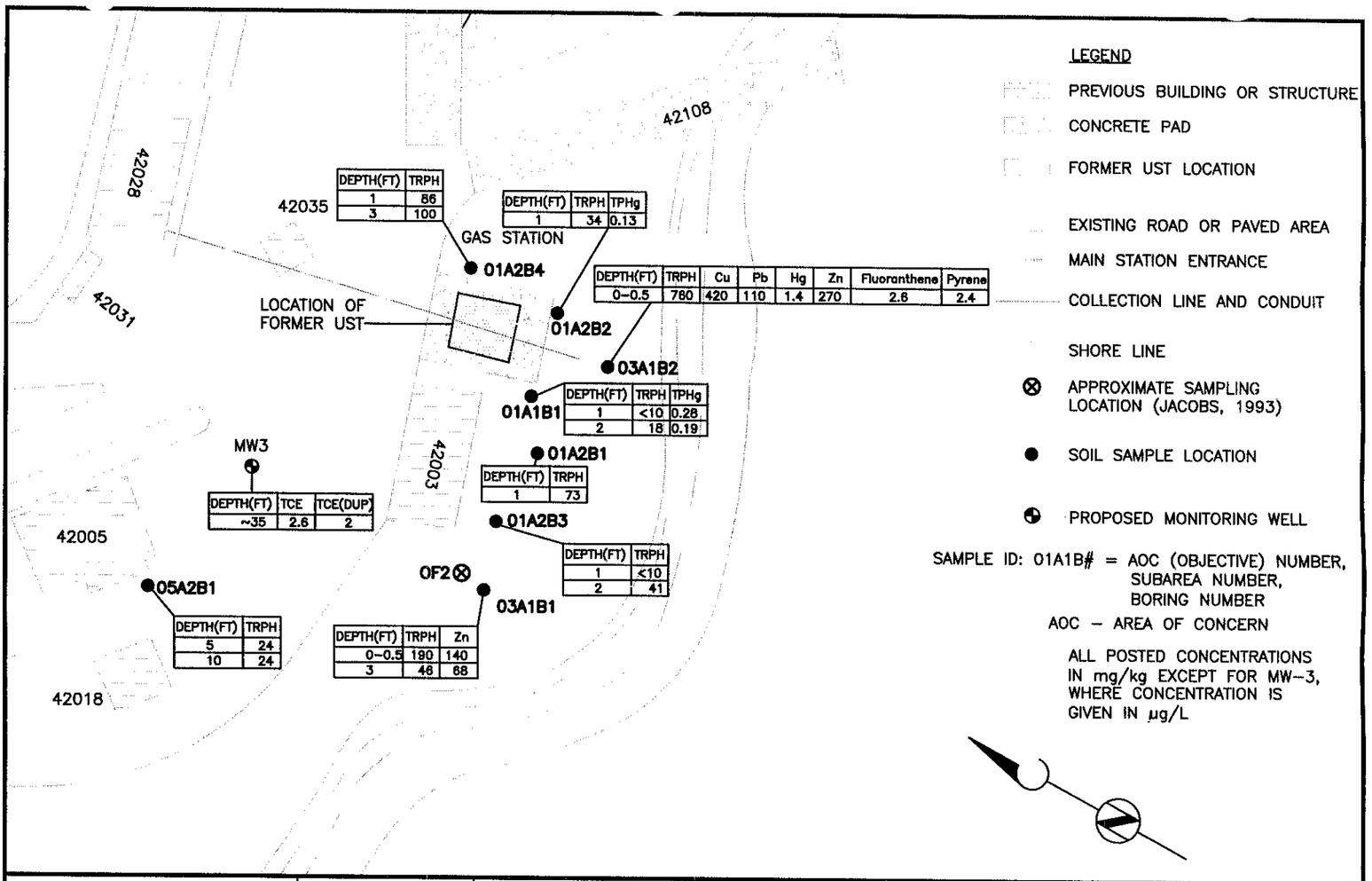
FIGURE 4-12

BACKGROUND AREA 1 (OBJECTIVE 12) SOIL VAPOR SAMPLE LOCATION AND RESULTS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DDAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF/14796011.DWG



BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

PROJECT NUMBER 14796

DATE FEB. 2002

PROJECT LOCATION NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-13

AOC (OBJECTIVES) 1, 3 (SUBAREA 1), AND 5 (SUBAREA 2), AND 8 (MW-3 ONLY) SAMPLING LOCATIONS

LAF 14796041.DWG

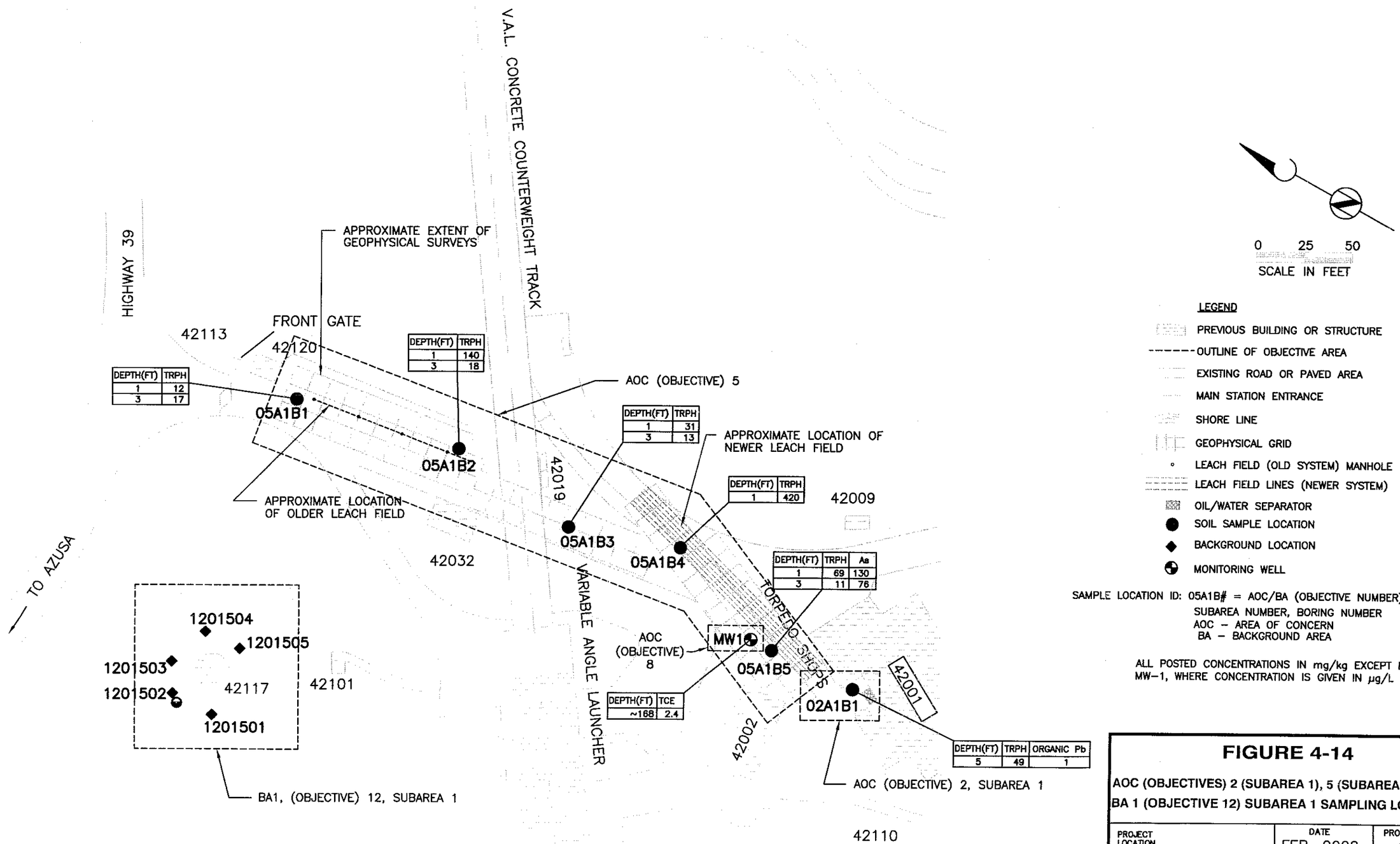


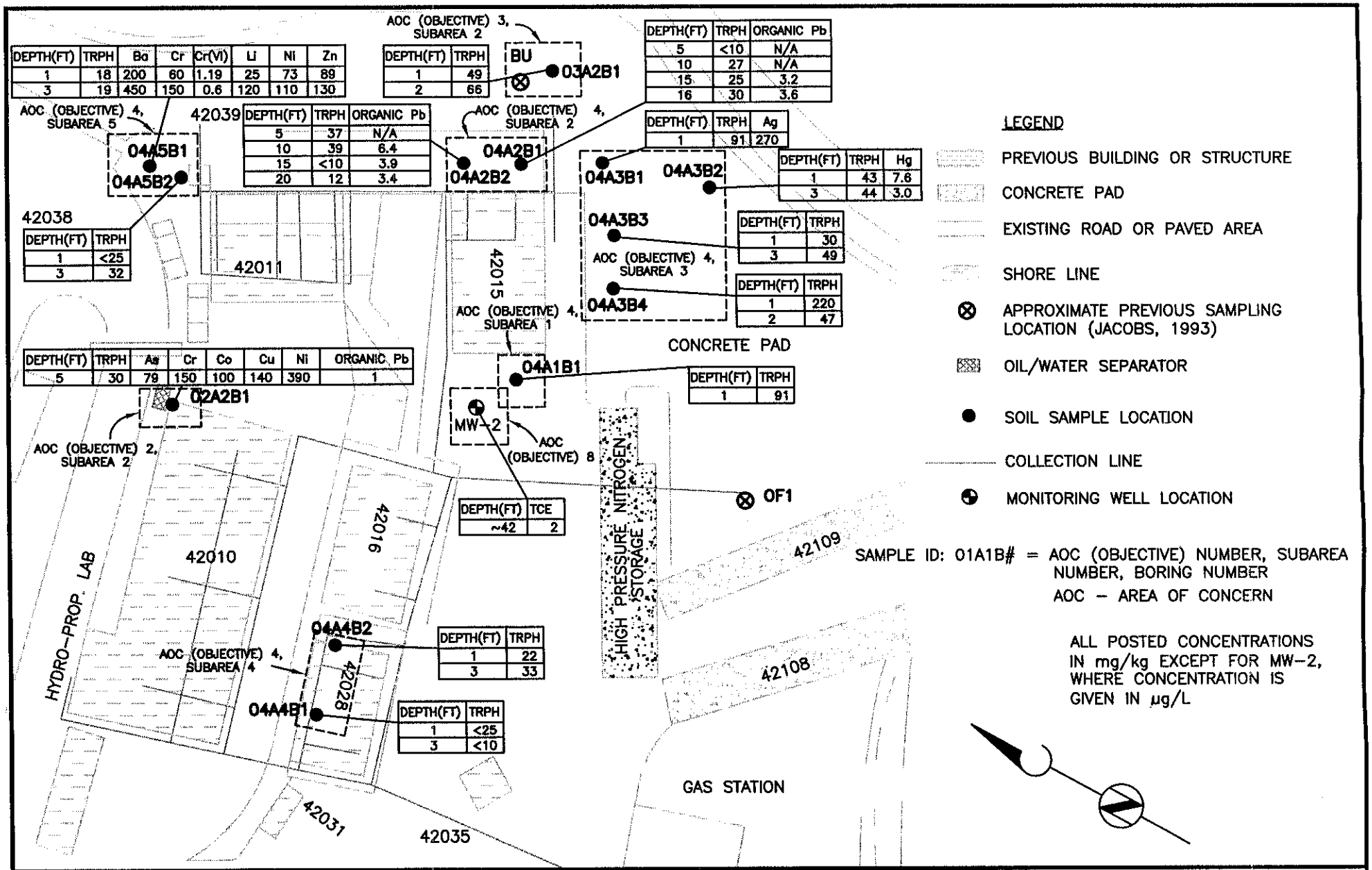
FIGURE 4-14

AOC (OBJECTIVES) 2 (SUBAREA 1), 5 (SUBAREA 1), 8, AND BA 1 (OBJECTIVE 12) SUBAREA 1 SAMPLING LOCATIONS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF/14796043.DWG



BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

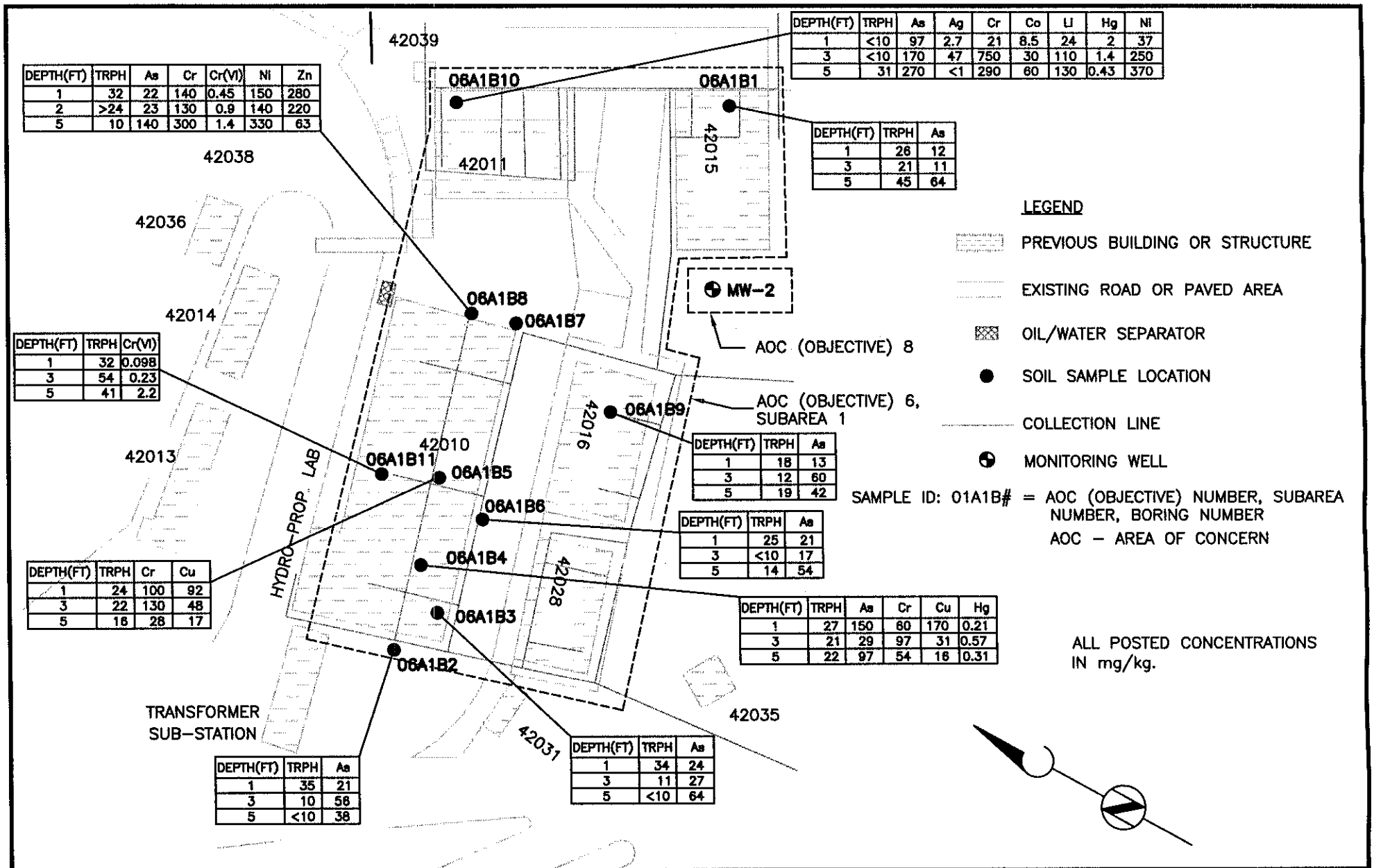
PROJECT NUMBER	DATE
14796	FEB. 2002

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-15

AOC (OBJECTIVES) 2 (SUBAREA 2), 3 (SUBAREA 2), AND 4 SAMPLING LOCATIONS

LAF 14796042.DWG



DEPTH(FT)	TRPH	As	Cr	Cr(VI)	Ni	Zn
1	32	22	140	0.45	150	280
2	>24	23	130	0.9	140	220
5	10	140	300	1.4	330	63

DEPTH(FT)	TRPH	As	Ag	Cr	Co	Li	Hg	Ni
1	<10	97	2.7	21	8.5	24	2	37
3	<10	170	47	750	30	110	1.4	250
5	31	270	<1	290	60	130	0.43	370

DEPTH(FT)	TRPH	As
1	26	12
3	21	11
5	45	64

DEPTH(FT)	TRPH	Cr(VI)
1	32	0.098
3	54	0.23
5	41	2.2

DEPTH(FT)	TRPH	As
1	18	13
3	12	60
5	19	42

DEPTH(FT)	TRPH	As
1	25	21
3	<10	17
5	14	54

DEPTH(FT)	TRPH	Cr	Cu
1	24	100	92
3	22	130	48
5	16	28	17

DEPTH(FT)	TRPH	As	Cr	Cu	Hg
1	27	150	60	170	0.21
3	21	29	97	31	0.57
5	22	97	54	16	0.31

DEPTH(FT)	TRPH	As
1	35	21
3	10	58
5	<10	38

DEPTH(FT)	TRPH	As
1	34	24
3	11	27
5	<10	64

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

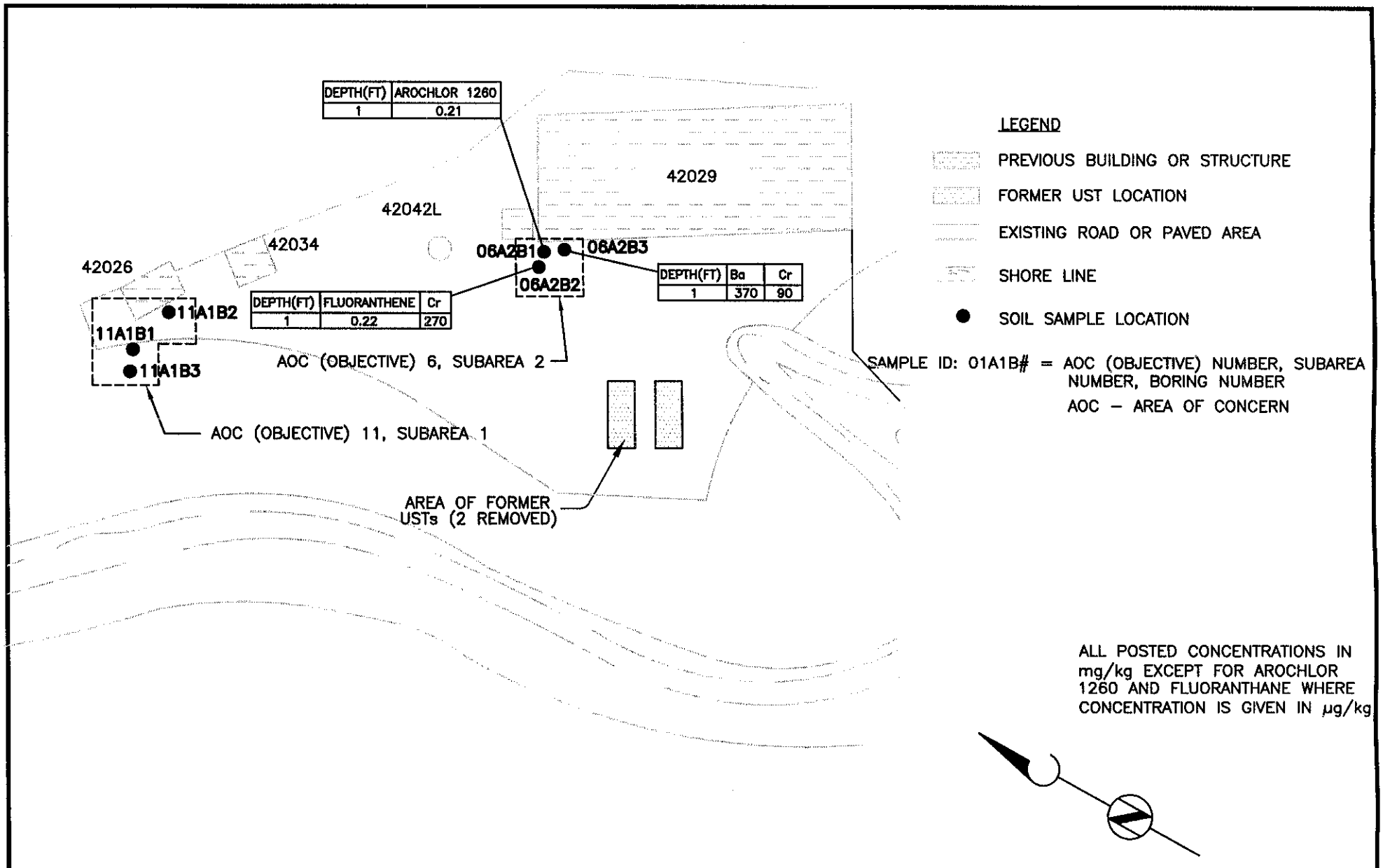
PROJECT NUMBER	DATE
14796	FEB. 2002

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-16

AOC (OBJECTIVE) 6 (SUBAREA 1) SAMPLING LOCATIONS

LAF 14796044.DWG



BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

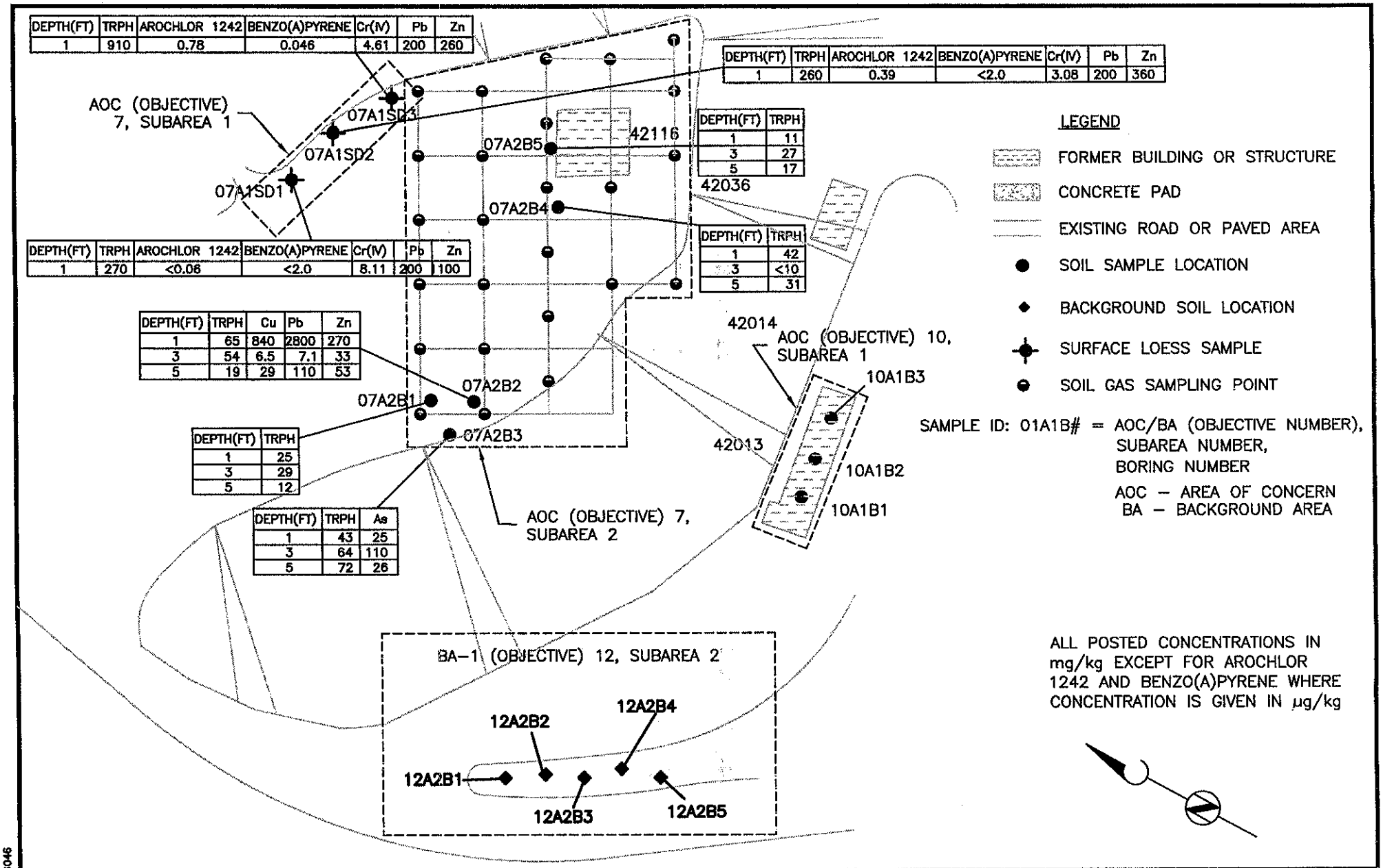
PROJECT NUMBER	DATE
14796	FEB. 2002

PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-17

AOC (OBJECTIVES) 6 (SUBAREA 2) AND 11 (SUBAREA 1) SAMPLING LOCATIONS

LAF 14796045.DWG



DEPTH(FT)	TRPH	AROCHLOR 1242	BENZO(A)PYRENE	Cr(IV)	Pb	Zn
1	910	0.78	0.046	4.61	200	260

DEPTH(FT)	TRPH	AROCHLOR 1242	BENZO(A)PYRENE	Cr(IV)	Pb	Zn
1	260	0.39	<2.0	3.08	200	360

DEPTH(FT)	TRPH
1	11
3	27
5	17

DEPTH(FT)	TRPH	AROCHLOR 1242	BENZO(A)PYRENE	Cr(IV)	Pb	Zn
1	270	<0.06	<2.0	8.11	200	100

DEPTH(FT)	TRPH
1	42
3	<10
5	31

DEPTH(FT)	TRPH	Cu	Pb	Zn
1	65	840	2800	270
3	54	6.5	7.1	33
5	19	29	110	53

DEPTH(FT)	TRPH
1	25
3	29
5	12

DEPTH(FT)	TRPH	As
1	43	25
3	64	110
5	72	26

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

0 40 80
SCALE IN FEET

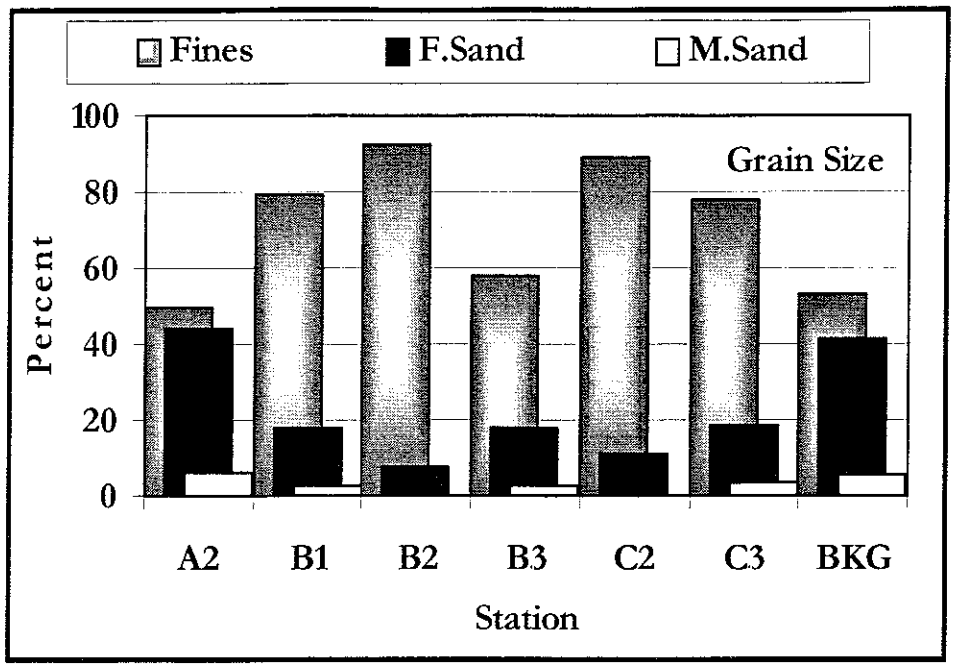
PROJECT NUMBER	DATE
14796	FEB. 2001

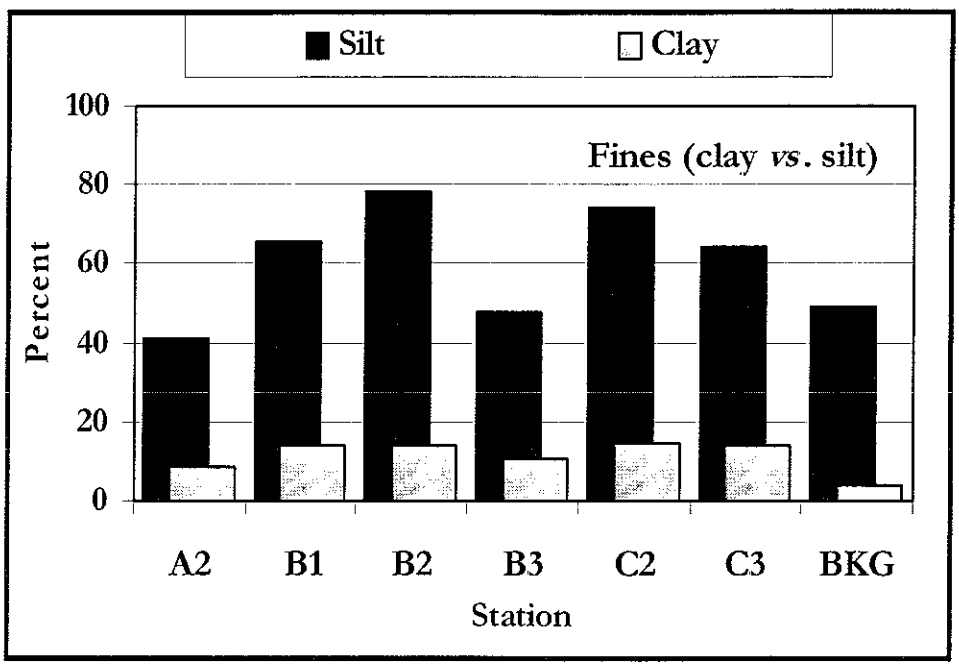
PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

FIGURE 4-18

AOC (OBJECTIVES) 7,10, AND BA 1 (OBJECTIVE 12) SUBAREA 2 SAMPLING LOCATIONS

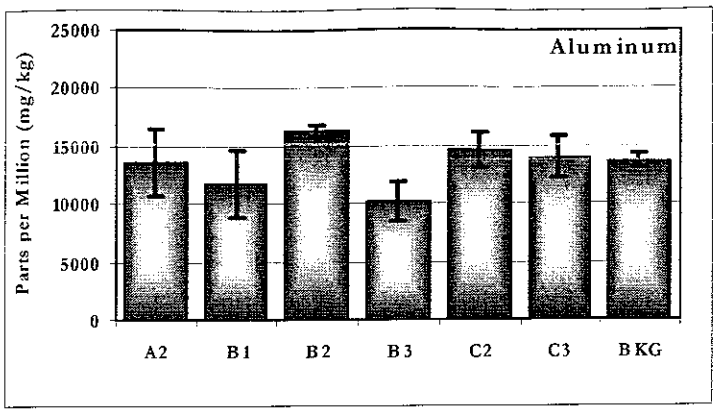
EAS – CAD\14796\14796046

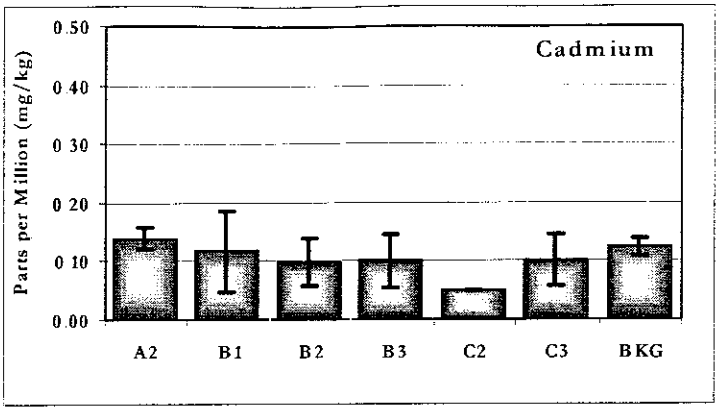


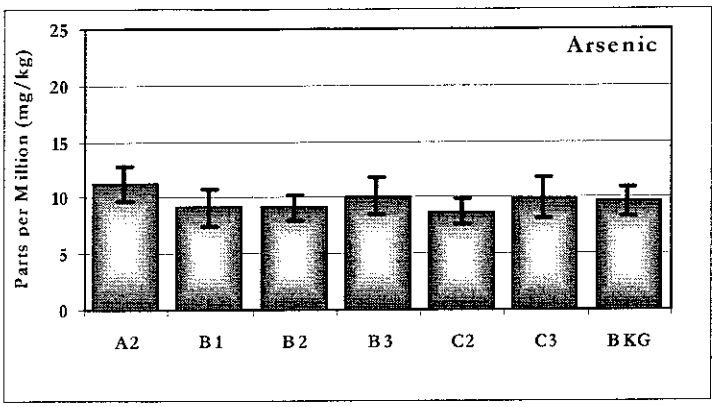


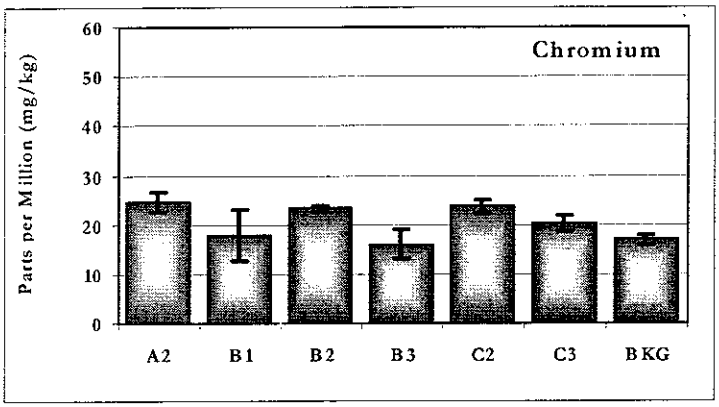
DATE	PROJECT NUMBER	AREA OF CONCERN (OBJECTIVE) 9 SEDIMENT GRAIN SIZE DISTRIBUTION		
FEB. 2002	14796			
BROWN AND CALDWELL SAN DIEGO, CALIFORNIA		PROJECT LOCATION	NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FIGURE 4-19

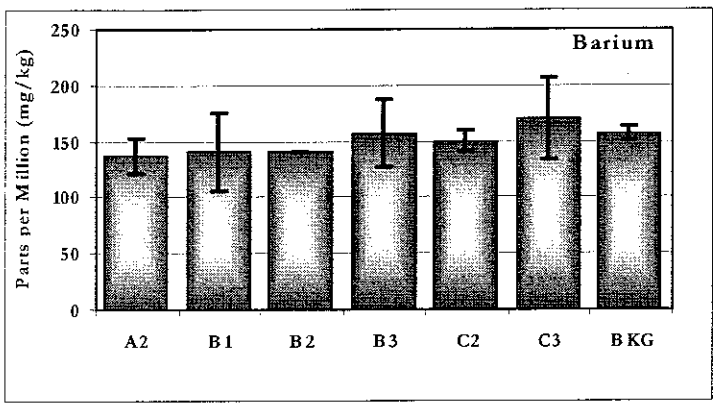
LAF 14796023.DWG

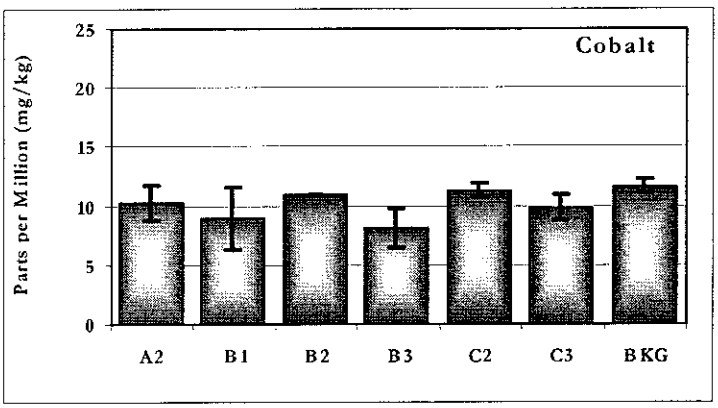


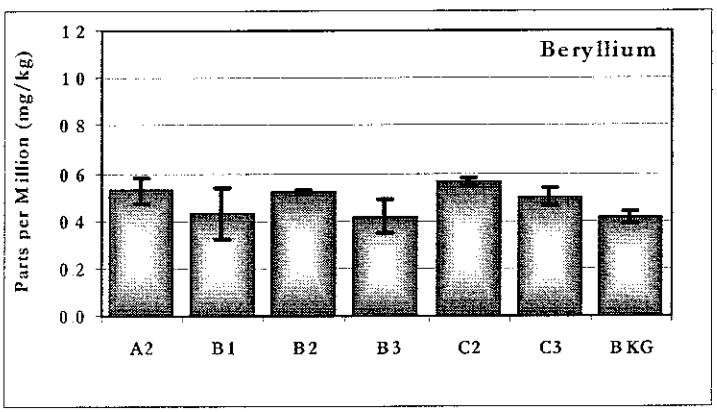


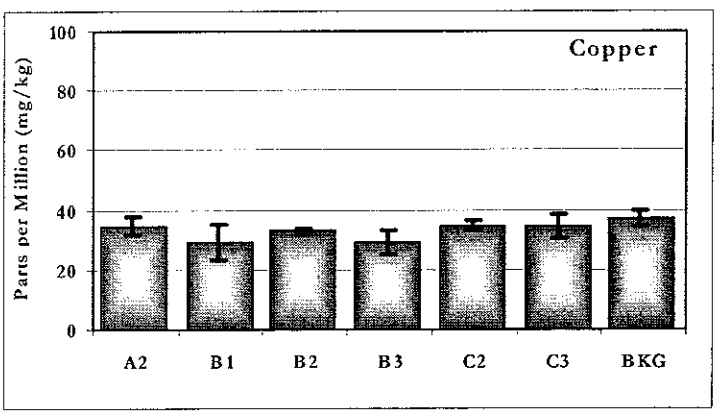












DATE	PROJECT NUMBER
FEB. 2002	14796

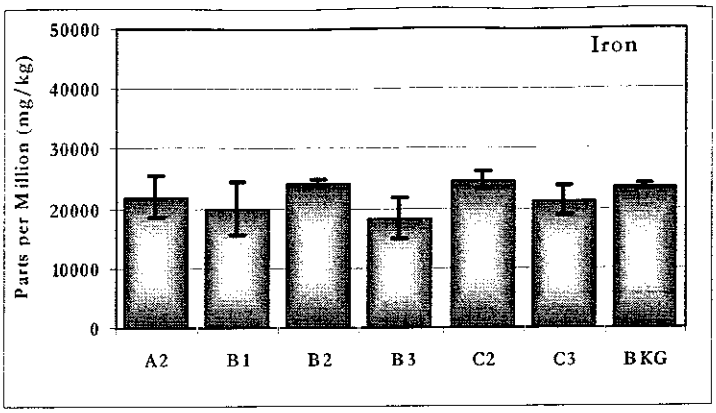
BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

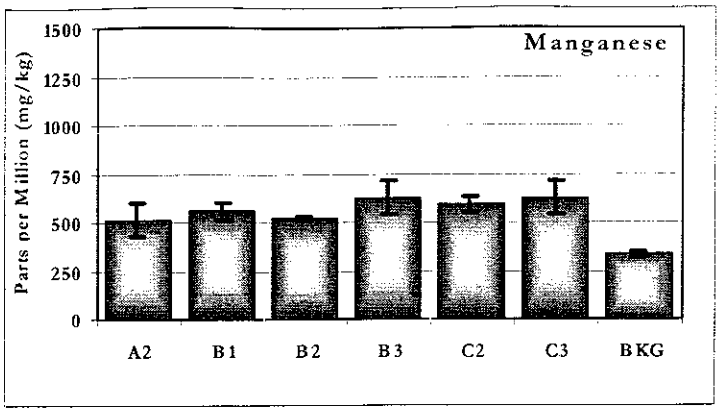
AREA OF CONCERN (OBJECTIVE) 9 - TORPEDO SLURRY OUTFALL SEDIMENT METALS (ALUMINUM THROUGH COPPER)

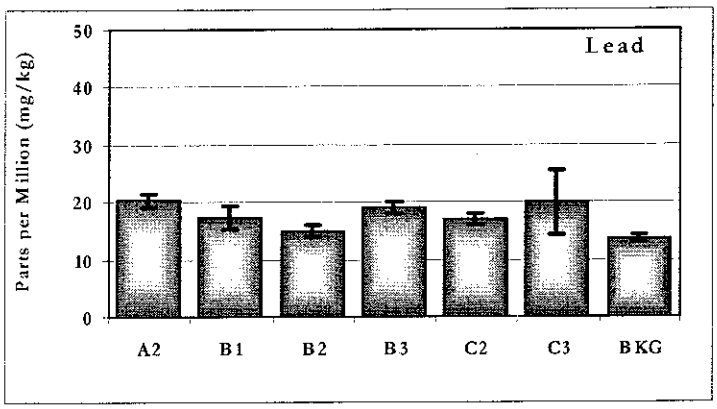
PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA

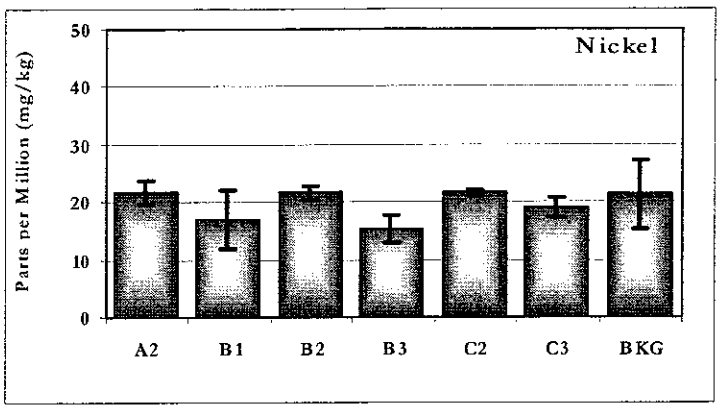
FIGURE **4-20**

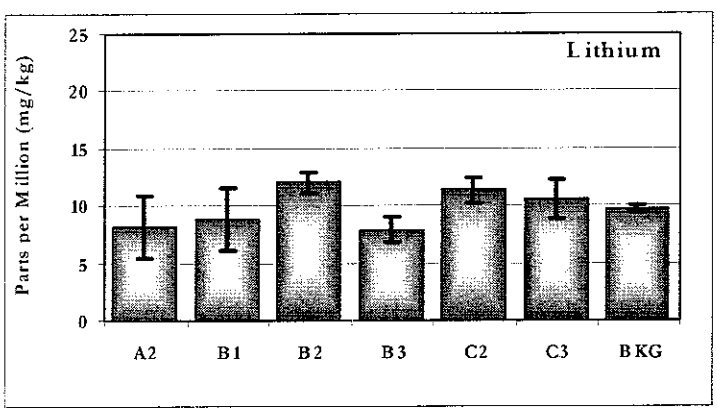
LAF 14796024.DWG

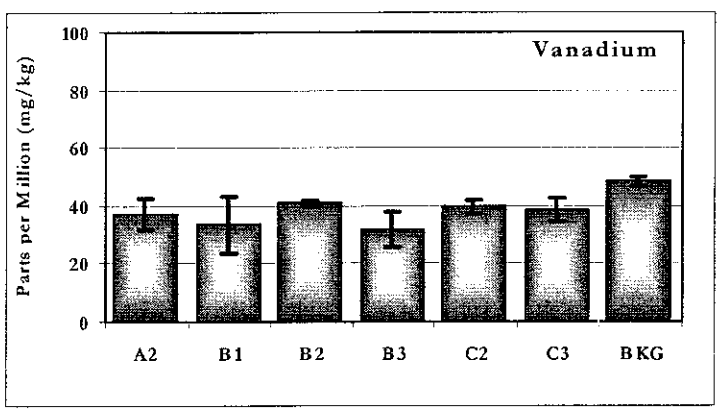


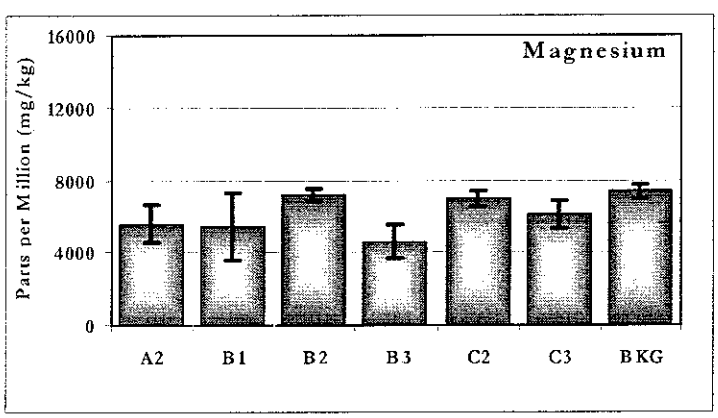


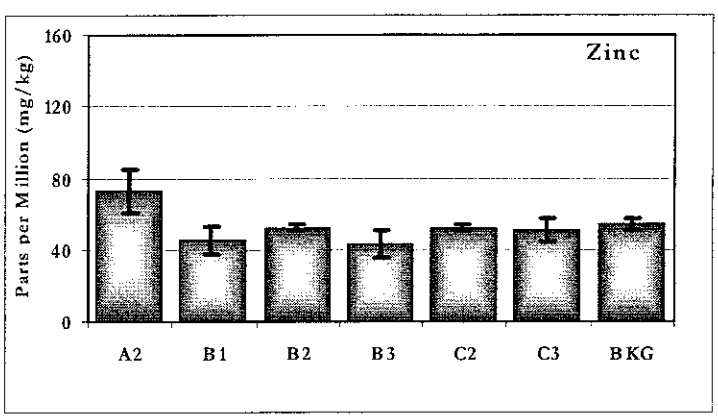








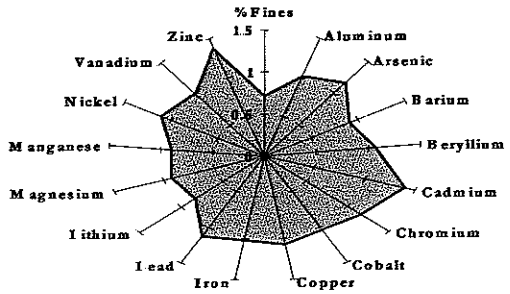




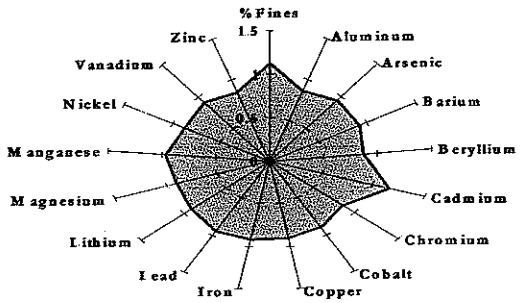
DATE	PROJECT NUMBER	AREA OF CONCERN (OBJECTIVE) 9 SEDIMENT METALS (IRON THROUGH ZINC)	
FEB. 2002	14796		
BROWN AND CALDWELL SAN DIEGO, CALIFORNIA		PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FIGURE 4-21

LAF 14796025.DWG

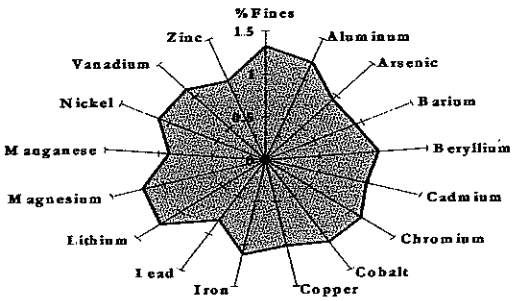
Station A2



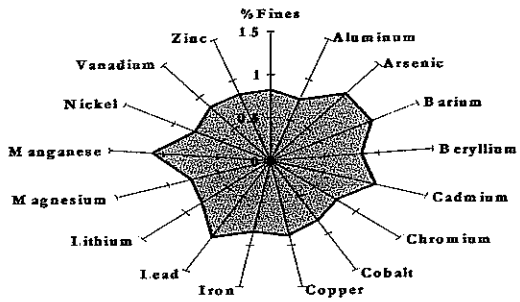
Station B1



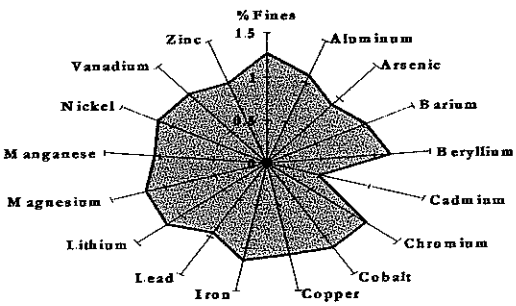
Station B2



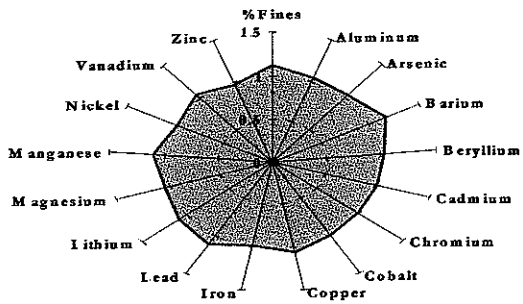
Station B3



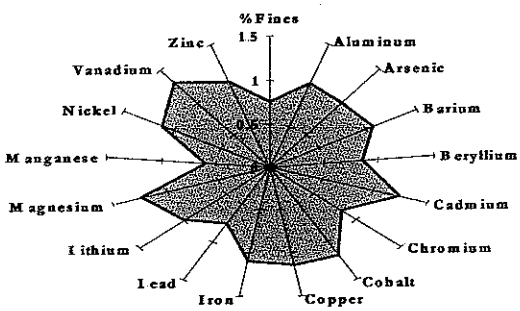
Station C2



Station C3



Station BKG



DATE	PROJECT NUMBER
FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

AREAR OF CONCERN (OBJECTIVE) 9
SEDIMENT METALS RADAR PLOTS

PROJECT LOCATION: NCCOSC MORRIS DAM
R & D FACILITY
AZUSA, CALIFORNIA

FIGURE
4-22

LAF 14796026.DWG

5.0
ECOLOGICAL SCOPING ASSESSMENT AND HUMAN HEALTH SCREENING RISK ASSESSMENT

This section presents the information from an initial ecological scoping assessment and information associated with conducting the human health screening risk assessment at the site. The purpose of the section is two-fold: 1) identify if potential sensitive ecological receptors exist at the site and if complete ecological pathways are present, and 2) evaluating potential exposure pathways for human health risk screening, determining the chemicals of potential background concern, and identifying the risk screening levels, and how they will be used. The section is divided into two subsections described below:

- The Ecological Scoping Assessment includes selection of ecological Chemicals of Potential Concern ($COPC_E$), a Biological Characterization, and an Exposure Pathway Assessment.
- The Human Health Screening Risk Assessment includes selection of the human health Chemicals of Potential Concern ($COPC_H$), an Exposure Pathway Assessment, and comparison of concentrations to Human Health Screening Risk Assessment Levels. A preliminary health risk is also calculated.

5.1 ECOLOGICAL SCOPING ASSESSMENT

The ecological scoping assessment is used to define if further ecological risk screening is required at a particular site. The scoping assessment defines the need for further risk screening by evaluating the chemicals of potential concern, the ecological receptors, and potential ecological pathways at the site. The procedures used during this scoping assessment follow the State of California Department of Toxic Substances Control (DTSC) guidance documents for ecological risk assessment (State of California, 1996a, 1996b)

The Morris Dam Facility is located at Morris Reservoir on the San Gabriel River, Los Angeles County. On a peninsula, the site represents approximately 0.52 hectare (ha) (1.3 acre [ac]) and is bordered by Morris Reservoir to the northeast, east, south, and southwest. State Route 39 and slopes of the San Gabriel Mountains border the site to the west and north (refer to Figure 2-1).

The site is located on a steep slope, often at a greater than a 45 degree angle, bordering Morris Dam. At least 40 percent of the site has been disturbed by construction activities in the past for roads, buildings and other facilities. Much of the disturbed portion is level. A site description including discussions of land use and site history has been presented in Section 2.

5.1.1 Identification of Chemicals of Potential Concern for Ecological Health (COPCE)

Samples of soil, groundwater, sediment, and rock were collected from locations on and near the Morris Dam Facility during the summer of 1997 and summer of 2000. Analytical results from

these samples were evaluated to identify chemicals of potential concern. Historical sediment data were not included in this evaluation because sufficient data quality for these data could not be demonstrated.

The $COPC_E$ selection process is done for the data from each AOC (Objective) separately. All chemicals with at least one positive detection in the validated data are included as a $COPC_E$ with the following exceptions:

1. Essential nutrients, calcium, iron, magnesium, potassium and sodium are not included,
2. All naturally occurring inorganic chemicals with concentrations below the ambient concentration limits (Appendix A) are not included.

The $COPC_E$ for the Morris Dam R& D Facility are presented in Table 5-1, and can be determined from Tables 6-1 through 6-11 as those metals with concentrations above the ambient concentration limit, and any organic chemicals that were detected. These $COPC_E$ are the same chemicals found as $COPC_H$. We assume at this initial step of evaluation, that any positively detected organic chemical, or any metal detected above its ambient concentration threshold represents a $COPC_E$. At this time no ecological risk screening levels have been defined. The intention of the Scoping Assessment included in this SI is just to evaluate if a further risk screening is necessary through review of chemicals present, habitats present, potential ecological receptors present, and potentially complete pathways to those receptors. Should the SI find that further ecological risk screening is warranted, then the Navy, in consultation with regulatory agencies, shall identify relevant and appropriate screening criteria.

5.1.2 Biological Characterization

The biological characterization consists of identifying habitats and potential receptors through field surveys and data base searches through lists maintained by various regulatory agencies (e.g., California Department of Fish and Game).

The biological characterization for the site is determined by its location in the coastal portion of the San Gabriel Mountains in the transverse ranges of southern California and also affected by site elevation (Schoenherr 1992), which ranges from 1150 to 1320 feet. According to observations taken during two site visits, the predominant habitat types of the Morris Dam Facility are Mixed Chaparral (Mayer and Laudenslayer, Jr. 1988) and Mule Fat Scrub (Holland 1986). Although not generally considered a habitat, paved and ruderal areas also represent a substantial portion of the site. Figure 5-1 presents a qualitative distribution of these areas at the site. A summary of habitats and representative species occurring at the site or in the vicinity of the site is presented in Table 5-2. Representative species of these habitats were identified from pertinent literature (Sawyer and Keeler-Wolf 1995, Zeiner et al. 1988, Zeiner et al. 1990a, Zeiner et al. 1990b).

The paved and ruderal areas are the remnants of the developed portions of the site. All structures, except for a water tower and some concrete slabs, have been removed. Paved roadways and other surfaces and structure foundations remain. The paved and ruderal area represents approximately 40 percent of the site or 0.20 ha. Adjacent to many of the paved areas are ruderal areas principally occupied by non-native grasses. The paved and ruderal areas offer little opportunity for forage or cover for animals.

Mixed Chaparral is the predominant habitat type and represents 45 percent of the site (0.23 ha). Mule Fat Scrub habitat occurs along the border of the site adjacent to the reservoir. The Mule Fat Scrub habitat represents 16 percent of the site or 0.09 ha.

Several species of special status could occur or may occur at the site (DFG, 1997). The special status species include those species that are federally or state listed as threatened or endangered, and those species federally or stated listed as of special concern (Table 5-3).

Morris Dam Facility is located within Angeles National Forest and several important wilderness areas are situated within a few miles of the site. San Gabriel Wilderness is located approximately four miles north of the site. Sheep Mountain Wilderness is located approximately eight miles northeast of the site. San Dimas Experimental Forest is located approximately three miles east of the site.

5.1.3 Exposure Pathway Assessment

The exposure pathway assessment evaluates the potential for contact between the biota of the site and the $COPC_E$s. Each exposure route is considered for each potentially affected medium. Exchange of $COPC_E$s from one medium to another is considered while evaluating pathways to the biota.

For ecological risk assessment, the exposure pathway analysis evaluates functional groups of the biota in each habitat rather than all species occurring at the site. Table 5-2 lists the habitats occurring at the site and representative species of those habitats. Functional groups of the species occurring in the terrestrial habitats can be represented by the conceptual site model shown on Figure 5-2.

As shown on Figure 5-2, soil is connected to plants as well as all other components of the model. The solid line from soil to plants indicates a primary connection. The dashed lines from soil to the biota indicate secondary connections (i.e. incidental ingestion of soil with food materials). The lines between biota groups indicate the predator - prey relationships. Chemicals of concern that occur in one medium may transfer through the model according to the connections shown in the model. One of the lines in the model extends from the soil to the lacustrine environment (the reservoir). Figure 5-3 shows the conceptual site model for the lacustrine (aquatic) habitat of the reservoir. Functional groups for the aquatic habitat also are shown in Figure 5-3.

Figure 5-4 identifies the routes by which exposure pathways are potentially complete. Leaks or spills of chemicals would have been released to the primary media (soil or water). Subsequent transport mechanisms provide potential pathways for exchange of constituents between the media. Biota are eventually exposed to chemicals by way of several exposure routes (i.e. uptake, ingestion, dermal contact, inhalation, and prey).

Uptake refers to the transfer of chemicals from soil or water to plants or detritivores. Ingestion refers to the transfer of chemicals to biota, which are consuming the media. Inhalation refers to the transfer of chemicals to biota directly inhaling the media. Prey represents the transfer of chemicals to biota feeding on contaminated food or prey.

Primary producers and detritivores have potential exposure pathways to chemicals through uptake from soil, surface water, and sediment (aquatic species only). Primary consumers have potential exposure pathways through ingestion and dermal contact of soil, surface water, and sediment (aquatic species only). Primary consumers also have a potential exposure pathway through the inhalation of soil particles.

Secondary consumers have potential exposure pathways through ingestion and dermal contact of soil, surface water, and sediment (aquatic species only). Secondary consumers also have a potential exposure pathway through the inhalation of soil particles, and through the consumption of prey.

None of the biota functional groups has a potential exposure pathway to groundwater. However, chemicals occurring in groundwater may transfer to soil or surface water (i.e. reservoir water).

Table 5-4 summarizes the assessment of potentially complete pathways. As shown in the table, many potentially complete pathways exist. Some of the pathways represent a strong potential for contaminant transfer; and the strength of that pathway is classified as primary. Some pathways are potentially present but do not represent strong potential for contaminant transfer; and the strength of those pathways is classified as secondary.

In summary, $COPC_E$s have been identified, receptors exist, and primary complete pathways exist at the site. Given these facts, further ecological risk screening should be considered.

5.2 HUMAN HEALTH SCREENING RISK ASSESSMENT

This human health screening risk assessment was conducted to determine the need for further risk assessment or remediation at the Morris Dam Facility to protect human health. Data from each media were compiled and $COPC_H$ were selected. An exposure pathway analysis was conducted to determine how people could come into contact with the impacted media. Human health screening risk assessment levels were selected, and finally cancer risks and hazard indices were calculated for each AOC (Objective).

5.2.1 Exposure Pathway Assessment

The exposure pathway assessment evaluates the potential for contact between the humans at the site and the $COPC_H$ in each media. There are three possible future uses for the Morris Dam Facility:

- Truck and vehicle maintenance/storage facility
- Home(s) for certain Morris Dam Facility personnel
- Recreational/park

For the protection of human health, the exposure pathways of most concern are defined through a future residential land use scenario. These pathways include direct contact with soil (ingestion, inhalation, and dermal contact), inhalation of vapors, contact with surface water and ingestion of groundwater.

5.2.2 Selection of Chemicals of Potential Concern for Human Health

Samples of soil, groundwater, and sediment collected from locations on and near the Morris Dam Facility during the summer of 1997 were compiled and tabulated. Results of the analyses of these samples were evaluated to identify $COPC_H$ risk screening. Historical sediment data were not included in this evaluation because sufficient data quality for these data could not be demonstrated.

$COPC_H$ are chemicals with concentrations that warrant further consideration but do not necessarily represent a threat to human health. $COPC_H$ were selected from the analytical data for each AOC (Objective) separately. All chemicals with at least one positive detection above the human health screening risk assessment levels in the validated data, were initially included with the following exceptions:

1. Essential nutrients, calcium, iron, magnesium, potassium and sodium were not included,
2. Naturally occurring inorganic chemicals with concentrations below the ambient concentration limits (Appendix A), were not included.

In summary, $COPC_H$ are organic chemicals with at least one positive detection, and those chemicals detected at the site that are not considered naturally occurring. Table 5-1 identifies these $COPC_H$.

5.2.3 Human Health Screening Risk Assessment Levels

The United States Environmental Protection Agency Region IX Preliminary Remediation Goals (PRGs, EPA, 2000) using CAL-EPA toxicity factors where available were selected as the human health risk screening criteria for soil and groundwater. The Residential PRGs for soil address potential health effects from direct contact with soil including ingestion, dermal absorption and

inhalation of soil vapors or particulates. The Tap Water PRGs for groundwater address potential health effects from direct contact with groundwater including ingestion and inhalation (volatile chemicals only). These PRGs were selected because they are protective of the most sensitive receptor (future residents) identified for the site.

The other routes of exposure considered during this evaluation included vapors from chemicals in soil into indoor and outdoor air. The vapor pathways were not included because the majority of chemicals detected were inorganic metals that are not volatile or polychlorinated biphenyls (PCBs) and phthalates that are not very volatile.

Arsenic and hexavalent chromium have ambient concentration limits in soil above their Residential PRGs for soil, resulting in a cancer risk for background above the de minimus risk level of $1x10^{-6}$. These chemicals are shown in Table 5-5.

5.2.4 Calculation of Cancer Risks and Non-Cancer Hazard Indices

Cancer Risks and Non-Cancer Hazard Indices were calculated for $COPC_H$ at each AOC (Objective). Additivity was also considered where more than one $COPC_H$ is present. The California Department of Toxic Substances Control recommends that the maximum concentration of a chemical be divided by its PRG to calculate either a cancer risk or non-cancer hazard index for each chemical. The overall additive impact of these numbers can then be calculated by summing these individual risks together. Cancer risks for each $COPC_H$ can be added to calculate a cancer risk for each AOC, or Subarea, whichever was most appropriate (i.e., for AOCs with Subareas in different parts of the facility, risk was evaluated for each Subarea). Non-cancer risk hazard indices should only be added if the chemicals affect similar target organs, but were added in this SI to provide conservative estimates.

Although the Region IX PRGs only list the most stringent value calculated, cancer and non-cancer PRGs may both be available. It is recommended that both these values be used when conducting a human health screening risk assessment. $COPC_H$ with both cancer and non-cancer PRGs are listed in Table 5-5 for soil and groundwater, respectively.

In accordance with USEPA Risk Assessment Guidance for Superfund, the cancer risks and hazard indices are reported in one significant figure. The calculations are based on the maximum concentration of each chemical in each AOC (Objective) or Subarea within an AOC, if applicable.

Table 5-1. Summary of COPCs in Soil and Groundwater having Non-Cancer and Cancer PRGs

Chemical	Residential Soil PRGs, mg/kg	
	Non-Cancer	Cancer
Acetone	1,600	---
Aroclor 1242	---	0.22
Aroclor 1260	---	0.22
Benzo(a)pyrene	---	0.062
Bis(2-ethylhexyl)phthalate	1,200	35
Dibutylphthalate	6,100	---
Diethylphthalate	49,000	---
Fluoranthene	2,300	---
Methylene Chloride	1,900	8.9
Pyrene	2,300	---
Tetrachloroethene	330	5.7
Tetraethyl Lead	0.0061	---
Aluminum	76,000	---
Antimony	31	---
Arsenic	22	0.39
Barium	5,400	---
Beryllium	150	1,100
Cadmium	37	9
Chromium	---	210
Cobalt	4,700	---
Copper	2,900	---
Hexavalent Chromium	230	0.2
Lead	150	---
Lithium	1,600	---
Manganese	1,800	---
Mercury	23	---
Molybdenum	390	---
Nickel	1,600	150
Selenium	390	---
Silver	390	---
Thallium	5.2	---
Zinc	23,000	---

Chemical	Tap Water PRGs, µg/L	
	Non-Cancer	Cancer
Acetone	610	---
Toluene	720	---
Trichloroethene	37	1.6
Barium	2,600	---
Manganese	880	---
Molybdenum	180	---
Zinc	11,000	---

Table 5-2. Summary of Habitats and Potential Ecological Receptors, Morris Dam Facility

Habitat Type	Area (% of Site)	Proximity to Site[1]	Representative Expected Species		Special Status[2]
Paved and Ruderal	39	A	None		
Mixed Chaparral	45	A	**Flora**		
(Mayer and Laudenslayer Jr 1988)			Chamise	*Adenostoma fasciculatum*	
			California Sagebrush	*Artemisia californica*	
			Toyon	*Heteromeles arbutifolia*	
			Scrub Oak	*Quercus berberidifolia*	
			California Coffeeberry	*Rhamnus californica*	
			Our Lord's Candle Yucca	*Yucca whipplei parishii*	
			Reptiles		
			San Diego Horned Lizard	*Phrynosoma coronatum blainvillei*	FC SC
			Western fence lizard	*Sceloporus occidentalis*	
			Coastal western whiptail	*Cnemidophorus tigris multiscutatus*	FC
			Gopher snake	*Pituophis melanoleucus*	
			Mammals		
			California ground squirrel	*Spermophilus beecheyi*	
			Woodrat	*Neotoma sp.*	
			White-footed mice	*Peromyscus sp.*	
			Coyote	*Canis latrans*	
			Black bear	*Ursus americanus*	
			Mountain lion	*Felis concolor*	
			Striped Skunk	*Mephitis mephitis*	
			Nelson's bighorn sheep	*Orvis canadensis nelsoni*	
			Mule deer	*Odocoileus hemionus*	
			Birds		
			California quail	*Callipepla californica*	
			Red-tailed Hawk	*Buteo jamaicensis*	
			Mourning dove	*Zenaida macroura*	
			Rufous-sided towhee	*Pipilo erythrophthalmus*	
			S. Cal. rufous-crowned sparrow	*Aimophila ruficeps canescens*	
Mule Fat Scrub	16	A	**Flora**		
(Holland 1986)			Mulefat	*Baccharis salicifolia*	
			Sandbar willow	*Salix exigua*	
			Arroyo willow	*Salix lasiolepis*	
			Hoary nettle	*Urtica dioica holosericea*	
			Reptiles		
			San Diego Horned Lizard	*Phrynosoma coronatum blainvillei*	FC SC
			Western fence lizard	*Sceloporus occidentalis*	
			Coastal western whiptail	*Cnemidophorus tigris multiscutatus*	FC
			Gopher snake	*Pituophis melanoleucus*	
			Mammals		
			California ground squirrel	*Spermophilus beecheyi*	
			Woodrat	*Neotoma sp*	
			White-footed mice	*Peromyscus sp*	
			Coyote	*Canis latrans*	
			Black bear	*Ursus americanus*	
			Mountain lion	*Felis concolor*	
			Striped Skunk	*Mephitis mephitis*	
			Nelson's bighorn sheep	*Orvis canadensis nelsoni*	
			Mule deer	*Odocoileus hemionus*	
			Birds		
			California quail	*Callipepla californica*	
			Red-tailed Hawk	*Buteo jamaicensis*	
			Mourning dove	*Zenaida macroura*	
			Rufous-sided towhee	*Pipilo erythrophthalmus*	

Table 5-2. Summary of Habitats and Potential Ecological Receptors, Morris Dam Facility.

Habitat Type	Area (% of Site)	Proximity to Site[1]	Representative Expected Species		Special Status[2]
Southern Coast Live Oak Riparian Forest (Holland 1986)	0	V	**Flora**		
			Big-leaf maple	*Acer macrophyllum*	
			Mugwort	*Artemisia douglasiana*	
			Eucrypta	*Eucrypta chrysanthemifolia*	
			Toyon	*Heteromeles arbutifolia*	
			Honeysuckles	*Lonicera spp.*	
			California blackberry	*Rubus ursinus*	
			California bay	*Umbellularia californica*	
			Amphibians		
			California newt	*Taricha torosa*	
			Reptiles		
			San Diego Horned Lizard	*Phrynosoma coronatum blainvillei*	FC SC
			Western fence lizard	*Sceloporus occidentalis*	
			Coastal western whiptail	*Cnemidophorus tigris multiscutatus*	FC
			Gopher snake	*Pituophis melanoleucus*	
			Mammals		
			California ground squirrel	*Spermophilus beecheyi*	
			Woodrat	*Neotoma sp.*	
			White-footed mice	*Peromyscus sp.*	
			Coyote	*Canis latrans*	
			Black bear	*Ursus americanus*	
			Mountain lion	*Felis concolor*	
			Striped Skunk	*Mephitis mephitis*	
			Mule deer	*Odocoileus hemionus*	
			Birds		
			Red-tailed Hawk	*Buteo jamaicensis*	
			Mourning dove	*Zenaida macroura*	
			Rufous-sided towhee	*Pipilo erythrophthalmus*	
			Least Bell's vireo	*Vireo bellii pusillus*	FE, SE
Southern Sycamore Alder Riparian Woodland (Holland 1986)	0	V	**Flora**		
			White alder	*Alnus rhombifolia*	
			California Sycamore	*Platanus racemosa*	
			Amphibians		
			California newt	*Taricha torosa*	
			Reptiles		
			San Diego Horned Lizard	*Phrynosoma coronatum blainvillei*	FC SC
			Western fence lizard	*Sceloporus occidentalis*	
			Coastal western whiptail	*Cnemidophorus tigris multiscutatus*	FC
			Gopher snake	*Pituophis melanoleucus*	
			Mammals		
			California ground squirrel	*Spermophilus beecheyi*	
			Woodrat	*Neotoma sp.*	
			White-footed mice	*Peromyscus sp.*	
			Coyote	*Canis latrans*	
			Black bear	*Ursus americanus*	
			Mountain lion	*Felis concolor*	
			Striped Skunk	*Mephitis mephitis*	
			Mule deer	*Odocoileus hemionus*	
			Birds		
			Great horned owl	*Bubo virginianus*	
			Red-shouldered hawk	*Buteo lineatus*	
			Red-tailed Hawk	*Buteo jamaicensis*	
			Mourning dove	*Zenaida macroura*	
			Rufous-sided towhee	*Pipilo erythrophthalmus*	
			Least Bell's vireo	*Vireo bellii pusillus*	FE, SE

Table 5-2. Summary of Habitats and Potential Ecological Receptors, Morris Dam Facility.

Habitat Type	Area (% of Site)	Proximity to Site[1]	Representative Expected Species		Special Status[2]
Riversidean Alluvial Fan	0	V	**Flora**		
Sage Scrub			California Sagebrush	*Artemisia californica*	
(Holland 1986)			Red Brome	*Bromus madritensis rubens*	
			California Buckwheat	*Eriogonum fasciculatum*	
			White sage	*Salvia apiana*	
			Black sage	*Salvia mellifera*	
			Our Lord's Candle Yucca	*Yucca whipplei parishii*	
			Reptiles		
			San Diego Horned Lizard	*Phrynosoma coronatum blainvillei*	FC SC
			Western fence lizard	*Sceloporus occidentalis*	
			Coastal western whiptail	*Cnemidophorus tigris multiscutatus*	FC
			Gopher snake	*Pituophis melanoleucus*	
			Mammals		
			California ground squirrel	*Spermophilus beecheyi*	
			Woodrat	*Neotoma sp*	
			White-footed mice	*Peromyscus sp*	
			Coyote	*Canis latrans*	
			Black bear	*Ursus americanus*	
			Mountain lion	*Felis concolor*	
			Striped Skunk	*Mephitis mephitis*	
			Nelson's bighorn sheep	*Orvis canadensis nelsoni*	
			Mule deer	*Odocoileus hemionus*	
			Birds		
			California quail	*Callipepla californica*	
			Red-tailed Hawk	*Buteo jamaicensis*	
			Mourning dove	*Zenaida macroura*	
			Rufous-sided towhee	*Pipilo erythrophthalmus*	
Southern California	0	V	**Fish**		
Arroyo Chub/Santa Ana Sucker Stream			Santa Ana Sucker	*Catostomus santaanae*	FC SC
(Moyle and Ellison 1991)			Santa Ana Speckled Dace	*Rhinichthys osculus*	FC, SC
			Arroyo chub	*Gila orcutti*	SC
			Amphibians		
			California newt	*Taricha torosa*	
			Reptiles		
			Southwestern pond turtle	*Clemmys marmorata pallida*	FC SC
			Birds		
			Great Blue Heron	*Ardea herodias*	
Lacustrine	0	A	**Fish**		
(Mayer and Laudenslayer Jr 1988)			Santa Ana Sucker	*Catostomus santaanae* (native)	FC, SC
			Arroyo chub	*Gila orcuti (native)*	SC
			Santa Ana Speckled Dace	*Rhinichthys osculus (native)*	FC SC
			Channel catfish	*Ictalurus punctatus*	
			Bluegill	*Lepomis macrochirus*	
			Redear perch	*Lepomis microlophus*	
			Smallmouth bass	*Micropterus dolomieu*	
			Largemouth bass	*Micropterus salmoides*	
			Crappie	*Pomoxis spp*	
			Rainbow trout	*Salmo gairdneri*	
			Birds		
			Great Blue Heron	*Ardea herodias*	
			Osprey	*Pandion haliaetus*	

1 - A - Adjacent to site
V - Vicinity of site (potentially occurring within 1 mile radius)

2 - FC - Federal: Species of Concern
FE - Federal: Endangered Species
SC - State of California: Species of Concern
SE - State of California: Endangered Species

Table 5-3. Special Status Species

Common Name	Scientific Name	Status
Animal Species		
Least Bell's vireo	*Vireo bellii pusillus*	Federal and state endangered
Santa Ana sucker	*Catostomus santaanae*	Federal & state species of concern
Nelson's bighorn sheep	*Ovis canadensis nelsoni*	
Southwestern pond turtle	*Clemmys marmorata pallida*	Federal & state species of concern
San Diego horned lizard	*Phrynosoma coronatum blainvillei*	Federal & state species of concern
Plant Species		
Pious daisy	*Erigeron breweri var bisanctus*	
Rayless ragwort	*Scenecio aphanactis*	
Robinson's pepper-grass	*Lepidium virginicum var robinsonii*	
San Gabriel River dudleya	*Dudleya cymosa ssp crebrifolia*	Federal species of concern
San Gabriel Mountain dudleya	*Dudleya densiflora*	Federal candidate
Many-stemmed dudleya	*Dudleya multicaulis*	Federal species of concern
Braunton's milk-vetch	*Astragalus brauntonii*	Federal proposed endangered
San Gabriel bedstraw	*Galium grande*	Federal species of concern
Thread-leaved brodiaea	*Brodiaea filifolia*	Federal proposed threatened
Slender mariposa lily	*Calochortus clavatus var gracilis*	Federal species of concern
Plummer's mariposa lily	*Calochortus plummerae*	Federal species of concern
Downy wood fern	*Thelypteris puberula var sonorensis*	
Big Bear valley woollypod	*Astragalus leucolobus*	Federal species of concern
Parish's gooseberry	*Ribes divaricatum var parishii*	Federal species of concern
Orcutt's linanthus	*Linanthus orcuttii*	Federal species of concern

Source: California Department of Fish and Game 1997

Table 5-4. Assessment of Potentially Complete Pathways, Morris Dam Facility

Potential Receptor Group	Potential Contaminant Group	Medium	Exposure Path	Pathway Complete	Strength of Pathway
	Habitat Type: Mixed Chaparral or Mule Fat Scrub				
Plants (Primary producers)	Metals, PCBs, PAHs, Phthalates	soil	uptake	yes	Primary
	Metals, PAHs, VOCs	groundwater	uptake	no	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	uptake	yes	Secondary
Detritivores	Metals, PCBs, PAHs, Phthalates	soil	uptake	yes	Primary
	Metals, PAHs, VOCs	groundwater	uptake	no	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	uptake	yes	Secondary
Small mammals (Primary consumers omnivores)	Metals, PCBs, PAHs, Phthalates	soil	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	soil	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates	soil	inhalation	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	VOCs	groundwater	ingestion	no	
	PAHs, Phthalates	surface water	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	ingestion	yes	Secondary
Small birds (Primary consumers omnivores)	Metals, PCBs, PAHs, Phthalates	soil	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	soil	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates	soil	inhalation	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PAHs, VOCs	groundwater	ingestion	no	
	Metals, PCBs, PAHs, Phthalates	surface water	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	ingestion	yes	Secondary
Large mammals (Secondary consumers predators)	Metals, PCBs, PAHs, Phthalates	soil	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	soil	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates	soil	inhalation	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PAHs, VOCs	groundwater	ingestion	no	
	Metals, PCBs, PAHs, Phthalates	surface water	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	ingestion	yes	Secondary
Large birds (Secondary consumers predators)	Metals, PCBs, PAHs, Phthalates	soil	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	soil	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates	soil	inhalation	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PAHs, VOCs	groundwater	ingestion	no	
	Metals, PCBs, PAHs, Phthalates	surface water	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates	surface water	ingestion	yes	Secondary

Table 5-4. Assessment of Potentially Complete Pathways, Morris Dam Facility

Potential Receptor Group	Potential Contaminant Group	Medium	Exposure Path	Pathway Complete	Strength of Pathway
	Habitat Type: Lacustrine				
Aquatic plants (Primary producers)	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	uptake	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	uptake	yes	Primary
Detritivores	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	uptake	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	uptake	yes	Primary
Herbivores (Primary consumers)	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	dermal contact	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	ingestion	yes	Secondary
Fish (Secondary consumers, omnivores)	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	ingestion	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	dermal contact	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	ingestion	yes	Secondary
Large birds (Secondary consumers predators)	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	sediment	ingestion	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	prey	ingestion	yes	Primary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	dermal contact	yes	Secondary
	Metals, PCBs, PAHs, Phthalates, VOCs	surface water	ingestion	yes	Primary

Table 5-5. Metals with Background Concentrations Above Screening Criteria.

Chemical	Statistic Representative of Natural Background (mg/kg)	USEPA Region IX Residential PRG (mg/kg)	Cancer Risk Level
Arsenic	32	0.39	$8x10^{-5}$
Chromium VI	0.74	0.2	$4x10^{-6}$
Background Cancer Risk Level			**$9x10^{-5}$**

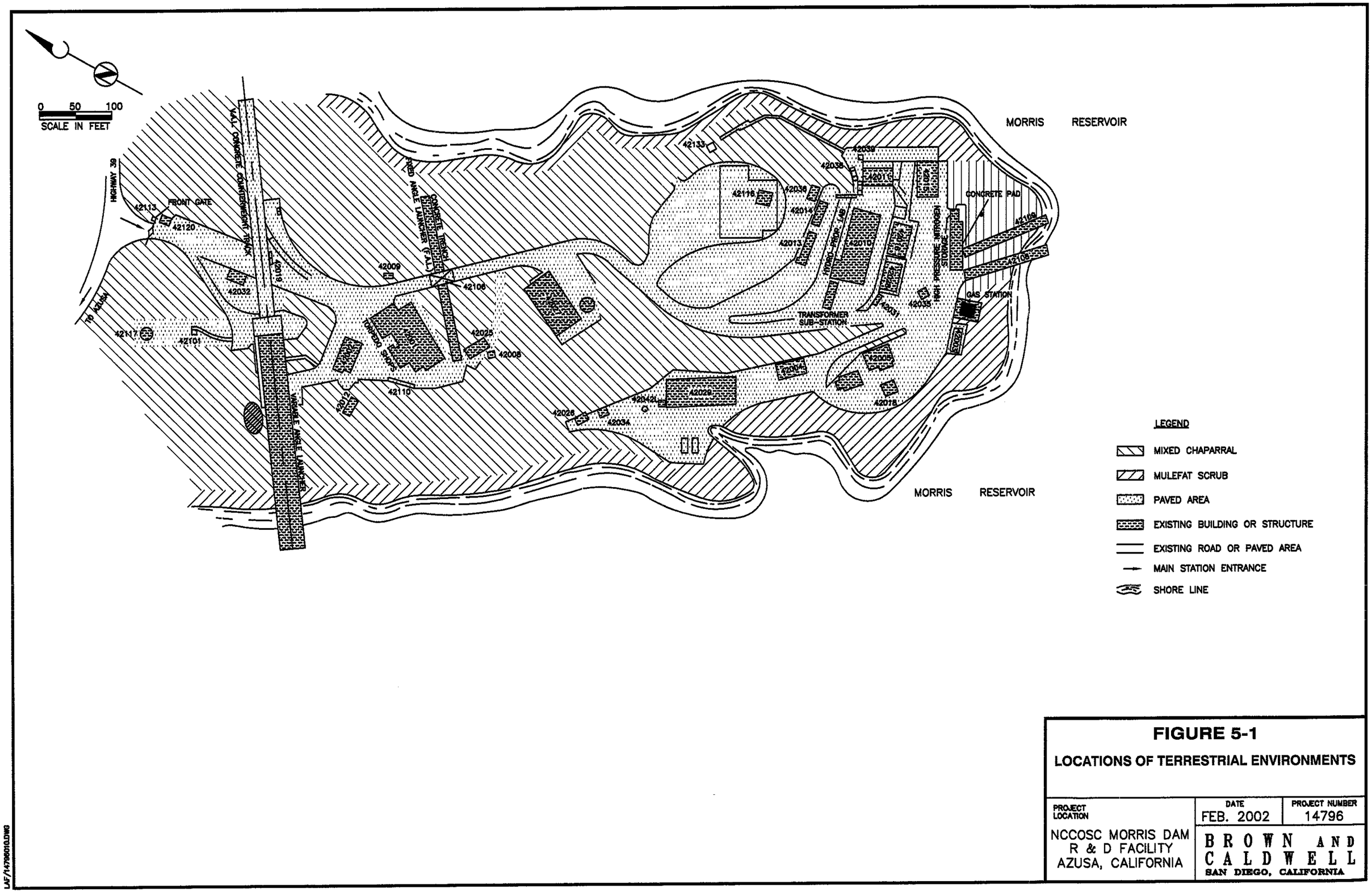


FIGURE 5-1

LOCATIONS OF TERRESTRIAL ENVIRONMENTS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796
	BROWN AND CALDWELL SAN DIEGO, CALIFORNIA	

LAF/14796010.DWG

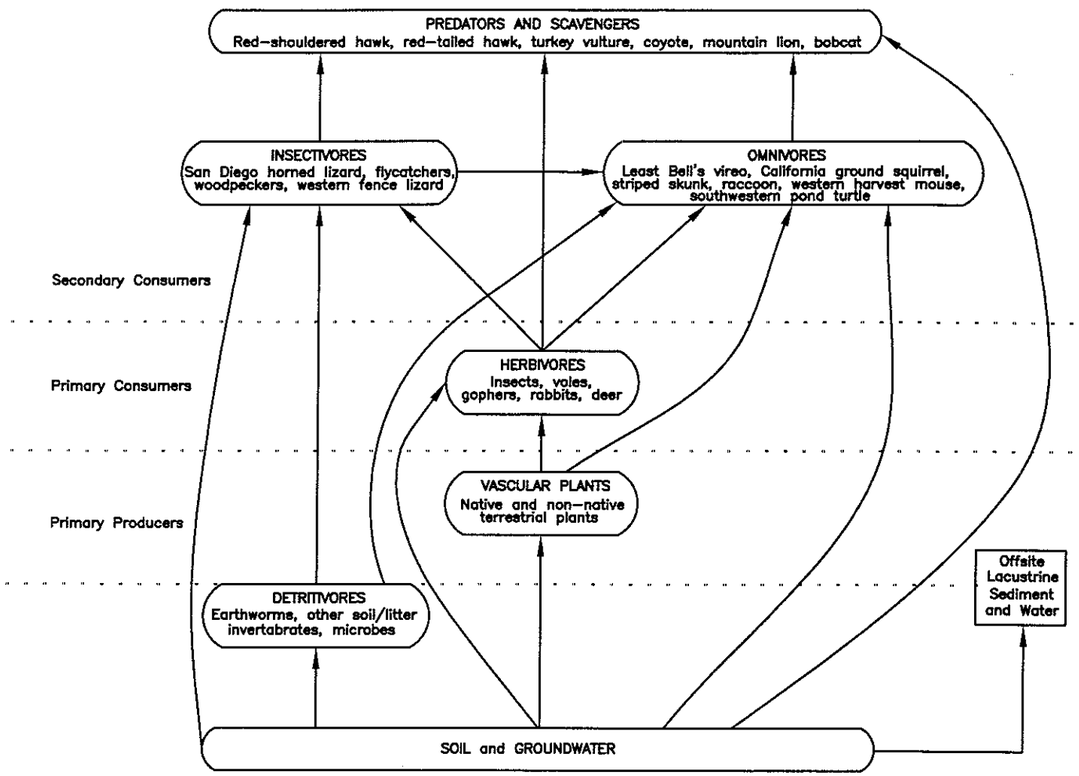


FIGURE 5-2

CONCEPTUAL SITE MODEL
TERRESTRIAL SETTING

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796016.DWG

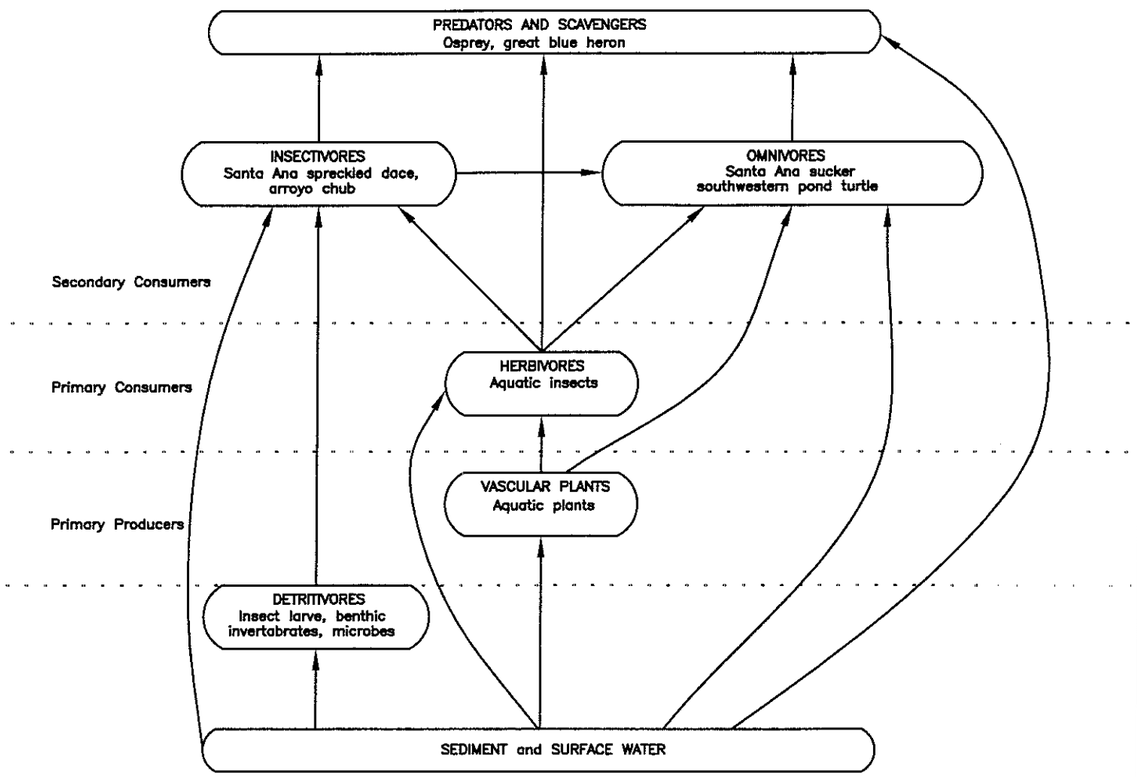


FIGURE 5-3

CONCEPTUAL SITE MODEL
AQUATIC SETTING

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796018.DWG

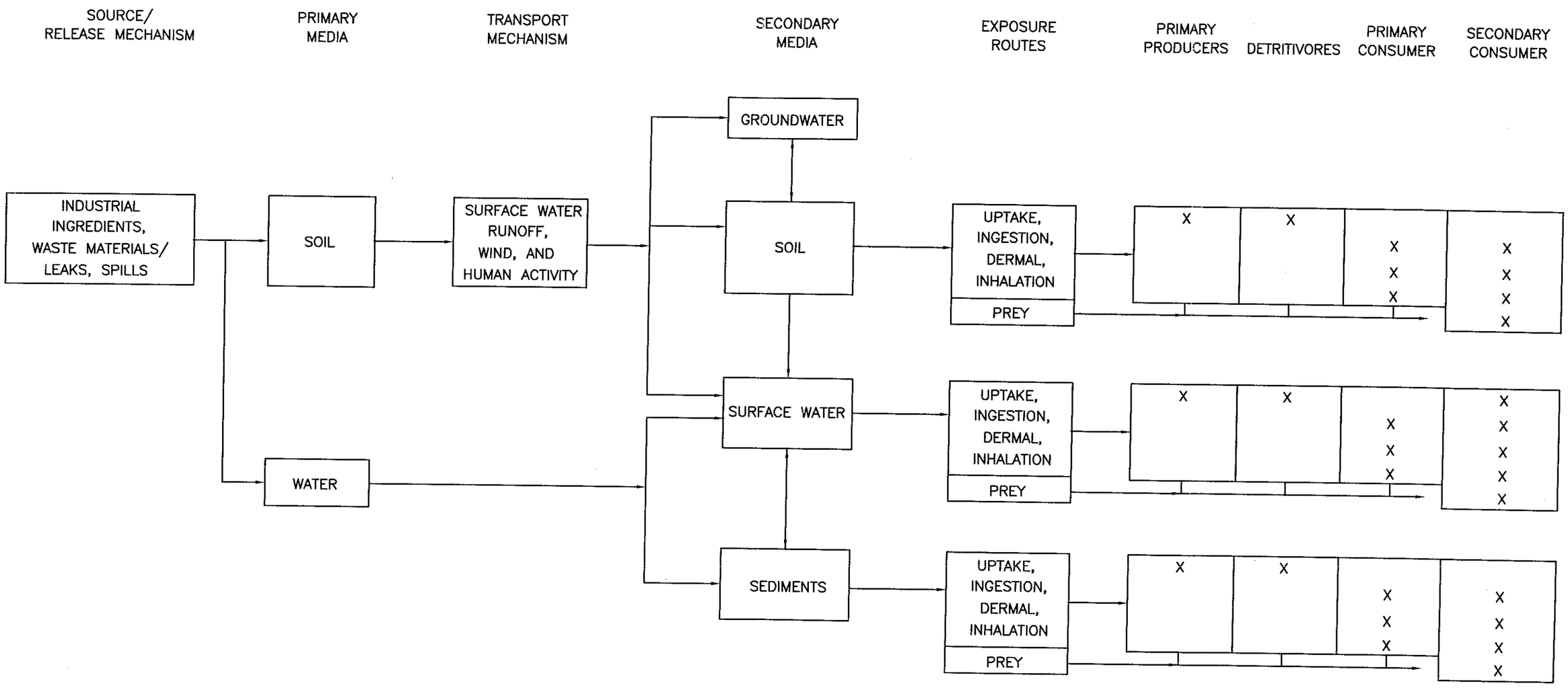


FIGURE 5-4

ANALYSIS OF POTENTIAL EXPOSURE PATHWAYS

PROJECT LOCATION	DATE	PROJECT NUMBER
NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FEB. 2002	14796

BROWN AND CALDWELL
SAN DIEGO, CALIFORNIA

LAF 14796017.DWG

6.0
AREA OF CONCERN (OBJECTIVE)-SPECIFIC HUMAN HEALTH SCREENING RISK ASSESSMENT

In this section COPCs for human health ($COPC_H$) are identified and compared to human health screening risk assessment levels and preliminary health risk estimates are calculated. Comparisons and calculations are done on an AOC-by-AOC (or Subarea by Subarea) basis, with AOCs (or Subareas) being the investigative-focus regions as defined in Section 4. Tables 6-1 through 6-11 contain AOC (Objective) by AOC (Objective) risk screening summaries. Table 6-12 contains risk screening calculations for each AOC (Objective).

As mentioned in Section 5.0, no ecological risk screening is presented because no values had been developed for the $COPC_E$. Once it has been determined that ecological risk screening needs to occur, and relevant and appropriate risk screening values have been developed by the Navy in consultation with the regulatory agencies, then a comprehensive ecological risk screening will be performed.

6.1 AREA OF CONCERN (OBJECTIVE) 1: GASOLINE STORAGE AREA

Table 6-1 contains a summary of the chemicals identified for AOC (Objective) 1. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Copper and mercury were identified as $COPC_H$ for human health. The maximum concentration of each of these chemicals (62 mg/kg and 0.14 mg/kg) exceeded their respective ambient concentration limits (55 mg/kg and 0.10 mg/kg). AOC (Objective) 1 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a hazard index of 0.02 for Subarea 1 and a hazard index of 0.03 for Subarea 2, two orders of magnitude below the level of concern (1.0). Neither copper or mercury have toxicity factors for carcinogenic effects.

6.2 AREA OF CONCERN (OBJECTIVE) 2: OIL/WATER SEPARATORS

Table 6-2 contains a summary of the chemicals identified for AOC (Objective) 2. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Tetraethyl lead, arsenic, chromium, hexavalent chromium, cobalt, copper and nickel were identified as $COPC_H$ for human health. The maximum concentration of the six metals (79 mg/kg, 150 mg/kg, 0.95 mg/kg, 100 mg/kg, 140mg/kg, 390 mg/kg) exceeded their respective ambient concentration limits (32 mg/kg, 46 mg/kg, 0.74 mg/kg, 23 mg/kg, 55 mg/kg, 63 mg/kg). AOC (Objective) 2 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a cancer risk of $5x10^{-5}$ and a hazard index of

165 for Subarea 1 and a cancer risk of $2x10^{-4}$ and a hazard index of 168 for Subarea 2. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic and tetraethyl lead, respectively.

The concentrations detected for hexavalent chromium may not represent soil impacted by anthropogenic activities as the maximum concentration of 0.95 mg/kg is close to the ambient concentration limit of 0.74 mg/kg. The maximum concentration of hexavalent chromium detected in the ambient soil from Background Area 1 (Objective 12) was 0.94 mg/kg. Hence, it is possible that additional statistical analysis would show that these concentrations are not different.

6.3 AREA OF CONCERN (OBJECTIVE) 3: OUTFALL DISCHARGE AREAS

Table 6-3 contains a summary of the chemicals identified for AOC (Objective) 3. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Dibutylphthalate, fluoranthene, pyrene, cadmium, copper, lead, lithium, mercury and zinc were identified as $COPC_H$ for human health. The maximum concentration of the six metals (0.92 mg/kg, 420 mg/kg, 110 mg/kg, 40mg/kg, 1.4 mg/kg, 340 mg/kg) exceeded their respective ambient concentration limits (0.41 mg/kg, 55 mg/kg, 64 mg/kg, 22 mg/kg, 0.1 mg/kg, 125 mg/kg). AOC (Objective) 3 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a cancer risk of $1x10^{-7}$ and a hazard index of 0.3 for Subarea 1 and a hazard index of 0.06 for Subarea 2. Cadmium, the only chemical with toxicity factors for carcinogenic effects identified in AOC (Objective) 3, was not identified in Subarea 2.

The health risk associated with lead is non-cancerous but the model is based on levels in the blood. Therefore, calculation of a hazard index is not appropriate. The maximum concentration of lead in both Subarea 1 (110 mg/kg) and Subarea 2 (15 mg/kg) is below the Residential PRG of 150 mg/kg.

6.4 AREA OF CONCERN (OBJECTIVE) 4: PROPULSION SYSTEM TESTING AREA

Table 6-4 contains a summary of the chemicals identified for AOC (Objective) 4. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Tetraethyl lead, antimony, arsenic, barium, cadmium, chromium, hexavalent chromium, cobalt, copper, lithium, mercury, molybdenum, nickel, silver, thallium, and zinc were identified as $COPC_H$ for human health. The maximum concentration of the 15 metals (30 mg/kg, 84 mg/kg, 450 mg/kg, 0.74 mg/kg, 440 mg/kg, 1.19 mg/kg, 100 mg/kg, 64 mg/kg, 250 mg/kg, 7.6 mg/kg, 20 mg/kg, 930 mg/kg, 270 mg/kg, 0.38 mg/kg, 140 mg/kg) exceeded their respective ambient

concentration limits (10 mg/kg, 32 mg/kg, 263 mg/kg, 0.41 mg/kg, 46 mg/kg, 0.74 mg/kg, 23 mg/kg, 55 mg/kg, 22 mg/kg, 0.10 mg/kg, 3.2 mg/kg, 63 mg/kg, 1.0 mg/kg, 0.30 mg/kg, 125 mg/kg). AOC (Objective) 4 is comprised of five subareas: Subarea 1, Subarea 2, Subarea 3, Subarea 4 and Subarea 5. The maximum chemical concentrations in each subarea result in a cancer risk of $2x10^{-7}$ and a hazard index of 0.05 for Subarea 1, a cancer risk of $3x10^{-5}$ and a hazard index of 1051 for Subarea 2, a cancer risk of $5x10^{-5}$ and a hazard index of 2 for Subarea 3, a cancer risk of $3x10^{-5}$ and a hazard index of 0.6 for Subarea 4, and a cancer risk of $2x10^{-4}$ and a hazard index of 5 for Subarea 5. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic and tetraethyl lead, respectively.

Appendix A shows that occasional findings of elevated levels of chromium and nickel do occur in the ambient soils and rock.

6.5 AREA OF CONCERN (OBJECTIVE) 5: SEWER SEPTIC TANK AND LEACH FIELD LINES

Table 6-5 contains a summary of the chemicals identified for AOC (Objective) 5. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Antimony, arsenic, mercury, selenium, and thallium were identified as $COPC_H$ for human health. The maximum concentration of the five metals (30 mg/kg, 130 mg/kg, 0.20 mg/kg, 35 mg/kg, 0.3 mg/kg) exceeded their respective ambient concentration limits (10 mg/kg, 32 mg/kg, 0.10 mg/kg, 33 mg/kg, 0.3 mg/kg). AOC (Objective) 5 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a cancer risk of $3x10^{-4}$ and a hazard index of 6 for Subarea 1 and a cancer risk of $1x10^{-4}$ and a hazard index of 3 for Subarea 2. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic.

6.6 AREA OF CONCERN (OBJECTIVE) 6: SURFACE SUMPS AND COLLECTION LINE SYSTEM

Table 6-6 contains a summary of the chemicals identified for AOC (Objective) 6. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Bis(2-ethylhexyl)phthalate, diethylphthalate, fluoranthene, Aroclor 1260, aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, lithium, manganese, mercury, nickel, selenium, silver, thallium and zinc were identified as $COPC_H$ for human health. The maximum concentration of the 18 metals (43,000 mg/kg, 21 mg/kg, 270 mg/kg, 370 mg/kg, 1.5 mg/kg, 0.51 mg/kg, 750 mg/kg, 2.2 mg/kg, 60 mg/kg, 170 mg/kg, 130 mg/kg, 1,300 mg/kg, 2.0 mg/kg, 370 mg/kg, 57 mg/kg, 47 mg/kg, 0.44 mg/kg, 280 mg/kg) exceeded their respective ambient concentration limits (22,729 mg/kg, 10 mg/kg, 32 mg/kg, 263 mg/kg, 1.3 mg/kg, 0.41 mg/kg, 46 mg/kg, 0.74 mg/kg, 23 mg/kg, 55 mg/kg, 22 mg/kg, 1,172

mg/kg, 0.10 mg/kg, 63 mg/kg, 33 mg/kg, 1.0 mg/kg, 0.30 mg/kg, 125 mg/kg). AOC (Objective) 6 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a cancer risk of $7x10^{-4}$ and a hazard index of 14 for Subarea 1 and a cancer risk of $3x10^{-5}$ and a hazard index of 1 for Subarea 2. Greater than ninety-nine percent of these cancer risks are due to arsenic. Eighty-six percent of the hazard index for Subarea 1 and fifty percent of the hazard index for Subarea 2 is due to arsenic.

Appendix A shows that occasional findings of elevated levels of chromium and nickel do occur in the ambient soils and rock.

6.7 AREA OF CONCERN (OBJECTIVE) 7: TEMPORARY DRUM STAGING AREA

Table 6-7 contains a summary of the chemicals identified for AOC (Objective) 7. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Benzo(a)pyrene, Aroclor 1242, antimony, arsenic, cadmium, hexavalent chromium, copper, lead, mercury, molybdenum, selenium, thallium, and zinc were identified as $COPC_H$ for human health. The maximum concentration of the 11 metals (36 mg/kg, 110 mg/kg, 2.9 mg/kg, 8.11 mg/kg, 840 mg/kg, 2,800 mg/kg, 0.17 mg/kg, 2.8 mg/kg, 40 mg/kg, 0.42 mg/kg, 1,100 mg/kg) exceeded their respective ambient concentration limits (10 mg/kg, 32 mg/kg, 0.41 mg/kg, 0.74 mg/kg, 55 mg/kg, 64 mg/kg, 0.10 mg/kg, 3.2 mg/kg, 33 mg/kg, 0.30 mg/kg, 125 mg/kg). AOC (Objective) 7 is comprised of two subareas: Subarea 1 and Subarea 2. The maximum chemical concentrations in each subarea result in a cancer risk of $7x10^{-5}$ and a hazard index of 0.6 for Subarea 1 and a cancer risk of $3x10^{-4}$ and a hazard index of 7 for Subarea 2. Greater than ninety-nine percent of the cancer risk for Subarea 1 is due to arsenic and chromium and greater than ninety-nine percent of the cancer risk for Subarea 2 is due to arsenic. Seventy-one percent of the hazard index for Subarea 2 is due to arsenic.

The health risk associated with lead is non-cancerous but the model is based on levels in the blood. Therefore, calculation of a hazard index is not appropriate. The maximum concentration of lead in Subarea 1 (200 mg/kg) is slightly above the Residential PRG of 150 mg/kg. The maximum concentration of lead in Subarea 2 is 2,800 mg/kg or 20 times the Residential PRG of 150 mg/kg.

6.8 AREA OF CONCERN (OBJECTIVE) 8: GROUNDWATER INVESTIGATION

Table 6-8 contains a summary of the chemicals identified for AOC (Objective) 8. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

Acetone, toluene, trichloroethene, barium, manganese, molybdenum, and zinc were identified as $COPC_H$ for human health. The maximum chemical concentrations result in a cancer risk of $2x10^{-6}$ and a hazard index of 0.7. One hundred percent of the cancer risk is due to

trichloroethene. However, there is no completed exposure pathway at this AOC (Objective) to this chemical in groundwater.

6.9 AREA OF CONCERN (OBJECTIVE) 9: SLURRY OUTFALL PIPE SEDIMENTS

Table 6-9 contains a summary of the chemicals identified for AOC (Objective) 9. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

No human health risk is interpreted, because no complete pathways exist for human exposure to sediments. To allow a preliminary assessment of potential human health risks, the concentrations were compared to Residential PRGs. No chemicals were identified at concentrations above their respective ambient concentration limits or the PRGs.

6.10 AREAS OF CONCERN (OBJECTIVES) 10 AND 11: ELECTRONIC TESTING AND PROPELLANT MAGAZINE AREAS

Tables 6-10 and 6-11 contain a summary of the chemicals identified for AOCs (Objectives) 10 and 11, respectively. Table 6-12 contains the specific risk screening calculation results. These tables provide a basis for the risk screening discussion below.

As seen in Tables 6-10 and 6-11, no $COPC_H$ were identified. Therefore no risk to human receptors is interpreted for these AOCs (Objectives).

6.11 SUMMARY OF FINDINGS

The Ecological Scoping Assessment conducted for the Morris Dam R & D facility identified that $COPC_ES$, demonstrated that ecological receptors exist, and that primary complete pathways exist at the site. Given these facts, further ecological risk screening should be considered.

Potential risk to human health calculated at AOCs (Objectives) 1, 3, 9, 10, and 11 was below the target incremental cancer risk of $1x10^{-6}$.

AOCs (Objectives) 2 (Subarea 2), 4 (Subarea 5), 5 (Subareas 1 and 2), 6 (Subarea 1), and 7 (Subarea 2), had cancer risk levels greater than 1×10^{-6}. This cancer risk was primarily due to arsenic, which has not been identified as a naturally occurring metal. Other constituents contributing smaller percentages to the risk at these AOCs (Objectives) include chromium, chromium (VI), and nickel; not all of these constituents were detected at each AOC (Objective) (See Table 6-12). Chromium and nickel contribute much of the additional risk, but have been found to exist at rather high concentrations naturally in areas surround the facility. As discussed previously, chromium (VI) is not thought to have been release at this facility, and tends to not persist under typical environmental conditions such as those found at the Morris Dam R & D facility, and hence these detections may represent false positives in laboratory data. In addition, AOCs (Objectives) 2 (Subarea 1), 4 (Subareas 2, 3, and 4), 6 (Subarea 2), and 7 (Subarea 1), had

cancer risk levels greater than 1×10^{-5}, which is similar to that identified as within the range posed by ambient conditions at the site. Again, most of this risk was due to arsenic, with some contribution from other metals such as chromium, chromium (VI), and nickel; again not all of these constituents were detected at each AOC (Objective) (See Table 6-12), and may not be present due to anthropogenic activities at the site. However, some risk contribution was from other chemicals such as PCB at AOC (Objective) 6, Subarea 2, and PNAs and PCB at AOC (Objective) 7, Subarea 1.

AOCs (Objectives) 2 (Subareas 1 and 2), 4 (Subareas 2, 3, and 5), 5 (Subareas 1 and 2), 6 (Subareas 1 and 2), and 7 (Subarea 2) also had non-cancer hazard indices greater than 1. The metals arsenic and chromium, and in isolated cases, antimony, mercury and silver, were the chemicals primarily contributing to non-cancer risk at these AOCs (Objectives). Non cancer risk at AOC (Objective) 4 was primarily due to organic or tertraethyl lead.

Lead was found at AOC (Objective 7) Subareas 1 and 2. No hazard index was calculated for lead because the health risk associated with lead is non-cancerous but the model is based on levels in the blood. The maximum concentration of lead in Subarea 1 (200 mg/kg) is slightly above the Residential PRG of 150 mg/kg. The maximum concentration of lead in Subarea 2 is 2,800 mg/kg or 20 times the Residential PRG of 150 mg/kg.

In groundwater (AOC (Objective) 8), a total cancer risk of 2×10^{-6} was calculated for groundwater, primarily based on the detection of TCE in groundwater. However, the low concentrations of trichloroethene do not represent a human health risk given that no one is drinking the groundwater directly. The water from the reservoir is directed downstream through a turbulent stream channel and then allowed to infiltrate through spreading centers, which would likely result in TCE being significantly diluted and volatilized. Hence, while TCE is detected, a complete pathway for exposure does not exist.

Table 6–1. Summary of Human Health Risk Screening – Area of Concern (Objective) 1: Gasoline Storage Area (9 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Aluminum	22,729	76,000	13,000	0	–	NO
Antimony	10	31	10U	9(a)	0	NO
Arsenic	32	0.39	12	0	–	NO
Barium	263	5,400	210	0	–	NO
Beryllium	1.3	150	0.63	0	–	NO
Cadmium	0.41	9.0	0.27	0	–	NO
Chromium	46	210	32	0	–	NO
Chromium VI	0.74	0.2	0.24	0	–	NO
Cobalt	23	4,700	16	0	–	NO
Copper	55	2,900	62	1	0	YES
Lead	64	150	19	0	–	NO
Lithium	22	1,600	8.2	0	–	NO
Manganese	1172	1,800	470	0	–	NO
Mercury	0.10	23	0.14	9(a)	0	YES
Molybdenum	3.2	390	2U	0	–	NO
Nickel	63	150	25	0	–	NO
Selenium	33	390	0.4U	0	–	NO

Table 6-1. Summary of Human Health Risk Screening Area of Concern (Objective) 1: Gasoline Storage Area (Continued) (9 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Silver	1.0	390	1U	9(a)	0	NO
Thallium	0.30	5.2	0.3U	9(a)	0	NO
Vanadium	122	550	47	0	–	NO
Zinc	125	23,000	100	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–2. Summary of Human Health Risk Screening Area of Concern (Objective) 2: - Oil/Water Separators (2 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Tetraethyl Lead	NV	0.0061	1	NA	2	YES
Aluminum	22,729	76,000	6,400	0	–	NO
Antimony	10	31	10U	2(a)	0	NO
Arsenic	32	0.39	79	1	2	YES
Barium	263	5,400	38	0	–	NO
Beryllium	1.3	150	0.29	0	–	NO
Cadmium	0.41	9.0	1U	2(a)	0	NO
Chromium	46	210	150	1	0	YES
Chromium VI	0.74	0.20	0.95	1	1	YES
Cobalt	23	4,700	100	1	0	YES
Copper	55	2,900	140	1	0	YES
Lead	64	150	5U	0	–	NO
Lithium	22	1,600	6.8	0	–	NO

Table 6–2. Summary of Human Health Risk Screening Area of Concern (Objective) 2: - Oil/Water Separators (Continued) (2 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Manganese	1,172	1,800	520	0	–	NO
Mercury	0.10	23	0.1U	2(a)	0	NO
Molybdenum	3.2	390	3.0	0	–	NO
Nickel	63	150	390	1	1	YES
Selenium	33	390	10U	0	–	NO
Silver	1.0	390	1UJ	2(a)	0	NO
Thallium	0.30	5.2	0.3U	2(a)	0	NO
Vanadium	122	550	16	0	–	NO
Zinc	125	23,000	59	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
NV – No value
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–3. Summary of Human Health Risk Screening Area of Concern (Objective) 3: Outfall Discharge Areas (5 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Dibutylphthalate	NV	6,100	0.52	NA	0	YES
Fluoranthene	NV	2,300	2.6	NA	0	YES
Pyrene	NV	2,300	2.4	NA	0	YES
Aluminum	22,729	76,000	10,000	0	–	NO
Antimony	10	31	10U	5[a]	0	NO
Arsenic	32	0.39	26	0	–	NO
Barium	263	5,400	200	0	–	NO
Beryllium	1.3	150	0.56	0	–	NO
Cadmium	0.41	9.0	0.92	4[a]	0	YES
Chromium	46	210	34	0	–	NO
Chromium VI	0.74	0.20	0.18	0	–	NO
Cobalt	23	4,700	12	0	–	NO
Copper	55	2,900	420	2	0	YES
Lead	64	150	110	1	0	YES
Lithium	22	1,600	40	2	0	YES
Manganese	1172	1,800	450	0	–	NO

Table 6–3. Summary of Human Health Risk Screening Area of Concern (Objective) 3: Outfall Discharge Areas (Continued) (5 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Mercury	0.10	23	1.4	5(a)	0	YES
Molybdenum	3.2	390	2U	0	–	NO
Nickel	63	150	23	0	–	NO
Selenium	33	390	10U	0	–	NO
Silver	1.0	390	1U	2(a)	0	NO
Thallium	0.30	5.2	0.3U	5(a)	0	NO
Vanadium	122	550	46	0	–	NO
Zinc	125	23,000	340	4	0	YES

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
NA – Not applicable
NV – No value
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–4. Summary of Human Health Risk Screening Area of Concern (Objective) 4: Propulsion System Testing Area (24 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Tetraethyl Lead	NV	0.0061	6.4	NA	5	YES
Aluminum	22,729	76,000	16,000	0	–	NO
Antimony	10	31	30	24[a]	0	YES
Arsenic	32	0.39	84	1	24[a]	YES
Barium	263	5,400	450	1	0	YES
Beryllium	1.3	150	1.1	0	–	NO
Cadmium	0.41	9.0	0.74	1	0	YES
Chromium	46	210	440	5	2	YES
Chromium VI	0.74	0.20	1.19	2	8	YES
Cobalt	23	4,700	100	2	0	YES
Copper	55	2,900	64	2	0	YES
Lead	64	150	30	0	–	NO
Lithium	22	1,600	250	5	0	YES
Manganese	1172	1,800	760	0	–	NO
Mercury	0.10	23	7.6	24[a]	0	YES
Molybdenum	3.2	390	20	2	0	YES

Table 6–4. Summary of Human Health Risk Screening Area of Concern (Objective) 4: Propulsion System Testing Area (Continued) (24 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Nickel	63	150	930	3	2	YES
Selenium	33	390	42	1	–	NO
Silver	1.0	390	270	24[a]	0	YES
Thallium	0.30	5.2	0.38	24[a]	0	YES
Vanadium	122	550	96	0	–	NO
Zinc	125	23,000	140	2	0	YES

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
NA – Not applicable
NV – No value
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–5. Summary of Human Health Risk Screening Area of Concern (Objective) 5: Sewer Septic Tank and Leach Field Lines (11 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Aluminum	22,729	76,000	21,000	0	–	NO
Antimony	10	31	30	11[a]	0	YES
Arsenic	32	0.39	130	3	11	YES
Barium	263	5,400	240	0	–	NO
Beryllium	1.3	150	1.2	0	–	NO
Cadmium	0.41	9.0	1U	8[a]	0	NO
Chromium	46	210	39	0	–	NO
Chromium VI	0.74	0.20	0.21	0	–	NO
Cobalt	23	4,700	16	0	–	NO
Copper	55	2,900	52	0	–	NO
Lead	64	150	15	0	–	NO
Lithium	22	1,600	8.0	0	–	NO
Manganese	1172	1,800	640	0	–	NO
Mercury	0.10	23	0.20	11[a]	0	YES
Molybdenum	3.2	390	2U	0	–	NO
Nickel	63	150	30	0	–	NO

Table 6–5. Summary of Human Health Risk Screening Area of Concern (Objective) 5: Sewer Septic Tank and Leach Field Lines (Continued)
(11 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Selenium	33	390	35	1	0	YES
Silver	1.0	390	1U	11(a)	0	NO
Thallium	0.3	5.2	0.3	11(a)	0	YES
Vanadium	122	550	77	0	–	NO
Zinc	125	23,000	97	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–6. Summary of Human Health Risk Screening Area of Concern (Objective) 6: Sump and Surface Drain Collection Lines (36 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Bis(2-ethylhexl) phthalate	NV	35	0.92	NA	0	YES
Diethylphthalate	NV	49,000	1.3	NA	0	YES
Fluoranthene	NV	2,300	0.22	NA	0	YES
Aroclor 1260	NV	0.22	0.21	NA	0	YES
Aluminum	22,729	76,000	43,000	3	0	YES
Antimony	10	31	21	36[a]	0	YES
Arsenic	32	0.39	270	13	36	YES
Barium	263	5,400	370	4	0	YES
Beryllium	1.3	150	1.5	2	0	YES
Cadmium	0.41	9.0	0.51	6 [a]	0	YES
Chromium	46	210	750	17	3	YES
Chromium VI	0.74	0.20	2.2	3	16	YES
Cobalt	23	4,700	60	5	0	YES
Copper	55	2,900	170	10	0	YES
Lead	64	150	52	0	--	NO
Lithium	22	1,600	130	4	0	YES

Table 6–6. Summary of Human Health Risk Screening Area of Concern (Objective) 6: Sump and Surface Drain Collection Lines (Continued)
(36 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Manganese	1,172	1,800	1,300	1	0	YES
Mercury	0.10	23	2.0	36(a)	0	YES
Molybdenum	3.2	390	2.1	0	–	NO
Nickel	63	150	370	7	3	YES
Selenium	33	390	57	8	0	YES
Silver	1.0	390	47	27(a)	0	YES
Thallium	0.30	5.2	0.44	36(a)	0	YES
Vanadium	122	550	110	0	–	NO
Zinc	125	23,000	280	4	0	YES

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
NA – Not applicable
NV – No value
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–7. Summary of Human Health Risk Screening Area of Concern (Objective) 7: Temporary Drum Staging Area (18 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Benzo(a) pyrene	NV	0.062	0.046	NA	0	YES
Aroclor 1242	NV	0.22	0.78	NA	2	YES
Aluminum	22,729	76,000	14,000	0	–	NO
Antimony	10	31	36	18[a]	1	YES
Arsenic	32	0.39	110	1	18	YES
Barium	263	5,400	160	0	–	NO
Beryllium	1.3	150	0.79	0	–	NO
Cadmium	0.41	9.0	2.9	18[a]	0	YES
Chromium	46	210	38	0	–	NO
Chromium VI	0.74	0.20	8.11	3[b]	3 [b]	YES
Cobalt	23	4,700	12	0	–	NO
Copper	55	2,900	840	4	0	YES
Lead	64	150	2,800	5	4	YES
Lithium	22	1,600	NA	NA	NA	NA
Manganese	1172	1,800	680	0	–	NO
Mercury	0.10	23	0.17	18[a]	0	YES

Table 6–7. Summary of Human Health Risk Screening Area of Concern (Objective) 7: Temporary Drum Staging Area (Continued) (18 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Molybdenum	3.2	390	2.8	2	0	YES
Nickel	63	150	24	0	–	NO
Selenium	33	390	40	1	0	YES
Silver	1.0	390	14UJ	18(a)	0	NO
Thallium	0.30	5.2	0.42	18(a)	0	YES
Vanadium	122	550	66	0	–	NO
Zinc	125	23,000	1,100	4	0	YES

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
NA – Not applicable
NV – No value
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
(b) – All samples that exceed are surface loess samples.
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–8. Summary of Human Health Risk Screening Area of Concern (Objective) 8: Groundwater Investigation (3 samples)

Compound or Metal	Screening levels	Area of Concern (Objective) maximum concentration (µg/L)	Number of samples above screening level	Selected as COPC?
	Tap Water PRG (µg/L)		Tap Water PRG	
Acetone	610	12	0	YES
Toluene	720	0.58	0	YES
Trichloroethene	1.6	2.6	3	YES
Barium	2,600	110	0	YES
Manganese	880	17	0	YES
Molybdenum	180	100	0	YES
Zinc	11,000	13	0	YES

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
Several TICs reported in one sample (MW-3). Similar results not reported for duplicate sample from same well, so results not presented for risk analysis.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening. Additionally, highest metals results from dissolved and total metals concentrations used in screenings.

Table 6–9. Summary of Human Health Risk Screening Area of Concern (Objective) 9: Slurry Outfall Pipe Sediments (21 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Soil Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Soil Ambient Threshold	Residential PRG	
Acetone	NV	1,600	0.20	NA	0	YES
Methylene Chloride	NV	8.9	0.0079	NA	0	YES
Aluminum	22,729	76,000	17,000	0	–	NO
Antimony	10	31	10U	21(a)	0	NO
Arsenic	32	0.39	13	0	–	NO
Barium	263	5,400	200	0	–	NO
Beryllium	1.3	150	0.58	0	–	NO
Cadmium	0.41	9.0	0.19	0	–	NO
Chromium	46	210	27	0	–	NO
Cobalt	23	4,700	12	0	–	NO
Copper	55	2,900	40	0	–	NO
Lead	64	150	25	0	–	NO
Lithium	22	1,600	13	0	–	NO
Manganese	1172	1,800	710	0	–	NO
Mercury	0.10	23	0.1U	21(a)	0	NO
Molybdenum	3.2	390	2U	0	–	NO
Nickel	63	150	28	0	–	NO

Table 6–9. Summary of Human Health Risk Screening Area of Concern (Objective) 9: Slurry Outfall Pipe Sediments (Continued) (21 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Soil Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Soil Ambient Threshold	Residential PRG	
Selenium	33	390	0.4U	0	–	NO
Silver	1.0	390	10U	21(a)	0	NO
Thallium	0.30	5.2	0.3U	21(a)	0	NO
Vanadium	122	550	50	0	–	NO
Zinc	125	23,000	87	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
NV – No value
NA – Not applicable
COPC – Chemical of potential concern
(a) – Number includes detection limit values that equal or exceed screening concentrations
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6–10. Summary of Human Health Risk Screening Area of Concern (Objective) 10: Electronic Test Area (3 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Chromium VI	0.74	0.20	0.67	0	–	NO
Lithium	22	1,600	17	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
– – No samples exceeded ambient threshold, number above residential remediation goal.

Table 6–11. Summary of Human Health Risk Screening Area of Concern (Objective) 11: Propellant Magazine (3 samples)

Compound or Metal	Screening levels		Area of Concern (Objective) maximum concentration (mg/kg)	Number of samples above screening level		Selected as COPC?
	Ambient Threshold Maximum (mg/kg)	Residential PRG (mg/kg)		Ambient Threshold	Residential PRG	
Lithium	22	1,600	17	0	–	NO

PRG – Region IX Preliminary Remediation Goal (EPA, 2000)
COPC – Chemical of potential concern
– – No samples exceeded ambient threshold, number above residential remediation goal.
Duplicate results are not included as additional samples in count; however, highest concentration from duplicate samples used in screening.

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Area of Concern 1							
Subarea 1							
Copper	44	2,900	---	0.02	---		
Mercury	---	23	---	---	---	0.02	N/C
Subarea 2							
Copper	62	2,900	---	0.02	---		
Mercury	0.14	23	---	0.006	---	0.03	N/C
Area of Concern 2							
Subarea 1							
Tetraethyl Lead	1	0.0061	---	164	---		
Arsenic	18	22	0.39	0.8	5E-5		
Chromium	4.6	---	210	---	2E-8		
Hexavalent Chromium	---	230	0.2	---	---		
Cobalt	4.7	4,700	---	0.001	---		
Copper	6.1	2,900	---	0.002	---		
Nickel	6.9	1,600	150	0.004	5E-8	165	5E-5
Subarea 2							
Tetraethyl Lead	1	0.0061	---	164	---		
Arsenic	79	22	0.39	4	2E-4		
Chromium	150	---	210	---	7E-7		
Hexavalent Chromium	0.95	230	0.2	0.004	5E-6		
Cobalt	100	4,700	---	0.02	---		
Copper	140	2,900	---	0.05	---		
Nickel	390	1,600	150	0.2	3E-6	168	2E-4
Area of Concern 3							
Subarea 1							
Dibutylphthalate	0.52	6,100	---	0.00009	---		
Fluoranthene	2.6	2,300	---	0.001	---		
Pyrene	2.4	2,300	---	0.001	---		
Cadmium	0.92	37	9	0.02	1E-7		
Copper	420	2,900	---	0.1	---		
Lead	110	150	---	---	---		
Lithium	12	1,600	---	0.008	---		
Mercury	1.4	23	---	0.06	---		
Zinc	270	23,000	---	0.01	---	0.3	1E-7
Subarea 2							
Dibutylphthalate	0.52	6,100	---	0.00009	---		
Fluoranthene	---	2,300	---	---	---		
Pyrene	---	2,300	---	---	---		
Cadmium	---	37	9	---	---		
Copper	36	2,900	---	0.01	---		
Lead	15	150	---	---	---		
Lithium	40	1,600	---	0.03	---		
Mercury	0.2	23	---	0.009	---		
Zinc	340	23,000	---	0.01	---	0.06	N/C

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Area of Concern 4							
Subarea 1							
Tetraethyl lead	---	0.0061	---	---	---		
Antimony	---	31	---	---	---		
Arsenic	---	22	0.39	---	---		
Barium	120	5400	---	0.02	---		
Cadmium	---	37	9	---	---		
Chromium	16	---	210	---	8E-8		
Hexavalent Chromium	---	230	0.2	---	---		
Cobalt	9.4	4,700	---	0.002	---		
Copper	22	2,900	---	0.008	---		
Lithium	5.8	1,600	---	0.004	---		
Mercury	---	23	---	---	---		
Molybdenum	---	390	---	---	---		
Nickel	14	1,600	150	0.009	9E-8		
Silver	---	390	---	---	---		
Thallium	---	5.2	---	---	---		
Zinc	49	23,000	---	0.002	---	0.05	2E-7
Subarea 2							
Tetraethyl lead	6.4	0.0061	---	1049	---		
Antimony	30	31	---	1	---		
Arsenic	12	22	0.39	0.5	3E-5		
Barium	180	5400	---	0.03	---		
Cadmium	---	37	9	---	---		
Chromium	59	---	210	---	3E-7		
Hexavalent Chromium	0.3	230	0.2	0.001	2E-6		
Cobalt	19	4,700	---	0.004	---		
Copper	45	2,900	---	0.02	---		
Lithium	8.6	1,600	---	0.005	---		
Mercury	---	23	---	---	---		
Molybdenum	2.1	390	---	0.005	---		
Nickel	78	1,600	150	0.05	5E-7		
Silver	---	390	---	---	---		
Thallium	0.3	5.2	---	0.06	---		
Zinc	84	23,000	---	0.004	---	1051	3E-5
Subarea 3							
Tetraethyl lead	---	0.0061	---	---	---		
Antimony	---	31	---	---	---		
Arsenic	19	22	0.39	0.9	5E-5		
Barium	190	5400	---	0.04	---		
Cadmium	0.74	37	9	0.02	8E-8		
Chromium	37	---	210	---	2E-7		
Hexavalent Chromium	0.3	230	0.2	0.001	2E-6		
Cobalt	14	4,700	---	0.003	---		
Copper	64	2,900	---	0.02	---		

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Lithium	26	1,600	---	0.02	---		
Mercury	7.6	23	---	0.3	---		
Molybdenum	---	390	---	---	---		
Nickel	30	1,600	150	0.02	2E-7		
Silver	270	390	---	0.7	---		
Thallium	---	5.2	---	---	---		
Zinc	140	23,000	---	0.006	---	2	5E-5
Subarea 4							
Tetraethyl lead	---	0.0061	---	---	---		
Antimony	---	31	---	---	---		
Arsenic	11	22	0.39	0.5	3E-5		
Barium	120	5400	---	0.02	---		
Cadmium	---	37	9	---	---		
Chromium	24	---	210	---	1E-7		
Hexavalent Chromium	---	230	0.2	---	---		
Cobalt	14	4,700	---	0.003	---		
Copper	25	2,900	---	0.009	---		
Lithium	6.3	1,600	---	0.004	---		
Mercury	---	23	---	---	---		
Molybdenum	---	390	---	---	---		
Nickel	17	1,600	150	0.01	1E-7		
Silver	---	390	---	---	---		
Thallium	---	5.2	---	---	---		
Zinc	52	23,000	---	0.002	---	0.6	3E-5
Subarea 5							
Tetraethyl lead	---	0.0061	---	---	---		
Antimony	---	31	---	---	---		
Arsenic	84	22	0.39	4	2E-4		
Barium	450	5400	---	0.08	---		
Cadmium	0.37	37	9	0.01	4E-8		
Chromium	440	---	210	---	2E-6		
Hexavalent Chromium	1.19	230	0.2	0.005	6E-6		
Cobalt	100	4,700	---	0.02	---		
Copper	57	2,900	---	0.02	---		
Lithium	250	1,600	---	0.2	---		
Mercury	0.18	23	---	0.008	---		
Molybdenum	20	390	---	0.05	---		
Nickel	930	1,600	150	0.6	6E-6		
Silver	---	390	---	---	---		
Thallium	0.38	5.2	---	0.07	---		
Zinc	130	23,000	---	0.006	---	5	2E-4

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Area of Concern 5							
Subarea 1							
Antimony	---	31	---	---	---		
Arsenic	130	22	0.39	6	3E-4		
Mercury	0.2	23	---	0.01	---		
Selenium	22	390	---	0.06	---		
Thallium	0.3	5.2	---	0.06	---	6	3E-4
Subarea 2							
Antimony	30	31	---	1	---		
Arsenic	47	22	0.39	2	1E-4		
Mercury	---	23	---	---	---		
Selenium	35	390	---	0.09	---		
Thallium	---	5.2	---	---	---	3	1E-4
Area of Concern 6							
Subarea 1							
Bis(2-ethylhexyl)phthalate	0.92	1,200	35	0.0008	3E-8		
Diethylphthalate	1.43	49,000	---	0.00003	---		
Fluoranthene	---	2,300	---	---	---		
Aroclor 1260	---	---	0.22	---	---		
Aluminum	43,000	76,000	---	0.6	---		
Antimony	21	31	---	0.7	---		
Arsenic	270	22	0.39	12	7E-4		
Barium	280	5,400	---	0.05	---		
Beryllium	1.5	150	1,100	0.01	1E-9		
Cadmium	0.51	37	9	0.01	6E-8		
Chromium	750	---	210	---	4E-6		
Hexavalent Chromium	2.2	230	0.2	0.01	1E-5		
Cobalt	60	4,700	---	0.01	---		
Copper	170	2,900	---	0.06	---		
Lithium	130	1,600	---	0.08	---		
Manganese	1300	1,800	---	0.7	---		
Mercury	2	23	---	0.09	---		
Nickel	370	1,600	150	0.2	2E-6		
Selenium	57	390	---	0.1	---		
Silver	47	390	---	0.1	---		
Thallium	0.44	5.2	---	0.08	---		
Zinc	280	23,000	---	0.01	---	15	7E-4
Subarea 2							
Bis(2-ethylhexyl)phthalate	---	1,200	35	---	---		
Diethylphthalate	---	49,000	---	---	---		
Fluoranthene	0.22	2,300	---	0.0001	---		
Aroclor 1260	0.21	---	0.22	---	1E-6		
Aluminum	20,000	76,000	---	0.3	---		
Antimony	---	31	---	---	---		
Arsenic	11	22	0.39	0.5	3E-5		

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Barium	370	5,400	---	0 07	---		
Beryllium	0.68	150	1,100	0.005	6E-10		
Cadmium	---	37	9	---	---		
Chromium	90	---	210	---	4E-7		
Hexavalent Chromium	0 28	230	0.2	0.001	1E-6		
Cobalt	14	4,700	---	0.003	---		
Copper	67	2,900	---	0 02	---		
Lithium	---	1,600	---	---	---		
Manganese	400	1,800	---	0.2	---		
Mercury	---	23	---	---	---		
Nickel	58	1,600	150	0 04	4E-7		
Selenium	35	390	---	0.09	---		
Silver	---	390	---	---	---		
Thallium	---	5 2	---	---	---		
Zinc	110	23,000	---	0.005	---	1	3E-5
Area of Concern 7							
Subarea 1							
Benzo(a)pyrene	0.046	---	0 062	---	7E-7		
Aroclor 1242	0 78	---	0.22	---	4E-6		
Antimony	---	31	---	---	---		
Arsenic	8.2	22	0.39	0 4	2E-5		
Cadmium	2.9	37	9	0.08	3E-7		
Hexavalent Chromium	8.11	230	0 2	0.04	4E-5		
Copper	60	2,900	---	0.02	---		
Lead	200	150	---	---	---		
Mercury	---	23	---	---	---		
Molybdenum	2.8	390	---	0.007	---		
Selenium	---	390	---	---	---		
Thallium	---	5.2	---	---	---		
Zinc	1,100	23,000	---	0.05	---	0.6	7E-5
Subarea 2							
Benzo(a)pyrene	---	---	0 062	---	---		
Aroclor 1242	---	---	0 22	---	---		
Antimony	36	31	---	1	---		
Arsenic	110	22	0.39	5	3E-4		
Cadmium	---	37	9	---	---		
Hexavalent Chromium	0.18	230	0 2	0 0008	9E-7		
Copper	840	2,900	---	0.3	---		
Lead	2,800	150	---	---	---		
Mercury	0 17	23	---	0.007	---		
Molybdenum	---	390	---	---	---		
Selenium	40	390	---	0.1	---		
Thallium	0.42	5 2	---	0 08	---		
Zinc	270	23,000	---	0.012	---	7	3E-4

Table 6-12. Calculated Risk by Area of Concern (Objective)

Chemicals of Concern	Maximum Concentration	Non Cancer PRG	Cancer PRG	Non Cancer Risk	Cancer Risk	Total Non Cancer Risk	Total Cancer Risk
Area of Concern 8							
Acetone	12	610	---	0.02	---		
Toluene	0.58	720	---	0.001	---		
Trichloroethene	2.6	37	1.6	0.07	2E-6		
Barium	110	2,600	---	0.04	---		
Manganese	17	880	---	0.02	---		
Molybdenum	100	180	---	0.6	---		
Zinc	13	11,000	---	0.001	---	0.7	2E-6
Area of Concern 9							
Acetone	0.2	1,600	---	0.0001	---		
Methylene Chloride	0.0079	1,900	8.9	0.000004	9E-10	0.0001	9E-10
Area of Concern 10							
None	---	---	---	---	---	---	---
Area of Concern 11							
None	---	---	---	---	---	---	---

N/C - Not calculated No carcinogenic chemicals present

7.0
CONCLUSIONS AND RECOMMENDATIONS

This section contains a summary of the conclusions for each AOC (Objective) and recommendations for further action. The section will present general conclusions regarding the site and overall setting followed by the conclusions reached for each AOC (Objective). The conclusions for each AOC will be directly followed by recommendations for that AOC.

7.1 GENERAL CONSIDERATIONS

The Morris Dam R & D Facility was leased by the Navy starting in 1939, and was operated as a Navy torpedo testing facility from 1943 to 1993. The facility was located within the San Gabriel Mountains north of Azusa, California. The facility was located on a peninsula that extends into and is surrounded on all but the southwestern side by Morris Reservoir. Water from the reservoir is allowed to flow down the San Gabriel River and enters spreading zones in the San Gabriel basin.

Part of the results from sampling and analysis indicates many metals are found at higher than expected concentrations. These metals include aluminum, antimony, arsenic, barium, beryllium, chromium, cobalt, copper, iron, lead, lithium, manganese, mercury, molybdenum, nickel, selenium, vanadium, and zinc, among others. The expected concentrations are based on experience with metals found in soils from alluvial basins, below mountain ranges. For reasons discussed below, the Morris Dam R & D facility has a geologic framework much different than those found in alluvial basins, and hence, the rocks near the facility contribute metals at higher concentrations than would be expected.

The geological framework for the peninsula and surrounding areas is complex, consisting of rock that has undergone varying degrees of metamorphic and secondary alteration. Metamorphic alteration means the rock formations have undergone transformations due to heat and pressure. Metamorphic rocks often have changes in their original mineral assemblages when subjected to the heat and pressure. Secondary alteration occurs when rocks are exposed to fluids moving through the rock through fractures. These fluids, which can deposit secondary minerals, include those that originally come from magmas deep within the earth and seep upward in the rock column, as well as surface fluids that seep downward and interface with rock and other fluids with at depth. Fluids of magmatic origin would have been present in this area due to intrusion of magmas below the San Gabriel Mountains as they were built. Both types of fluids can be enriched in metals due to a variety of reasons including leaching of metals from the rocks they contact. Magmatic fluids can be enriched in metals because the original magma, which was their source, was enriched in metals. Mining for enriched metal-bearing minterals often occurs in mountainous regions where metamorphism and secondary alteration of rock has occurred.

Reconnaissance geological mapping of the Morris Dam area shows a wide variety of rock types most of which have been subject to varying degrees of metamorphic and secondary alteration.

Further evidence of rock alteration is present in data from mineralogical analysis of the rock samples from Background Area 2 (Objective 13). Alteration has occurred both from metamorphism, and from fluids depositing secondary minerals in fractures. These rocks, which are exposed at the surface throughout the San Gabriel Mountains, then are the source material for soils as they weather and break down. While soil has formed over some of the peninsula and surrounding areas, it is generally a thin veneer formed from the altered rock, and rock outcrops are found throughout the area. The altered rock provides sources for metals formed in soils since the facility is located on a bedrock terrain. Reportedly, some of the soil and rock on site was used as fill material underneath pads prior to building construction.

Metals were detected in all of the site samples. Most of the metals were found at varying concentrations. As discussed in Appendix A, metals can exist naturally in the rocks and soil at concentrations ranging over several orders of magnitude. Hence defining whether a metal is present due to anthropogenic (human induced) reasons or is present naturally is a difficult question to address, and the difficulty of defining a range of naturally occurring metals concentrations is exacerbated at this site by the very heterogeneous nature of the metamorphic geologic material below and surrounding the facility. A quantitative analysis consisting of statistical analysis of soil and rock data that ultimately yields an "ambient" concentration limit is presented in Appendix A. Metals concentrations that are below this threshold are not considered in any case to be due to a release at the site. However other lines of evidence, from geochemical relationships and mineralogical results suggest that even some metals that are found in concentrations well above these calculated limits may be naturally occurring. Hence, the Navy believes that the statistically-derived ambient concentration limits may not adequately define ambient concentration ranges for most metals.

Groundwater elevations were measured in three monitoring wells installed on site. The groundwater elevations in the three wells are very similar. The water elevation in the monitoring wells tracks closely with the reservoir elevation, suggesting direct hydraulic connection between the reservoir and groundwater below the peninsula. The groundwater gradient suggests flow is parallel to the axis of the reservoir, which in turn implies that the overall movement of water through the reservoir also controls groundwater movement below the peninsula.

Future land use for the facility could be implemented under different scenarios including a residential scenario, therefore all evaluation of risk through screening was conducted with respect to the most conservative case, a residential scenario using California Modified Preliminary Remediation Goals (PRGs). AOC (Objective) specific conclusions based on this risk screening are presented below.

Before presenting and discussing AOC specific conclusions it is important to note that many of the conclusions presented highlight detection of metals above ambient concentration limits. The ambient concentration limits were developed through a statistical procedure, and as such represent the upper end concentrations of metals found in background areas on and off site. However, as discussed several paragraphs previously, the metals concentrations found in rock samples from the peninsula and surrounding areas suggest that some metals may be found

naturally at concentrations that exceed the statistically-derived ambient concentration limit Hence, while each site specific discussion below presents those metals that exceed the ambient concentration limit, further techniques and evaluation may be necessary to identify those metals that are of concern and those that are not

The initial Ecological Scoping Assessment was for both the terrestrial and aquatic environments at the site. The scoping assessment is intended only to define $COPC_E$s, whether sensitive species exist, and whether complete pathways exist. The scoping assessment does conclude that all three conditions exist so further ecological risk screening is necessary. No ecological risk screening has been conducted for any of the AOCs (Objectives) because screening criteria for the site have not been determined.

Based on the above findings several conclusions and recommendations follow from the SI. The recommended actions primarily are derived from the risk screening results, but also follow from discussions with regulatory personnel during the SI and overall assessment of potential release areas that may not have been completely characterized during the SI.

7.2 AREA OF CONCERN (OBJECTIVE) SPECIFIC CONCLUSIONS AND RECOMMENDATIONS

Area of Concern (Objective) 1 Former Gasoline Station/Drum Storage Pad

This AOC was broken into two subareas. Subarea 1 is a small concrete pad that covered stained soils as seen in historical photographs. Subarea 2 covers slope soils below the former gasoline station drum storage pad that appeared stained in historical photographs. The total petroleum hydrocarbon data suggest that the soil does contain low quantities of gasoline range hydrocarbons, which are likely related to the former activities surrounding this AOC (Objective). The concentrations do not suggest a widespread, significant problem. All detected concentrations of petroleum hydrocarbons were below 100 mg/kg. No VOCs or SVOCs were detected. Metal concentrations were all below the ambient concentration limits. As mentioned, this AOC (Objective), as well as two other areas at the site, had USTs removed, site assessments completed, and cases closed by the RWQCB in 1994.

No $COPC_H$ were identified during human health risk screening. None of the chemicals found in soil at concentrations above the ambient concentration limits were found at concentrations above the Residential PRGs.

Based on the above results, no further action is recommended for AOC 1.

Area of Concern (Objective) 2 Oil/Water Separators

The AOC (Objective) was split into two subareas to represent the two oil/water separators that are approximately 800 feet apart, and are not connected to each other in any way. TRPH results, while detected, are low (less than 100 mg/kg), and not suggestive of a widespread release.

Arsenic, chromium, chromium VI, cobalt, copper, and nickel were found above ambient concentration limits and enriched at Subarea 2, and could signify a release. Organic lead was detected in both Subareas 1 and 2.

Chromium, cobalt, copper, and nickel could be due to natural mineralization as discussed in Appendix A. Chromium VI does not generally exist under natural conditions and detection of this constituent may have resulted from false positives during laboratory analysis. However, arsenic was not found correlated with natural conditions. The clustering of several metals in this area (Subarea 2) at concentrations above ambient concentration limits, coupled with the detection of arsenic suggests a release of these constituents is possible. As discussed below, because the oil/water separator in Subarea 2 is immediately adjacent to AOC (Objective) 6, Subarea 1, the release also may be related to activities with that AOC (Objective) and not the Oil/Water separator.

The maximum chemical concentrations in each subarea result in a cancer risk of $5x10^{-5}$ and a hazard index of 165 for Subarea 1 and a cancer risk of $2x10^{-4}$ and a hazard index of 168 for Subarea 2. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic and tetraethyl lead, respectively.

The concentrations detected for hexavalent chromium may not represent soil impacted by anthropogenic activities as the maximum concentration of 0.95 mg/kg is close to the ambient concentration limit of 0.74 mg/kg. The maximum concentration of hexavalent chromium detected in the ambient soil from Background Area 1 (Objective 12) was 0.94 mg/kg. Hence, it is possible that additional statistical analysis would show that these concentrations are not different.

Confirmation sampling is recommended for tetraethyl lead in soils at AOC (Objective) 2, Subareas 1 and 2 (the Oil/Water Separators near former Buildings 42001 and 42010, respectively). AOC (Objective) 2, Subarea 2 soils exhibit detection of chemicals similar to AOC (Objective) 6, Subarea 1, and any action taken for this AOC (Objective) should be incorporated into the action taken for AOC (Objective) 6 as discussed below.

Area of Concern (Objective) 3. Outfall Areas

AOC 3 had two subareas sampled. Subarea 1 was defined on the southern portion of the peninsula directly below two outfalls from the facility, one of which was designated OF2 during sampling associated with earlier site inspections (Jacobs, 1992). Subarea 2 was defined on the eastern side of the peninsula directly below an outfall designated as BU during a preview site inspection (Jacobs, 1992). TRPH and PNAs were detected in some of the samples below outfall points in Subarea 1. Flouranthene and pyrene were detected in low concentrations in one sample, which corresponds to the highest TRPH result. Field observations noted asphalt chips in this sample, which may account for the PNAs. Metals were detected, but most were found at concentrations below the ambient concentration limit. Exceptions include copper, lead, mercury and zinc. These outfall points from Subareas 1 and 2 were directly fed from the sump and

collection lines that ran through the propulsion area (AOCs (Objectives) 4 and 6), and hence could signify a release from these areas.

The maximum chemical concentrations in each subarea result in a cancer risk of $1x10^{-7}$ and a hazard index of 0.3 for Subarea 1 and a hazard index of 0.06 for Subarea 2. Cadmium, the only chemical with toxicity factors for carcinogenic effects identified in AOC (Objective) 3, was not identified in Subarea 2.

The health risk associated with lead is non-cancerous but the model is based on levels in the blood. Therefore, calculation of a hazard index is not appropriate. The maximum concentration of lead in both Subarea 1 (110 mg/kg) and Subarea 2 (15 mg/kg) is below the Residential PRG of 150 mg/kg.

Slope soils investigated below the outfall points do exhibit some evidence of potential releases, particularly in Subarea 1, on slopes east and south of the former gas station. However, human health risk screening suggests that incremental cancer risk is below the de minimus value of $1x10^{-6}$. Hence, no further action is recommended for these locations.

Area of Concern (Objective) 4: Propulsion System Testing Area

Five subareas were sampled as part of this AOC. All subareas are located in the southern and eastern portion of the facility. Each subarea was associated with different buildings where propulsion testing took place, or with soils where direct discharge could have occurred. TRPH was detected in all samples, with one sample exhibiting a concentration above 100 mg/kg in soils on the slope southeast of former Building 42015 (Subarea 3). A significantly lower concentration was found in the deeper sample from this borehole suggesting that a widespread release did not occur. No SVOCs were detected with the exception that tetrachloroethene was reported (0.6 mg/kg) as a tentatively identified compound (TIC) in one sample from the semivolatile organic analysis. This is not the typical analysis this compound would be reported. This sample was collected from deeper in the boring below the pad in front of Building 42015. This compound was not detected in other nearby samples. Several metals were detected at concentrations above ambient concentration limits in several of the Subareas. Mercury and silver were detected at elevated concentrations in soil samples from the slope southeast of former Building 42015 (Subarea 3). Additionally, barium, chromium, chromium (VI), lithium, nickel, and zinc were found at elevated concentrations in samples below former Building 42039 (Subarea 5). Both of these occurrences could signify a release, especially below former Building 42039, where several metals are clustered together. Organic lead (tetraethyl lead) was detected in deeper soil samples below the pad in front of former Building 42015 (Subarea 2). This constituent was not correlated with any other constituents, but may signify a release from activities in this area.

The maximum chemical concentrations in each subarea result in a cancer risk of $2x10^{-7}$ and a hazard index of 0.05 for Subarea 1, a cancer risk of $3x10^{-5}$ and a hazard index of 1051 for Subarea 2, a cancer risk of $5x10^{-5}$ and a hazard index of 2 for Subarea 3, a cancer risk of $3x10^{-5}$

and a hazard index of 0.6 for Subarea 4, and a cancer risk of $2x10^{-4}$ and a hazard index of 5 for Subarea 5. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic and tetraethyl lead, respectively.

Depending upon future use and the future of the concrete pads in this area, further evaluation of organic lead and potentially VOCs may be necessary at AOC (Objective) 4. Samples should be collected to confirm the existence and extent of any compound in Subareas 1 and 2. Any evaluation of this area should be incorporated into planning with AOC (Objective) 6 given the close proximity of these two AOCs (Objectives), with the possibility that these two AOCs should be combined. Additional samples also should be collected from slope soils southeast of Building 42015 to confirm if elevated silver and mercury concentrations exist in these soils and the extent of these constituents and petroleum hydrocarbons on the slopes. Upon confirmation, the Navy, in consultation with other decision makers may decide that hot spot removal is appropriate.

Area of Concern (Objective) 5: Sewer Septic Tank and Leach Field Lines

Two subareas were sampled as part of investigations at AOC 5. Subarea 1 was associated with the leach field lines on the northern part of the peninsula, and Subarea 2 associated with the sewer septic tank near Building 42005 at the southern end of the peninsula. TRPH was detected above 100 mg/kg in two samples collected adjacent to the former leach fields (Subarea 1), and may signify that some release occurred along the leach field lines. In one location a deeper sample exhibited concentrations an order of magnitude lower. Arsenic was also detected in one location at concentrations above the ambient concentration limit. All other metals were detected at concentrations below the ambient concentration limit.

The maximum chemical concentrations in each subarea result in a cancer risk of $3x10^{-4}$ and a hazard index of 6 for Subarea 1 and a cancer risk of $1x10^{-4}$ and a hazard index of 3 for Subarea 2. Greater than ninety-nine percent of these cancer risks and hazard indices are due to arsenic.

AOC (Objective) 5 Subarea 2 (leach field) data suggest that some release of TRPH and arsenic may have occurred. Currently not enough data exist to define the extent of any release in this Subarea, so further soil sampling should occur in this area to help define any hot spots. Upon further delineation, the Navy, in consultation with other parties may decide that hot spot removal of affected soil is appropriate.

Area of Concern (Objective) 6: Sump and Collection Lines

AOC (Objective) 6 had two subareas. These subareas were separated by some distance and are discussed separately. In Subarea 1, the primary area of investigation where the sump and collection lines were located near Buildings 42010, 42011, 42015, 42016, and 42028, no organic compounds were detected and TRPH concentrations were all below 100 mg/kg. However, multiple soil samples in this Subarea exhibited metals that were found above ambient concentration limits and to be enriched. These metals include arsenic, chromium, chromium (VI), cobalt, copper, lithium, mercury, nickel, and zinc. Not all of these metals were found in all

samples. However, the overall trend, together with information from AOC (Objective) 2, Subarea 2, and AOC (Objective) 4 samples from this region of the peninsula, suggest that a significant number of the metals were all found in this general region, below the pads where propulsion testing occurred. The clustering of metals in this Subarea suggests a release could have occurred. It is important to note, however, that during the rock sampling an extremely unusual and very basic geologic dike was noted on the eastern slope below former Building 42015. Samples from the rock in this dike exhibited very high concentrations of chromium and nickel, and gave the only indication of minerals that could host arsenic of all rocks sampled on site. This dike could not be fully mapped in extent because large portions of this area are covered with concrete. While at this time there is not enough evidence to suggest this could be the source of the metals found in these samples, it certainly should be considered if further action is implemented in this area.

Data from AOC (Objective) 6, Subarea 1 suggest that releases of metals may have occurred throughout this area. In fact, some other AOCs (Objectives) that overlap into this area (e.g., AOC (Objective) 2, Subarea 2, and AOC (Objective) 4, Subarea 5, suggest that the release may be fairly widespread throughout the entire area surrounding former Buildings 42010, 42011, 42015, 42038, and 42039, and the pads that surround them. Further action at this site completely depends on further usage. Currently soils that present a risk are below former building pads, and are not available for contact with either human or ecological receptors. Should these pads be removed during construction at a later date, the pathways for contact would be complete. The Navy should discuss future actions with all stakeholders at this facility to determine whether leaving the pads in place is a realistic long-term scenario. If leaving the pads in place in the future is not a reasonable scenario, then further action should include removal of the pads and soil/rock material below that would case a risk to human health and the environment. Any removal action in this area should be cognizant of a geologic feature, the peridotite/pyroxenite dike that is observed east of former Building 42015, which could be a significant source of metals. Additionally, the Navy and other decision makers may decide to combine the overlapping AOCs (AOC 2, Subarea 2, AOC 4; all Subareas, and AOC 6, Subarea 1) into one AOC.

Subarea 2 for AOC (Objective) 6, located on the western side of the peninsula near Building 42029, exhibited detection of Arochlor 1260 in one sample and fluoranthene in one sample. Chromium was also detected at concentrations above the ambient concentration limit. These constituents indicate a release has likely occurred in this area. This area was added after a site visit with regulatory personnel because a small amount of green "sludge" was observed on the surface material. No sludge was observed during sampling, however, given the cracks in the surface material in this area, the sludge may have migrated to the subsurface.

The maximum chemical concentrations in each subarea result in a cancer risk of $7x10^{-4}$ and a hazard index of 14 for Subarea 1 and a cancer risk of $3x10^{-5}$ and a hazard index of 1 for Subarea 2. Greater than ninety-nine percent of these cancer risks are due to arsenic. Eighty-six percent of the hazard index for Subarea 1 and fifty percent of the hazard index for Subarea 2 is due to arsenic.

Area of Concern (Objective) 7: Temporary Drum Staging Area

Two subareas were sampled in AOC (Objective) 7. Additionally, passive soil gas sampling was conducted in this over the entire area associated with AOC (Objective) 7 to identify potential soil boring locations. Subarea 1 consisted of surface loess samples, and Subarea 2 consisted of passive soil gas sampling and subsurface soils. These Subareas will be discussed separately.

Soil gas sampling results exhibited very low concentrations (sub parts per trillion) of acetone, benzene, tetrachloroethene (PCE), toluene, trichloroethene (TCE), and xylenes. Toluene, benzene, and xylenes were found sporadically in the background soil gas sampling as well, which indicates these chemicals are likely do to poor air quality in the Los Angeles area. However, acetone, PCE, and TCE were not found in background samples and could be due to a release. Soil borings were placed near locations that exhibited the detection of PCE and TCE. Subarea 1 sampling consisted of collecting three surface loess (windblown) sediment samples. All three of these loess samples exhibit detection of elevated TRPH, benzo(a)pyrene, arochlor 1242, chromium (VI), lead, and zinc. Asphalt chips were observed in the samples during field collection, which could explain the high TRPH and benzo(a)pyrene. However, the other constituents indicate a release has occurred to the loess.

The surface loess should be collected and removed from AOC (Objective) 7, Subarea 1. Surface soil exposed near former Building 42116 (which housed transformers) at AOC (Objective) 7 should be sampled for metals and PCB, and removed if necessary. Several subsurface soil samples suggest that a release may have occurred. The Navy should consider further delineation of metals near bore holes 1 and 2 in Subarea 2, and hot spot removal of soils if further contamination if found in this area.

Subarea 2 consisted of subsurface soils in this area. In two locations the subsurface soils exhibited concentrations of arsenic, copper, lead and zinc that were above ambient concentration limits suggesting that a release may have occurred in this area. No volatile constituents were detected in the soil borings. However, the Navy should consider further actions to determine whether a volatile constituent release occurred in this area, because of the passive soil vapor results.

The maximum chemical concentrations in each subarea result in a cancer risk of $7x10^{-5}$ and a hazard index of 0.6 for Subarea 1 and a cancer risk of $3x10^{-4}$ and a hazard index of 7 for Subarea 2. Greater than ninety-nine percent of the cancer risk for Subarea 1 is due to arsenic and chromium and greater than ninety-nine percent of the cancer risk for Subarea 2 is due to arsenic. Seventy-one percent of the hazard index for Subarea 2 is due to arsenic.

The health risk associated with lead is non-cancerous but the model is based on levels in the blood. Therefore, calculation of a hazard index is not appropriate. The maximum concentration of lead in Subarea 1 (200 mg/kg) is slightly above the Residential PRG of 150 mg/kg. The maximum concentration of lead in Subarea 2 is 2,800 mg/kg or 20 times the Residential PRG of 150 mg/kg.

Area of Concern (Objective) 8. Groundwater Investigation

Three groundwater wells were installed and sampled. Acetone and toluene were detected once in different wells. Both constituents were found at concentrations below drinking water quality criteria. Acetone could be a laboratory contaminant. Methyl tert butyl ether (MTBE) and several other organic chemicals were tentatively identified and quantified. Tentatively identified compounds (TICs) were not evaluated in the risk assessment. Toluene could be associated with the former USTs. TCE was detected in all three samples at concentrations below the maximum contaminant level as defined by California. Several metals were also detected, including barium, manganese, molybdenum, and zinc. All metal concentrations were below drinking water quality criteria.

Acetone, toluene, trichloroethene, barium, manganese, molybdenum, and zinc were identified as $COPC_H$ for human health. The maximum chemical concentrations result in a cancer risk of $2x10^{-6}$ and a hazard index of 0.7. One hundred percent of the cancer risk is due to trichloroethene. However, the low concentrations of trichloroethene do not represent a human health risk given that no one is drinking the groundwater directly. The water from the reservoir is directed downstream and then allowed to infiltrate through spreading centers, which would likely result in TCE being significantly diluted and volatilized. Hence, while TCE is detected, a complete pathway for exposure does not exist.

In groundwater (AOC (Objective) 8), the low concentrations of trichloroethene do represent a risk to human receptors. Given the possibility that a source for TCE could exist in fractures above the groundwater elevation as sampled during the SI, some groundwater monitoring should be considered to determine if seasonal fluctuations occur. Any monitoring program should include at least one event where samples are collected from the reservoir in areas surrounding the peninsula.

Area of Concern (Objective) 9. Slurry Outfall Pipe

Acetone and methylene chloride were found in sediment samples. Both were detected at concentrations near the detection limit and could be associated with laboratory contamination. Metals were also detected in the sediment samples at variable concentrations. No metals were found at concentrations above the soil ambient concentration limits, and none exceeded the "background" sediment samples collected from across the reservoir from the peninsula. No release of metals is interpreted from these data.

No human health risk is interpreted, because no complete pathways exist for human exposure to sediments. To allow a preliminary assessment of potential human health risks, the concentrations were compared to Residential PRGs. No chemicals were identified as concentrations above their respective ambient concentration limits or the PRGs.

Decisions for further action for AOC (Objective) 9 sediments should be postponed until additional data can be collected. These data were examined by Brown and Caldwell staff and Navy Quality Assurance personnel for their applicability, and found to not have supporting documentation that could meet all Navy guidelines for quality assurance and data validation. In no way does this suggest the data are of poor quality, it simply means that documentation necessary to conduct Level IV data validation is no included in the raw data reports, and no previous validation was performed. Navy guidance stipulates that certain levels of data validation must be performed before data can be used in decision making. The Navy will consider validating the existing data to Level III, and collecting additional sediment samples at a higher level of quality documentation in order to satisfy internal requirements for level IV data validation.

The Navy has conducted previous sediment sampling investigation (Law Crandall, 1993), and the sediment sampling that occurred during the SI. Neither of these samplings suggests that a release has occurred at this AOC (Objective) or elsewhere along the shoreline. However, a full evaluation of all existing data should provide stronger conclusions regarding any impacts to human or ecological receptors.

The risk screening for AOC (Objective) 9 only evaluated the sediments with respect to human health screening criteria. No potential risk to human health was found. No risk screening values for ecological receptors have been developed for this site, so no ecological risk screening was performed. However, complete pathways and receptors exist in the aquatic environment. Hence, additional ecological risk screening is necessary.

Area of Concern (Objective) 10: Electronic Testing Area

Explosives analysis was conducted at this site at the request of regulatory agencies. No explosives were found in the soil samples. No organic parameters were detected. Lithium and chromium (VI) were detected in the soil samples at concentrations below ambient concentration limits. No anthropogenic release is suggested by these data.

No $COPC_H$ were identified during human health risk screening. None of the chemicals found in soil at concentrations above the ambient concentration limits were found at concentrations above the Residential PRGs.

Based on the above results, no further action is recommended for AOC 10.

Area of Concern (Objective) 11: Propellant Magazine

No SVOCs or Otto Fuel were detected in the soil samples. Lithium was detected in all three samples ranging from 12 to 17 mg/kg. No other metals were targeted for analysis at this AOC (Objective). No anthropogenic release is interpreted from this data given that no SVOCs or Otto Fuel were detected and that lithium concentrations were below the background concentration.

No $COPC_H$ were identified during human health risk screening. None of the chemicals found in soil at concentrations above the ambient concentration limits were found at concentrations above the Residential PRGs.

Based on the above results, no further action is recommended for AOC 11.

Background Area 1: (Objective 12) Background Soil Sampling

The metals data collected from Background Area 1 (Objective 12) provide part of the basis for metal ambient concentration limits. Interestingly, several metals were detected at concentrations above their statistically-derived ambient concentration limit. These data highlight the difficulty with using statistical techniques to define "thresholds" or "concentration limits" as screening for ambient conditions. By definition, the statistical approach as used in this SI excludes higher concentrations, which are nevertheless part of the same background data set. Some segment of a population will be naturally occurring and yet exceed the calculated "thresholds."

No human health risk screening was conducted for the soil background samples.

No action is necessary for Background Area 1 (Objective 12) under any circumstances, since this Background Area (Objective) targeted defining ambient conditions for soils.

Background Area 2: (Objective 13) Rock Background Sampling

Rock outcrop samples were collected to examine ranges of metals in the source rocks in this area and examine minerals that could be present that would contain metals in their chemical structure. Most of the rock samples from Background Area 2 (Objective 13) exhibited metals which have concentrations within the general ranges found on site. In some cases, one to several of the rock samples exhibited concentrations well above the general range. These higher concentrations represent natural conditions of these rocks (as is corroborated through the mineralogical analysis discussed below). Chromium, cobalt, copper, lithium, nickel, selenium, and zinc were found in some rock samples at concentrations above their respective ambient concentration limits as calculated in Appendix A.

Many of the rock samples from Background Area 2 (Objective 13) contain minerals that include metals as part of their main chemical structure. The most common minerals identified in rock samples on site that contain metals as part of their main chemical structure include chalcopyrite (CuS), galena (PbS), sphalerite (ZnS) illmenite ($FeTiO_3$), millerite (NiS), pentlandite (Fe, Ni, Co)$_9O_8$, zircon ($ZrSiO_4$), titanium dioxides (TiO_2), covellite (CuS), malachite ($Cu_2CO_3OH_2$), heazlewoodite (Ni_3S_2), and chromite ($FeCr_2O_4$). These minerals are not found in every sample, nor are some of them found very commonly. However, given the overall sampling approach (i.e., 20 samples collected in a metamorphosed, very heterogeneous region), the fact that many of these metals were detected in the rock suggests that they could have contributed to overall higher than expected ambient metals. In many cases biotite was found in the rock samples as a significant percent of the rock matrix. Petrography analysis identified that chromium and nickel

are part of biotite structure, possible as replacement metals for iron or magnesium. Hence, the rock found near and on site could provide a source of chromium and nickel. Corresponding metals analysis in split samples corroborates the presence of these metals.

Statistical analysis of both soil and rock samples resulted in an ambient concentration limit for each metal. However, metals results from rock samples collected in Background Area 2 indicate that some metals may naturally exist at concentrations exceeding these limits. Decision making with respect to these metals needs to carefully consider such information.

No human health risk screening was conducted for the rock samples.

No action is necessary for Background Area 2 (Objective 13) under any circumstances, since this Background Area (Objective) targeted defining ambient conditions for rocks found in the Morris Dam area.

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REFERENCES

Brown and Caldwell, 1997, Final Site Investigation Work Plan, NCCOSC RTD&E Division, Department of the Navy, Southwest Division, NAVFACENGCOM.

Brown and Caldwell, 2000, Final Site Inspection Work Plan Addendum, NCCOSC RTD&E Division, Department of the Navy, Southwest Division, NAVFACENGCOM, January 2000.

Brown and Caldwell, Revised Preliminary Assessment NCCOSC, RTD&E Division, Department of the Navy, Southwest Division, NAVFACENG, February 1995.

California Department of Toxic Substances Control (DTSC), 1994, Internal Memo-Recommended Outline for Using US EPA Region IX Preliminary Remediation Goals in Screening Risk Assessments at Military Facilities, To: Ken Smith, Chief Office of Military Facilities, DTSC, From: Michael Wade, Laura Valoppi, and John Christopher, DTSC. October 28, 1994.

_____, 1996a, Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities, Part A: Overview, California Environmental Protection Agency. July 4th, 1996.

_____, 1996b, Guidance for Ecological Risk Assessment at Hazardous Waste Sites and Permitted Facilities, Part B: Scoping Assessment. California Environmental Protection Agency. July 4th, 1996.

_____, 1997, Selecting Inorganic Constituents as Chemical of Potential Concern at Risk Assessments at Hazardous Waste Sites and Permitted Facilities, Final Policy, California Environmental Protection Agency, February 1997.

California Regional Water Quality Control Board - Los Angeles Region, 1992. Naval Command Control and Ocean Surveillance Center Morris Dam Facility Los Angeles County, Site Investigation Report, May.

Department of Fish and Game (DPG), 1997, Memorandum. Natural Communities/Species List for Morris Dam NOSC (7155/60140/NTX078 00:10). Susan R. Ellis. 31 July 1997.

Department of Navy, letters dated 23 January 1995 and 14 February 1995 to Brown and Caldwell from Julia F. Garcia, Contracting Officer and Bob Monroe to Kim Ostrowski, respectively.

Department of Water Resources (DWR), 1966, Planned Utilization of Ground Water Basins, San Gabriel Valley, Appendix A, Geohydrology, Bulletin No. 104-2.

Diaz, Art, 1997, Personal Communication, regarding monitoring of water loss in reservoir, December 5, 1997.

Dibblee, T., W., 1982a, Geology of the San Gabriel Mountains: *in*: D.L Fife and J.A. Minch Ed., Geology and Mineral Wealth of the Transverse Ranges, Southcoast Geological Society.

Dibblee, T., W., 1982a, Regional Geology of the Transverse Ranges Province of southern California: *in*: D.L Fife and J.A. Minch Ed., Geology and Mineral Wealth of the Transverse Ranges, Southcoast Geological Society.

Dragun, J., 1988, The Soil Chemistry of Hazardous Materials, Hazardous Materials Control Research Institute, Silver Spring, Maryland.

Ehlig, P. L., 1975, Basement rocks of the San Gabriel Mountains south of the San Andreas fault, southern California: *in*: Crowell, J. C., ed., San Andreas fault in southern California; Calif. Div. Mines and Geology Spec. Rept. 118, p. 294-305.

Ehlig, P. L., 1981, Origin and tectonic history of the basement terrain of the San Gabriel Mountains, central Transverse Ranges: *in*: Ernst, W. G., ed., The Geotectonic development of California: Rubey Volume 1, Prentice-Hall, New jersey, p. 258-283.

Gibbons, R.D., 1994, Statistical Methods for Groundwater Monitoring. John Wiley & Sons, Inc., New York, NY, 286 pp.

Gilbert, R.O., 1987, Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold, New York, NY, 320 pp.

Holland, R.F., 1986. Preliminary Descriptions of the Terrestrial Natural Communities of California. Nongame Heritage Program. California Department of Fish and Game, Sacramento, California. 156 pages.

Hulett, T. G., and Associates, Report on the Removal of Seven Tanks Located at NCCOSC, RTD&E Division, Morris Dam Facility, Azusa, California, January 13, 1994.

Iman, R.L. and W.J. Conover, 1983, A Modern Approach to Statistics. John Wiley and Sons, New York, NY.

Iman, R.L. and W.J. Conover, 1983, A Modern Approach to Statistics. John Wiley and Sons, New York.

Jacobs Engineering Group, Incorporated, Naval Command Control and Ocean Surveillance Center, Morris Dam Facility, Los Angeles County, California, Site Investigation, March 10, 1992.

Jacobs Engineering Group, Incorporated, Naval Command Control and Ocean Surveillance Center (NCCOSC), Morris Dam Activity, Azusa, California, Emergency Removal Final Report, April 12, 1993.

Jacobs Engineering Group, Incorporated, Naval Ocean Systems Center (NOSC), Morris Dam Activity, Los Angeles County, California, Preliminary Assessment, November 1991.

Law/Crandall, Inc. 1993. Report of Sediment Sampling Naval Command Control Ocean Systems Center RDT&E Morris Dam Facility, Azusa, California. Prepared for Naval Facilities Engineering Command. July

Los Angeles County Department of Public Works and Metropolitan Water District of Southern California , Morris Reservoir Sediments Investigation, Los Angeles, California. Vol. 1. Interpretive Report. Prepared by Fugro West, Inc., March, 1995.

Mayer, K.E. and W.F. Laudenslayer. 1988. A guide to wildlife habitats of California. California Department of Forestry and Fire Protection. Sacramento, California.

McLean, J. E., and Bledsoe, B. E., 1992, Behavior of Metals in Soils, in United States Environmental Protection Agency, Ground Water Issue, Office of Research and Development, Office of Solid Waste and Emergency Response, EPA/540/S-92/018, October 1992.

Moreno, Marty, 1997, Personal Communication, Nature of Azusa Conduit, December 10, 1997.

Morton, D., M., 1973, Geology of parts of the Azusa and Mount Wilson quadrangles, San Gabriel Mountains, Los Angeles, California: California Division of Mines and Geology, Special Report 105, Scale 1:12000.

Naval Command, Control and Ocean Surveillance Center, Morris Dam Review 1992, Videocassette, Unclassified, 26 minutes.

Naval Command, Control, and Ocean Surveillance Center, RDT&E Division, Environmental Compliance Evaluation, Morris Dam Facility, February 26, 1992, and September 1-2, 1992.

Powell, R. E., 1982, Crystalline basement terrain in the Transverse Ranges: *in*: Cooper, J. D., ed., Geological Excursions in the Transverse Ranges; Geol. Soc. America, Cordilleran Sec., 78th an Mtg., Anaheim, Calif., p. 109-136.

Regional Water Quality Control Board (RWQCB), Los Angeles Region, 1994, Water Quality Control Plan Los Angeles Region, Basin Plan for the Coastal Watersheds of Los Angeles and Ventura Counties.

Ryan, T.A., Jr. and B.L. Joiner. 1976. Normal Probability Plots and Tests for Normality. Minitab Inc.

Sample, B.E., D.M. Opresko, and G.W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. ES/ER/TM-86/R3. Oak Ridge National Laboratory, Oak Ridge, TN.

Sawyer, J.O. and T. Keeler-Wolf, 1995, A Manual of California Vegetation. California Native Plant Society. Sacramento, California.

Schoenherr, A.A., 1992, A Natural History of California. University of California Press. Berkeley, California.

Sephram, Steven, Personal Communication, January 19, 1995.

Southwest Division, 1996, Policy Memorandum No. 13, Data Validation, Naval Facilities Engineering Command, March 11, 1996.

United States Army Corps of Engineers (USACE), EIS/EIR for the San Gabriel Canyon Sediment Management Plan, August 1994.

United States Environmental Protection Agency, 1989a, Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), EPA/540/1-89/02.

United States Environmental Protection Agency, 1989b, Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual, Interim Final, EPA/540/1-89/001.

United States Environmental Protection Agency, 1992, Guidance for Performing Site Inspections Under CERCLA, Interim Final, EPA/540-R-92-01.

United States Environmental Protection Agency, 1996, Region IX Preliminary Remediation Goals (PRGs) 1996, August 1, 1996.

United States Environmental Protection Agency, Test Methods for Evaluating Solid Waste, Update 3, 1995, SW-846.

Vogel, J., Preliminary Assessment Report, Naval Ocean Systems Center, Morris Dam Facility, Azusa, California, Naval Energy and Environmental Support Activity, NEESA 13-149PA, March 1988.

Willis, David, 1997, Personal Communication regarding Source and Use of Fill Material, NCCOSC Morris Dam Facility, December 3, 1997.

Willis, David, 2001, Personal Communication regarding the use and recycling and disposal of solvent in the cleaning system, Building 42038, NCCOSC Morris Dam Facility, September 21, 2001.

Woodward-Clyde Consultants, Phase I Environmental Site Assessment for Morris Reservoir, Los Angeles County, California, February 1994.

Zar, J.H., 1984, Biostatistical Analysis. 2nd Ed. Prentice-Hall, Englewood Cliffs, NJ.

Zeiner, D.C., W.F. Laudenslayer, K.E. Mayer, and M. White (eds.). 1988. California's Wildlife, Volume I: Amphibians and Reptiles. State of California, Department of Fish and Game. Sacramento, California.

———, 1990a, California's Wildlife, Volume II: Birds. State of California, Department of Fish and Game. Sacramento, California.

———, 1990b, California's Wildlife, Volume III: Mammals. State of California, Department of Fish and Game. Sacramento, California.

APPENDIX A

DETERMINATION OF AMBIENT METAL CONCENTRATIONS

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DETERMINATION OF AMBIENT METALS CONCENTRATIONS IN SOIL

This appendix presents a detailed description of the techniques and processes used to evaluate ambient metals concentrations in soil at the Morris Dam R&D facility (site). Metals that were evaluated include: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, cobalt, copper, lead, lithium, manganese, mercury and molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc. The evaluation of ambient metals concentrations included the following five steps:

1. Ambient data sets were created using statistical analysis techniques.

2. 99th percentiles were calculated for all ambient data sets.

3. Geochemical relationships were used to evaluate the applicability of using 99th percentiles of the ambient data to represent the upper limits of ambient metals concentrations.

4. High-end outliers were identified using a geochemical technique known as "enrichment ratios."

5. Final ambient concentration limits were established based on combined results of the statistical and geochemical assessments.

This appendix is organized into three sections. Section A.1 presents the statistical methods used to create ambient data sets and calculate the 99th percentile concentrations. Methods used to evaluate geochemical relationships of the metals are described in Section A.2, and results of the ambient analysis are summarized in Section A.3 and Table A-15.

A.1. STATISTICAL DETERMINATION OF AMBIENT CONCENTRATION LIMITS

A.1.1 General Approach

The statistical methodology that was used to calculate ambient concentration limits for soil is based on the California Department of Toxic Substances Control (DTSC) guidance document entitled *"Selecting Inorganic Constituents as Chemicals of Potential Concern in Risk Assessments at Hazardous Waste Sites and Permitted Facilities"* (DTSC, 1997). The DTSC document presents an approach that extracts "ambient data sets" from larger "expanded data sets." Expanded data sets are formed by combining analytical results from known background areas with results from potentially contaminated areas, because, as the guidance states, "the best description of ambient conditions will be obtained from the largest data set possible." This is a particularly effective technique for soil samples that are analyzed for many metals because a

sample contaminated with one metal may exhibit ambient concentrations for the remaining metals. Once the ambient data sets are formed, a concentration that is representative of the upper range of ambient conditions is calculated, and measurements from potentially impacted samples are compared to that limit.

The protocol that was used to develop ambient concentration limits is shown in a flow chart presented as Figure A-1. The following discussion of the statistical methodology closely follows that flow chart. The discussion is meant to be as concise as possible while still providing sufficient detail so that the reader could recreate the analysis, if desired. The figures and tables, which also follow the sequence of events laid out in the flow chart, are key elements of the discussion.

A.1.2 Data Preparation

The raw data were carefully examined and adjusted to ensure that subsequent statistical analysis results are not misleading due multiple detection limits. The raw data include all soil and rock results with the exception of results from Area of Concern (Objective) 9, which are for reservoir sediment. Sediment results are not directly comparable to soil results because grain size and metals concentrations are often inversely related. Results from the loess samples that were collected for Area of Concern (Objective) 7 also were excluded from the analysis because the surface loess, or wind blown sediment was deemed a different matrix than the soil. Small asphalt particles were observed in the loess samples as well as sand and gravel. Results from field duplicates were not included in the raw data.

The following rules were used to prepare the raw data:

- A single reporting limit was selected for each analyte that would optimize the usefulness of the data set. The selected reporting limit is shown at the bottom of Table A-1. In general, statistical analysis methods work best when there is only one reporting limit.
- Non-detect values that have a higher reporting limit than the selected reporting limit were removed.[1]
- Non-detect values that are less than or equal to the selected reporting limit were set equal to one-half the selected reporting limit.
- Detected values that are less than one-half the selected reporting limit were removed.

[1] An exception to this rule was made for the molybdenum rock data from Background Area 2 (Objective 13). Even though non-detect results were reported as "< 10 mg/kg", the values are known to be less than the method detection limit (MDL) since trace values between the RL and MDL were reported in this case. Therefore, instead of removing the non-detect rock values because they exceed the selected reporting limit, the results were set equal to ½ the selected reporting limit (i.e. ½ * 2, which is larger than the MDL of approximately 0.8 mg/kg).

A.1.3 Incorporation of Rock data from Background Area 2 (Objective 13)

After the raw data were prepared, statistical procedures were used to determine if the rock data from Background Area 2 (Objective 13) could be combined with the soil data (i.e. background) from Background Area 1 (Objective 12, Subareas 1, 2, and 3). This determination was based on comparability of reporting limits and population characteristics. Comparability of reporting limits was addressed during data preparation. All cadmium, silver and thallium results for rock were removed during data preparation because reporting limits for those analytes are elevated relative to the soil data. Reporting limits for rock and soil data for the remaining metals are comparable.

Comparability of population characteristics was addressed by comparing the rock data from Background Area 2 (Objective 13) with the soil data from Background Area 1 (Objective 12) using the Mann-Whitney test. Prior to conducting those tests, the data were plotted using box and whisker plots. Concentrations shown on those plots as extreme values were removed prior to conducting the Mann-Whitney test, and were not used in subsequent statistical analyses. This procedure was only conducted once for a given data set. For example, if one or more extreme values were removed from the data and the data were replotted, any additional extreme values were retained. The procedure was intended to remove only the most anomalous observations.

Boxplots for the rock data from Background Area 2 (Objective 13) and soil data from Background Area 1 (Objective 12) are shown in Figure A-2. Values that plot as "extremes" are those that fall outside of the outer fences, which are located at three times the interquartile range both above and below the box. Extreme values occur less than one in 300,000 times if the distribution is exactly normal (Helsel and Hirsch, 1992).

Data used in the Mann-Whitney test are summarized in Table A-2, and results are presented in Table A-3. A significance level of 1 percent was selected for the Mann-Whitney test. If the p-value exceeded 0.01, the null hypothesis of no difference between the two populations was accepted; otherwise it was rejected and the two populations were assumed to be different. In all cases, the boxplots were examined to verify results of the Mann-Whitney test. In instances where there were an insufficient number of detected results to conduct the Mann-Whitney test, the comparison was made using just the boxplots.

Based on comparability of reporting limits and population characteristics, if the rock data from Background Area 2 (Objective 13) could not be combined with the soil data from Background Area 1 (Objective 12), the rock data from Background Area 2 (Objective 13) were excluded from further statistical analysis for purposes of calculating ambient conditions. Otherwise, the rock data from Background Area 2 (Objective 13) were added to the data from Background Area 1 (Objective 12), and combined into a data set referred to as the "Combined Background" data. The rock samples were collected at a later time period than the soil data and are assumed to represent non-contaminated conditions.

A.1.4 Characterization of the Combined Background data

After it was determined whether or not to include the rock data from Background Area 2 (Objective 13) with Background Area 1 (Objective 12), the resulting Combined Background data were characterized using distributional analysis and summary statistics (Tables A-4 and A-5). Results of the data characterization were utilized in several stages of the statistical analysis as well as in the geochemical evaluation. For example, average concentrations of magnesium, potassium and sodium were used in enrichment ratio calculations as described in Section A.2.1.

Distributional testing was conducted using the Shapiro-Wilk test. Both the non-transformed and log-transformed data were tested and the best-fit distribution was identified based on the p-value of the test. A higher p-value indicates a better fit. The p-value for the best-fit distribution was then compared to a significance level of 1 percent. If the p-value exceeded 0.01, the null hypothesis of a normal (or lognormal) distribution was accepted. The p-value exceeded 0.01 in all cases.

All summary statistics with the exception of the 99th percentile were calculated using standard statistical procedures available in Microsoft® Excel. The number of summary statistics that were calculated for each analyte depended on the percentage of detected values in the data set. For example, the maximum and minimum detect were not expressed for data sets with no detects.

Parametric statistical methods were used to calculate the 99th percentile for analytes with more than 80 percent detected values. Those analytes include aluminum, arsenic, barium, beryllium, chromium, cobalt, copper, lead, manganese, nickel, vanadium and zinc. Non-parametric methods were used for the remaining data sets because distributional assumption could not be verified. Those analytes include antimony, cadmium, mercury, molybdenum, selenium and silver. 99th percentiles were calculated according to equations presented below.

percentage of detects > 80% and normally distributed

x_p = mean + Z_p * sdev (Gilbert, 1987, equation 11.1, page 134)

where: x_p = estimate of the pth percentile of the population
Z_p = pth quantile of the standard normal distribution

percentage of detects > 80% and lognormally distributed

x_p = exp [mean + Z_p * sdev] (Gilbert, 1987, equation 13.24, page 175)

where: x_p = estimate of the pth percentile of the population
Z_p = pth quantile of the standard normal distribution
exp = the inverse natural log of the quantity in brackets

percentage of detects ≤ 80%

x_p = k^{th} order statistic (Gilbert, 1987, Section 11.9, page 141)

$$k = p\,(n+1)$$

where: x_p = estimate of the pth percentile of the population
p = percentile of interest (i.e. 99th)
n = number of data points

If k was an integer, the estimate of the 99th percentile was simply the kth largest value in the data set. If k was not an integer, the 99th percentile was obtained by linear interpolation between the two closest data points. If k exceeded n, the 99th percentile was set equal to the maximum value rather than invoking extrapolation.

A.1.5 Expanded Data

The expanded data were used as the basis for forming ambient data. The expanded data (Table A-6) are the same as the prepared data presented in Table A-1 with two exceptions: (1) extreme values identified in the Combined Background data are not included, and (2) rock data from Background Area 2 (Objective 13) that were shown to be not comparable with the soil data from Background Area 1 (Objective 12) are also not included. Ranked data plots of the expanded data are shown in Figure A-4.

The expanded data were characterized using summary statistics (Table A-7). All summary statistics, with the exception of the 99th percentile, were calculated using standard statistical procedures available in Microsoft® Excel.

A.1.6 Ambient Data

Ambient data sets were formed for each metal by removing values from the expanded data that appear to lie outside the ambient population. For purposes of this investigation, "ambient" concentrations include both naturally occurring concentrations of chemicals, and anthropogenic concentrations of chemicals from human-made, non-site sources. Methods used to identify and remove outliers are discussed below. Ambient data and values identified in the outlier removal procedure are presented in Table A-8.

For data sets with greater than 80 percent detected values, suspected outliers were identified and removed using an outlier removal method based on consecutive application of the Shapiro-Wilk normality test (Gibbons, 1994, page 252). Either the original or the log-transformed data were used depending on the results of normality testing on the Combined Background data (see Section A.1.4). Data points furthest from the mean were removed one at a time until normality testing showed that the remaining data were normally (or lognormally) distributed at a significance level of 1 percent. The mean was recalculated after each data point was removed. Normal probability plots for the expanded and ambient data are presented in

Figure A-3. Maximum values in the ambient data are shown on the ranked data plots (Figure A-4).

For data sets with fewer than 80 percent detected values, the maximum value in the Combined Background data was used as the criteria for removing outliers from the expanded data. Those maximum values are shown on the ranked data plots (Figure A-4).

Summary statistics were calculated for the resulting ambient data (Table A-9). Those statistics include: the assumed distribution for the outlier removal procedure; the p-value from the Shapiro-Wilk test; the number of observations removed from the expanded data; the 99th percentile using equations presented in Section A.1.3; and the number of observations, maximum observation, mean, standard deviation, and coefficient of variation.

A.1.7 Determination of Ambient Concentration Limits

99th percentiles calculated from the ambient data were compared with 99th percentiles from the Combined Background data (Table A-10). The following equation for relative percent difference (RPD) was used for the comparison:

$$RPD = abs(A-B)/[(A+B)/2]$$

where: abs = absolute value
A = 99th percentile for ambient data
B = 99th percentile for the Combined Background data

The RPD is called a measure of *relative difference* because it is independent of the actual magnitude or units of measurement of the data. The RPD for an analyte with high concentrations (i.e. aluminum) is therefore comparable to the RPD for an analyte with low concentrations (i.e. beryllium).

The RPD for iron, 25 percent, was used as the threshold for evaluating the other RPDs. This decision was based on geochemical characteristics of the data. Iron results are well correlated with many metals as discussed in Section A.2, hence, iron is thought to represent natural variation in metals at the site. If the RPD is less than 25 percent, the 99th percentile calculated from the ambient data was selected as the ambient concentration limit. If the RPD exceeds 25 percent because the 99th percentile from ambient data is <u>higher</u> than the 99th percentile from the Combined Background data, the 99th percentile from the Combined Background data was selected as the ambient concentration limit. This situation occurred for arsenic, chromium and nickel. If the RPD exceeds 25 percent because the 99th percentile from ambient data is <u>lower</u> than the 99th percentile from the Combined Background data, the 99th percentile from the ambient data was selected as the ambient concentration limit. The final ambient concentration limits are summarized in Table A-11.

A.1.8 Statistical Definitions

Definitions used in Section A.1. of this appendix are presented below.

The **99th percentile** is the value, x_p, such that the probability is 99 percent that a unit in the population will have an observed value less than or equal to x_p, and 1 percent that the value will be larger than x_p.

Ambient concentrations include both naturally occurring concentrations of chemicals, and anthropogenic concentrations of chemicals from human-made, non-site sources.

Ambient concentration limits are concentrations that represent the upper range of ambient conditions.

Ambient data sets consist of data that represent ambient conditions, and are used to calculate ambient concentrations limits. In this appendix, ambient data sets were formed by removing outliers from the expanded data.

Background Area 1 (Objective 12) data are from soil samples collected in three subareas considered to be representative of background conditions.

Background Area 2 (Objective 13) data are from rock samples collected from outcrops exposed near the site, and are assumed to represent non contaminated, natural conditions.

Combined Background data consist of a data set that results after rock data are compared with soil data and combined with the soil data, if statistically warranted, to produce an overall background data set.

A **data set** consists of laboratory results for a particular analyte.

Expanded data sets consist of site characterization data that are typically collected to assess the magnitude and extent of possible contamination. They may also include data from known background areas.

The term "**multiple detection limits**", in this appendix, refers to the situation where non-detect data for a particular analyte are reported at different limits. For example, the data set may include values such as <10, <5 and <0.5 mg/kg. ("Multiple reporting limits" is a more accurate term, however, "multiple detection limits" is the commonly used term for this condition).

The **method detection limit** is the minimum amount of an analyte that can be routinely identified using a specific method (U.S. EPA, 1992).

A **normal probability plot** is a plot used to determine how well the data fit the normal distribution. If observations are normally distributed, they will lie approximately in a straight

line. Also, if log-transformed values are plotted, they will lie in a straight line if the data are lognormally distributed.

Non-detect values are results that are reported by the laboratory as <RL, where RL is the reporting limit. Non-detects may also be reported as "ND".

An **outlier** is an observation whose value is quite different than other observations in the data set.

The **p-value** is the smallest level of significance that would have allowed the null hypothesis to be rejected.

A **ranked data plot** is an X-Y plot of the data from smallest to largest at evenly spaced intervals.

Raw data are concentrations of analytes as received from the laboratory. In some cases, raw data are not suitable for statistical analysis because of multiple detection limits.

The **reporting limit** is the limit used by the laboratory to report non-detect data.

The **significance level**, also known as Type I error, is the probability of rejecting the null hypothesis when it is in fact true.

A.2. GEOCHEMICAL EVALUATION OF METALS IN SOIL

Geochemical techniques were used to assess if ambient concentration thresholds calculated in Section A.1 are reasonable. Methods used to examine geochemical relationships of the metals and calculate enrichment ratios are described in this section.

A.2.1 Population Analysis

A.2.1.1 Geochemical Basis for Evaluating Ambient Concentrations of Metals in Soil

As discussed in the introduction to this appendix, a second approach to corroborate the statistical evaluation of trace metal ambient concentrations is to examine geochemical relationships between trace metals of interest and cations/metals commonly found in soils. This approach was conducted because: 1) in soils metals are often correlated due to a variety of mechanisms that will be discussed below, and 2) the physical setting surrounding the Morris Dam R&D facility consists of a very heterogeneous mixture of metamorphic rock, in which assemblages of minerals (i.e., trace metals) exist that are unusual to the typically alluvial depositional environment found at most sites. These assemblages result in higher than expected metals concentrations.

This subsection of the appendix presents the evaluation of potential geochemical relationships between cations/metals such as iron or magnesium and trace metals of interest at the site. In addition, enrichment ratios were used to identify which samples may contain higher than normal or "enriched" amounts of a particular metal with respect to a cation. Enrichment rations are an

established procedure for evaluating many physical phenomena and have been used to evaluate metals during environmental analysis (Zdanwicz, 1991; USGS, 2000).

Metals exist naturally in soils and rock, and can be added to the soil either through decay of rocks during soil formation or through anthropogenic processes. Hence, there is a need to evaluate whether a particular concentration represents naturally occurring conditions, or is a result of activities that occurred at (or near) the site. Statistical analysis, which provides one means of quantifying ambient metals concentrations, typically assumes that the data represent a single population without regard to geochemical variations within the distribution. Additionally, some of the metals concentrations that are naturally occurring may be above the quantified ambient threshold because statistical analysis, by the very nature of defining a particular percentile threshold, leaves some data outside the defined range. This is particularly evident in the Morris Dam data set through examination of the rock data from Background Area 2 (Objective 13) versus those concentrations found in soil.

Geochemical techniques can be used to distinguish the relative contribution of natural and anthropogenic processes. They can also provide support for calculation of ambient metals concentrations. Trace metals, when they exist naturally, often exist in relatively fixed ratios with naturally occurring cations/metals. Analysis of the variation in these ratios can often isolate areas or samples that are outside the normal, expected ranges. The enrichment ratio technique is frequently used when examining marine sediment data, but is also applicable to terrestrial environments. Overall analysis using several tools will provide more basis for decision making with respect to ambient metals concentrations.

Ambient metals concentrations can vary in soil and rock for a variety of geochemical reasons. Clay minerals, organic matter, and iron, manganese, and aluminum oxides and hydroxides can enhance the adsorption of metals in soils. Clay minerals can act to adsorb trace metals through cation exchange. Inorganic adsorption processes are often controlled by soil pH through complicated changes in net surface charges.

Organic matter is an important mechanism for metal adsorption onto soils, and for metal complexing and transport in fluids. Soils high in natural organic material (i.e., humus) often show enriched metals concentrations due to the net negative surface charge that develops from organic acid disassociation (Dragun, 1988).

Iron, manganese, and aluminum oxides and hydroxides have been shown to be important adsorbents, controlling trace metal concentrations in soils through their relatively large specific surface areas and surface chemical reactivity (Rai and Zachara, 1984, and Strumm, 1992). All of the above cations are present in abundance in soils at the site. The usefulness of geochemical relationship in soils to the site ambient evaluation is based on characteristics of common metals and cations in soils. Some correlation would be expected between these cations and the associated trace metals, and therefore, correlation between trace metals and these cations is examined in this section.

In addition to the above adsorption mechanisms, metals can precipitate as mineral phases onto the soil or rock matrix from meteoric or hydrothermal solutions. Meteoric solutions are those

that formed from mineral reaction with infiltrating water percolating through the soil matrix. Hydrothermal solutions form from water that has been released by magma bodies or connate waters that have reacted with such bodies, and which then flow towards the surface under thermal gradients. Generally, meteoric water flows through the soil pore matrix or near surface rock fractures, while hydrothermal solutions flow through the fractures, which provide avenues towards the surface. The precipitation or reaction of mineral phases is dependent upon many factors that change dynamically in the system, resulting in heterogeneous mineral deposits. Some of the factors controlling precipitation or reaction include solution pH, temperature, and oxidation-reduction potential.

Minerals can form as pure or mixed solids. Pure solids are formed with just the metal and an associated anion, e.g. zinc sulfide (ZnS_2), while mixed solids are formed by mixtures of metals in different proportions with an anion, e.g., iron-chromium hydroxide $(Fe_xCr_{1-x})(OH)_4$. Mineral phases that can form in this way include sulfides, carbonates, hydroxides, oxides, halides, nitrates, and sulfates. Additionally, some iron, manganese, and aluminum oxides and hydroxides form under ambient near-surface conditions, and can include trace metals as part of the mineral structure.

A.2.1.2 Correlation of Metals Data

Natural geochemical relationships were evaluated by determining the correlation between major cations/metals (iron, magnesium, manganese, sodium, and aluminum) and the trace metals of interest. Statistical methods were used to calculate correlation coefficients and to determine their statistical significance. Scatter plots were then prepared for data that exhibit statistically significant correlations. Ambient concentration limits developed in Section A.1 are shown on the scatter plots. These plots were used to examine the distribution and compare it with the statistically-derived ambient concentration limit. Additionally, any values that appear by inspection to be outside the correlated data set were identified.

Table A-12 presents the calculated correlation coefficients between all metals that were evaluated as part of this SI. These correlation coefficients were evaluated to determine whether they represented significant correlation through a comparison with the critical t-value. This procedure is outlined in EPA (1996). In this case, the test is defined by the null hypothesis "there is no correlation between the metals." To test the null hypothesis, the t-statistic is calculated for each correlation and then compared with the critical t-value for a certain confidence level. If the t-statistic for the correlation is greater than the critical t-value, then the null hypothesis is false, and correlation is assumed between the controlling metal and the adsorbed metal. The t-statistic for each correlation is calculated as

$$t = r[(n-2)^{0.5}]/[(1-r^2)^{0.5}]$$

where r = correlation coefficient
n = number of observations.

Table A-12 shows the t-statistic calculated for each correlation. A 99.9 percent significance level was used and the critical t-value was 3.360. Values for the t-statistic that were found to represent correlated data sets are bolded in the table.

As seen in Table A-12, correlation was observed between many trace metals and aluminum, iron, magnesium, manganese, and sodium. For a smaller number of metals, correlation was observed with potassium. Lead, copper, and zinc did not correlate with any of the controlling cations or metals, but they did correlate with each other. Hexavalent chromium (chromium VI) exhibits correlation only with zinc. Calcium only exhibits correlation with barium. Based on these results, the plotted data will only compare trace metal concentrations with cations/metals such as iron that exhibit correlation with many trace metals.

Figures A-5 through A-20 exhibit the graphical correlation between the cations/metals and trace metals for all data collected, including the rock samples from Background Area 2 (Objective 13). Further discussion of these plots with respect to the rock analysis is presented in Section A.2.1.4. Figures A-5 and A-6 show the correlation between aluminum and iron and magnesium and iron. Plot A-5 shows that the majority of cation data points lie below the statistically-calculated ambient concentration for aluminum, and also exhibits what the natural variation looks like between two cation/metals that are not thought to be contaminants at this site. Hence, the cation distribution should represent the natural distribution of ambient concentrations. Similar ambient distributions should occur for other metals that are found in site soils. Note, however, that for each of the cations, several points exist above the statistical ambient concentration limit. The following paragraphs discuss each of the correlation scatter plots for those metals thought to present the greatest risk to human health or the environment. No discussion is presented regarding the geochemical relationships found between cadmium, mercury, molybdenum, selenium, silver, or thallium because data sets for these metals had less than 80 percent detections (often much less), and hence do not yield meaningful correlation information.

Iron versus Arsenic

Figure A-7 shows a scatter plot of arsenic versus iron concentrations at the site. Two general linear trends can be observed, one with a low slope in which most of the data points are below the statistical ambient threshold for arsenic, and one of which shows a high slope, which extends above the statistical ambient threshold. Note the linear nature of the upper curve. This trend suggests that two populations may exist at the Morris Dam R&D facility. Scatter plots for aluminum versus arsenic, and magnesium versus arsenic (not included) show similar relationships.

Iron versus Barium

Figure A-8 shows a scatter plot of iron versus barium. Note the general correlation as well as the linear trend that extends out to some of the highest barium concentrations. This continuous linear trend suggests that most barium concentrations detected on site may be considered within the natural population.

Iron versus Beryllium

Figure A-9 shows a scatter plot of iron versus beryllium. Note the general correlation and the linear trend that extends towards the statistical ambient threshold. This continuous linear trend suggests that all beryllium concentrations detected at the site may be considered within the natural population.

Iron versus Chromium

Figure A-10 shows the correlation of iron and chromium. This plot is similar to the iron versus arsenic plot in that a lower population is evident below the statistical ambient concentration limit, with some points plotting above. In this case, most of the rock sample results are well above the ambient concentration limit. This is significant because it suggests that the rock presents an on site source of chromium that is naturally occurring, and of which the statistical procedure used does not adequately characterize. The values above the limit are scattered and exhibit no visible trends. From examining this data, it appears that the ambient concentration limit encompasses most of the data that are within the main linear relationship. Further discussion of the chromium data is presented in the section discussing mineralogical analysis (Section A.2.1.4).

Hexavalent Chromium

No plot is given for hexavalent chromium, because no correlation was found between this metal and any other metal except zinc. The reason this metal is even presented here is because its toxic nature often results in it being considered a chemical of potential concern (COPC). As is clear from the correlation coefficient and t-statistic calculations, something other than the natural adsorption mechanisms discussed previously is controlling chromium VI distribution; hence, the geochemical evaluation does not help in examining this trace metal.

It should also be mentioned that chromium VI is a highly oxidized form of chromium that does not generally exist in the natural environment. The analysis for chromium VI is subject to false positives, although no definitive conclusions regarding false positives was found in the data quality assessment. While chromium VI is a compound to be evaluated with respect to human health and the environment, we believe any further action should not be based on chromium VI data alone because it rarely exists naturally in the environment.

Iron versus Cobalt

Figure A-11 shows the correlation of iron and cobalt. This plot is similar to the iron versus arsenic plot in that a lower population is evident below the statistically-derived ambient concentration limit. However, linear trends in the data are not evident in values above the concentration limit. This could reflect a heterogeneous source area, or these samples could be impacted by anthropogenic activities. However, note that two rock sample concentrations are above the statistical threshold as well. As discussed in the iron versus chromium discussion above, the rock data suggest that a source for cobalt in soils exists from the rock outcrops found on site. Hence, the statistical analysis performed may not adequately characterize the

background cobalt concentrations. Further discussion of the rock samples results is presented below. From examining Figure A-9, it appears that the statistically-derived ambient concentration limit obtained from the 99th percentile yields a reasonable value for the ambient threshold.

Magnesium versus Lithium

Figure A-12 shows the scatter plot for magnesium versus lithium. Note that lithium did not correlate well with any other metals and therefore little trend between the two metals is observed in the plotted data. However, it is illustrative to examine how the data scatter, and how the proposed threshold ambient concentration relates to the data.

Iron versus Manganese

Figure A-13 shows the scatter plot for iron versus manganese. Note that the correlation is similar to barium and beryllium, with a continuous linear trend extending up to the statistical ambient threshold plotted on the figure. No soils concentrations from the facility appear to be anomalous.

Iron versus Nickel

Figure A-14 shows the correlation of iron and nickel. This plot is similar to the iron versus arsenic plot in that a lower population is evident below the ambient concentration limit. In this case, the linear trend for the main relationship extends up to the ambient threshold for the bulk of the data set. Subtle linear trends are evident in data above the ambient threshold, but are not sufficient to make definitive conclusions regarding multiple populations. This could reflect a heterogeneous source area, or these samples could be impacted by anthropogenic activities.

Iron versus Vanadium

Figure A-15 shows a scatter plot of iron versus vanadium. Note the general correlation, as well as the linear trend that extends up to the statistical ambient threshold.

In the cases discussed above, comparison of the ambient concentration limit with the population distribution suggests that the ambient concentration limit presents a reasonable representation of the majority of data. However, it is also important to note that in most cases some data exist above the ambient concentration limit, and, in fact, some of these points above the limit are from the rock data in Background Area 2 (Objective 13), which indicates that extreme concentrations for most metals can be explained through understanding that these rocks are the source material for soils and fill material on site. The only exception to this conclusion for the plots above is for arsenic, where the arsenic concentrations appear to group into two distinctly separate populations. With arsenic, all rock data from Background Area 2 (Objective 13) are found at concentrations below the ambient concentration limit.

A.2.1.3 Correlation of Other Metals

As observed in Table A-12, several trace metals exhibit correlation with each other, including cobalt, chromium, lithium, and nickel, and a second group consisting of copper, lead, and zinc. Figure A-16 shows an example of the correlation between chromium and nickel. Note the correlation and linear trend between most of the points extending well beyond the statistical ambient thresholds for either metal. This suggests that a geochemical relationship between these two may exist; possibly representing mineral assemblages found in hydrothermal deposits e.g., sphalerite, galena, and chalcopyrite (for zinc, lead, and copper, respectively).

Figures A-17 through A-20 exhibit the correlation between magnesium and copper, copper and lead, lead and zinc, and iron and selenium, respectively. In general, what these plots show is that the majority of site soils appear to have some correlation to each other, and that the majority of these metals exist at concentrations below each of the metals' respective statistical ambient thresholds. Further discussion of metals mineral relationships is provided below.

A.2.1.4 Ambient Rock Outcrop Analysis

Twenty-two samples were collected from rock outcrops at 20 locations on the peninsula and surrounding areas from an area designated as Background Area 2 (Objective 13). These samples were collected specifically to examine if the rock surrounding the area, and which is the source for soils on site, either through natural soil development processes or through crushing and use as fill for pads, could be a source for higher metals concentrations observed on site. These samples were submitted for two types of complementary analysis: typical metals analysis as performed on the soils on site through EPA 3005/6010 or 7000 series analysis, and mineralogical analysis through petrography and electron microprobe. The following paragraphs summarize the findings from these analyses as they relate to ambient conditions. Results from the metals analysis can be found in Appendix E in Table E-13. The reports from full mineralogical analysis can be found in Appendix I.

Total Metals Analysis

Plots of analytical results for the metals are presented in Figures A-5 to A-19. As shown on those plots, most of the rock samples exhibit metals concentrations within the general ranges found in soils at the site. For some analytes, however, one to several of the rock samples exhibit concentrations well above the general range. These higher concentrations represent natural conditions of the rock as corroborated through the mineralogical analysis. Rock sample analysis does not necessarily correspond directly to soils results because many processes affect the rock as it is weathered to form soil. However, given that the site is situated directly in bedrock terrain with outcrops visible at multiple locations across the site, it is likely that metals that are found in the rock will be also found at higher concentrations in surrounding soil and have the potential to be found at concentrations similar to the maximum found in the rock. Arsenic, chromium, cobalt, copper, lead, lithium, nickel, and selenium are

discussed below because they are metals of interest that may be of potential concern through risk evaluation at the site.

Arsenic. Arsenic concentrations in the rock samples are all well below concentrations observed in the overall data set, and even below concentrations observed in the data set (background) from The Combined Background data. Hence, some of the much higher concentrations of arsenic observed in site soils are not thought to be due to surrounding rock material. It should be mentioned that one sample (13L53 – peridotite/pyroxenite) did show slight evidence for possible arsenic in the rock as discussed below, but corresponding total metals analysis did not corroborate the presence of arsenic in this sample.

Chromium. As shown in Figure A-10, chromium concentrations in many of the rock samples are higher than those observed in most soils, and some much higher. One location in particular (13L53) had very high concentrations of chromium. Hence, the surrounding rock at the site is interpreted as being a likely source for higher chromium. We believe that this suggests that high chromium concentrations could exist naturally at the site, and any decisions regarding further action for a particular Area of Concern (Objective) should not be based on chromium results alone.

Cobalt. Two rock samples exhibit cobalt concentrations well above the statistically-derived ambient concentration limit, although most of the results are below the ambient threshold. The higher cobalt values are similar in magnitude to concentrations found in on-site soils. The rock analysis suggests that the surrounding source rock could provide significant amounts of cobalt to the site soils, certainly within the general range of cobalt concentrations observed at the site. We believe that any decision regarding further action for a particular Area of Concern (Objective) should not be based on cobalt results alone.

Copper. Four rock sample results for copper exceed the ambient concentration limit. Those four concentrations are higher than all but two of the copper results for on-site soils. The two soil concentrations are almost twice the rock sample results, and may therefore represent an anthropogenic source. However, the fact that covellite and malachite were found in some rock samples suggests that a significant source of copper could exist in the rock. Again, we suggest that decisions regarding further action for a particular Area of Concern (Objective) be made by taking several factors into account and not just copper results alone.

Lead. Figures A-18 and A-19 show correlation between lead and copper, and lead and zinc, respectively. Lead concentrations for most samples, including the rock samples, are below the ambient concentration limit. Galena (PbS), a sulfide mineral with lead as part of its chemical structure was identified in one sample (13-17-RK-01). However, it was not found consistently in other samples, and the total metals concentration for this sample did not suggest an anomalous source of lead from mineralogy. Hence, we believe the on-site concentrations that are above the ambient threshold could be from anthropogenic sources.

Lithium. Lithium was analyzed because the Navy used a lithium and sulfur hexafluoride mixture in propulsion testing. Lithium is not considered a metal that would drive significant health risk management decisions due to the relatively high risk screening-concentration;

however, we believed it would provide a good indication of potential release areas. As seen in Figure A-12, nine of the rock results for lithium contain natural amounts above the ambient concentration limit. Therefore, we do not believe that lithium will provide a good tool to evaluate potential release areas due to its prevalence in source rock.

Nickel. Two rock samples exhibit nickel concentrations well above the ambient concentration limit, although most of the results are below the limit. The higher nickel values are similar in magnitude to concentrations found in on-site soils. The rock analysis suggests that the surrounding source rock could provide significant amounts of nickel to the site soils, certainly within the general range of concentrations observed at the site. We believe that any decision regarding further action for a particular Area of Concern (Objective) should not be based on nickel results alone.

Selenium. Although selenium does not correlate well with any metal, Figure A-20 presents a scatter plot of selenium versus iron. This figure shows that selenium concentrations are clearly higher in the rock samples than in the soil samples. We believe this indicates that the rocks provide a significant source of selenium, and that any further action for a particular Area of Concern (Objective) should not be based on selenium results alone.

Zinc. Two rock samples exhibit zinc concentrations well above the ambient concentration limit, although most of the results are below the limit. The higher zinc values are similar in magnitude to concentrations found in on-site soils. The rock analysis suggests that the surrounding source rock could provide significant amounts of zinc to the site soils, certainly within the general range of concentrations observed at the site. We believe that any decision regarding further action for a particular Area of Concern (Objective) should not be based on zinc results alone.

For most metals discussed above, except arsenic and lead, the results show that some of the concentrations were well above the statistically-derived ambient concentration limit. In the statistical analysis procedure, many of these high values were identified as outliers when in fact they are naturally occurring in the rock. Therefore, the Navy believes that this fact indicates that the statistically-derived ambient concentration limit does not adequately characterize the potential range of concentrations that can occur naturally.

Mineralogical Analysis

Table A-13 summarizes the findings from the petrography and electron microprobe analysis. Appendix I contains the reports from the mineralogical analysis. As observed in Table A-13, many of the rock samples contain minerals that include trace metals as part of their main chemical structure. There are generally two ways the trace metals would be included as part of the chemical structure: 1) the metal is a main component (e.g., galena or lead sulfide, [PbS]), or 2) it replaces another trace metal in the chemical structure. Typically, with metal replacement, the replacing metal needs to have similar chemical properties to the replaced metal (e.g., oxidation state, size). Often with replacement metals, the structure of the mineral is such that it allows easy replacement. For example, the mineral biotite has a chemical formula [$K(MgFe)_3(AlSi_3O_{10})(OH)_2$] with multiple iron and magnesium molecules. Trace metals can replace some of the iron or magnesium in the chemical structure, often when the mineral is weathered or undergoes hydrothermal alteration.

The most common minerals identified in rock samples on site that contain trace metals as part of their main chemical structure include chalcopyrite (CuS), galena (PbS), sphalerite (ZnS) illmenite ($FeTiO_3$), millerite (NiS), pentlandite $(Fe, Ni, Co)_9O_8$, zircon ($ZrSiO_4$), titanium dioxides (TiO_2), covellite (CuS), malachite ($Cu_2CO_3OH_2$), heazlewoodite (Ni_3S_2), and chromite ($FeCr_2O_4$). These minerals are not found in every sample and were relatively uncommon. However, given the overall sampling approach (i.e., 20 samples collected in a metamorphosed, very heterogeneous region), the fact that many of these metals were detected in the rock suggests that the presence of these minerals could have contributed to overall ambient metals concentrations that were higher than expected.

One significant finding from the mineralogical analysis was that in many cases biotite, which is found in most of the rocks at site, varies from less than 1 percent to 87 percent of the rock matrix. Most rocks varied between 1 and 20 percent biotite. However, petrography analysis identified that chromium and nickel are part of biotite structure, possibly as replacement metals for iron or magnesium. Iron and manganese oxides, titanium dioxides, muscovite, epidote, apatite, hematite, and hornblende also are minerals that could have trace metals replacing cations in their structure, particularly iron. No definitive evidence was found regarding trace metal replacement these minerals, however, such replacement can commonly occur.

The concentration of a particular mineral is often listed as less than 1 percent of the overall rock; however, a rock bearing 1 percent of a mineral, contains 10,000 mg/kg of that particular mineral. While the mineral may contain a variety of atoms as part of it's make up, it only takes a low percentage of the total mineral (less than 5 percent) to yield concentrations for a metal within the higher ranges observed on site (100's of mg/kg or 1 to several percent of the mineral).

Corresponding metals analysis in split samples corroborates the presence of trace metals identified by the microprobe. Hence, we interpret this corroboration to mean that many of the metals detected in the site soils are a direct reflection of the mineralogy of the surround rocks. It is significant to note that arsenic rich minerals were not usually detected, and total

metals analysis corroborates with this finding as well – very little arsenic was detected in the rock samples. Two samples either 1) did have a mineral that contained arsenic (13-RK-15), or 2) the microprobe analysis identified one mineral crystal (pentlandite) as having arsenic as part (0.02 to 0.03 weight percent) of its chemical structure (13-RK-53). However, the associated total metals analysis did not report higher arsenic concentrations. Alternatively, many of the rock samples had minerals that contain chromium and nickel as part of their main chemical structure or had chromium and nickel added through replacement. The total metals analysis from these rocks did have correspondingly higher chromium and nickel concentrations.

A.2.1.5 Enrichment Ratios

One other way of evaluating whether a particular sample contains higher or "enriched" concentrations of a particular metal, especially when a high degree of correlation exists geochemically between the metal and a cation such as iron, is to calculate "enrichment ratios". These calculated enrichment ratios do not help quantify the ambient threshold for any particular metal, but they do help identify sample locations that may be anomalous, and these results can be compared with outliers from the statistical analysis for further evidence that contamination may exist in a particular location.

As discussed previously, metals often exist in relatively uniform ratios with respect to each other. The enrichment ratio technique normalizes a sample result for a particular metal with respect to the ratio between the element in question and an appropriate cation in the ambient results. Typically, an appropriate cation exhibits a significant correlation as described in Section A.2.1.3 above. Theoretically, if the ratio is the same in the ambient values and on site soil, then the value in an "non-enriched" sample will be 1, while enriched samples well have ratios greater than 1. The enrichment ratio is calculated with the following formula:

$$EF = \frac{[\text{conc of metal in sample/conc of cation in sample}]}{[\text{Mean conc of metal in ambient/Mean conc of cation in ambient}]}$$

Variation occurs in sample results due to soil heterogeneity. Additionally, some variation is present due to laboratory variations. Both of these sources decrease the precision of results such that the theoretical result of 1 is usually not obtained. Some number for the ratio higher than 1 is assigned to reduce the possibility for erroneous interpretation of results. For this analysis, we used a factor of 3 because of the relative percent differences observed in some of the sample duplicate results. It should be noted that finding a metal to be enriched does not remove the uncertainty about the source of the metal, i.e., whether the enrichment is from anthropogenic sources or from natural mineralized deposits. Rather, the method provides another means for identifying which samples exhibit enriched concentrations relative to ambient mean values.

Enrichment ratios were calculated for all metals in soil with detection greater than 80 percent, using the cations that exhibited the greatest correlation. Those cations include aluminum, iron, manganese, magnesium, and sodium. Table A-14 exhibits the results from this

calculation. A metal is considered enriched when ratios greater than 3 are observed with respect to three or more of the controlling cations.

As shown in Table A-14, 48 samples have at least one metal enriched with respect to at least two of the cations. The most common metals observed as enriched include arsenic, chromium (both +3 and +6 oxidation states), lead, lithium, nickel, and zinc. In many cases, more than one metal is found as enriched, so that clusters of metals at higher concentrations appear together. Those particular samples could potentially represent areas where a release has occurred. Note that many of the clustered metals appear to be related to each other. For example arsenic, chromium, and nickel are often found as enriched in the same location. Further evaluation of the locations with clusters of enriched metals concentrations is presented in Section 4 of the SI report.

A.3. SUMMARY OF AMBIENT ANALYSIS

The methodology that was used to determine ambient concentration limits for metals in soil at the Morris Dam facility is presented in this appendix. For this report, the protocol shown in Figure A-1 was used to determine ambient concentration limits for metals in soil. Statistical methods were used to calculate the 99th percentile for both the ambient data and the data from a Combined Background data set. The Combined Background data resulted from comparison with soil background data from Background Area 1(Objective 12), and rock data from Background Area 2 (Objective 13). In general, we selected the threshold values calculated from the ambient data because we think the ambient data provide a better overall representation of the population due to larger sample sizes. In some cases, however, where the relative difference between the 99th percentile of the ambient data set and the 99th percentile of the Combined Background data for a particular metal varied by more than 25 percent, we followed a decision process to define the most appropriate ambient threshold. This process consists of comparing the 99th percentiles from both data sets, and picking the most conservative value of the two. This decision process was used for arsenic, chromium, lead, manganese and nickel. Table A-15 summarizes the final ambient concentration limits (which will be used for risk screening), details the statistical method for obtaining the limit, and provides any supporting comments or rationale for selecting the limit.

The statistically-derived ambient concentration limits were then evaluated using geochemical relationships to determine whether the limits make sense given other natural relationships found between metals at the site. In some comparisons, the statistically-derived ambient concentration limit appears to represent a reasonable estimate as an upper bound for a specific metal found on site. However, a statistical threshold implies by its very definition that some data will lie outside the range, and for some metals data, the geochemical relationships and rock sampling data suggest that the statistical limits may not be appropriate. Table A-16 highlights some of these observations. As seen in the table, the maximum concentration found in rock samples from Background Area 2 (Objective 13) exceeds the statistically-derived ambient concentration limit and maximum concentration in the ambient data set for aluminum, barium, chromium, cobalt, copper, lithium, manganese, mercury, molybdenum, nickel, selenium and zinc. The maximum concentration in rock is approximately equal to the ambient concentration limit and maximum concentration in the ambient data set for

beryllium, cadmium, hexavalent chromium, silver, and thallium. Only for arsenic, lead, and vanadium is the ambient concentration limit and the maximum in the ambient data set greater than the maximum rock concentration. In the statistical analysis, many of the higher concentrations in rock and in soil are identified as outliers and removed from the data set prior to calculating the ambient concentration limit, thereby biasing these limits.

Mineralogical analysis verified that mineral species containing trace metals as part of their chemical structure are found in site rocks. As a result, trace metals in site soils could be due to weathering of the nearby rocks or through other placement methods such as using crushed rock as fill. The presence of metals in rock samples, which for the basis form soil formation on site, at concentrations exceeding those in soil samples, means that a natural source exists that explains how many of the metals can exist in soil at concentrations exceeding the ambient concentration limit. Hence, the statistically-derived ambient concentration limit does not provide adequate evaluation and screening of whether a specific metal is part of the ambient population.

Evidence obtained during this SI suggests that several metals of concern at the site may be controlled by geochemical mineralization. In those cases, ambient concentration limits established in this report are conservative, and the chances of erroneously defining a metal as a contaminant of potential concern are increased. For the purposes of further screening and data evaluation, the statistically-derived ambient concentration limit for each metal will be used throughout the report. This represents a conservative approach and yields findings that are consistent with this stage of investigation (i.e., Site Inspection). However, significant question remains regarding their true representation of ambient concentrations, and recommendations in the report will suggest further evaluation using additional methods.

REFERENCES

Department of Toxic Substances Control (DTSC). 1997. Selecting Inorganic Constituents and Chemicals of Potential Concern for Risk Assessments at Hazardous Waste Sites and Permitted Facilities, Final Policy. Prepared by: Human and Ecological Risk Division, Department of Toxic Substances Control, California Environmental Protection Agency.

Dragun, J. 1988. The Soil Chemistry of Hazardous Materials, Hazardous Materials Control Research Institute, Silver Spring Maryland.

Gibbons, R.D. 1994. Statistical Methods for Groundwater Monitoring. John Wiley & Sons, Inc., New York, NY, 286 pages.

Gilbert, R.O. 1987. Statistical Methods for Environmental Pollution Monitoring. Van Nostrand Reinhold Company, New York, NY.

Helsel, D.R. and R.M. Hirsch. 1992. Statistical Methods in Water Resources. Elsevier Science Publishing Company, New York, NY, 522 pages.

Rai, D. and J.M. Zachara. 1984. Chemical Attenuation Rates, Coefficients, and Constants in Leachate Migration, Vol. 1: Critical Review, Battelle Pacific Northwest Laboratories, prepared for Electric Power Research Institute (EPRI), EA-3356.

Stumm, W. 1992. Chemistry of the Solid –Water Interface: Processes at the Mineral-Water and Particle-Water Interface in Natural Systems, John Wiley & Sons.

U.S. EPA. 1992. Guidance for Data Usability in Risk Assessment. Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington D.C. Publication 9285.7-09FS, June 1992.

_____. 1996. Guidance for Data Quality Assessment, Practical Methods for Data Analysis, EPA QA/G-9, QA96 Version, EPA/600/R-96/084.

U.S Geological Survey, 2000, Georeferenced Sea-Floor Mapping and Bottom Photography in Long Island Sound, Ed. by Paskevich, V.F., and Poppe, L. J., Open File Report 00-304.

Zdanowicz, V.S., 1991, Determining the Fates of Contaminated Wastes Dumped in New York Bight Apex by Use of Metal Enrichment Factors, Environmental Science and Technology, V. 25, No. 10, 1760 – 1766, American Chemical Society.

Table A-1. Raw and Prepared Data

Sample	Depth	Aluminum (mg/kg)			Antimony (mg/kg)			Arsenic (mg/kg)			Barium (mg/kg)			Beryllium (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
01A1B1	1	9500		9500	10	U	5	6.4		6.4	150		150	0.46		0.46
01A1B1	3	10000		10000	10	U	5	5.4		5.4	180		180	0.58		0.58
01A2B1	1	9000		9000	10	U	5	6.7		6.7	170		170	0.52		0.52
01A2B1	3	8300		8300	10	U	5	2.2		2.5	130		130	0.47		0.47
01A2B2	1	9800		9800	10	U	5	8.5		8.5	200		200	0.58		0.58
01A2B3	1	11000		11000	10	U	5	8.2		8.2	170		170	0.59		0.59
01A2B3	2	13000		13000	10	U	5	12		12	200		200	0.63		0.63
01A2B4	1	9700	J	9700	10	U	5	9.9		9.9	180		180	0.63		0.63
01A2B4	3	9100	J	9100	10	U	5	11		11	210		210	0.5		0.5
02A1B1	5	6400		6400	10	U	5	18	J	18	38		38	0.29		0.29
02A2B1	5	2400		2400	10	U	5	44	J	44	16		16	0.14		0.14
03A1B1	1	7200	J	7200	10	U	5	8.2		8.2	100		100	0.41		0.41
03A1B1	3	10000	J	10000	10	U	5	12		12	200		200	0.47		0.47
03A1B2	1	7300		7300	10	U	5	16		16	120		120	0.3	U	---
03A2B1	1	10000		10000	10	U	5	18		18	120		120	0.56	U	---
03A2B1	2	9800		9800	10	U	5	26		26	120		120	0.55	U	---
04A1B1	1	9300	J	9300	10	U	5	2.4	U	2.5	120		120	0.46		0.46
04A2B1	16	7700		7700	10	U	5	5	U	2.5	110		110	0.36		0.36
04A2B1	5	16000		16000	30		30	5	U	2.5	180		180	0.85		0.85
04A2B1	10	12000		12000	10	U	5	5	U	2.5	140		140	0.78		0.78
04A2B1	15	8800		8800	10	U	5	5	U	2.5	97		97	0.43		0.43
04A2B2	10	14000		14000	10	U	5	9.6		9.6	150		150	0.8		0.8
04A2B2	15	7700		7700	10	U	5	5	U	2.5	94		94	0.33		0.33
04A2B2	20	6200		6200	10	U	5	12		12	59		59	0.24		0.24
04A2B2	5	16000		16000	10	U	5	5	U	2.5	140		140	0.89		0.89
04A3B1	1	8700	J	8700	10	U	5	3.2		3.2	140		140	0.49		0.49
04A3B2	3	8800	J	8800	10	U	5	6.5		6.5	130		130	0.5		0.5
04A3B2	1	7700	J	7700	10	U	5	5.4		5.4	120		120	0.41		0.41
04A3B3	1	12000	J	12000	10	U	5	15		15	180		180	0.76		0.76
04A3B3	3	13000	J	13000	10	U	5	19		19	160		160	0.94		0.94
04A3B4	1	14000	J	14000	10	U	5	10		10	160		160	0.72		0.72
04A3B4	2	13000	J	13000	10	U	5	11		11	190		190	0.72		0.72
04A4B1	1	9800	J	9800	10	U	5	8.7		8.7	87		87	0.72		0.72
04A4B1	3	11000	J	11000	10	U	5	10		10	120		120	0.84		0.84
04A4B2	1	9600	J	9600	10	U	5	11		11	110		110	0.74		0.74
04A4B2	3	8700	J	8700	10	U	5	9.9		9.9	110		110	0.72		0.72
04A5B1	1	15000	J	15000	10	U	5	9.9		9.9	200		200	0.92		0.92
04A5B1	3	15000	J	15000	10	U	5	17		17	450		450	1.1		1.1
04A5B2	3	3800	J	3800	10	U	5	24		24	62		62	0.1	U	0.05
04A5B2	1	14000	J	14000	10	U	5	84		84	110		110	0.75		0.75
05A1B1	3	9400		9400	10	U	5	18		18	100		100	0.58		0.58
05A1B1	1	11000	J	11000	10	U	5	22	J	22	120		120	0.74		0.74
05A1B2	1	7300		7300	10	U	5	18		18	160		160	0.54		0.54
05A1B2	3	9000		9000	10	U	5	19		19	120		120	0.59		0.59
05A1B3	1	3600		3600	10	U	5	8.1		8.1	240		240	0.48		0.48
05A1B3	3	8300		8300	10	U	5	19		19	210		210	0.76		0.76
05A1B4	1	9700		9700	10	U	5	23		23	140		140	0.56		0.56
05A1B5	3	21000		21000	10	U	5	76	J	76	39		39	1.2		1.2
05A1B5	1	16000	J	16000	10	U	5	130	J	130	59		59	0.93		0.93
05A2B1	10	21000	J	21000	10	U	5	5	U	2.5	140		140	1.1		1.1
05A2B1	5	19000		19000	10	U	5	5	U	2.5	150		150	0.96		0.96
06A1B10	3	37000	J	37000	10	U	5	170		170	130		130	1.4		1.4
06A1B10	5	38000	J	38000	20		20	270		270	110		110	1.5		1.5
06A1B10	1	15000	J	15000	10	U	5	97		97	130		130	0.92		0.92
06A1B1	5	11000	J	11000	10	U	5	64		64	170		170	0.55		0.55
06A1B1	1	11000	J	11000	10	U	5	12		12	160		160	0.62		0.62
06A1B1	3	9500	J	9500	10	U	5	11		11	120		120	0.73		0.73
06A1B11	1	950		950	10	U	5	15		15	12		12	0.17		0.17
06A1B11	3	3700		3700	10	U	5	29		29	41		41	0.26		0.26
06A1B11	5	1400		1400	10	U	5	19		19	24		24	0.13		0.13
06A1B2	3	8800	J	8800	10	U	5	56		56	110		110	0.73		0.73
06A1B2	5	6200	J	6200	10	U	5	38		38	65		65	0.37		0.37
06A1B2	1	18000	J	18000	10	U	5	21		21	140		140	1.1		1.1
06A1B3	5	10000	J	10000	10	U	5	64		64	110		110	0.74		0.74
06A1B3	1	17000	J	17000	10	U	5	24		24	160		160	1.1		1.1
06A1B3	3	19000	J	19000	10	U	5	27		27	160		160	1.1		1.1
06A1B4	5	16000	J	16000	10	U	5	97		97	220		220	0.77		0.77
06A1B4	3	43000	J	43000	10	U	5	29		29	280		280	1.1		1.1
06A1B4	1	16000	J	16000	10	U	5	150		150	180		180	0.85		0.85
06A1B5	5	4900	J	4900	10	U	5	31		31	75		75	0.33		0.33
06A1B5	1	19000	J	19000	10	U	5	25		25	160		160	1		1
06A1B5	3	17000	J	17000	10	U	5	23		23	150		150	0.99		0.99
06A1B6	5	8800	J	8800	10	U	5	54		54	100		100	0.73		0.73
06A1B6	1	12000	J	12000	10	U	5	21		21	130		130	1.1		1.1
06A1B6	3	13000	J	13000	10	U	5	17		17	96		96	0.94		0.94
06A1B7	1	18000	J	18000	10	U	5	25		25	150		150	1.3		1.3

Table A-1. Raw and Prepared Data

Sample	Depth	Aluminum (mg/kg)			Antimony (mg/kg)			Arsenic (mg/kg)			Barium (mg/kg)			Beryllium (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
06A1B7	3	14000	J	14000	10	U	5	24		24	160		160	1.2		1.2
06A1B7	5	8000		8000	10	U	5	22		22	130		130	0.68		0.68
06A1B8	5	13000	J	13000	10	U	5	140		140	89		89	0.99		0.99
06A1B8	1	12000	J	12000	10	U	5	22		22	130		130	0.81		0.81
06A1B8	2	12000	J	12000	10	U	5	23		23	120		120	0.57		0.57
06A1B9	3	9600	J	9600	20		20	60		60	130		130	0.75		0.75
06A1B9	5	7000	J	7000	10	U	5	42		42	140		140	0.53		0.53
06A1B9	1	9000	J	9000	10	U	5	13		13	97		97	0.71		0.71
06A2B1	1	15000		15000	10	U	5	9		9	290		290	0.68		0.68
06A2B2	1	15000		15000	10	U	5	10		10	270		270	0.55		0.55
06A2B3	3	20000	J	20000	10	U	5	11		11	370		370	0.57		0.57
07A2B1	1	5500		5500	10	U	5	15	J	15	65		65	0.48		0.48
07A2B1	3	8600		8600	10	U	5	20	J	20	110		110	0.42		0.42
07A2B1	5	6500		6500	10	U	5	17	J	17	72		72	0.47		0.47
07A2B2	1	4500		4500	36		36	12	J	12	130		130	0.34		0.34
07A2B2	3	5200		5200	10	U	5	10	J	10	42		42	0.37		0.37
07A2B2	5	7600		7600	20		20	17	J	17	68		68	0.52		0.52
07A2B3	3	14000		14000	10	U	5	110	J	110	160		160	0.79		0.79
07A2B3	5	12000		12000	20		20	26	J	26	120		120	0.68		0.68
07A2B3	1	9300		9300	10	U	5	25	J	25	110		110	0.7		0.7
07A2B4	1	4900		4900	10	U	5	13	J	13	80		80	0.36		0.36
07A2B4	3	6000		6000	10	U	5	16	J	16	77		77	0.43		0.43
07A2B4	5	5400	J	5400	10	U	5	11	J	11	95		95	0.37		0.37
07A2B5	1	7600	J	7600	10	U	5	15	J	15	89		89	0.47		0.47
07A2B5	3	9000	J	9000	10	U	5	17	J	17	140		140	0.51		0.51
07A2B5	5	5400	J	5400	10	U	5	11	J	11	70		70	0.37		0.37
10A1B1	1	NA		—	NA		—	NA		—	NA		—	NA		—
10A1B2	1	NA		—	NA		—	NA		—	NA		—	NA		—
10A1B3	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B1	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B1D	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B2	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B3	1	NA		—	NA		—	NA		—	NA		—	NA		—
12A1B1	1	12000		12000	10	U	5	7.4		7.4	140		140	0.85		0.85
12A1B2	1	13000		13000	10	U	5	9		9	150		150	0.87		0.87
12A1B3	1	12000		12000	10	U	5	11		11	140		140	0.82		0.82
12A1B4	1	9300		9300	10	U	5	12		12	150		150	0.82		0.82
12A1B5	1	10000		10000	10	U	5	25		25	140		140	0.81		0.81
12A2B1	1	4900		4900	10	U	5	5.9		5.9	79		79	0.48		0.48
12A2B2	1	8000		8000	10	U	5	11		11	130		130	0.59		0.59
12A2B3	1	5400		5400	10	U	5	1.4		2.5	84		84	0.39		0.39
12A2B4	1	16000		16000	10	U	5	9.2		9.2	160		160	1.1		1.1
12A2B5	1	13000		13000	10	U	5	7.2		7.2	190		190	0.95		0.95
12A3B1	1	17000	J	17000	10	UJ	5	16		16	180		180	0.59		0.59
12A3B2	1	18000	J	18000	10	UJ	5	18		18	200		200	0.68		0.68
12A3B3	1	23000	J	23000	10	U	5	7.8		7.8	230		230	0.89		0.89
12A3B4	1	18000	J	18000	10	U	5	7.9		7.9	250		250	0.81		0.81
12A3B5	1	19000	J	19000	10	UJ	5	6.8		6.8	290		290	0.68		0.68
13L01		16700		16700	6.46	J	6.46	6.06	J	6.06	134	J	134	0.774	J	0.774
13L02		17500		17500	3.76	J	5	12.3	J	12.3	112	J	112	0.755	J	0.755
13L03		8480		8480	4.86	J	5	2.63	J	2.63	83.2	J	83.2	0.708	J	0.708
13L05		12900		12900	10	U	5	3.73	J	3.73	72.1	J	72.1	0.561	J	0.561
13L10		13900		13900	6.21	J	6.21	4.52	J	4.52	33.4	J	33.4	0.838	J	0.838
13L11D		10800		10800	4.32	J	5	5.7	J	5.7	639	J	639	0.744	J	0.744
13L11		7030		7030	10	U	5	14.7	J	14.7	1770	J	1770	0.536	J	0.536
13L15		16200		16200	10	U	5	3.17	J	3.17	99.4	J	99.4	0.624	J	0.624
13L17		27000		27000	10	U	5	1.18	J	2.5	245	J	245	0.365	J	0.365
13L18		15800		15800	10	U	5	3.36	J	3.36	54.8	J	54.8	0.697	J	0.697
13L21		13700		13700	10	U	5	9.44	J	9.44	52.7	J	52.7	0.641	J	0.641
13L22		14600		14600	10	U	5	2.8	J	2.8	110	J	110	0.971	J	0.971
13L23		17800		17800	3.91	J	5	4.72	J	4.72	98.3	J	98.3	1.04	J	1.04
13L30		11400		11400	9.31	J	9.31	2.28	J	2.5	90.5	J	90.5	0.387	J	0.387
13L34		41400		41400	9.53	J	9.53	2	J	2.5	107	J	107	1.43	J	1.43
13L38		14100		14100	10	U	5	1.2	J	2.5	42.4	J	42.4	0.0964	U	0.05
13L42D		9730		9730	10	U	5	2.74	J	2.74	66.5	J	66.5	0.445	J	0.445
13L42		17100		17100	5.88	J	5.88	1.5	J	2.5	51.6	J	51.6	0.345	J	0.345
13L46		9740		9740	10	U	5	3.26	J	3.26	52.1	J	52.1	0.267	J	0.267
13L47		23400		23400	6.47	J	6.47	0.909	J	2.5	293	J	293	0.507	J	0.507
13L53		2700		2700	7.61	J	7.61	7.7	J	7.7	56.1	J	56.1	0.051	U	0.05
13L57		18700		18700	7.53	J	7.53	1.6	J	2.5	139	J	139	0.681	J	0.681
Reporting Limit		20			10			5			0.5			0.1		

Table A-1. Raw and Prepared Data

Sample	Depth	Cadmium (mg/kg)			Chromium (mg/kg)			Hex. Chromium (mg/kg)			Cobalt (mg/kg)			Copper (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
01A1B1	1	0.1	U	0.05	19		19	0.18	J	0.18	9.1		9.1	31		31
01A1B1	3	0.1	U	0.05	28		28	0.11	J	0.11	16		16	44		44
01A2B1	1	0.16		0.16	17		17	0.19	J	0.19	8.7		8.7	54		54
01A2B1	3	0.1	U	0.05	15		15	0.11	UJ	0.1	8.6		8.6	50		50
01A2B2	1	0.19		0.19	19		19	0.11	UJ	0.1	11		11	42		42
01A2B3	1	0.1	U	0.05	22		22	0.1	J	0.1	11		11	62		62
01A2B3	2	0.27		0.27	32		32	0.24		0.24	12		12	51		51
01A2B4	1	0.16		0.16	31		31	0.18	J	0.18	12		12	35		35
01A2B4	3	0.26		0.26	19		19	0.09	UJ	0.1	10		10	33		33
02A1B1	5	1	U	---	4.6		4.6	0.052	UJ	0.1	4.7		4.7	6.1		6.1
02A2B1	5	1	U	---	120		120	0.73		0.73	67		67	110		110
03A1B1	1	0.92		0.92	14		14	0.18	J	0.18	8.1		8.1	43		43
03A1B1	3	0.1	U	0.05	17		17	0.09	UJ	0.1	12		12	60		60
03A1B2	1	1	UJ	—	34		34	0.052	UJ	0.1	7.9		7.9	420		420
03A2B1	1	1	UJ	—	17		17	0.061	UJ	0.1	8.9		8.9	36		36
03A2B1	2	1	UJ	—	17		17	0.063	UJ	0.1	9.1		9.1	32		32
04A1B1	1	0.1	U	0.05	16		16	0.11	B	0.11	9.4		9.4	22		22
04A2B1	16	0.1	U	0.05	14		14	0.17	J	0.17	11		11	19		19
04A2B1	5	0.1	U	0.05	26		26	0.07	J	0.1	14		14	45		45
04A2B1	10	0.1	U	0.05	24		24	0.035	UJ	0.1	12		12	22		22
04A2B1	15	0.1	U	0.05	16		16	0.13	J	0.13	8		8	18		18
04A2B2	10	0.1	U	0.05	37		37	0.26	J	0.26	19		19	28		28
04A2B2	15	0.1	U	0.05	24		24	0.3	J	0.3	7		7	17		17
04A2B2	20	0.1	U	0.05	59		59	0.23	J	0.23	11		11	20		20
04A2B2	5	0.1	U	0.05	26		26	0.081	J	0.1	14		14	32		32
04A3B1	1	0.74		0.74	20		20	0.3	J	0.3	10		10	31		31
04A3B2	3	0.31		0.31	18		18	0.09	UJ	0.1	9.1		9.1	34		34
04A3B2	1	0.14		0.14	24		24	0.1	UJ	0.1	8.5		8.5	30		30
04A3B3	1	0.1	U	0.05	23		23	0.13	UJ	0.1	13		13	64		64
04A3B3	3	0.1	U	0.05	37		37	0.18	J	0.18	14		14	46		46
04A3B4	1	0.14		0.14	23		23	0.1	UJ	0.1	12		12	38		38
04A3B4	2	0.1	U	0.05	29		29	0.1	UJ	0.1	10		10	36		36
04A4B1	1	0.1	U	0.05	19		19	0.13	UJ	0.1	14		14	20		20
04A4B1	3	0.1	U	0.05	24		24	0.15	UJ	0.1	14		14	23		23
04A4B2	1	0.1	U	0.05	18		18	0.14	UJ	0.1	11		11	25		25
04A4B2	3	0.1	U	0.05	20		20	0.12	UJ	0.1	11		11	24		24
04A5B1	1	0.1	U	0.05	60		60	1.19	J	1.19	11		11	24		24
04A5B1	3	0.1	U	0.05	150		150	0.6	J	0.6	21		21	57		57
04A5B2	3	0.1	U	0.05	260		260	0.72	J	0.72	100		100	37		37
04A5B2	1	0.37		0.37	440		440	1.1	J	1.1	47		47	54		54
05A1B1	3	1	U	—	16		16	0.05	UJ	0.1	15		15	5.2		5.2
05A1B1	1	1	U	—	14		14	0.063	UJ	0.1	16		16	10		10
05A1B2	1	1	U	---	10		10	0.16	J	0.16	8.3		8.3	16		16
05A1B2	3	1	U	---	15		15	0.027	UJ	0.1	13		13	16		16
05A1B3	1	1	U	—	4.2		4.2	0.04	UJ	0.1	6.5		6.5	15		15
05A1B3	3	1	U	---	11		11	0.055		0.1	10		10	30		30
05A1B4	1	1	U	---	39		39	0.12		0.12	8.7		8.7	45		45
05A1B5	3	1	U	—	6.7		6.7	0.022	UJ	0.1	11		11	37		37
05A1B5	1	1	U	—	6.2		6.2	0.034	UJ	0.1	8.9		8.9	52		52
05A2B1	10	0.1	U	0.05	24		24	0.21	J	0.21	12		12	27		27
05A2B1	5	0.1	U	0.05	24		24	0.14	J	0.14	16		16	24		24
06A1B10	3	0.1	UJ	0.05	750		750	0.17	J	0.17	30		30	11		11
06A1B10	5	0.1	UJ	0.05	290		290	0.47	J	0.47	60		60	52		52
06A1B10	1	0.1	UJ	0.05	21		21	0.092	J	0.1	8.5		8.5	18		18
06A1B1	5	0.1	UJ	0.05	14		14	0.049	UJ	0.1	6.3		6.3	36		36
06A1B1	1	0.1	U	0.05	15		15	0.07	UJ	0.1	7.8		7.8	37		37
06A1B1	3	0.1	U	0.05	20		20	0.1	UJ	0.1	13		13	23		23
06A1B11	1	1	U	—	2.7		2.7	0.098	J	0.1	4	U	2	14		14
06A1B11	3	1	U	—	8.8		8.8	0.23	J	0.23	4	U	2	45		45
06A1B11	5	1	U	---	3.8		3.8	2.2		2.2	6.2		6.2	29		29
06A1B2	3	0.1	UJ	0.05	29		29	0.31	J	0.31	14		14	22		22
06A1B2	5	0.1	UJ	0.05	16		16	0.2		0.2	6.8		6.8	11		11
06A1B2	1	0.1	U	0.05	58		58	0.23	UJ	---	15		15	51		51
06A1B3	5	0.1	UJ	0.05	30		30	0.16	J	0.16	13		13	24		24
06A1B3	1	0.1	U	0.05	58		58	0.33	B	0.33	14		14	49		49
06A1B3	3	0.1	U	0.05	63		63	0.5	J	0.5	17		17	55		55
06A1B4	5	0.1	UJ	0.05	54		54	0.18	J	0.18	13		13	16		16
06A1B4	3	0.1	U	0.05	97		97	0.41	J	0.41	17		17	31		31
06A1B4	1	0.1	U	0.05	60		60	0.56	J	0.56	22		22	170		170
06A1B5	5	0.1	UJ	0.05	28		28	0.22	J	0.22	6.5		6.5	17		17
06A1B5	1	0.1	U	0.05	100		100	0.29	J	0.29	21		21	92		92
06A1B5	3	0.1	U	0.05	130		130	0.38	J	0.38	18		18	48		48
06A1B6	5	0.1	UJ	0.05	18		18	0.093	J	0.1	15		15	18		18
06A1B6	1	0.1	U	0.05	30		30	0.22	J	0.22	13		13	46		46
06A1B6	3	0.1	U	0.05	27		27	0.16	J	0.16	15		15	44		44
06A1B7	1	0.1	U	0.05	30		30	0.12	UJ	0.1	18		18	56		56

Table A-1. Raw and Prepared Data

Sample	Depth	Cadmium (mg/kg)			Chromium (mg/kg)			Hex. Chromium (mg/kg)			Cobalt (mg/kg)			Copper (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
06A1B7	3	0.1	U	0.05	29		29	0.07	UJ	0.1	10		10	57		57
06A1B7	5	1	U	—	15		15	0.085	J	0.1	13		13	16		16
06A1B8	5	0.1	UJ	0.05	300		300	1.4	J	1.4	32		32	60		60
06A1B8	1	0.47		0.47	140		140	0.45	J	0.45	27		27	65		65
06A1B8	2	0.51		0.51	130		130	0.9	J	0.9	28		28	54		54
06A1B9	3	0.1	UJ	0.05	18		18	0.048	UJ	0.1	15		15	20		20
06A1B9	5	0.1	UJ	0.05	14		14	0.05	UJ	0.1	12		12	15		15
06A1B9	1	0.1	U	0.05	16		16	0.06	UJ	0.1	11		11	19		19
06A2B1	1	0.1	U	0.05	52		52	0.18		0.18	14		14	40		40
06A2B2	1	0.1	U	0.05	64		64	0.13	UJ	0.1	14		14	63		63
06A2B3	3	0.1	U	0.05	90		90	0.28	UJ	—	14		14	67		67
07A2B1	1	1	U	—	9.8		9.8	0.069	UJ	0.1	6.3		6.3	19		19
07A2B1	3	1	U	—	5.5		5.5	0.033	UJ	0.1	7.6		7.6	25		25
07A2B1	5	1	U	—	10		10	0.037	UJ	0.1	8.8		8.8	15		15
07A2B2	1	1	U	—	4.1		4.1	0.1	J	0.1	4	U	2	840		840
07A2B2	3	1	U	—	2		2	0.18	J	0.18	4	U	2	6.5		6.5
07A2B2	5	1	U	—	6.3		6.3	0.13	J	0.13	4.3		4.3	29		29
07A2B3	3	1	U	—	28		28	0.035	UJ	0.1	8.3		8.3	8.5		8.5
07A2B3	5	1	U	—	8.1		8.1	0.21	UJ	—	8.4		8.4	15		15
07A2B3	1	1	U	—	15		15	0.086	J	0.1	6.6		6.6	20		20
07A2B4	1	1	U	—	6.6		6.6	0.084	J	0.1	6.3		6.3	14		14
07A2B4	3	1	U	—	5.9		5.9	0.088	J	0.1	7.8		7.8	36		36
07A2B4	5	1	U	—	9.4		9.4	0.11	J	0.11	6.8		6.8	22		22
07A2B5	1	1	U	—	12		12	0.045	UJ	0.1	8.9		8.9	19		19
07A2B5	3	1	U	—	8.8		8.8	0.049	UJ	0.1	12		12	21		21
07A2B5	5	1	U	—	9.9		9.9	0.085	J	0.1	5.1		5.1	14		14
10A1B1	1	NA		—	NA		—	0.083	J	0.1	NA		—	NA		—
10A1B2	1	NA		—	NA		—	0.33	J	0.33	NA		—	NA		—
10A1B3	1	NA		—	NA		—	0.67	J	0.67	NA		—	NA		—
11A1B1	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B1D	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B2	1	NA		—	NA		—	NA		—	NA		—	NA		—
11A1B3	1	NA		—	NA		—	NA		—	NA		—	NA		—
12A1B1	1	0.19		0.19	18		18	0.15	J	0.15	13		13	26		26
12A1B2	1	0.1	U	0.05	19		19	0.12	J	0.12	13		13	27		27
12A1B3	1	0.15	U	—	18		18	0.21	J	0.21	12		12	27		27
12A1B4	1	0.1	U	0.05	13		13	0.14	J	0.14	11		11	19		19
12A1B5	1	0.16		0.16	16		16	0.21	J	0.21	11		11	31		31
12A2B1	1	0.41		0.41	8.9		8.9	0.26	J	0.26	21		21	16		16
12A2B2	1	0.24		0.24	26		26	0.94	J	0.94	8.7		8.7	29		29
12A2B3	1	0.1	U	0.05	13		13	0.52	J	0.52	8.5		8.5	11		11
12A2B4	1	0.1	U	0.05	42		42	0.46	J	0.46	10		10	31		31
12A2B5	1	0.1	U	0.05	32		32	0.63	J	0.63	13		13	27		27
12A3B1	1	0.14	J	0.14	17		17	0.034	UJ	0.1	13		13	36		36
12A3B2	1	0.1	UJ	0.05	23		23	0.02	UJ	0.1	17		17	43		43
12A3B3	1	0.1	UJ	0.05	14		14	0.043	UJ	0.1	18		18	43		43
12A3B4	1	0.1	UJ	0.05	18		18	0.071	J	0.1	12		12	44		44
12A3B5	1	0.22	J	0.22	23		23	0.115	J	0.115	17		17	51		51
13L01		0.501	U	—	449	J	449	0.2	U	0.1	16.9	J	16.9	7.13		7.13
13L02		0.501	U	—	377	J	377	0.2	U	0.1	20.3	J	20.3	249		249
13L03		0.501	U	—	442	J	442	0.721		0.721	7.61	J	7.61	150		150
13L05		0.502	U	—	186	J	186	0.675		0.675	15.6	J	15.6	8.61		8.61
13L10		0.501	U	—	244	J	244	0.451		0.451	16.2	J	16.2	7.39		7.39
13L11D		0.501	U	—	167	J	167	0.406		0.406	11.5	J	11.5	24.5		24.5
13L11		0.501	U	—	203	J	203	0.2	U	0.1	11.5	J	11.5	50.6		50.6
13L15		0.501	U	—	90.9	J	90.9	0.2	U	0.1	15.2	J	15.2	3.95		3.95
13L17		0.501	U	—	259	J	259	0.2	U	0.1	21.3	J	21.3	192		192
13L18		0.501	U	—	137	J	137	0.36		0.36	15.4	J	15.4	4.6		4.6
13L21		0.501	U	—	177	J	177	0.36		0.36	17.5	J	17.5	7.57		7.57
13L22		0.501	U	—	144	J	144	0.36		0.36	17.5	J	17.5	4.89		4.89
13L23		0.502	U	—	174	J	174	0.452		0.452	17.1	J	17.1	8.09		8.09
13L30		0.501	U	—	967	J	967	0.629		0.629	5.86	J	5.86	21.1		21.1
13L34		0.501	U	—	525	J	525	0.36		0.36	40.1	J	40.1	10		10
13L38		0.501	U	—	139	J	139	0.2	U	0.1	16.8	J	16.8	2.54		2.54
13L42D		0.501	U	—	136	J	136	0.2	U	0.1	19.5	J	19.5	263		263
13L42		0.501	U	—	664	J	664	0.539		0.539	12.3	J	12.3	10.1		10.1
13L46		0.501	U	—	351	J	351	0.494		0.494	6.17	J	6.17	6.1		6.1
13L47		0.501	U	—	178	J	178	0.587		0.587	15	J	15	38.6		38.6
13L53		0.501	U	—	230	J	230	0.361		0.361	94.6	J	94.6	22.9		22.9
13L57		0.501	U	—	292	J	292	0.68		0.68	13.1	J	13.1	21.4		21.4
Reporting Limit		0.1			2			0.2			4			2		

Table A-1. Raw and Prepared Data

Sample	Depth	Iron (mg/kg)			Lead (mg/kg)			Lithium (mg/kg)			Magnesium (mg/kg)			Manganese (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
01A1B1	1	23000	J	23000	6		6	N/A		—	6300		6300	390		390
01A1B1	3	26000	J	26000	9.2		9.2	N/A		—	6700		6700	400		400
01A2B1	1	20000	J	20000	13		13	6.8		6.8	5900		5900	320		320
01A2B1	3	20000	J	20000	5.9		5.9	5	U	2.5	5200		5200	300		300
01A2B2	1	27000	J	27000	17		17	8.2		8.2	6400		6400	360		360
01A2B3	1	26000	J	26000	9.1		9.1	N/A		—	6800		6800	390		390
01A2B3	2	30000	J	30000	16		16	N/A		—	7800		7800	470		470
01A2B4	1	22000	J	22000	19		19	5.8		5.8	6100	J	6100	320	J	320
01A2B4	3	23000	J	23000	16		16	5.7		5.7	6100	J	6100	320	J	320
02A1B1	5	20000	J	20000	5	U	2.5	6.8		6.8	4000	J	4000	340	J	340
02A2B1	5	10000	J	10000	5	U	2.5	5	U	2.5	5900	J	5900	370	J	370
03A1B1	1	18000	J	18000	27		27	6.3		6.3	4800	J	4800	240	J	240
03A1B1	3	22000	J	22000	21		21	12		12	7300	J	7300	310	J	310
03A1B2	1	20000	J	20000	110		110	8.1		8.1	4600		4600	230	J	230
03A2B1	1	22000	J	22000	14		14	40		40	5400		5400	350	J	350
03A2B1	2	22000	J	22000	15		15	31		31	4700		4700	450	J	450
04A1B1	1	20000		20000	8.8		8.8	5.8		5.8	4800	J	4800	270	J	270
04A2B1	16	20000	J	20000	3.6		3.6	6.1		6.1	4900		4900	300	J	300
04A2B1	5	40000	J	40000	8.9		8.9	8.6		8.6	8300		8300	440	J	440
04A2B1	10	30000	J	30000	8.3		8.3	5	U	2.5	5100		5100	420	J	420
04A2B1	15	20000	J	20000	3.2		3.2	5	U	2.5	4300	J	4300	380		380
04A2B2	10	32000	J	32000	6.4		6.4	5.7		5.7	6100		6100	450	J	450
04A2B2	15	19000	J	19000	3.9		3.9	5	U	2.5	4300		4300	270	J	270
04A2B2	20	15000	J	15000	3.4		3.4	5	U	2.5	6700		6700	210		210
04A2B2	5	34000	J	34000	12		12	7.9		7.9	6600		6600	390	J	390
04A3B1	1	24000		24000	11		11	9.1		9.1	6000		6000	340	J	340
04A3B2	3	23000	J	23000	18	J	18	8.5		8.5	5500	J	5500	260	J	260
04A3B2	1	20000	J	20000	9.6	J	9.6	7.3		7.3	5200	J	5200	260	J	260
04A3B3	1	40000	J	40000	14	J	14	15		15	7400		7400	460	J	460
04A3B3	3	43000	J	43000	15		15	26		26	6900		6900	420	J	420
04A3B4	1	31000		31000	15		15	10	J	10	5900	J	5900	390	J	390
04A3B4	2	32000		32000	10		10	12	J	12	7500	J	7500	390	J	390
04A4B1	1	24000		24000	7.8		7.8	5.7	J	5.7	5700	J	5700	360	J	360
04A4B1	3	29000		29000	9.4	U	—	6.3	J	6.3	5800	J	5800	440	J	440
04A4B2	1	24000	J	24000	6.6		6.6	5	U	2.5	5600	J	5600	320	J	320
04A4B2	3	23000	J	23000	6.3		6.3	5	U	2.5	5800	J	5800	250	J	250
04A5B1	1	38000	J	38000	9.2		9.2	25		25	9400		9400	570	J	570
04A5B1	3	60000	J	60000	13		13	120		120	18000		18000	570	J	570
04A5B2	3	46000		46000	1.3		2.5	250	J	250	46000	J	46000	760	J	760
04A5B2	1	37000		37000	30		30	170	J	170	28000	J	28000	730	J	730
05A1B1	3	16000		16000	6		6	NA		—	9100		9100	420		420
05A1B1	1	19000		19000	5.7		5.7	NA		—	9400	J	9400	440	J	440
05A1B2	1	17000		17000	10		10	NA		—	6100		6100	350		350
05A1B2	3	20000		20000	5.8		5.8	NA		—	7600		7600	490		490
05A1B3	1	9700		9700	5	U	2.5	NA		—	2300		2300	380		380
05A1B3	3	20000		20000	6.3		6.3	NA		—	5700		5700	440		440
05A1B4	1	25000		25000	11		11	NA		—	8300		8300	380		380
05A1B5	3	32000		32000	15		15	NA		—	9700	J	9700	500	J	500
05A1B5	1	34000		34000	13		13	NA		—	13000	J	13000	590	J	590
05A2B1	10	37000	J	37000	9.3		9.3	8		8	7000		7000	480		480
05A2B1	5	33000	J	33000	8.6		8.6	5.8		5.8	5700		5700	640	J	640
06A1B10	3	54000		54000	22		22	110		110	50000	J	50000	650	J	650
06A1B10	5	63000		63000	45		45	130		130	52000	J	52000	1100	J	1100
06A1B10	1	40000		40000	7.6		7.6	24		24	9800	J	9800	330	J	330
06A1B1	5	35000		35000	6.3		6.3	17		17	6700	J	6700	380	J	380
06A1B1	1	29000	J	29000	8	J	8	NA		—	6100	J	6100	350	J	350
06A1B1	3	26000	J	26000	8.2	J	8.2	NA		—	5300	J	5300	350	J	350
06A1B11	1	3300		3300	28		28	NA		—	280		280	130		130
06A1B11	3	9100		9100	22		22	NA		—	1600		1600	110		110
06A1B11	5	3100		3100	46		46	NA		—	690		690	110		110
06A1B2	3	27000		27000	9.8		9.8	5		5	4100	J	4100	460	J	460
06A1B2	5	16000		16000	8.5		8.5	5.9		5.9	4200	J	4200	210	J	210
06A1B2	1	48000	J	48000	14		14	NA		—	6100		6100	590	J	590
06A1B3	5	33000		33000	6.1		6.1	5	U	2.5	5200	J	5200	450	J	450
06A1B3	1	53000	J	53000	17		17	NA		—	6200		6200	550	J	550
06A1B3	3	54000	J	54000	15		15	NA		—	6800		6800	600	J	600
06A1B4	5	36000		36000	9.5		9.5	12		12	13000	J	13000	320	J	320
06A1B4	3	62000	J	62000	16		16	NA		—	15000		15000	370	J	370
06A1B4	1	43000	J	43000	29		29	NA		—	6200		6200	370	J	370
06A1B5	5	12000		12000	8.7		8.7	5	U	2.5	3100	J	3100	240	J	240
06A1B5	1	43000	J	43000	14		14	NA		—	7700		7700	670	J	670
06A1B5	3	47000	J	47000	15		15	NA		—	7800		7800	600	J	600
06A1B6	5	28000		28000	8.1		8.1	5.6		5.6	5900	J	5900	410	J	410
06A1B6	1	44000	J	44000	17		17	NA		—	5500		5500	340	J	340
06A1B6	3	38000	J	38000	12		12	NA		—	5900		5900	320	J	320
06A1B7	1	50000	J	50000	15		15	NA		—	6100		6100	520	J	520

Table A-1. Raw and Prepared Data

Sample	Depth	Iron (mg/kg)			Lead (mg/kg)			Lithium (mg/kg)			Magnesium (mg/kg)			Manganese (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
06A1B7	3	48000	J	48000	15		15	NA		---	5900		5900	430	J	430
06A1B7	5	21000		21000	6.5		6.5	NA		—	5600		5600	380		380
06A1B8	5	45000		45000	50		50	22		22	14000	J	14000	1300	J	1300
06A1B8	1	34000		34000	30		30	16		16	8300	J	8300	500	J	500
06A1B8	2	29000		29000	26		26	15		15	8800	J	8800	520	J	520
06A1B9	3	32000		32000	7.9		7.9	6.5		6.5	5800	J	5800	490	J	490
06A1B9	5	21000		21000	6.3		6.3	5.8		5.8	5100	J	5100	350	J	350
06A1B9	1	22000	J	22000	3.9	J	3.9	5	U	2.5	5400	J	5400	250	J	250
06A2B1	1	38000	J	38000	15		15	NA		—	8900		8900	290		290
06A2B2	1	37000		37000	15		15	17		17	8600		8600	350		350
06A2B3	3	50000		50000	12		12	12		12	13000	J	13000	400	J	400
07A2B1	1	16000	J	16000	6.7		6.7	NA		—	3500	J	3500	230	J	230
07A2B1	3	26000	J	26000	6.5		6.5	NA		---	6300	J	6300	400	J	400
07A2B1	5	18000	J	18000	5.4		5.4	NA		---	4800	J	4800	270	J	270
07A2B2	1	14000	J	14000	2800		2800	NA		—	2500	J	2500	320	J	320
07A2B2	3	12000	J	12000	7.1		7.1	NA		—	2500	J	2500	320	J	320
07A2B2	5	18000	J	18000	110		110	NA		---	3400	J	3400	330	J	330
07A2B3	3	39000	J	39000	8.6		8.6	NA		---	7600	J	7600	680	J	680
07A2B3	5	26000	J	26000	7.5		7.5	NA		—	5400	J	5400	280	J	280
07A2B3	1	29000	J	29000	10		10	NA		—	4300	J	4300	230	J	230
07A2B4	1	15000	J	15000	5.1		5.1	NA		—	3700	J	3700	190	J	190
07A2B4	3	19000	J	19000	5	U	2.5	NA		---	4000	J	4000	310	J	310
07A2B4	5	13000	J	13000	8.6		8.6	NA		—	4200	J	4200	680	J	680
07A2B5	1	16000		16000	5.1		5.1	NA		—	5400	J	5400	250	J	250
07A2B5	3	19000		19000	6.6		6.6	NA		---	5900	J	5900	270	J	270
07A2B5	5	12000		12000	5	U	2.5	NA		—	4200	J	4200	200	J	200
10A1B1	1	NA		—	NA		---	5	U	2.5	NA		---	NA		---
10A1B2	1	NA		---	NA		---	17		17	NA		—	NA		—
10A1B3	1	NA		—	NA		—	5	U	2.5	NA		—	NA		—
11A1B1	1	NA		---	NA		---	17	J	17	NA		---	NA		---
11A1B1D	1	NA		—	NA		—	15	J	15	NA		—	NA		—
11A1B2	1	NA		—	NA		—	12	J	12	NA		—	NA		—
11A1B3	1	NA		---	NA		---	16	J	16	NA		---	NA		---
12A1B1	1	25000	J	25000	8.4		8.4	8.6		8.6	6300		6300	590		590
12A1B2	1	63000	J	63000	13		13	11		11	7200		7200	540		540
12A1B3	1	42000	J	42000	14		14	9.9		9.9	6100		6100	540		540
12A1B4	1	37000	J	37000	14		14	5	U	2.5	4800		4800	490		490
12A1B5	1	35000	J	35000	32		32	9.3		9.3	6400		6400	500		500
12A2B1	1	14000	J	14000	4.1		4.1	5	U	2.5	1500		1500	120		120
12A2B2	1	23000	J	23000	21		21	5	U	2.5	2900		2900	200		200
12A2B3	1	13000	J	13000	5.6		5.6	5	U	2.5	2100		2100	220		220
12A2B4	1	40000	J	40000	11		11	6.6		6.6	5800		5800	310		310
12A2B5	1	32000	J	32000	12		12	6.9		6.9	4900		4900	400		400
12A3B1	1	30000	J	30000	44		44	8.9		8.9	7700		7700	530		530
12A3B2	1	39000	J	39000	28		28	17		17	10000		10000	590		590
12A3B3	1	48000	J	48000	21		21	22		22	12000		12000	870		870
12A3B4	1	36000	J	36000	40		40	17		17	9600		9600	670		670
12A3B5	1	34000	J	34000	65		65	12		12	7300		7300	590		590
13L01		32200	J	32200	9.47	J	9.47	28.3		28.3	16700	J	16700	527	J	527
13L02		28400	J	28400	5.86	J	5.86	52.1		52.1	18700	J	18700	794	J	794
13L03		16000	J	16000	5.17	J	5.17	11.9		11.9	7010	J	7010	283	J	283
13L05		24700	J	24700	5.17	J	5.17	26		26	13600	J	13600	465	J	465
13L10		24300	J	24300	7.53	J	7.53	22.4		22.4	15800	J	15800	529	J	529
13L11D		24800	J	24800	8.54	J	8.54	20.9		20.9	8130	J	8130	1160	J	1160
13L11		25000	J	25000	11.2		11.2	12.1		12.1	12400	J	12400	1760	J	1760
13L15		28500	J	28500	4.05	J	4.05	22.7		22.7	13500	J	13500	545	J	545
13L17		51800	J	51800	9.12	J	9.12	21.1		21.1	17700	J	17700	754	J	754
13L18		28200	J	28200	11.8		11.8	22.4		22.4	14900	J	14900	525	J	525
13L21		24100	J	24100	4.82	J	4.82	30.1		30.1	15600	J	15600	490	J	490
13L22		29100	J	29100	9.72	J	9.72	27.4		27.4	8370	J	8370	375	J	375
13L23		30800	J	30800	4.6	J	4.6	28.6		28.6	15900	J	15900	465	J	465
13L30		20800	J	20800	7.15	J	7.15	26		26	14900	J	14900	316	J	316
13L34		56600	J	56600	9.01	J	9.01	84.5	J	84.5	53900	J	53900	1420	J	1420
13L38		18400	J	18400	6.77	J	6.77	9.36		9.36	12600	J	12600	108	J	108
13L42D		27700	J	27700	10	U	---	8.72		8.72	6320	J	6320	224	J	224
13L42		34900	J	34900	4.07	J	4.07	12.3		12.3	12900	J	12900	222	J	222
13L46		22200	J	22200	24.8		24.8	13.1		13.1	7200	J	7200	275	J	275
13L47		37900	J	37900	6.41	J	6.41	14.8		14.8	11100	J	11100	267	J	267
13L53		44400	J	44400	6.41	J	6.41	6.94		6.94	133000	J	133000	946	J	946
13L57		36300	J	36300	20		20	19		19	8510	J	8510	328	J	328
Reporting Limit		20			5			5			100			1		

Table A-1. Raw and Prepared Data

Sample	Depth	Mercury (mg/kg)			Moybdenum (mg/kg)			Nickel (mg/kg)			Potassium (mg/kg)			Selenium (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
01A1B1	1	0.1	UJ	0.05	2	U	1	19		19	2500		2500	0.4	UJ	0.2
01A1B1	3	0.1	UJ	0.05	2	U	1	24		24	2600		2600	0.4	UJ	0.2
01A2B1	1	0.1	U	0.05	2	U	1	15		15	2000		2000	0.4	U	0.2
01A2B1	3	0.1	U	0.05	2	U	1	16		16	2200	J	2200	0.4	U	0.2
01A2B2	1	0.1	U	0.05	2	U	1	23		23	2700	J	2700	0.4	U	0.2
01A2B3	1	0.14	J	0.14	2	U	1	20		20	2500		2500	0.4	UJ	0.2
01A2B3	2	0.1	UJ	0.05	2	U	1	25		25	3500		3500	0.4	UJ	0.2
01A2B4	1	0.1		0.1	2	U	1	25		25	2700	J	2700	0.4	U	0.2
01A2B4	3	0.13		0.13	2	U	1	19		19	3300	J	3300	0.4	U	0.2
02A1B1	5	0.1	U	0.05	3		3	6.9		6.9	630		630	10	UJ	—
02A2B1	5	0.1	U	0.05	2	U	1	260		260	50	R	—	10	UJ	—
03A1B1	1	0.1	U	0.05	2	U	1	19		19	2300		2300	0.4	U	0.2
03A1B1	3	0.1	U	0.05	2	U	1	20		20	2400		2400	0.4	U	0.2
03A1B2	1	1.4		1.4	2	U	1	23		23	2300		2300	10	U	—
03A2B1	1	0.2		0.2	2	U	1	15		15	1400		1400	10	U	—
03A2B1	2	0.1	U	0.05	2	U	1	17		17	2300		2300	10	U	—
04A1B1	1	0.1	U	0.05	2	U	1	14		14	2200	J	2200	0.4	UJ	0.2
04A2B1	16	0.1	U	0.05	2	U	1	11		11	2100		2100	0.4	UJ	0.2
04A2B1	5	0.1	U	0.05	2	U	1	21		21	3300		3300	0.4	UJ	0.2
04A2B1	10	0.1	U	0.05	2	U	1	17		17	2100		2100	0.4	UJ	0.2
04A2B1	15	0.1	U	0.05	2	U	1	14		14	1500		1500	0.4	UJ	0.2
04A2B2	10	0.1	U	0.05	2.1		2.1	22		22	2200		2200	0.4	UJ	0.2
04A2B2	15	0.1	U	0.05	2	U	1	33		33	1900		1900	0.4	UJ	0.2
04A2B2	20	0.7		0.7	2	U	1	78		78	1200		1200	0.4	UJ	0.2
04A2B2	5	0.1	U	0.05	2	U	1	21		21	2600		2600	0.4	UJ	0.2
04A3B1	1	1.5		1.5	2	U	1	18		18	2300	J	2300	0.4	U	0.2
04A3B2	3	2.6		2.6	2	U	1	17		17	3200	J	3200	0.4	U	0.2
04A3B2	1	2.2		2.2	2	U	1	17		17	2100	J	2100	0.4	U	0.2
04A3B3	1	0.1	U	0.05	2	U	1	21		21	3000	J	3000	0.4	U	0.2
04A3B3	3	0.1	U	0.05	2	U	1	26		26	2600	J	2600	0.4	U	0.2
04A3B4	1	0.38		0.38	2	U	1	20		20	2500	J	2500	0.4	UJ	0.2
04A3B4	2	0.25		0.25	2	U	1	30		30	3000	J	3000	19		19
04A4B1	1	0.1	U	0.05	2	U	1	14		14	1800	J	1800	0.4	UJ	0.2
04A4B1	3	0.1	U	0.05	2	U	1	17		17	2500	J	2500	13		13
04A4B2	1	0.1	U	0.05	2	U	1	14		14	1700	J	1700	0.4	U	0.2
04A4B2	3	0.1	U	0.05	2	U	1	15		15	1600	J	1600	0.4	U	0.2
04A5B1	1	0.1	U	0.05	6.9		6.9	73		73	3400	J	3400	22		22
04A5B1	3	0.1	U	0.05	20		20	110		110	6900	J	6900	42		42
04A5B2	3	0.13		0.13	2	U	1	930		930	120	J	250	32		32
04A5B2	1	0.18		0.18	2	U	1	400		400	1100	J	1100	10		10
05A1B1	3	0.1	U	0.05	2	U	1	15		15	260		260	10	U	—
05A1B1	1	0.1	U	0.05	2	U	1	16		16	340		340	10	UJ	—
05A1B2	1	0.1	U	0.05	2	U	1	11		11	1300		1300	10	U	—
05A1B2	3	0.1	U	0.05	2	U	1	14		14	880		880	10	U	—
05A1B3	1	0.2		0.2	2	U	1	7.1		7.1	920		920	10	U	—
05A1B3	3	0.15		0.15	2	U	1	13		13	1400		1400	10	U	—
05A1B4	1	0.1	U	0.05	2	U	1	25		25	1800		1800	10	U	—
05A1B5	3	0.1	U	0.05	2	U	1	14		14	640	J	640	12	J	12
05A1B5	1	0.1	U	0.05	2	U	1	25		25	1300	J	1300	22	J	22
05A2B1	10	0.1	U	0.05	2	U	1	30		30	1400		1400	35	J	35
05A2B1	5	0.1	U	0.05	2	U	1	21		21	2100		2100	18	J	18
06A1B10	3	1.4		1.4	2	U	1	250		250	640	J	640	34	J	34
06A1B10	5	0.43		0.43	2	U	1	370		370	410	J	410	25	J	25
06A1B10	1	2		2	2	U	1	37		37	2200	J	2200	0.4	R	—
06A1B1	5	0.1	U	0.05	2	U	1	21		21	2100	J	2100	20	J	20
06A1B1	1	0.1	U	0.05	2	U	1	19		19	2500	J	2500	0.8	U	—
06A1B1	3	0.1	U	0.05	2	U	1	22		22	2200	J	2200	0.4	U	0.2
06A1B11	1	0.1	U	0.05	2	U	1	4	U	2	440		440	10	U	—
06A1B11	3	0.1	U	0.05	2	U	1	6.1		6.1	610		610	10	U	—
06A1B11	5	0.1	U	0.05	2	U	1	4	U	2	340		340	20		20
06A1B2	3	0.1	U	0.05	2	U	1	18		18	2300	J	2300	0.4	R	—
06A1B2	5	0.1	U	0.05	2	U	1	11		11	1600	J	1600	0.4	R	—
06A1B2	1	0.1	U	0.05	2	U	1	50		50	4300	J	4300	48		48
06A1B3	5	0.1	U	0.05	2	U	1	19		19	2500		2500	0.4	R	—
06A1B3	1	0.1	U	0.05	2	U	1	48		48	4800	J	4800	49		49
06A1B3	3	0.1	U	0.05	2	U	1	50		50	4700	J	4700	46		46
06A1B4	5	0.31		0.31	2	U	1	43		43	2100	J	2100	31	J	31
06A1B4	3	0.57		0.57	2	U	1	65		65	8700	J	8700	57		57
06A1B4	1	0.21		0.21	2.1		2.1	41		41	4100	J	4100	18		18
06A1B5	5	0.1	U	0.05	2	U	1	15		15	1200	J	1200	0.4	R	—
06A1B5	1	0.1	U	0.05	2	U	1	57		57	3400	J	3400	22		22
06A1B5	3	0.1	U	0.05	2	U	1	69		69	3300	J	3300	18		18
06A1B6	5	0.1	U	0.05	2	U	1	15		15	1500	J	1500	0.4	R	—
06A1B6	1	0.1	U	0.05	2	U	1	29		29	2800	J	2800	21		21
06A1B6	3	0.1	U	0.05	2	U	1	20		20	1700	J	1700	12		12
06A1B7	1	0.1	U	0.05	2	U	1	34		34	2000	J	2000	46		46

Table A-1. Raw and Prepared Data

Sample	Depth	Mercury (mg/kg)			Moybdenum (mg/kg)			Nickel (mg/kg)			Potassium (mg/kg)			Selenium (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
06A1B7	3	0.1	U	0.05	2	U	1	32		32	3100	J	3100	42		42
06A1B7	5	0.1	U	0.05	2	U	1	12		12	1400		1400	10	U	—
06A1B8	5	0.18		0.18	2	U	1	330		330	1200	J	1200	16	J	16
06A1B8	1	0.16		0.16	2	U	1	150		150	2400	J	2400	0.4	UJ	0.2
06A1B8	2	1		1	2	U	1	140		140	2400	J	2400	0.4	UJ	0.2
06A1B9	3	0.1	U	0.05	2	U	1	14		14	1600	J	1600	0.4	R	---
06A1B9	5	0.1	U	0.05	2	U	1	13		13	1200	J	1200	0.4	U	0.2
06A1B9	1	0.1	UJ	0.05	2	U	1	13		13	1300	J	1300	0.4	U	0.2
06A2B1	1	0.1	U	0.05	2	U	1	37		37	4500		4500	0.4	U	0.2
06A2B2	1	0.1	U	0.05	2	U	1	38		38	4700		4700	12		12
06A2B3	3	0.1	U	0.05	2	U	1	58		58	9400	J	9400	35		35
07A2B1	1	0.1	U	0.05	2	U	1	8.2		8.2	640	J	640	10	UJ	—
07A2B1	3	0.1	U	0.05	2	U	1	7.2		7.2	3200	J	3200	10	UJ	—
07A2B1	5	0.1	U	0.05	2	U	1	9.1		9.1	980	J	980	10	UJ	---
07A2B2	1	0.17		0.17	2	U	1	4	U	2	2200	J	2200	10	UJ	---
07A2B2	3	0.1	U	0.05	2	U	1	4	U	2	2200	J	2200	10	UJ	—
07A2B2	5	0.1	U	0.05	2	U	1	5		5	2100	J	2100	40	J	40
07A2B3	3	0.1	U	0.05	2	U	1	22		22	5900	J	5900	31	U	—
07A2B3	5	0.1	U	0.05	2	U	1	7.5		7.5	2700	J	2700	10	UJ	---
07A2B3	1	0.1	U	0.05	2	U	1	9.2		9.2	1400	J	1400	10	UJ	—
07A2B4	1	0.1	U	0.05	2	U	1	5.7		5.7	1100	J	1100	10	UJ	—
07A2B4	3	0.1	U	0.05	2	U	1	7.3		7.3	1500	J	1500	10	UJ	---
07A2B4	5	0.1	U	0.05	2	U	1	11		11	1000	J	1000	10	UJ	—
07A2B5	1	0.1	U	0.05	2	U	1	11		11	1200	J	1200	10	UJ	—
07A2B5	3	0.1	U	0.05	2	U	1	13		13	1300	J	1300	10	UJ	---
07A2B5	5	0.1	U	0.05	2	U	1	9.1		9.1	1100	J	1100	10	UJ	—
10A1B1	1	NA		—	NA		—	NA		—	NA		—	NA		---
10A1B2	1	NA		---	NA		—	NA		—	NA		—	NA		—
10A1B3	1	NA		—	NA		—	NA		—	NA		—	NA		---
11A1B1	1	NA		—	NA		---	NA		---	NA		---	NA		---
11A1B1D	1	NA		---	NA		---	NA		---	NA		---	NA		---
11A1B2	1	NA		---	NA		—	NA		—	NA		—	NA		—
11A1B3	1	NA		—	NA		—	NA		—	NA		—	NA		—
12A1B1	1	0.1	UJ	0.05	2	U	1	18		18	2800		2800	0.4	UJ	0.2
12A1B2	1	0.1	UJ	0.05	2	U	1	18		18	2500		2500	0.4	UJ	0.2
12A1B3	1	0.1	UJ	0.05	2	U	1	20		20	2900		2900	0.4	UJ	0.2
12A1B4	1	0.1	UJ	0.05	2	U	1	13		13	2300		2300	0.4	UJ	0.2
12A1B5	1	0.1	UJ	0.05	2	U	1	15		15	1900		1900	0.4	UJ	0.2
12A2B1	1	0.1	UJ	0.05	2	U	1	11		11	900		900	0.4	UJ	0.2
12A2B2	1	0.1	UJ	0.05	2	U	1	21		21	1700		1700	0.4	UJ	0.2
12A2B3	1	0.1	UJ	0.05	2	U	1	9.8		9.8	1800		1800	0.4	UJ	0.2
12A2B4	1	0.1	UJ	0.05	2	U	1	35		35	5000		5000	33	J	33
12A2B5	1	0.1	UJ	0.05	2	U	1	29		29	4300		4300	29	J	29
12A3B1	1	0.1	U	0.05	2	U	1	22		22	4600		4600	0.4	U	0.2
12A3B2	1	0.1	U	0.05	2	U	1	30		30	5500		5500	0.4	U	0.2
12A3B3	1	0.1	U	0.05	2	U	1	44		44	8000		8000	28		28
12A3B4	1	0.1	U	0.05	3.2		3.2	43		43	7300		7300	25		25
12A3B5	1	0.1		0.1	2	U	1	25		25	4300		4300	0.4	U	0.2
13L01		0.1	U	0.05	4.46	J	4.46	27.3	J	27.3	1440		1440	55.3		55.3
13L02		0.1	U	0.05	3.98	J	3.98	26.7	J	26.7	1240		1240	55.9		55.9
13L03		0.1	U	0.05	5.45	J	5.45	16.3	J	16.3	961		961	31.9		31.9
13L05		0.1	U	0.05	0.96	J	1	21.4	J	21.4	1230		1230	49.6		49.6
13L10		0.166		0.166	2.42	J	2.42	23.4	J	23.4	953		953	45.1		45.1
13L11D		0.1	U	0.05	1.52	J	1.52	15.8	J	15.8	1810		1810	40		40
13L11		0.137		0.137	1.44	J	1.44	14	J	14	1440		1440	46.3		46.3
13L15		0.1	U	0.05	1.13	J	1.13	20.2	J	20.2	1260		1260	48.6		48.6
13L17		0.1	U	0.05	10	U	1	52.5	J	52.5	16000		16000	105		105
13L18		0.1	U	0.05	0.968	J	1	20.2	J	20.2	1010		1010	49.2		49.2
13L21		0.1	U	0.05	1.22	J	1.22	22.6	J	22.6	617		617	45.6		45.6
13L22		0.1	U	0.05	10	U	1	22.5	J	22.5	1820		1820	51.7		51.7
13L23		0.1	U	0.05	1.22	J	1.22	20.9	J	20.9	958		958	55.8		55.8
13L30		0.1	U	0.05	11.4		11.4	18.2	J	18.2	4930		4930	35.6		35.6
13L34		0.1	U	0.05	10	U	1	237	J	237	3900		3900	95.3		95.3
13L38		0.1	U	0.05	10	U	1	72.5	J	72.5	2640		2640	41.1		41.1
13L42D		0.1	U	0.05	2.38	J	2.38	21.7	J	21.7	422	J	422	53.6		53.6
13L42		0.1	U	0.05	7.83	J	7.83	34.6	J	34.6	3130		3130	60.7		60.7
13L46		0.1	U	0.05	5.25	J	5.25	15.1	J	15.1	3640		3640	47.1		47.1
13L47		0.1	U	0.05	1.43	J	1.43	36.3	J	36.3	7370		7370	64		64
13L53		0.1	U	0.05	1.36	J	1.36	820	J	820	501	U	---	76.3		76.3
13L57		0.1	U	0.05	3.71	J	3.71	29	J	29	5340		5340	73.8		73.8
Reporting Limit		0.1			2			4			500			0.4		

Table A-1. Raw and Prepared Data

Sample	Depth	Silver (mg/kg)			Sodium (mg/kg)			Thallium (mg/kg)			Vanadium (mg/kg)			Zinc (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
01A1B1	1	1	U	0.5	230		230	0.3	U	0.15	35		35	71	J	71
01A1B1	3	1	U	0.5	270		270	0.3	U	0.15	40		40	80	J	80
01A2B1	1	1	U	0.5	190		190	0.3	U	0.15	30		30	95	J	95
01A2B1	3	1	U	0.5	160		160	0.3	U	0.15	33		33	66	J	66
01A2B2	1	1	U	0.5	200		200	0.3	U	0.15	42		42	69	J	69
01A2B3	1	1	U	0.5	260	J	260	0.3	U	0.15	42		42	71	J	71
01A2B3	2	1	U	0.5	330	J	330	0.3	U	0.15	47		47	100	J	100
01A2B4	1	1	U	0.5	230		230	0.3	U	0.15	41		41	84	J	84
01A2B4	3	1	U	0.5	180		180	0.3	U	0.15	41		41	70	J	70
02A1B1	5	1	UJ	0.5	290		290	0.3	U	0.15	13		13	59		59
02A2B1	5	1	UJ	0.5	50	U	25	0.3	U	0.15	11		11	15		15
03A1B1	1	1	U	0.5	160		160	0.3	U	0.15	29		29	140		140
03A1B1	3	1	U	0.5	230		230	0.3	U	0.15	46		46	68		68
03A1B2	1	1	R	—	120		120	0.3	U	0.15	25		25	270		270
03A2B1	1	1	R	—	190		190	0.3	U	0.15	44		44	340		340
03A2B1	2	1	R	—	120		120	0.3	U	0.15	44		44	200		200
04A1B1	1	1	U	0.5	220		220	0.3	U	0.15	33		33	49	J	49
04A2B1	16	1	U	0.5	180		180	0.3	U	0.15	29		29	42		42
04A2B1	5	1	U	0.5	210		210	0.3	U	0.15	55		55	84		84
04A2B1	10	1	U	0.5	150		150	0.3	U	0.15	44		44	46		46
04A2B1	15	1	U	0.5	150		150	0.3	U	0.15	32		32	36		36
04A2B2	10	1	U	0.5	190		190	0.3	U	0.15	47		47	54		54
04A2B2	15	1	U	0.5	550		550	0.3	U	0.15	29		29	36		36
04A2B2	20	1	U	0.5	250		250	0.3	U	0.15	23		23	28		28
04A2B2	5	1	U	0.5	240		240	0.3	U	0.15	52		52	64		64
04A3B1	1	270		270	600		600	0.3	U	0.15	35		35	140	J	140
04A3B2	3	1	U	0.5	190		190	0.3	U	0.15	36		36	90	J	90
04A3B2	1	1	U	0.5	180		180	0.3	U	0.15	31		31	69	J	69
04A3B3	1	1	U	0.5	640		640	0.3	U	0.15	56		56	93	J	93
04A3B3	3	1	U	0.5	390		390	0.3	U	0.15	64		64	77	J	77
04A3B4	1	1	U	0.5	260		260	0.3	U	0.15	46		46	73	J	73
04A3B4	2	1	U	0.5	550		550	0.3	U	0.15	53		53	82	J	82
04A4B1	1	1	U	0.5	330		330	0.3	U	0.15	44		44	49	J	49
04A4B1	3	1	U	0.5	240		240	0.3	U	0.15	48		48	52	J	52
04A4B2	1	1	U	0.5	230		230	0.3	U	0.15	41		41	52	J	52
04A4B2	3	1	U	0.5	230		230	0.3	U	0.15	40		40	52	J	52
04A5B1	1	1	U	0.5	750		750	0.38		0.38	52		52	89	J	89
04A5B1	3	1	U	0.5	350		350	0.3	U	0.15	96		96	130	J	130
04A5B2	3	1	U	0.5	930		930	0.33		0.33	25		25	36	J	36
04A5B2	1	1	U	0.5	640		640	0.3	U	0.15	32		32	71	J	71
05A1B1	3	1	UJ	0.5	140		140	0.3	U	0.15	33		33	58		58
05A1B1	1	1	U	0.5	180		180	0.3	U	0.15	39		39	57	J	57
05A1B2	1	1	U	0.5	100		100	0.3	U	0.15	23		23	44		44
05A1B2	3	1	U	0.5	150		150	0.3	U	0.15	31		31	57		57
05A1B3	1	1	U	0.5	59		59	0.3	U	0.15	12		12	24		24
05A1B3	3	1	U	0.5	96		96	0.3	U	0.15	27		27	48		48
05A1B4	1	1	U	0.5	150		150	0.3	U	0.15	32		32	56		56
05A1B5	3	1	UJ	0.5	340		340	0.3	U	0.15	40		40	74		74
05A1B5	1	1	UJ	0.5	290		290	0.3	U	0.15	77		77	97	J	97
05A2B1	10	1	U	0.5	160		160	0.3	U	0.15	74		74	53		53
05A2B1	5	1	U	0.5	120		120	0.3	U	0.15	58		58	45		45
06A1B10	3	47		47	310		310	0.3	U	0.15	75		75	160	J	160
06A1B10	5	1	U	0.5	380		380	0.3	U	0.15	64		64	160		160
06A1B10	1	2.7		2.7	150		150	0.3	U	0.15	41		41	58		58
06A1B1	5	1	R	—	620		620	0.3	U	0.15	42		42	84	J	84
06A1B1	1	1	U	0.5	520		520	0.3	U	0.15	43		43	79	J	79
06A1B1	3	1	U	0.5	210		210	0.3	U	0.15	41		41	54	J	54
06A1B11	1	1	U	0.5	50	U	25	0.3	U	0.15	4	U	2	5.5		5.5
06A1B11	3	1	U	0.5	110		110	0.3	U	0.15	7.3		7.3	18		18
06A1B11	5	1	U	0.5	71		71	0.3	U	0.15	4	U	2	9.5		9.5
06A1B2	3	1	R	—	580		580	0.3	U	0.15	44		44	34	J	34
06A1B2	5	1	R	—	79		79	0.3	U	0.15	25		25	33	J	33
06A1B2	1	1	U	0.5	580		580	0.35		0.35	83		83	66	J	66
06A1B3	5	1	U	0.5	140		140	0.3	U	0.15	45		45	44	J	44
06A1B3	1	1	U	0.5	450		450	0.3	U	0.15	88		88	70	J	70
06A1B3	3	1	U	0.5	350		350	0.3	U	0.15	85		85	81	J	81
06A1B4	5	1	R	—	910		910	0.3	U	0.15	72		72	82	J	82
06A1B4	3	1	U	0.5	920		920	0.44		0.44	110		110	110	J	110
06A1B4	1	1	U	0.5	400		400	0.3	U	0.15	45		45	120	U	—
06A1B5	5	1	R	—	110		110	0.3	U	0.15	19		19	23	J	23
06A1B5	1	1	U	0.5	400		400	0.3	U	0.15	59		59	96	J	96
06A1B5	3	1	U	0.5	360		360	0.3	U	0.15	60		60	78	J	78
06A1B6	5	1	U	0.5	130		130	0.3	U	0.15	40		40	46	J	46
06A1B6	1	1	U	0.5	700		700	0.3	U	0.15	75		75	83		83
06A1B6	3	1	U	0.5	240		240	0.3	U	0.15	66		66	65	J	65
06A1B7	1	1	U	0.5	270		270	0.3	U	0.15	86		86	92	J	92

Table A-1. Raw and Prepared Data

Sample	Depth	Silver (mg/kg)			Sodium (mg/kg)			Thallium (mg/kg)			Vanadium (mg/kg)			Zinc (mg/kg)		
Description	(feet)	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared	Raw	Q	Prepared
06A1B7	3	1	U	0.5	560		560	0.3	U	0.15	76		76	70	J	70
06A1B7	5	1	U	0.5	230		230	0.3	U	0.15	32		32	47		47
06A1B8	5	1	U	0.5	1300		1300	0.3	U	0.15	41		41	63	J	63
06A1B8	1	1	U	0.5	410		410	0.3	U	0.15	37		37	280	J	280
06A1B8	2	1	U	---	490		490	0.3	U	0.15	34		34	220	J	220
06A1B9	3	1	R	---	380		380	0.3	U	0.15	41		41	49	J	49
06A1B9	5	1	R	---	200	J	200	0.3	U	0.15	28		28	44		44
06A1B9	1	1	U	0.5	350		350	0.3	U	0.15	39		39	48	J	48
06A2B1	1	1	U	0.5	370	J	370	0.3	U	0.15	51		51	76	J	76
06A2B2	1	1	U	0.5	300		300	0.3	U	0.15	45		45	79		79
06A2B3	3	1	U	0.5	980		980	0.3	U	0.15	81		81	110	J	110
07A2B1	1	1	UJ	0.5	61		61	0.3	U	0.15	27		27	30		30
07A2B1	3	1	UJ	0.5	71		71	0.3	U	0.15	33		33	47		47
07A2B1	5	1	UJ	0.5	130		130	0.3	U	0.15	34		34	34		34
07A2B2	1	14	J	14	50	U	25	0.3	U	0.15	15		15	270		270
07A2B2	3	1	UJ	0.5	50	U	25	0.3	U	0.15	14		14	33		33
07A2B2	5	1	UJ	0.5	50	U	25	0.38		0.38	25		25	53		53
07A2B3	3	1	UJ	0.5	65		65	0.42		0.42	66		66	65		65
07A2B3	5	1	UJ	0.5	120		120	0.3	U	0.15	44		44	37		37
07A2B3	1	1	UJ	0.5	60		60	0.3	U	0.15	49		49	32		32
07A2B4	1	1	UJ	0.5	67		67	0.3	U	0.15	19		19	32		32
07A2B4	3	1	UJ	0.5	83		83	0.3	U	0.15	26		26	35		35
07A2B4	5	1	UJ	0.5	74		74	0.3	U	0.15	26		26	31	J	31
07A2B5	1	1	UJ	0.5	200		200	0.3	U	0.15	31		31	38	J	38
07A2B5	3	1	UJ	0.5	430		430	0.3	U	0.15	32		32	40	J	40
07A2B5	5	1	UJ	0.5	300		300	0.3	U	0.15	20		20	31	J	31
10A1B1	1	NA		---	NA		---	NA		---	NA		---	NA		---
10A1B2	1	NA		---	NA		---	NA		---	NA		---	NA		---
10A1B3	1	NA		---	NA		---	NA		---	NA		---	NA		---
11A1B1	1	NA		---	NA		---	NA		---	NA		---	NA		---
11A1B1D	1	NA		---	NA		---	NA		---	NA		---	NA		---
11A1B2	1	NA		---	NA		---	NA		---	NA		---	NA		---
11A1B3	1	NA		---	NA		---	NA		---	NA		---	NA		---
12A1B1	1	1	U	0.5	290	J	290	0.3	U	0.15	42		42	63	J	63
12A1B2	1	1	U	0.5	290	J	290	0.3	U	0.15	46		46	66	J	66
12A1B3	1	1	U	0.5	260	J	260	0.3	U	0.15	44		44	73	J	73
12A1B4	1	1	U	0.5	220	J	220	0.3	U	0.15	38		38	58	J	58
12A1B5	1	1	U	0.5	220	J	220	0.3	U	0.15	36		36	76	J	76
12A2B1	1	1	U	0.5	190	J	190	0.3	U	0.15	19		19	24	J	24
12A2B2	1	1	U	0.5	230	J	230	0.3	U	0.15	29		29	44	J	44
12A2B3	1	1	U	0.5	160	J	160	0.3	U	0.15	23		23	23	J	23
12A2B4	1	1	U	0.5	730	J	730	0.3	U	0.15	81		81	52	J	52
12A2B5	1	1	U	0.5	640		640	0.3	U	0.15	67		67	46	J	46
12A3B1	1	10	U	---	120		120	0.3	U	0.15	59		59	80		80
12A3B2	1	1	U	0.5	110		110	0.3	U	0.15	76		76	79		79
12A3B3	1	1	U	0.5	91		91	0.3	U	0.15	95		95	91		91
12A3B4	1	1	U	0.5	110		110	0.3	U	0.15	72		72	110		110
12A3B5	1	1	U	0.5	140		140	0.3	U	0.15	73		73	91		91
13L01		2	U	---	184		184	1.09	U	---	55.2	J	55.2	87.9	J	87.9
13L02		2	U	---	199		199	0.965	U	---	42	J	42	89.3	J	89.3
13L03		2	U	---	77.5	J	77.5	0.6	U	---	18.8	J	18.8	35.3	J	35.3
13L05		2.01	U	---	92.6	J	92.6	0.691	U	---	44.8	J	44.8	73.2	J	73.2
13L10		2	U	---	184		184	1.45	U	---	43.4	J	43.4	79.5	J	79.5
13L11D		2	U	---	139		139	2	U	---	31.1	J	31.1	67.9	J	67.9
13L11		2	U	---	92.5	J	92.5	2	U	---	24.1	J	24.1	64.1	J	64.1
13L15		2	U	---	151		151	0.915	U	---	43.1	J	43.1	84.3	J	84.3
13L17		2	U	---	213		213	0.76	U	---	85.9	J	85.9	252	J	252
13L18		2	U	---	139		139	2	U	---	47	J	47	92.6	J	92.6
13L21		2	U	---	183		183	2	U	---	52.5	J	52.5	81.3	J	81.3
13L22		2	U	---	92.4	J	92.4	2	U	---	32	J	32	87.9	J	87.9
13L23		2.01	U	---	139		139	2.01	U	---	44.6	J	44.6	92.3	J	92.3
13L30		2	U	---	139		139	2	U	---	18.9	J	18.9	49.3	J	49.3
13L34		2	U	---	118		118	0.814	U	---	94	J	94	145	J	145
13L38		2	U	---	508		508	2	U	---	16.3	J	16.3	29.6	J	29.6
13L42D		2	U	---	602		602	2	U	---	68	J	68	35	J	35
13L42		2	U	---	149		149	1.24	U	---	35	J	35	52.6	J	52.6
13L46		2	U	---	138		138	0.822	U	---	21.6	J	21.6	97.9	J	97.9
13L47		2	U	---	209		209	1.13	U	---	57.2	J	57.2	80.9	J	80.9
13L53		2	U	---	46	J	46	1.43	U	---	9.85	J	9.85	53	J	53
13L57		2	U	---	138		138	2	U	---	34.7	J	34.7	83.5	J	83.5
Reporting Limit		1			50			0.3			4			2		

Table A-2. Soil Data from Background Area 1 (Objective 12) and Rock Data from Background Area 2 (Objective 13)

Media	Sample Description	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
Soil	12A1B1	12000	5	7.4	140	0.85	0.19	18	0.15	13	26	25000	8.4	8.6
Soil	12A1B2	13000	5	9	150	0.87	0.05	19	0.12	13	27	63000	13	11
Soil	12A1B3	12000	5	11	140	0.82		18	0.21	12	27	42000	14	9.9
Soil	12A1B4	9300	5	12	150	0.82	0.05	13	0.14	11	19	37000	14	2.5
Soil	12A1B5	10000	5	25	140	0.81	0.16	16	0.21	11	31	35000	32	9.3
Soil	12A2B1	4900	5	5.9	79	0.48	0.41	8.9	0.26	21	16	14000	4.1	2.5
Soil	12A2B2	8000	5	11	130	0.59	0.24	26	0.94	8.7	29	23000	21	2.5
Soil	12A2B3	5400	5	2.5	84	0.39	0.05	13	0.52	8.5	11	13000	5.6	2.5
Soil	12A2B4	16000	5	9.2	160	1.1	0.05	42	0.46	10	31	40000	11	6.6
Soil	12A2B5	13000	5	7.2	190	0.95	0.05	32	0.63	13	27	32000	12	6.9
Soil	12A3B1	17000	5	16	180	0.59	0.14	17	0.1	13	36	30000	44	8.9
Soil	12A3B2	18000	5	18	200	0.68	0.05	23	0.1	17	43	39000	28	17
Soil	12A3B3	23000	5	7.8	230	0.89	0.05	14	0.1	18	43	48000	21	22
Soil	12A3B4	18000	5	7.9	250	0.81	0.05	18	0.1	12	44	36000	40	17
Soil	12A3B5	19000	5	6.8	290	0.68	0.22	23	0.115	17	51	34000	65	12
Rock	13L01	16700	6.46	6.06	134	0.774		449	0.1	16.9	7.13	32200	9.47	28.3
Rock	13L02	17500	5	12.3	112	0.755		377	0.1	20.3	249	28400	5.86	52.1
Rock	13L03	8480	5	2.63	83.2	0.708		442	0.721	7.61	150	16000	5.17	11.9
Rock	13L05	12900	5	3.73	72.1	0.561		186	0.675	15.6	8.61	24700	5.17	26
Rock	13L10	13900	6.21	4.52	33.4	0.838		244	0.451	16.2	7.39	24300	7.53	22.4
Rock	13L11D	10800	5	5.7	639	0.744		167	0.406	11.5	24.5	24800	8.54	20.9
Rock	13L11	7030	5	14.7	1770	0.536		203	0.1	11.5	50.6	25000	11.2	12.1
Rock	13L15	16200	5	3.17	99.4	0.624		90.9	0.1	15.2	3.95	28500	4.05	22.7
Rock	13L17	27000	5	2.5	245	0.365		259	0.1	21.3	192	51800	9.12	21.1
Rock	13L18	15800	5	3.36	54.8	0.697		137	0.36	15.4	4.6	28200	11.8	22.4
Rock	13L21	13700	5	9.44	52.7	0.641		177	0.36	17.5	7.57	24100	4.82	30.1
Rock	13L22	14600	5	2.8	110	0.971		144	0.36	17.5	4.89	29100	9.72	27.4
Rock	13L23	17800	5	4.72	98.3	1.04		174	0.452	17.1	8.09	30800	4.6	28.6
Rock	13L30	11400	9.31	2.5	90.5	0.387		967	0.629	5.86	21.1	20800	7.15	26
Rock	13L34	41400	9.53	2.5	107	1.43		525	0.36	40.1	10	56600	9.01	84.5
Rock	13L38	14100	5	2.5	42.4	0.05		139	0.1	16.8	2.54	18400	6.77	9.36
Rock	13L42D	9730	5	2.74	66.5	0.445		136	0.1	19.5	263	27700		8.72
Rock	13L42	17100	5.88	2.5	51.6	0.345		664	0.539	12.3	10.1	34900	4.07	12.3
Rock	13L46	9740	5	3.26	52.1	0.267		351	0.494	6.17	6.1	22200	24.8	13.1
Rock	13L47	23400	6.47	2.5	293	0.507		178	0.587	15	38.6	37900	6.41	14.8
Rock	13L53	2700	7.61	7.7	56.1	0.05		230	0.361	94.6	22.9	44400	6.41	6.94
Rock	13L57	18700	7.53	2.5	139	0.681		292	0.68	13.1	21.4	36300	20	19

= extreme observation

All concentrations in mg/kg

Table A-2. Soil Data from Background Area 1 (Objective 12) and Rock Data from Background Area 2 (Objective 13)

Media	Sample Description	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil	12A1B1	6300	590	0.05	1	18	2800	0.2	0.5	290	0.15	42	63
Soil	12A1B2	7200	540	0.05	1	18	2500	0.2	0.5	290	0.15	46	66
Soil	12A1B3	6100	540	0.05	1	20	2900	0.2	0.5	260	0.15	44	73
Soil	12A1B4	4800	490	0.05	1	13	2300	0.2	0.5	220	0.15	38	58
Soil	12A1B5	6400	500	0.05	1	15	1900	0.2	0.5	220	0.15	36	76
Soil	12A2B1	1500	120	0.05	1	11	900	0.2	0.5	190	0.15	19	24
Soil	12A2B2	2900	200	0.05	1	21	1700	0.2	0.5	230	0.15	29	44
Soil	12A2B3	2100	220	0.05	1	9.8	1800	0.2	0.5	160	0.15	23	23
Soil	12A2B4	5800	310	0.05	1	35	5000	33	0.5	730	0.15	81	52
Soil	12A2B5	4900	400	0.05	1	29	4300	29	0.5	640	0.15	67	46
Soil	12A3B1	7700	530	0.05	1	22	4600	0.2		120	0.15	59	80
Soil	12A3B2	10000	590	0.05	1	30	5500	0.2	0.5	110	0.15	76	79
Soil	12A3B3	12000	870	0.05	1	44	8000	28	0.5	91	0.15	95	91
Soil	12A3B4	9600	670	0.05	3.2	43	7300	25	0.5	110	0.15	72	110
Soil	12A3B5	7300	590	0.1	1	25	4300	0.2	0.5	140	0.15	73	91
Rock	13L01	16700	527	0.05	4.46	27.3	1440	55.3		184		55.2	87.9
Rock	13L02	18700	794	0.05	3.98	26.7	1240	55.9		199		42	89.3
Rock	13L03	7010	283	0.05	5.45	16.3	961	31.9		77.5		18.8	35.3
Rock	13L05	13600	465	0.05	1	21.4	1230	49.6		92.6		44.8	73.2
Rock	13L10	15800	529	0.166	2.42	23.4	953	45.1		184		43.4	79.5
Rock	13L11D	8130	1160	0.05	1.52	15.8	1810	40		139		31.1	67.9
Rock	13L11	12400	1760	0.137	1.44	14	1440	46.3		92.5		24.1	64.1
Rock	13L15	13500	545	0.05	1.13	20.2	1260	48.6		151		43.1	84.3
Rock	13L17	17700	754	0.05	1	52.5	16000	105		213		85.9	252
Rock	13L18	14900	525	0.05	1	20.2	1010	49.2		139		47	92.6
Rock	13L21	15600	490	0.05	1.22	22.6	617	45.6		183		52.5	81.3
Rock	13L22	8370	375	0.05	1	22.5	1820	51.7		92.4		32	87.9
Rock	13L23	15900	465	0.05	1.22	20.9	958	55.8		139		44.6	92.3
Rock	13L30	14900	316	0.05	11.4	18.2	4930	35.6		139		18.9	49.3
Rock	13L34	53900	1420	0.05	1	237	3900	95.3		118		94	145
Rock	13L38	12600	108	0.05	1	72.5	2640	41.1		508		16.3	29.6
Rock	13L42D	6320	224	0.05	2.38	21.7	422	53.6		602		68	35
Rock	13L42	12900	222	0.05	7.83	34.6	3130	60.7		149		35	52.6
Rock	13L46	7200	275	0.05	5.25	15.1	3640	47.1		138		21.6	97.9
Rock	13L47	11100	267	0.05	1.43	36.3	7370	64		209		57.2	80.9
Rock	13L53	133000	946	0.05	1.36	820		76.3		46		9.85	53
Rock	13L57	8510	328	0.05	3.71	29	5340	73.8		138		34.7	83.5

= extreme observation

All concentrations in mg/kg

Table A-3. Comparison of Soil Data from Background Area 1 (Objective 12) and Rock Data from Background Area 2 (Objective 13)

Analyte	Comparison Method	P-value	P-value > 0.01	Conclusion
Aluminum	Mann-Whitney test	0.6804	yes	same
Antimony	boxplots - all soil values equal			different
Arsenic	Mann-Whitney test	0.0003	no	different
Barium	Mann-Whitney test	0.0003	no	different
Beryllium	Mann-Whitney test	0.0607	yes	same
Cadmium	not applicable - no rock data			
Chromium	Mann-Whitney test	0.0000	no	different
Hex. Chromium	Mann-Whitney test	0.3660	yes	same
Cobalt	Mann-Whitney test	0.2270	yes	same
Copper	Mann-Whitney test	0.0002	no	different
Iron	Mann-Whitney test	0.1807	yes	same
Lead	Mann-Whitney test	0.0003	no	different
Lithium	Mann-Whitney test	0.0001	no	different
Magnesium	Mann-Whitney test	0.0000	no	different
Manganese	Mann-Whitney test	0.9149	yes	same
Mercury	boxplots - only one soil detect			same
Molybdenum	boxplots - only one soil detect			different
Nickel	Mann-Whitney test	0.4993	yes	same
Potassium	Mann-Whitney test	0.0230	yes	same
Selenium	Mann-Whitney test	0.0000	no	different
Silver	not applicable - no rock data			
Sodium	Mann-Whitney test	0.0173	yes	same
Thallium	not applicable - no rock data			
Vanadium	Mann-Whitney test	0.1348	yes	same
Zinc	Mann-Whitney test	0.2259	yes	same

Table A-4. Distributional Testing Results for Combined Background Data

Analyte	P-value Non-tranformed data	P-value Log-transformed data	Best-fit Distribution	Is P-value for Best-fit Distribution >0.01
Aluminum	0.9418	0.0091	normal	yes
Arsenic	0.0480	0.4738	lognormal	yes
Barium	0.5422	0.5362	normal	yes
Beryllium	0.6277	0.0000	normal	yes
Chromium	0.0538	0.9170	lognormal	yes
Cobalt	0.5495	0.0318	normal	yes
Copper	0.7435	0.2687	normal	yes
Iron	0.1661	0.8592	lognormal	yes
Lead	0.0364	0.9801	lognormal	yes
Manganese	0.0001	0.5366	lognormal	yes
Nickel	0.0001	0.7130	lognormal	yes
Vanadium	0.1247	0.3022	lognormal	yes
Zinc	0.2206	0.0117	normal	yes

Table A-5. Summary Statistics for Combined Background Data

Statistic	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hex. Chromium	Cobalt
selected reporting limit	20	10	5	0.5	0.1	0.1	2	0.2	4
number of observations	36	15	15	15	37	14	15	37	35
number of detects	36	0	15	15	35	6	15	27	35
number of non-detects	0	15	0	0	2	8	0	10	0
percentage of detects	100	0	100	100	95	43	100	73	100
maximum detect	27000	nc	25	290	1.43	0.41	42	0.94	21.3
minimum detect	2700	nc	2.5	79	0.27	0.14	8.9	0.1	5.86
median	13800	nc	9.0	150	0.68	nc	18	0.36	13.1
mean	13830	nc	10	168	0.67	nc	20	0.33	14
standard deviation	5302	nc	5.6	58	0.28	nc	8.4	0.23	4.0
coefficient of variation	0.4	nc	0.5	0.3	0.4	nc	0.4	0.7	0.3
coefficient of skewness	0.2	nc	1.4	0.6	-0.01	nc	1.4	0.7	-0.2
99th percentile	26167	10*	32	302	1.3	0.41	46	0.94	23
Concentrations given in mg/kg									
nc = not calculated									
* 99th percentile = reporting limit									

Table A-5. Summary Statistics for Combined Background Data

Statistic	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel
selected reporting limit	2	20	5	5	100	1	0.1	2	4
number of observations	15	37	15	15	15	37	35	15	35
number of detects	15	37	15	11	15	37	1	1	35
number of non-detects	0	0	0	4	0	0	34	14	0
percentage of detects	100	100	100	73	100	100	3	7	100
maximum detect	51	63000	65	22	12000	1760	0.1	3.2	72.5
minimum detect	11	13000	4.1	6.6	1500	108	0.1	3.2	9.8
median	29	30000	14	8.9	6300	500	nc	nc	21.7
mean	31	31841	22	9.3	6307	539	nc	nc	25
standard deviation	11	11206	17	5.9	2898	344	nc	nc	13
coefficient of variation	0.4	0.4	0.8	0.6	0.5	0.6	nc	nc	0.5
coefficient of skewness	0.1	0.8	1.3	0.7	0.1	1.8	nc	nc	1.9
99th percentile	57	84520	103	22	nc	1865	0.1	3.2	63
Concentrations given in mg/kg									
nc = not calculated									
* 99th percentile = reporting limit									

Table A-5. Summary Statistics for Combined Background Data

Statistic	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
selected reporting limit	500	0.4	1	50	0.3	4	2
number of observations	35	15	14	35	15	37	36
number of detects	35	4	0	35	0	37	36
number of non-detects	0	11	14	0	15	0	0
percentage of detects	100	27	0	100	0	100	100
maximum detect	8000	33	nc	730	nc	95	145
minimum detect	422	25	nc	46	nc	9.85	23
median	2300	nc	nc	149	nc	43	75
mean	2912	nc	nc	189	nc	46	71
standard deviation	2060	nc	nc	137	nc	23	26
coefficient of variation	0.7	nc	nc	0.7	nc	0.5	0.4
coefficient of skewness	1.0	nc	nc	2.9	nc	0.5	0.2
99th percentile	nc	33	1*	nc	0.3*	143	130
Concentrations given in mg/kg							
nc = not calculated							
* 99th percentile = reporting limit							

Table A-6. Expanded Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
01A1B1	1	9500	5	6.4	150	0.46	0.05	19
01A1B1	3	10000	5	5.4	180	0.58	0.05	28
01A2B1	1	9000	5	6.7	170	0.52	0.16	17
01A2B1	3	8300	5	2.5	130	0.47	0.05	15
01A2B2	1	9800	5	8.5	200	0.58	0.19	19
01A2B3	1	11000	5	8.2	170	0.59	0.05	22
01A2B3	2	13000	5	12	200	0.63	0.27	32
01A2B4	1	9700	5	9.9	180	0.63	0.16	31
01A2B4	3	9100	5	11	210	0.5	0.26	19
02A1B1	5	6400	5	18	38	0.29	—	4.6
02A2B1	5	2400	5	44	16	0.14	—	120
03A1B1	1	7200	5	8.2	100	0.41	0.92	14
03A1B1	3	10000	5	12	200	0.47	0.05	17
03A1B2	1	7300	5	16	120	—	—	34
03A2B1	1	10000	5	18	120	—	—	17
03A2B1	2	9800	5	26	120	—	—	17
04A1B1	1	9300	5	2.5	120	0.46	0.05	16
04A2B1	16	7700	5	2.5	110	0.36	0.05	14
04A2B1	5	16000	30	2.5	180	0.85	0.05	26
04A2B1	10	12000	5	2.5	140	0.78	0.05	24
04A2B1	15	8800	5	2.5	97	0.43	0.05	16
04A2B2	10	14000	5	9.6	150	0.8	0.05	37
04A2B2	15	7700	5	2.5	94	0.33	0.05	24
04A2B2	20	6200	5	12	59	0.24	0.05	59
04A2B2	5	16000	5	2.5	140	0.89	0.05	26
04A3B1	1	8700	5	3.2	140	0.49	0.74	20
04A3B2	3	8800	5	6.5	130	0.5	0.31	18
04A3B2	1	7700	5	5.4	120	0.41	0.14	24
04A3B3	1	12000	5	15	180	0.76	0.05	23
04A3B3	3	13000	5	19	160	0.94	0.05	37
04A3B4	1	14000	5	10	160	0.72	0.14	23
04A3B4	2	13000	5	11	190	0.72	0.05	29
04A4B1	1	9800	5	8.7	87	0.72	0.05	19
04A4B1	3	11000	5	10	120	0.84	0.05	24
04A4B2	1	9600	5	11	110	0.74	0.05	18
04A4B2	3	8700	5	9.9	110	0.72	0.05	20
04A5B1	1	15000	5	9.9	200	0.92	0.05	60
04A5B1	3	15000	5	17	450	1.1	0.05	150
04A5B2	3	3800	5	24	62	0.05	0.05	260
04A5B2	1	14000	5	84	110	0.75	0.37	440
05A1B1	3	9400	5	18	100	0.58	—	16
05A1B1	1	11000	5	22	120	0.74	—	14
05A1B2	1	7300	5	18	160	0.54	—	10
05A1B2	3	9000	5	19	120	0.59	—	15
05A1B3	1	3600	5	8.1	240	0.48	—	4.2
05A1B3	3	8300	5	19	210	0.76	—	11
05A1B4	1	9700	5	23	140	0.56	—	39
05A1B5	3	21000	5	76	39	1.2	—	6.7
05A1B5	1	16000	5	130	59	0.93	—	6.2
05A2B1	10	21000	5	2.5	140	1.1	0.05	24
05A2B1	5	19000	5	2.5	150	0.96	0.05	24
06A1B10	3	37000	5	170	130	1.4	0.05	750
06A1B10	5	38000	20	270	110	1.5	0.05	290

Table A-6. Expanded Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
06A1B10	1	15000	5	97	130	0.92	0.05	21
06A1B1	5	11000	5	64	170	0.55	0.05	14
06A1B1	1	11000	5	12	160	0.62	0.05	15
06A1B1	3	9500	5	11	120	0.73	0.05	20
06A1B11	1	950	5	15	12	0.17	---	2.7
06A1B11	3	3700	5	29	41	0.26	---	8.8
06A1B11	5	1400	5	19	24	0.13	---	3.8
06A1B2	3	8800	5	56	110	0.73	0.05	29
06A1B2	5	6200	5	38	65	0.37	0.05	16
06A1B2	1	18000	5	21	140	1.1	0.05	58
06A1B3	5	10000	5	64	110	0.74	0.05	30
06A1B3	1	17000	5	24	160	1.1	0.05	58
06A1B3	3	19000	5	27	160	1.1	0.05	63
06A1B4	5	16000	5	97	220	0.77	0.05	54
06A1B4	3	43000	5	29	280	1.1	0.05	97
06A1B4	1	16000	5	150	180	0.85	0.05	60
06A1B5	5	4900	5	31	75	0.33	0.05	28
06A1B5	1	19000	5	25	160	1	0.05	100
06A1B5	3	17000	5	23	150	0.99	0.05	130
06A1B6	5	8800	5	54	100	0.73	0.05	18
06A1B6	1	12000	5	21	130	1.1	0.05	30
06A1B6	3	13000	5	17	96	0.94	0.05	27
06A1B7	1	18000	5	25	150	1.3	0.05	30
06A1B7	3	14000	5	24	160	1.2	0.05	29
06A1B7	5	8000	5	22	130	0.68	---	15
06A1B8	5	13000	5	140	89	0.99	0.05	300
06A1B8	1	12000	5	22	130	0.61	0.47	140
06A1B8	2	12000	5	23	120	0.57	0.51	130
06A1B9	3	9600	20	60	130	0.75	0.05	18
06A1B9	5	7000	5	42	140	0.53	0.05	14
06A1B9	1	9000	5	13	97	0.71	0.05	16
06A2B1	1	15000	5	9	290	0.68	0.05	52
06A2B2	1	15000	5	10	270	0.55	0.05	64
06A2B3	3	20000	5	11	370	0.57	0.05	90
07A2B1	1	5500	5	15	65	0.48	---	9.8
07A2B1	3	8600	5	20	110	0.42	---	5.5
07A2B1	5	6500	5	17	72	0.47	---	10
07A2B2	1	4500	36	12	130	0.34	---	4.1
07A2B2	3	5200	5	10	42	0.37	---	2
07A2B2	5	7600	20	17	68	0.52	---	6.3
07A2B3	3	14000	5	110	160	0.79	---	28
07A2B3	5	12000	20	26	120	0.68	---	8.1
07A2B3	1	9300	5	25	110	0.7	---	15
07A2B4	1	4900	5	13	80	0.36	---	6.6
07A2B4	3	6000	5	16	77	0.43	---	5.9
07A2B4	5	5400	5	11	95	0.37	---	9.4
07A2B5	1	7600	5	15	89	0.47	---	12
07A2B5	3	9000	5	17	140	0.51	---	8.8
07A2B5	5	5400	5	11	70	0.37	---	9.9
10A1B1	1	---	---	---	---	---	---	---
10A1B2	1	---	---	---	---	---	---	---
10A1B3	1	---	---	---	---	---	---	---
11A1B1	1	---	---	---	---	---	---	---

Table A-6. Expanded Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
11A1B1D	1	---	---	---	---	---	---	---
11A1B2	1	---	---	---	---	---	---	---
11A1B3	1	---	---	---	---	---	---	---
12A1B1	1	12000	5	7.4	140	0 85	0.19	18
12A1B2	1	13000	5	9	150	0.87	0.05	19
12A1B3	1	12000	5	11	140	0.82	---	18
12A1B4	1	9300	5	12	150	0.82	0.05	13
12A1B5	1	10000	5	25	140	0.81	0.16	16
12A2B1	1	4900	5	5.9	79	0.48	0.41	8.9
12A2B2	1	8000	5	11	130	0.59	0 24	26
12A2B3	1	5400	5	2.5	84	0.39	0.05	13
12A2B4	1	16000	5	9.2	160	1.1	0.05	42
12A2B5	1	13000	5	7.2	190	0.95	0.05	32
12A3B1	1	17000	5	16	180	0.59	0.14	17
12A3B2	1	18000	5	18	200	0.68	0.05	23
12A3B3	1	23000	5	7.8	230	0.89	0.05	14
12A3B4	1	18000	5	7.9	250	0.81	0.05	18
12A3B5	1	19000	5	6.8	290	0.68	0.22	23
13L01		16700	---	---	---	0.774	---	---
13L02		17500	---	---	---	0.755	---	---
13L03		8480	---	---	---	0.708	---	---
13L05		12900	---	---	---	0.561	---	---
13L10		13900	---	---	---	0.838	---	---
13L11D		10800	---	---	---	0.744	---	---
13L11		7030	---	---	---	0.536	---	---
13L15		16200	---	---	---	0.624	---	---
13L17		27000	---	---	---	0.365	---	---
13L18		15800	---	---	---	0.697	---	---
13L21		13700	---	---	---	0.641	---	---
13L22		14600	---	---	---	0.971	---	---
13L23		17800	---	---	---	1.04	---	---
13L30		11400	---	---	---	0.387	---	---
13L34			---	---	---	1.43	---	---
13L38		14100	---	---	---	0.05	---	---
13L42D		9730	---	---	---	0.445	---	---
13L42		17100	---	---	---	0.345	---	---
13L46		9740	---	---	---	0.267	---	---
13L47		23400	---	---	---	0.507	---	---
13L53		2700	---	---	---	0 05	---	---
13L57		18700	---	---	---	0.681	---	---
		All concentrations in mg/kg						

Table A-6. Expanded Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
01A1B1	1	0.18	9.1	31	23000	6	---
01A1B1	3	0.11	16	44	26000	9.2	---
01A2B1	1	0.19	8.7	54	20000	13	6.8
01A2B1	3	0.1	8.6	50	20000	5.9	2.5
01A2B2	1	0.1	11	42	27000	17	8.2
01A2B3	1	0.1	11	62	26000	9.1	---
01A2B3	2	0.24	12	51	30000	16	---
01A2B4	1	0.18	12	35	22000	19	5.8
01A2B4	3	0.1	10	33	23000	16	5.7
02A1B1	5	0.1	4.7	6.1	20000	2.5	6.8
02A2B1	5	0.73	67	110	10000	2.5	2.5
03A1B1	1	0.18	8.1	43	18000	27	6.3
03A1B1	3	0.1	12	60	22000	21	12
03A1B2	1	0.1	7.9	420	20000	110	8.1
03A2B1	1	0.1	8.9	36	22000	14	40
03A2B1	2	0.1	9.1	32	22000	15	31
04A1B1	1	0.11	9.4	22	20000	8.8	5.8
04A2B1	16	0.17	11	19	20000	3.6	6.1
04A2B1	5	0.1	14	45	40000	8.9	8.6
04A2B1	10	0.1	12	22	30000	8.3	2.5
04A2B1	15	0.13	8	18	20000	3.2	2.5
04A2B2	10	0.26	19	28	32000	6.4	5.7
04A2B2	15	0.3	7	17	19000	3.9	2.5
04A2B2	20	0.23	11	20	15000	3.4	2.5
04A2B2	5	0.1	14	32	34000	12	7.9
04A3B1	1	0.3	10	31	24000	11	9.1
04A3B2	3	0.1	9.1	34	23000	18	8.5
04A3B2	1	0.1	8.5	30	20000	9.6	7.3
04A3B3	1	0.1	13	64	40000	14	15
04A3B3	3	0.18	14	46	43000	15	26
04A3B4	1	0.1	12	36	31000	15	10
04A3B4	2	0.1	10	36	32000	10	12
04A4B1	1	0.1	14	20	24000	7.8	5.7
04A4B1	3	0.1	14	23	29000	---	6.3
04A4B2	1	0.1	11	25	24000	6.6	2.5
04A4B2	3	0.1	11	24	23000	6.3	2.5
04A5B1	1	1.19	11	24	38000	9.2	25
04A5B1	3	0.6	21	57	60000	13	120
04A5B2	3	0.72	100	37	46000	2.5	250
04A5B2	1	1.1	47	54	37000	30	170
05A1B1	3	0.1	15	5.2	16000	6	---
05A1B1	1	0.1	16	10	19000	5.7	---
05A1B2	1	0.16	8.3	16	17000	10	---
05A1B2	3	0.1	13	16	20000	5.8	---
05A1B3	1	0.1	6.5	15	9700	2.5	---
05A1B3	3	0.1	10	30	20000	6.3	---
05A1B4	1	0.12	8.7	45	25000	11	---
05A1B5	3	0.1	11	37	32000	15	---
05A1B5	1	0.1	8.9	52	34000	13	---
05A2B1	10	0.21	12	27	37000	9.3	8
05A2B1	5	0.14	16	24	33000	8.6	5.8
06A1B10	3	0.17	30	11	54000	22	110
06A1B10	5	0.47	60	52	63000	45	130

Table A-6. Expanded Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
06A1B10	1	0.1	8.5	18	40000	7.6	24
06A1B1	5	0.1	6.3	36	35000	6.3	17
06A1B1	1	0.1	7.8	37	29000	8	---
06A1B1	3	0.1	13	23	26000	8.2	---
06A1B11	1	0.1	2	14	3300	28	---
06A1B11	3	0.23	2	45	9100	22	---
06A1B11	5	2.2	6.2	29	3100	46	---
06A1B2	3	0.31	14	22	27000	9.8	5
06A1B2	5	0.2	6.8	11	16000	8.5	5.9
06A1B2	1	---	15	51	48000	14	---
06A1B3	5	0.16	13	24	33000	6.1	2.5
06A1B3	1	0.33	14	49	53000	17	---
06A1B3	3	0.5	17	55	54000	15	---
06A1B4	5	0.18	13	16	36000	9.5	12
06A1B4	3	0.41	17	31	62000	16	---
06A1B4	1	0.56	22	170	43000	29	---
06A1B5	5	0.22	6.5	17	12000	8.7	2.5
06A1B5	1	0.29	21	92	43000	14	---
06A1B5	3	0.38	18	48	47000	15	---
06A1B6	5	0.1	15	18	28000	8.1	5.6
06A1B6	1	0.22	13	46	44000	17	---
06A1B6	3	0.16	15	44	38000	12	---
06A1B7	1	0.1	18	56	50000	15	---
06A1B7	3	0.1	10	57	48000	15	---
06A1B7	5	0.1	13	16	21000	6.5	---
06A1B8	5	1.4	32	60	45000	50	22
06A1B8	1	0.45	27	65	34000	30	16
06A1B8	2	0.9	28	54	29000	26	15
06A1B9	3	0.1	15	20	32000	7.9	6.5
06A1B9	5	0.1	12	15	21000	6.3	5.8
06A1B9	1	0.1	11	19	22000	3.9	2.5
06A2B1	1	0.18	14	40	38000	15	---
06A2B2	1	0.1	14	63	37000	15	17
06A2B3	3	---	14	67	50000	12	12
07A2B1	1	0.1	6.3	19	16000	6.7	---
07A2B1	3	0.1	7.6	25	26000	6.5	---
07A2B1	5	0.1	8.8	15	18000	5.4	---
07A2B2	1	0.1	2	840	14000	2800	---
07A2B2	3	0.18	2	6.5	12000	7.1	---
07A2B2	5	0.13	4.3	29	18000	110	---
07A2B3	3	0.1	8.3	8.5	39000	8.6	---
07A2B3	5	---	8.4	15	26000	7.5	---
07A2B3	1	0.1	6.6	20	29000	10	---
07A2B4	1	0.1	6.3	14	15000	5.1	---
07A2B4	3	0.1	7.8	36	19000	2.5	---
07A2B4	5	0.11	6.8	22	13000	8.6	---
07A2B5	1	0.1	8.9	19	16000	5.1	---
07A2B5	3	0.1	12	21	19000	6.6	---
07A2B5	5	0.1	5.1	14	12000	2.5	---
10A1B1	1	0.1	---	---	---	---	2.5
10A1B2	1	0.33	---	---	---	---	17
10A1B3	1	0.67	---	---	---	---	2.5
11A1B1	1	---	---	---	---	---	17

Table A-6. Expanded Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
11A1B1D	1	---	---	---	---	---	15
11A1B2	1	---	---	---	---	---	12
11A1B3	1	---	---	---	---	---	16
12A1B1	1	0.15	13	26	25000	8.4	8.6
12A1B2	1	0.12	13	27	63000	13	11
12A1B3	1	0.21	12	27	42000	14	9.9
12A1B4	1	0 14	11	19	37000	14	2.5
12A1B5	1	0.21	11	31	35000	32	9.3
12A2B1	1	0.26	21	16	14000	4.1	2.5
12A2B2	1	0.94	8.7	29	23000	21	2.5
12A2B3	1	0.52	8.5	11	13000	5.6	2.5
12A2B4	1	0.46	10	31	40000	11	6.6
12A2B5	1	0.63	13	27	32000	12	6.9
12A3B1	1	0.1	13	36	30000	44	8.9
12A3B2	1	0.1	17	43	39000	28	17
12A3B3	1	0.1	18	43	48000	21	22
12A3B4	1	0.1	12	44	36000	40	17
12A3B5	1	0 115	17	51	34000	65	12
13L01		0.1	16.9	---	32200	---	---
13L02		0.1	20.3	---	28400	---	---
13L03		0.721	7.61	---	16000	---	---
13L05		0.675	15.6	---	24700	---	---
13L10		0.451	16.2	---	24300	---	---
13L11D		0.406	11.5	---	24800	---	---
13L11		0.1	11.5	---	25000	---	---
13L15		0.1	15.2	---	28500	---	---
13L17		0.1	21.3	---	51800	---	---
13L18		0.36	15 4	---	28200	---	---
13L21		0.36	17.5	---	24100	---	---
13L22		0.36	17.5	---	29100	---	---
13L23		0.452	17.1	---	30800	---	---
13L30		0.629	5.86	---	20800	---	---
13L34		0.36		---	56600	---	---
13L38		0.1	16.8	---	18400	---	---
13L42D		0.1	19.5	---	27700	---	---
13L42		0.539	12.3	---	34900	---	---
13L46		0.494	6.17	---	22200	---	---
13L47		0.587	15	---	37900	---	---
13L53		0.361		---	44400	---	---
13L57		0.68	13.1	---	36300	---	---
		All concentrations in mg/kg					

Table A-6. Expanded Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium
01A1B1	1	6300	390	0.05	1	19	2500
01A1B1	3	6700	400	0.05	1	24	2600
01A2B1	1	5900	320	0 05	1	15	2000
01A2B1	3	5200	300	0.05	1	16	2200
01A2B2	1	6400	360	0.05	1	23	2700
01A2B3	1	6800	390	0 14	1	20	2500
01A2B3	2	7800	470	0.05	1	25	3500
01A2B4	1	6100	320	0.1	1	25	2700
01A2B4	3	6100	320	0 13	1	19	3300
02A1B1	5	4000	340	0.05	3	6.9	630
02A2B1	5	5900	370	0.05	1	260	---
03A1B1	1	4800	240	0 05	1	19	2300
03A1B1	3	7300	310	0.05	1	20	2400
03A1B2	1	4600	230	1.4	1	23	2300
03A2B1	1	5400	350	0.2	1	15	1400
03A2B1	2	4700	450	0.05	1	17	2300
04A1B1	1	4800	270	0.05	1	14	2200
04A2B1	16	4900	300	0 05	1	11	2100
04A2B1	5	8300	440	0.05	1	21	3300
04A2B1	10	5100	420	0.05	1	17	2100
04A2B1	15	4300	380	0 05	1	14	1500
04A2B2	10	6100	450	0.05	2.1	22	2200
04A2B2	15	4300	270	0.05	1	33	1900
04A2B2	20	6700	210	0 7	1	78	1200
04A2B2	5	6600	390	0.05	1	21	2600
04A3B1	1	6000	340	1.5	1	18	2300
04A3B2	3	5500	260	2.6	1	17	3200
04A3B2	1	5200	260	2.2	1	17	2100
04A3B3	1	7400	460	0.05	1	21	3000
04A3B3	3	6900	420	0 05	1	26	2600
04A3B4	1	5900	390	0.38	1	20	2500
04A3B4	2	7500	390	0.25	1	30	3000
04A4B1	1	5700	360	0.05	1	14	1800
04A4B1	3	5800	440	0.05	1	17	2500
04A4B2	1	5600	320	0.05	1	14	1700
04A4B2	3	5800	250	0.05	1	15	1600
04A5B1	1	9400	570	0.05	6.9	73	3400
04A5B1	3	18000	570	0.05	20	110	6900
04A5B2	3	46000	760	0 13	1	930	250
04A5B2	1	28000	730	0.18	1	400	1100
05A1B1	3	9100	420	0.05	1	15	260
05A1B1	1	9400	440	0.05	1	16	340
05A1B2	1	6100	350	0.05	1	11	1300
05A1B2	3	7600	490	0.05	1	14	880
05A1B3	1	2300	380	0.2	1	7.1	920
05A1B3	3	5700	440	0 15	1	13	1400
05A1B4	1	8300	380	0 05	1	25	1800
05A1B5	3	9700	500	0.05	1	14	640
05A1B5	1	13000	590	0.05	1	25	1300
05A2B1	10	7000	480	0.05	1	30	1400
05A2B1	5	5700	640	0 05	1	21	2100
06A1B10	3	50000	650	1 4	1	250	640
06A1B10	5	52000	1100	0.43	1	370	410

Table A-6. Expanded Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium
06A1B10	1	9800	330	2	1	37	2200
06A1B1	5	6700	380	0.05	1	21	2100
06A1B1	1	6100	350	0.05	1	19	2500
06A1B1	3	5300	350	0.05	1	22	2200
06A1B11	1	280	130	0.05	1	2	440
06A1B11	3	1600	110	0.05	1	6.1	610
06A1B11	5	690	110	0.05	1	2	340
06A1B2	3	4100	460	0.05	1	18	2300
06A1B2	5	4200	210	0.05	1	11	1600
06A1B2	1	6100	590	0.05	1	50	4300
06A1B3	5	5200	450	0.05	1	19	2500
06A1B3	1	6200	550	0.05	1	48	4800
06A1B3	3	6800	600	0.05	1	50	4700
06A1B4	5	13000	320	0.31	1	43	2100
06A1B4	3	15000	370	0.57	1	65	8700
06A1B4	1	6200	370	0.21	2.1	41	4100
06A1B5	5	3100	240	0.05	1	15	1200
06A1B5	1	7700	670	0.05	1	57	3400
06A1B5	3	7800	600	0.05	1	69	3300
06A1B6	5	5900	410	0.05	1	15	1500
06A1B6	1	5500	340	0.05	1	29	2800
06A1B6	3	5900	320	0.05	1	20	1700
06A1B7	1	6100	520	0.05	1	34	2000
06A1B7	3	5900	430	0.05	1	32	3100
06A1B7	5	5600	380	0.05	1	12	1400
06A1B8	5	14000	1300	0.18	1	330	1200
06A1B8	1	8300	500	0.16	1	150	2400
06A1B8	2	8800	520	1	1	140	2400
06A1B9	3	5800	490	0.05	1	14	1600
06A1B9	5	5100	350	0.05	1	13	1200
06A1B9	1	5400	250	0.05	1	13	1300
06A2B1	1	8900	290	0.05	1	37	4500
06A2B2	1	8600	350	0.05	1	38	4700
06A2B3	3	13000	400	0.05	1	58	9400
07A2B1	1	3500	230	0.05	1	8.2	640
07A2B1	3	6300	400	0.05	1	7.2	3200
07A2B1	5	4800	270	0.05	1	9.1	980
07A2B2	1	2500	320	0.17	1	2	2200
07A2B2	3	2500	320	0.05	1	2	2200
07A2B2	5	3400	330	0.05	1	5	2100
07A2B3	3	7600	680	0.05	1	22	5900
07A2B3	5	5400	280	0.05	1	7.5	2700
07A2B3	1	4300	230	0.05	1	9.2	1400
07A2B4	1	3700	190	0.05	1	5.7	1100
07A2B4	3	4000	310	0.05	1	7.3	1500
07A2B4	5	4200	680	0.05	1	11	1000
07A2B5	1	5400	250	0.05	1	11	1200
07A2B5	3	5900	270	0.05	1	13	1300
07A2B5	5	4200	200	0.05	1	9.1	1100
10A1B1	1	—	—	—	—	—	—
10A1B2	1	—	—	—	—	—	—
10A1B3	1	—	—	—	—	—	—
11A1B1	1	—	—	—	—	—	—

Table A-6. Expanded Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium
11A1B1D	1	---	---	---	---	---	---
11A1B2	1	---	---	---	---	---	---
11A1B3	1	---	---	---	---	---	---
12A1B1	1	6300	590	0.05	1	18	2800
12A1B2	1	7200	540	0.05	1	18	2500
12A1B3	1	6100	540	0 05	1	20	2900
12A1B4	1	4800	490	0.05	1	13	2300
12A1B5	1	6400	500	0.05	1	15	1900
12A2B1	1	1500	120	0.05	1	11	900
12A2B2	1	2900	200	0 05	1	21	1700
12A2B3	1	2100	220	0.05	1	9.8	1800
12A2B4	1	5800	310	0.05	1	35	5000
12A2B5	1	4900	400	0.05	1	29	4300
12A3B1	1	7700	530	0.05	1	22	4600
12A3B2	1	10000	590	0.05	1	30	5500
12A3B3	1	12000	870	0.05	1	44	8000
12A3B4	1	9600	670	0.05	3.2	43	7300
12A3B5	1	7300	590	0.1	1	25	4300
13L01		---	527	0.05	---	27.3	1440
13L02		---	794	0.05	---	26.7	1240
13L03		---	283	0.05	---	16.3	961
13L05		---	465	0.05	---	21.4	1230
13L10		---	529		---	23.4	953
13L11D		---	1160	0 05	---	15.8	1810
13L11		---	1760		---	14	1440
13L15		---	545	0.05	---	20.2	1260
13L17		---	754	0.05	---	52.5	
13L18		---	525	0 05	---	20.2	1010
13L21		---	490	0.05	---	22.6	617
13L22		---	375	0.05	---	22.5	1820
13L23		---	465	0 05	---	20.9	958
13L30		---	316	0.05	---	18.2	4930
13L34		---	1420	0 05	---		3900
13L38		---	108	0.05	---	72.5	2640
13L42D		---	224	0.05	---	21.7	422
13L42		---	222	0.05	---	34.6	3130
13L46		---	275	0.05	---	15.1	3640
13L47		---	267	0.05	---	36.3	7370
13L53		---	946	0.05	---		---
13L57		---	328	0.05	---	29	5340
		All concentrations in mg/kg					

Table A-6. Expanded Data

Sample Description	Depth (feet)	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
01A1B1	1	0.2	0.5	230	0.15	35	71
01A1B1	3	0.2	0.5	270	0.15	40	80
01A2B1	1	0.2	0.5	190	0.15	30	95
01A2B1	3	0.2	0.5	160	0 15	33	66
01A2B2	1	0.2	0.5	200	0.15	42	69
01A2B3	1	0.2	0.5	260	0.15	42	71
01A2B3	2	0.2	0.5	330	0.15	47	100
01A2B4	1	0.2	0.5	230	0.15	41	84
01A2B4	3	0.2	0.5	180	0.15	41	70
02A1B1	5	---	0.5	290	0.15	13	59
02A2B1	5	---	0.5	25	0.15	11	15
03A1B1	1	0.2	0.5	160	0.15	29	140
03A1B1	3	0.2	0.5	230	0.15	46	68
03A1B2	1	---	---	120	0.15	25	270
03A2B1	1	---	---	190	0.15	44	340
03A2B1	2	---	---	120	0.15	44	200
04A1B1	1	0.2	0.5	220	0.15	33	49
04A2B1	16	0.2	0 5	180	0.15	29	42
04A2B1	5	0.2	0.5	210	0 15	55	84
04A2B1	10	0.2	0.5	150	0.15	44	46
04A2B1	15	0.2	0.5	150	0.15	32	36
04A2B2	10	0.2	0.5	190	0.15	47	54
04A2B2	15	0.2	0.5	550	0.15	29	36
04A2B2	20	0.2	0 5	250	0.15	23	28
04A2B2	5	0 2	0.5	240	0.15	52	64
04A3B1	1	0.2	270	600	0.15	35	140
04A3B2	3	0.2	0.5	190	0.15	36	90
04A3B2	1	0 2	0.5	180	0.15	31	69
04A3B3	1	0.2	0.5	640	0.15	56	93
04A3B3	3	0 2	0.5	390	0.15	64	77
04A3B4	1	0.2	0.5	260	0.15	46	73
04A3B4	2	19	0.5	550	0.15	53	82
04A4B1	1	0.2	0 5	330	0.15	44	49
04A4B1	3	13	0 5	240	0.15	48	52
04A4B2	1	0.2	0.5	230	0.15	41	52
04A4B2	3	0.2	0.5	230	0.15	40	52
04A5B1	1	22	0.5	750	0 38	52	89
04A5B1	3	42	0.5	350	0.15	96	130
04A5B2	3	32	0.5	930	0.33	25	36
04A5B2	1	10	0.5	640	0.15	32	71
05A1B1	3	---	0.5	140	0.15	33	58
05A1B1	1	---	0.5	180	0 15	39	57
05A1B2	1	---	0.5	100	0.15	23	44
05A1B2	3	---	0.5	150	0.15	31	57
05A1B3	1	---	0.5	59	0.15	12	24
05A1B3	3	---	0.5	96	0 15	27	48
05A1B4	1	---	0 5	150	0.15	32	56
05A1B5	3	12	0 5	340	0.15	40	74
05A1B5	1	22	0.5	290	0.15	77	97
05A2B1	10	35	0.5	160	0.15	74	53
05A2B1	5	18	0.5	120	0.15	58	45
06A1B10	3	34	47	310	0.15	75	160
06A1B10	5	25	0.5	380	0.15	64	160

Table A-6. Expanded Data

Sample Description	Depth (feet)	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
06A1B10	1	---	2.7	150	0.15	41	58
06A1B1	5	20	---	620	0.15	42	84
06A1B1	1	---	0.5	520	0.15	43	79
06A1B1	3	0.2	0.5	210	0.15	41	54
06A1B11	1	---	0.5	25	0.15	2	5.5
06A1B11	3	---	0.5	110	0.15	7.3	18
06A1B11	5	20	0.5	71	0.15	2	9.5
06A1B2	3	---	---	580	0.15	44	34
06A1B2	5	---	---	79	0.15	25	33
06A1B2	1	48	0.5	580	0.35	83	66
06A1B3	5	---	0.5	140	0.15	45	44
06A1B3	1	49	0.5	450	0.15	88	70
06A1B3	3	46	0.5	350	0.15	85	81
06A1B4	5	31	---	910	0.15	72	62
06A1B4	3	57	0.5	920	0.44	110	110
06A1B4	1	18	0.5	400	0.15	45	---
06A1B5	5	---	---	110	0.15	19	23
06A1B5	1	22	0.5	400	0.15	59	96
06A1B5	3	18	0.5	360	0.15	60	78
06A1B6	5	---	0.5	130	0.15	40	46
06A1B6	1	21	0.5	700	0.15	75	83
06A1B6	3	12	0.5	240	0.15	66	65
06A1B7	1	46	0.5	270	0.15	86	92
06A1B7	3	42	0.5	560	0.15	76	70
06A1B7	5	---	0.5	230	0.15	32	47
06A1B8	5	16	0.5	1300	0.15	41	63
06A1B8	1	0.2	0.5	410	0.15	37	280
06A1B8	2	0.2	---	490	0.15	34	220
06A1B9	3	---	---	380	0.15	41	49
06A1B9	5	0.2	---	200	0.15	28	44
06A1B9	1	0.2	0.5	350	0.15	39	48
06A2B1	1	0.2	0.5	370	0.15	51	76
06A2B2	1	12	0.5	300	0.15	45	79
06A2B3	3	35	0.5	980	0.15	81	110
07A2B1	1	---	0.5	61	0.15	27	30
07A2B1	3	---	0.5	71	0.15	33	47
07A2B1	5	---	0.5	130	0.15	34	34
07A2B2	1	---	14	25	0.15	15	270
07A2B2	3	---	0.5	25	0.15	14	33
07A2B2	5	40	0.5	25	0.38	25	53
07A2B3	3	---	0.5	65	0.42	66	65
07A2B3	5	---	0.5	120	0.15	44	37
07A2B3	1	---	0.5	60	0.15	49	32
07A2B4	1	---	0.5	67	0.15	19	32
07A2B4	3	---	0.5	83	0.15	26	35
07A2B4	5	---	0.5	74	0.15	26	31
07A2B5	1	---	0.5	200	0.15	31	38
07A2B5	3	---	0.5	430	0.15	32	40
07A2B5	5	---	0.5	300	0.15	20	31
10A1B1	1	---	---	---	---	---	---
10A1B2	1	---	---	---	---	---	---
10A1B3	1	---	---	---	---	---	---
11A1B1	1	---	---	---	---	---	---

Table A-6. Expanded Data

Sample Description	Depth (feet)	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
11A1B1D	1	---	---	---	---	---	---
11A1B2	1	---	---	---	---	---	---
11A1B3	1	---	---	---	---	---	---
12A1B1	1	0.2	0.5	290	0.15	42	63
12A1B2	1	0.2	0.5	290	0.15	46	66
12A1B3	1	0.2	0.5	260	0.15	44	73
12A1B4	1	0.2	0.5	220	0.15	38	58
12A1B5	1	0.2	0.5	220	0.15	36	76
12A2B1	1	0.2	0.5	190	0.15	19	24
12A2B2	1	0.2	0.5	230	0.15	29	44
12A2B3	1	0.2	0.5	160	0.15	23	23
12A2B4	1	33	0.5	730	0.15	81	52
12A2B5	1	29	0.5	640	0.15	67	46
12A3B1	1	0.2	---	120	0.15	59	80
12A3B2	1	0.2	0.5	110	0.15	76	79
12A3B3	1	28	0.5	91	0.15	95	91
12A3B4	1	25	0.5	110	0.15	72	110
12A3B5	1	0.2	0.5	140	0.15	73	91
13L01		---	---	184	---	55.2	87.9
13L02		---	---	199	---	42	89.3
13L03		---	---	77.5	---	18.8	35.3
13L05		---	---	92.6	---	44.8	73.2
13L10		---	---	184	---	43.4	79.5
13L11D		---	---	139	---	31.1	67.9
13L11		---	---	92.5	---	24.1	64.1
13L15		---	---	151	---	43.1	84.3
13L17		---	---	213	---	85.9	
13L18		---	---	139	---	47	92.6
13L21		---	---	183	---	52.5	81.3
13L22		---	---	92.4	---	32	87.9
13L23		---	---	139	---	44.6	92.3
13L30		---	---	139	---	18.9	49.3
13L34		---	---	118	---	94	145
13L38		---	---		---	16.3	29.6
13L42D		---	---		---	68	35
13L42		---	---	149	---	35	52.6
13L46		---	---	138	---	21.6	97.9
13L47		---	---	209	---	57.2	80.9
13L53		---	---	46	---	9.85	53
13L57		---	---	138	---	34.7	83.5
		All concentrations in mg/kg					

Table A-7. Summary Statistics for Expanded Data

Statistic	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Hex. Chromium	Cobalt
selected reporting limit	20	10	5	0.5	0.1	0.1	2	0.2	4
number of observations	138	117	117	117	136	83	117	139	137
number of detects	138	6	108	117	133	19	117	90	133
number of non-detects	0	111	9	0	3	64	0	49	4
percentage of detects	100	5	92	100	98	23	100	65	97
maximum detect	43000	36	270	450	1.5	0.92	750	2.2	100
minimum detect	950	20	2.5	12	0.13	0.14	2.0	0.1	4.3
median	10900	nc	15	130	0.68	nc	19	0.12	12
mean	12013	nc	26	139	0.67	nc	45	0.26	14
standard deviation	6326	nc	38	66	0.28	nc	90	0.29	11
coefficient of variation	0.5	nc	1.4	0.5	0.4	nc	2.0	1.1	0.8
coefficient of skewness	1.9	nc	3.7	1.4	0.4	nc	5.4	3.3	4.7
Concentrations given in mg/kg									
nc = not calculated									

Table A-7. Summary Statistics for Expanded Data

Statistic	Copper	Iron	Lead	Lithium	Magnesium	Manganese	Mercury	Molybdenum	Nickel
selected reporting limit	2	20	5	5	100	1	0.1	2	4
number of observations	117	139	116	78	117	139	137	117	137
number of detects	117	139	111	61	117	139	26	6	133
number of non-detects	0	0	5	17	0	0	111	111	4
percentage of detects	100	100	96	78	100	100	19	5	97
maximum detect	840	63000	2800	250	52000	1760	2.6	20	930
minimum detect	5.2	3100	2.5	5.0	280	108	0.10	2.1	5.0
median	31	27700	10	8.2	6000	390	nc	nc	20
mean	44	29362	39	19	7613	439	nc	nc	43
standard deviation	85	12484	259	39	7602	239	nc	nc	98
coefficient of variation	1.9	0.4	6.6	2.0	1.0	0.5	nc	nc	2.3
coefficient of skewness	7.9	0.6	10.7	4.2	4.6	2.5	nc	nc	6.6
Concentrations given in mg/kg									
nc = not calculated									

Table A-7. Summary Statistics for Expanded Data

Statistic	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
selected reporting limit	500	0.4	1	50	0.3	4	2
number of observations	136	80	105	137	117	139	137
number of detects	136	34	4	132	6	137	137
number of non-detects	0	46	101	5	111	2	0
percentage of detects	100	43	4	96	5	99	100
maximum detect	9400	57	270	1300	0.44	110	340
minimum detect	250	10	2.7	46	0.33	7.3	5.5
median	2100	nc	nc	200	nc	41	65
mean	2432	nc	nc	267	nc	44	73
standard deviation	1699	nc	nc	219	nc	21	51
coefficient of variation	0.7	nc	nc	0.8	nc	0.5	0.7
coefficient of skewness	1.7	nc	nc	1.9	nc	0.7	2.7
Concentrations given in mg/kg							
nc = not calculated							

Table A-8. Ambient Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
01A1B1	1	9500	5	6.4	150	0.46	0.05	19
01A1B1	3	10000	5	5.4	180	0.58	0.05	28
01A2B1	1	9000	5	6.7	170	0.52	0.16	17
01A2B1	3	8300	5	2.5	130	0.47	0.05	15
01A2B2	1	9800	5	8.5	200	0.58	0.19	19
01A2B3	1	11000	5	8.2	170	0.59	0.05	22
01A2B3	2	13000	5	12	200	0.63	0.27	32
01A2B4	1	9700	5	9.9	180	0.63	0.16	31
01A2B4	3	9100	5	11	210	0.5	0.26	19
02A1B1	5	6400	5	18	38	0.29		4.6
02A2B1	5	2400	5	44	16	0.14		120
03A1B1	1	7200	5	8.2	100	0.41	0.92	14
03A1B1	3	10000	5	12	200	0.47	0.05	17
03A1B2	1	7300	5	16	120			34
03A2B1	1	10000	5	18	120			17
03A2B1	2	9800	5	26	120			17
04A1B1	1	9300	5	2.5	120	0.46	0.05	16
04A2B1	16	7700	5	2.5	110	0.36	0.05	14
04A2B1	5	16000	30	2.5	180	0.85	0.05	26
04A2B1	10	12000	5	2.5	140	0.78	0.05	24
04A2B1	15	8800	5	2.5	97	0.43	0.05	16
04A2B2	10	14000	5	9.6	150	0.8	0.05	37
04A2B2	15	7700	5	2.5	94	0.33	0.05	24
04A2B2	20	6200	5	12	59	0.24	0.05	59
04A2B2	5	16000	5	2.5	140	0.89	0.05	26
04A3B1	1	8700	5	3.2	140	0.49	0.74	20
04A3B2	3	8800	5	6.5	130	0.5	0.31	18
04A3B2	1	7700	5	5.4	120	0.41	0.14	24
04A3B3	1	12000	5	15	180	0.76	0.05	23
04A3B3	3	13000	5	19	160	0.94	0.05	37
04A3B4	1	14000	5	10	160	0.72	0.14	23
04A3B4	2	13000	5	11	190	0.72	0.05	29
04A4B1	1	9800	5	8.7	87	0.72	0.05	19
04A4B1	3	11000	5	10	120	0.84	0.05	24
04A4B2	1	9600	5	11	110	0.74	0.05	18
04A4B2	3	8700	5	9.9	110	0.72	0.05	20
04A5B1	1	15000	5	9.9	200	0.92	0.05	60
04A5B1	3	15000	5	17	450	1.1	0.05	150
04A5B2	3	3800	5	24	62	0.05	0.05	260
04A5B2	1	14000	5	84	110	0.75	0.37	440
05A1B1	3	9400	5	18	100	0.58		16
05A1B1	1	11000	5	22	120	0.74		14
05A1B2	1	7300	5	18	160	0.54		10
05A1B2	3	9000	5	19	120	0.59		15
05A1B3	1	3600	5	8.1	240	0.48		4.2
05A1B3	3	8300	5	19	210	0.76		11
05A1B4	1	9700	5	23	140	0.56		39
05A1B5	3	21000	5	76	39	1.2		6.7
05A1B5	1	16000	5	130	59	0.93		6.2
05A2B1	10	21000	5	2.5	140	1.1	0.05	24

Table A-8. Ambient Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
05A2B1	5	19000	5	2.5	150	0.96	0.05	24
06A1B10	3	37000	5	170	130	1.4	0.05	750
06A1B10	5	38000	20	270	110	1.5	0.05	290
06A1B10	1	15000	5	97	130	0.92	0.05	21
06A1B1	5	11000	5	64	170	0.55	0.05	14
06A1B1	1	11000	5	12	160	0.62	0.05	15
06A1B1	3	9500	5	11	120	0.73	0.05	20
06A1B11	1	950	5	15	12	0.17		2.7
06A1B11	3	3700	5	29	41	0.26		8.8
06A1B11	5	1400	5	19	24	0.13		3.8
06A1B2	3	8800	5	56	110	0.73	0.05	29
06A1B2	5	6200	5	38	65	0.37	0.05	16
06A1B2	1	18000	5	21	140	1.1	0.05	58
06A1B3	5	10000	5	64	110	0.74	0.05	30
06A1B3	1	17000	5	24	160	1.1	0.05	58
06A1B3	3	19000	5	27	160	1.1	0.05	63
06A1B4	5	16000	5	97	220	0.77	0.05	54
06A1B4	3	43000	5	29	280	1.1	0.05	97
06A1B4	1	16000	5	150	180	0.85	0.05	60
06A1B5	5	4900	5	31	75	0.33	0.05	28
06A1B5	1	19000	5	25	160	1	0.05	100
06A1B5	3	17000	5	23	150	0.99	0.05	130
06A1B6	5	8800	5	54	100	0.73	0.05	18
06A1B6	1	12000	5	21	130	1.1	0.05	30
06A1B6	3	13000	5	17	96	0.94	0.05	27
06A1B7	1	18000	5	25	150	1.3	0.05	30
06A1B7	3	14000	5	24	160	1.2	0.05	29
06A1B7	5	8000	5	22	130	0.68		15
06A1B8	5	13000	5	140	89	0.99	0.05	300
06A1B8	1	12000	5	22	130	0.61	0.47	140
06A1B8	2	12000	5	23	120	0.57	0.51	130
06A1B9	3	9600	20	60	130	0.75	0.05	18
06A1B9	5	7000	5	42	140	0.53	0.05	14
06A1B9	1	9000	5	13	97	0.71	0.05	16
06A2B1	1	15000	5	9	290	0.68	0.05	52
06A2B2	1	15000	5	10	270	0.55	0.05	64
06A2B3	3	20000	5	11	370	0.57	0.05	90
07A2B1	1	5500	5	15	65	0.48		9.8
07A2B1	3	8600	5	20	110	0.42		5.5
07A2B1	5	6500	5	17	72	0.47		10
07A2B2	1	4500	36	12	130	0.34		4.1
07A2B2	3	5200	5	10	42	0.37		2
07A2B2	5	7600	20	17	68	0.52		6.3
07A2B3	3	14000	5	110	160	0.79		28
07A2B3	5	12000	20	26	120	0.68		8.1
07A2B3	1	9300	5	25	110	0.7		15
07A2B4	1	4900	5	13	80	0.36		6.6
07A2B4	3	6000	5	16	77	0.43		5.9
07A2B4	5	5400	5	11	95	0.37		9.4
07A2B5	1	7600	5	15	89	0.47		12
07A2B5	3	9000	5	17	140	0.51		8.8

Table A-8. Ambient Data

Sample Description	Depth (feet)	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium
07A2B5	5	5400	5	11	70	0.37		9.9
10A1B1	1							
10A1B2	1							
10A1B3	1							
11A1B1	1							
11A1B1D	1							
11A1B2	1							
11A1B3	1							
12A1B1	1	12000	5	7.4	140	0.85	0.19	18
12A1B2	1	13000	5	9	150	0.87	0.05	19
12A1B3	1	12000	5	11	140	0.82		18
12A1B4	1	9300	5	12	150	0.82	0.05	13
12A1B5	1	10000	5	25	140	0.81	0.16	16
12A2B1	1	4900	5	5.9	79	0.48	0.41	8.9
12A2B2	1	8000	5	11	130	0.59	0.24	26
12A2B3	1	5400	5	2.5	84	0.39	0.05	13
12A2B4	1	16000	5	9.2	160	1.1	0.05	42
12A2B5	1	13000	5	7.2	190	0.95	0.05	32
12A3B1	1	17000	5	16	180	0.59	0.14	17
12A3B2	1	18000	5	18	200	0.68	0.05	23
12A3B3	1	23000	5	7.8	230	0.89	0.05	14
12A3B4	1	18000	5	7.9	250	0.81	0.05	18
12A3B5	1	19000	5	6.8	290	0.68	0.22	23
13L01		16700				0.774		
13L02		17500				0.755		
13L03		8480				0.708		
13L05		12900				0.561		
13L10		13900				0.838		
13L11D		10800				0.744		
13L11		7030				0.536		
13L15		16200				0.624		
13L17		27000				0.365		
13L18		15800				0.697		
13L21		13700				0.641		
13L22		14600				0.971		
13L23		17800				1.04		
13L30		11400				0.387		
13L34						1.43		
13L38		14100				0.05		
13L42D		9730				0.445		
13L42		17100				0.345		
13L46		9740				0.267		
13L47		23400				0.507		
13L53		2700				0.05		
13L57		18700				0.681		
		= outlier - not included in ambient data						
		All concentrations in mg/kg						

Table A-8. Ambient Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
01A1B1	1	0.18	9.1	31	23000	6	
01A1B1	3	0.11	16	44	26000	9.2	
01A2B1	1	0.19	8.7	54	20000	13	6.8
01A2B1	3	0.1	8.6	50	20000	5.9	2.5
01A2B2	1	0.1	11	42	27000	17	8.2
01A2B3	1	0.1	11	62	26000	9.1	
01A2B3	2	0.24	12	51	30000	16	
01A2B4	1	0.18	12	35	22000	19	5.8
01A2B4	3	0.1	10	33	23000	16	5.7
02A1B1	5	0.1	4.7	6.1	20000	2.5	6.8
02A2B1	5	0.73	67	110	10000	2.5	2.5
03A1B1	1	0.18	8.1	43	18000	27	6.3
03A1B1	3	0.1	12	60	22000	21	12
03A1B2	1	0.1	7.9	420	20000	110	8.1
03A2B1	1	0.1	8.9	36	22000	14	40
03A2B1	2	0.1	9.1	32	22000	15	31
04A1B1	1	0.11	9.4	22	20000	8.8	5.8
04A2B1	16	0.17	11	19	20000	3.6	6.1
04A2B1	5	0.1	14	45	40000	8.9	8.6
04A2B1	10	0.1	12	22	30000	8.3	2.5
04A2B1	15	0.13	8	18	20000	3.2	2.5
04A2B2	10	0.26	19	28	32000	6.4	5.7
04A2B2	15	0.3	7	17	19000	3.9	2.5
04A2B2	20	0.23	11	20	15000	3.4	2.5
04A2B2	5	0.1	14	32	34000	12	7.9
04A3B1	1	0.3	10	31	24000	11	9.1
04A3B2	3	0.1	9.1	34	23000	18	8.5
04A3B2	1	0.1	8.5	30	20000	9.6	7.3
04A3B3	1	0.1	13	64	40000	14	15
04A3B3	3	0.18	14	46	43000	15	26
04A3B4	1	0.1	12	36	31000	15	10
04A3B4	2	0.1	10	36	32000	10	12
04A4B1	1	0.1	14	20	24000	7.8	5.7
04A4B1	3	0.1	14	23	29000		6.3
04A4B2	1	0.1	11	25	24000	6.6	2.5
04A4B2	3	0.1	11	24	23000	6.3	2.5
04A5B1	1	1.19	11	24	38000	9.2	25
04A5B1	3	0.6	21	57	60000	13	120
04A5B2	3	0.72	100	37	46000	2.5	250
04A5B2	1	1.1	47	54	37000	30	170
05A1B1	3	0.1	15	5.2	16000	6	
05A1B1	1	0.1	16	10	19000	5.7	
05A1B2	1	0.16	8.3	16	17000	10	
05A1B2	3	0.1	13	16	20000	5.8	
05A1B3	1	0.1	6.5	15	9700	2.5	
05A1B3	3	0.1	10	30	20000	6.3	
05A1B4	1	0.12	8.7	45	25000	11	
05A1B5	3	0.1	11	37	32000	15	
05A1B5	1	0.1	8.9	52	34000	13	
05A2B1	10	0.21	12	27	37000	9.3	8

Table A-8. Ambient Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
05A2B1	5	0.14	16	24	33000	8.6	5.8
06A1B10	3	0.17	30	11	54000	22	110
06A1B10	5	0.47	60	52	63000	45	130
06A1B10	1	0.1	8.5	18	40000	7 6	24
06A1B1	5	0.1	6.3	36	35000	6.3	17
06A1B1	1	0.1	7.8	37	29000	8	
06A1B1	3	0.1	13	23	26000	8.2	
06A1B11	1	0.1	2	14	3300	28	
06A1B11	3	0.23	2	45	9100	22	
06A1B11	5	2.2	6.2	29	3100	46	
06A1B2	3	0.31	14	22	27000	9.8	5
06A1B2	5	0.2	6.8	11	16000	8.5	5.9
06A1B2	1		15	51	48000	14	
06A1B3	5	0 16	13	24	33000	6.1	2.5
06A1B3	1	0.33	14	49	53000	17	
06A1B3	3	0 5	17	55	54000	15	
06A1B4	5	0.18	13	16	36000	9.5	12
06A1B4	3	0.41	17	31	62000	16	
06A1B4	1	0.56	22	170	43000	29	
06A1B5	5	0.22	6.5	17	12000	8.7	2.5
06A1B5	1	0.29	21	92	43000	14	
06A1B5	3	0.38	18	48	47000	15	
06A1B6	5	0.1	15	18	28000	8.1	5.6
06A1B6	1	0 22	13	46	44000	17	
06A1B6	3	0.16	15	44	38000	12	
06A1B7	1	0 1	18	56	50000	15	
06A1B7	3	0.1	10	57	48000	15	
06A1B7	5	0.1	13	16	21000	6.5	
06A1B8	5	1.4	32	60	45000	50	22
06A1B8	1	0.45	27	65	34000	30	16
06A1B8	2	0.9	28	54	29000	26	15
06A1B9	3	0.1	15	20	32000	7.9	6.5
06A1B9	5	0.1	12	15	21000	6.3	5.8
06A1B9	1	0 1	11	19	22000	3.9	2.5
06A2B1	1	0.18	14	40	38000	15	
06A2B2	1	0.1	14	63	37000	15	17
06A2B3	3		14	67	50000	12	12
07A2B1	1	0.1	6.3	19	16000	6 7	
07A2B1	3	0 1	7.6	25	26000	6.5	
07A2B1	5	0.1	8.8	15	18000	5.4	
07A2B2	1	0.1	2	840	14000	2800	
07A2B2	3	0 18	2	6.5	12000	7.1	
07A2B2	5	0 13	4.3	29	18000	110	
07A2B3	3	0 1	8.3	8.5	39000	8.6	
07A2B3	5		8.4	15	26000	7.5	
07A2B3	1	0.1	6.6	20	29000	10	
07A2B4	1	0.1	6.3	14	15000	5.1	
07A2B4	3	0.1	7 8	36	19000	2.5	
07A2B4	5	0.11	6.8	22	13000	8.6	
07A2B5	1	0.1	8.9	19	16000	5.1	
07A2B5	3	0.1	12	21	19000	6.6	

Table A-8. Ambient Data

Sample Description	Depth (feet)	Hex. Chromium	Cobalt	Copper	Iron	Lead	Lithium
07A2B5	5	0.1	5.1	14	12000	2.5	
10A1B1	1	0.1					2.5
10A1B2	1	0.33					17
10A1B3	1	0.67					2.5
11A1B1	1						17
11A1B1D	1						15
11A1B2	1						12
11A1B3	1						16
12A1B1	1	0.15	13	26	25000	8.4	8.6
12A1B2	1	0.12	13	27	63000	13	11
12A1B3	1	0.21	12	27	42000	14	9.9
12A1B4	1	0.14	11	19	37000	14	2.5
12A1B5	1	0.21	11	31	35000	32	9.3
12A2B1	1	0.26	21	16	14000	4.1	2.5
12A2B2	1	0.94	8.7	29	23000	21	2.5
12A2B3	1	0.52	8.5	11	13000	5.6	2.5
12A2B4	1	0.46	10	31	40000	11	6.6
12A2B5	1	0.63	13	27	32000	12	6.9
12A3B1	1	0.1	13	36	30000	44	8.9
12A3B2	1	0.1	17	43	39000	28	17
12A3B3	1	0.1	18	43	48000	21	22
12A3B4	1	0.1	12	44	36000	40	17
12A3B5	1	0.115	17	51	34000	65	12
13L01		0.1	16.9		32200		
13L02		0.1	20.3		28400		
13L03		0.721	7.61		16000		
13L05		0.675	15.6		24700		
13L10		0.451	16.2		24300		
13L11D		0.406	11.5		24800		
13L11		0.1	11.5		25000		
13L15		0.1	15.2		28500		
13L17		0.1	21.3		51800		
13L18		0.36	15.4		28200		
13L21		0.36	17.5		24100		
13L22		0.36	17.5		29100		
13L23		0.452	17.1		30800		
13L30		0.629	5.86		20800		
13L34		0.36			56600		
13L38		0.1	16.8		18400		
13L42D		0.1	19.5		27700		
13L42		0.539	12.3		34900		
13L46		0.494	6.17		22200		
13L47		0.587	15		37900		
13L53		0.361			44400		
13L57		0.68	13.1		36300		
		All concentrations in mg/kg					

Table A-8. Ambient Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium
01A1B1	1	6300	390	0.05	1	19	2500	0.2
01A1B1	3	6700	400	0.05	1	24	2600	0.2
01A2B1	1	5900	320	0.05	1	15	2000	0.2
01A2B1	3	5200	300	0.05	1	16	2200	0.2
01A2B2	1	6400	360	0.05	1	23	2700	0.2
01A2B3	1	6800	390	0.14	1	20	2500	0.2
01A2B3	2	7800	470	0.05	1	25	3500	0.2
01A2B4	1	6100	320	0.1	1	25	2700	0.2
01A2B4	3	6100	320	0.13	1	19	3300	0.2
02A1B1	5	4000	340	0.05	3	6.9	630	
02A2B1	5	5900	370	0.05	1	260		
03A1B1	1	4800	240	0.05	1	19	2300	0.2
03A1B1	3	7300	310	0.05	1	20	2400	0.2
03A1B2	1	4600	230	1.4	1	23	2300	
03A2B1	1	5400	350	0.2	1	15	1400	
03A2B1	2	4700	450	0.05	1	17	2300	
04A1B1	1	4800	270	0.05	1	14	2200	0.2
04A2B1	16	4900	300	0.05	1	11	2100	0.2
04A2B1	5	8300	440	0.05	1	21	3300	0.2
04A2B1	10	5100	420	0.05	1	17	2100	0.2
04A2B1	15	4300	380	0.05	1	14	1500	0.2
04A2B2	10	6100	450	0.05	2.1	22	2200	0.2
04A2B2	15	4300	270	0.05	1	33	1900	0.2
04A2B2	20	6700	210	0.7	1	78	1200	0.2
04A2B2	5	6600	390	0.05	1	21	2600	0.2
04A3B1	1	6000	340	1.5	1	18	2300	0.2
04A3B2	3	5500	260	2.6	1	17	3200	0.2
04A3B2	1	5200	260	2.2	1	17	2100	0.2
04A3B3	1	7400	460	0.05	1	21	3000	0.2
04A3B3	3	6900	420	0.05	1	26	2600	0.2
04A3B4	1	5900	390	0.38	1	20	2500	0.2
04A3B4	2	7500	390	0.25	1	30	3000	19
04A4B1	1	5700	360	0.05	1	14	1800	0.2
04A4B1	3	5800	440	0.05	1	17	2500	13
04A4B2	1	5600	320	0.05	1	14	1700	0.2
04A4B2	3	5800	250	0.05	1	15	1600	0.2
04A5B1	1	9400	570	0.05	6.9	73	3400	22
04A5B1	3	18000	570	0.05	20	110	6900	42
04A5B2	3	46000	760	0.13	1	930	250	32
04A5B2	1	28000	730	0.18	1	400	1100	10
05A1B1	3	9100	420	0.05	1	15	260	
05A1B1	1	9400	440	0.05	1	16	340	
05A1B2	1	6100	350	0.05	1	11	1300	
05A1B2	3	7600	490	0.05	1	14	880	
05A1B3	1	2300	380	0.2	1	7.1	920	
05A1B3	3	5700	440	0.15	1	13	1400	
05A1B4	1	8300	380	0.05	1	25	1800	
05A1B5	3	9700	500	0.05	1	14	640	12
05A1B5	1	13000	590	0.05	1	25	1300	22
05A2B1	10	7000	480	0.05	1	30	1400	35

Table A-8. Ambient Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium
05A2B1	5	5700	640	0.05	1	21	2100	18
06A1B10	3	50000	650	1.4	1	250	640	34
06A1B10	5	52000	1100	0.43	1	370	410	25
06A1B10	1	9800	330	2	1	37	2200	
06A1B1	5	6700	380	0.05	1	21	2100	20
06A1B1	1	6100	350	0.05	1	19	2500	
06A1B1	3	5300	350	0.05	1	22	2200	0.2
06A1B11	1	280	130	0.05	1	2	440	
06A1B11	3	1600	110	0.05	1	6.1	610	
06A1B11	5	690	110	0.05	1	2	340	20
06A1B2	3	4100	460	0.05	1	18	2300	
06A1B2	5	4200	210	0.05	1	11	1600	
06A1B2	1	6100	590	0.05	1	50	4300	48
06A1B3	5	5200	450	0.05	1	19	2500	
06A1B3	1	6200	550	0.05	1	48	4800	49
06A1B3	3	6800	600	0.05	1	50	4700	46
06A1B4	5	13000	320	0.31	1	43	2100	31
06A1B4	3	15000	370	0.57	1	65	8700	57
06A1B4	1	6200	370	0.21	2.1	41	4100	18
06A1B5	5	3100	240	0.05	1	15	1200	
06A1B5	1	7700	670	0.05	1	57	3400	22
06A1B5	3	7800	600	0.05	1	69	3300	18
06A1B6	5	5900	410	0.05	1	15	1500	
06A1B6	1	5500	340	0.05	1	29	2800	21
06A1B6	3	5900	320	0.05	1	20	1700	12
06A1B7	1	6100	520	0.05	1	34	2000	46
06A1B7	3	5900	430	0.05	1	32	3100	42
06A1B7	5	5600	380	0.05	1	12	1400	
06A1B8	5	14000	1300	0.18	1	330	1200	16
06A1B8	1	8300	500	0.16	1	150	2400	0.2
06A1B8	2	8800	520	1	1	140	2400	0.2
06A1B9	3	5800	490	0.05	1	14	1600	
06A1B9	5	5100	350	0.05	1	13	1200	0.2
06A1B9	1	5400	250	0.05	1	13	1300	0.2
06A2B1	1	8900	290	0.05	1	37	4500	0.2
06A2B2	1	8600	350	0.05	1	38	4700	12
06A2B3	3	13000	400	0 05	1	58	9400	35
07A2B1	1	3500	230	0.05	1	8.2	640	
07A2B1	3	6300	400	0.05	1	7.2	3200	
07A2B1	5	4800	270	0.05	1	9.1	980	
07A2B2	1	2500	320	0.17	1	2	2200	
07A2B2	3	2500	320	0.05	1	2	2200	
07A2B2	5	3400	330	0.05	1	5	2100	40
07A2B3	3	7600	680	0.05	1	22	5900	
07A2B3	5	5400	280	0.05	1	7.5	2700	
07A2B3	1	4300	230	0.05	1	9.2	1400	
07A2B4	1	3700	190	0.05	1	5.7	1100	
07A2B4	3	4000	310	0.05	1	7.3	1500	
07A2B4	5	4200	680	0.05	1	11	1000	
07A2B5	1	5400	250	0.05	1	11	1200	
07A2B5	3	5900	270	0.05	1	13	1300	

Table A-8. Ambient Data

Sample Description	Depth (feet)	Magnesium	Manganese	Mercury	Molybdenum	Nickel	Potassium	Selenium
07A2B5	5	4200	200	0.05	1	9.1	1100	
10A1B1	1							
10A1B2	1							
10A1B3	1							
11A1B1	1							
11A1B1D	1							
11A1B2	1							
11A1B3	1							
12A1B1	1	6300	590	0 05	1	18	2800	0.2
12A1B2	1	7200	540	0 05	1	18	2500	0.2
12A1B3	1	6100	540	0.05	1	20	2900	0 2
12A1B4	1	4800	490	0.05	1	13	2300	0.2
12A1B5	1	6400	500	0.05	1	15	1900	0.2
12A2B1	1	1500	120	0.05	1	11	900	0.2
12A2B2	1	2900	200	0.05	1	21	1700	0.2
12A2B3	1	2100	220	0.05	1	9.8	1800	0.2
12A2B4	1	5800	310	0.05	1	35	5000	33
12A2B5	1	4900	400	0 05	1	29	4300	29
12A3B1	1	7700	530	0.05	1	22	4600	0.2
12A3B2	1	10000	590	0.05	1	30	5500	0 2
12A3B3	1	12000	870	0.05	1	44	8000	28
12A3B4	1	9600	670	0 05	3.2	43	7300	25
12A3B5	1	7300	590	0.1	1	25	4300	0.2
13L01			527	0.05		27.3	1440	
13L02			794	0.05		26.7	1240	
13L03			283	0 05		16.3	961	
13L05			465	0.05		21.4	1230	
13L10			529			23.4	953	
13L11D			1160	0.05		15.8	1810	
13L11			1760			14	1440	
13L15			545	0.05		20.2	1260	
13L17			754	0.05		52.5		
13L18			525	0.05		20.2	1010	
13L21			490	0.05		22.6	617	
13L22			375	0.05		22.5	1820	
13L23			465	0 05		20.9	958	
13L30			316	0 05		18 2	4930	
13L34			1420	0.05			3900	
13L38			108	0.05		72.5	2640	
13L42D			224	0.05		21.7	422	
13L42			222	0 05		34.6	3130	
13L46			275	0.05		15.1	3640	
13L47			267	0 05		36.3	7370	
13L53			946	0.05				
13L57			328	0.05		29	5340	
		= outlier - not included in ambient data						
		All concentrations in mg/kg						

Table A-8. Ambient Data

Sample Description	Depth (feet)	Silver	Sodium	Thallium	Vanadium	Zinc
01A1B1	1	0.5	230	0.15	35	71
01A1B1	3	0.5	270	0.15	40	80
01A2B1	1	0.5	190	0.15	30	95
01A2B1	3	0.5	160	0.15	33	66
01A2B2	1	0.5	200	0.15	42	69
01A2B3	1	0.5	260	0.15	42	71
01A2B3	2	0.5	330	0.15	47	100
01A2B4	1	0.5	230	0.15	41	84
01A2B4	3	0.5	180	0.15	41	70
02A1B1	5	0.5	290	0.15	13	59
02A2B1	5	0.5	25	0.15	11	15
03A1B1	1	0.5	160	0.15	29	140
03A1B1	3	0.5	230	0.15	46	68
03A1B2	1		120	0.15	25	270
03A2B1	1		190	0.15	44	340
03A2B1	2		120	0.15	44	200
04A1B1	1	0.5	220	0.15	33	49
04A2B1	16	0.5	180	0.15	29	42
04A2B1	5	0.5	210	0.15	55	84
04A2B1	10	0.5	150	0.15	44	46
04A2B1	15	0.5	150	0.15	32	36
04A2B2	10	0.5	190	0.15	47	54
04A2B2	15	0.5	550	0.15	29	36
04A2B2	20	0.5	250	0.15	23	28
04A2B2	5	0.5	240	0.15	52	64
04A3B1	1	270	600	0.15	35	140
04A3B2	3	0.5	190	0.15	36	90
04A3B2	1	0.5	180	0.15	31	69
04A3B3	1	0.5	640	0.15	56	93
04A3B3	3	0.5	390	0.15	64	77
04A3B4	1	0.5	260	0.15	46	73
04A3B4	2	0.5	550	0.15	53	82
04A4B1	1	0.5	330	0.15	44	49
04A4B1	3	0.5	240	0.15	48	52
04A4B2	1	0.5	230	0.15	41	52
04A4B2	3	0.5	230	0.15	40	52
04A5B1	1	0.5	750	0.38	52	89
04A5B1	3	0.5	350	0.15	96	130
04A5B2	3	0.5	930	0.33	25	36
04A5B2	1	0.5	640	0.15	32	71
05A1B1	3	0.5	140	0.15	33	58
05A1B1	1	0.5	180	0.15	39	57
05A1B2	1	0.5	100	0.15	23	44
05A1B2	3	0.5	150	0.15	31	57
05A1B3	1	0.5	59	0.15	12	24
05A1B3	3	0.5	96	0.15	27	48
05A1B4	1	0.5	150	0.15	32	56
05A1B5	3	0.5	340	0.15	40	74
05A1B5	1	0.5	290	0.15	77	97
05A2B1	10	0.5	160	0.15	74	53

Table A-8. Ambient Data

Sample Description	Depth (feet)	Silver	Sodium	Thallium	Vanadium	Zinc
05A2B1	5	0.5	120	0.15	58	45
06A1B10	3	47	310	0.15	75	160
06A1B10	5	0.5	380	0.15	64	160
06A1B10	1	2.7	150	0.15	41	58
06A1B1	5		620	0.15	42	84
06A1B1	1	0.5	520	0.15	43	79
06A1B1	3	0.5	210	0.15	41	54
06A1B11	1	0.5	25	0.15	2	5.5
06A1B11	3	0.5	110	0.15	7.3	18
06A1B11	5	0.5	71	0.15	2	9.5
06A1B2	3		580	0.15	44	34
06A1B2	5		79	0.15	25	33
06A1B2	1	0.5	580	0.35	83	66
06A1B3	5	0.5	140	0.15	45	44
06A1B3	1	0.5	450	0.15	88	70
06A1B3	3	0.5	350	0.15	85	81
06A1B4	5		910	0.15	72	62
06A1B4	3	0.5	920	0.44	110	110
06A1B4	1	0.5	400	0.15	45	
06A1B5	5		110	0.15	19	23
06A1B5	1	0.5	400	0.15	59	96
06A1B5	3	0.5	360	0.15	60	78
06A1B6	5	0.5	130	0.15	40	46
06A1B6	1	0.5	700	0.15	75	83
06A1B6	3	0.5	240	0.15	66	65
06A1B7	1	0.5	270	0.15	86	92
06A1B7	3	0.5	560	0.15	76	70
06A1B7	5	0.5	230	0.15	32	47
06A1B8	5	0.5	1300	0.15	41	63
06A1B8	1	0.5	410	0.15	37	280
06A1B8	2		490	0.15	34	220
06A1B9	3		380	0.15	41	49
06A1B9	5		200	0.15	28	44
06A1B9	1	0.5	350	0.15	39	48
06A2B1	1	0.5	370	0.15	51	76
06A2B2	1	0.5	300	0.15	45	79
06A2B3	3	0.5	980	0.15	81	110
07A2B1	1	0.5	61	0.15	27	30
07A2B1	3	0.5	71	0.15	33	47
07A2B1	5	0.5	130	0.15	34	34
07A2B2	1	14	25	0.15	15	270
07A2B2	3	0.5	25	0.15	14	33
07A2B2	5	0.5	25	0.38	25	53
07A2B3	3	0.5	65	0.42	66	65
07A2B3	5	0.5	120	0.15	44	37
07A2B3	1	0.5	60	0.15	49	32
07A2B4	1	0.5	67	0.15	19	32
07A2B4	3	0.5	83	0.15	26	35
07A2B4	5	0.5	74	0.15	26	31
07A2B5	1	0.5	200	0.15	31	38
07A2B5	3	0.5	430	0.15	32	40

Table A-8. Ambient Data

Sample Description	Depth (feet)	Silver	Sodium	Thallium	Vanadium	Zinc
07A2B5	5	0.5	300	0.15	20	31
10A1B1	1					
10A1B2	1					
10A1B3	1					
11A1B1	1					
11A1B1D	1					
11A1B2	1					
11A1B3	1					
12A1B1	1	0.5	290	0.15	42	63
12A1B2	1	0.5	290	0.15	46	66
12A1B3	1	0.5	260	0.15	44	73
12A1B4	1	0.5	220	0.15	38	58
12A1B5	1	0.5	220	0.15	36	76
12A2B1	1	0.5	190	0.15	19	24
12A2B2	1	0.5	230	0.15	29	44
12A2B3	1	0.5	160	0.15	23	23
12A2B4	1	0.5	730	0.15	81	52
12A2B5	1	0.5	640	0.15	67	46
12A3B1	1		120	0.15	59	80
12A3B2	1	0.5	110	0.15	76	79
12A3B3	1	0.5	91	0.15	95	91
12A3B4	1	0.5	110	0.15	72	110
12A3B5	1	0.5	140	0.15	73	91
13L01			184		55.2	87.9
13L02			199		42	89.3
13L03			77.5		18.8	35.3
13L05			92.6		44.8	73.2
13L10			184		43.4	79.5
13L11D			139		31.1	67.9
13L11			92.5		24.1	64.1
13L15			151		43.1	84.3
13L17			213		85.9	
13L18			139		47	92.6
13L21			183		52.5	81.3
13L22			92.4		32	87.9
13L23			139		44.6	92.3
13L30			139		18.9	49.3
13L34			118		94	145
13L38					16.3	29.6
13L42D					68	35
13L42			149		35	52.6
13L46			138		21.6	97.9
13L47			209		57.2	80.9
13L53			46		9.85	53
13L57			138		34.7	83.5
		= outlier - not included in ambient data				
		All concentrations in mg/kg				

Table A-9. Summary Statistics for Ambient Data

Statistic	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium
Assumed distribution	normal	none	lognormal	normal	normal	none
P-value from Shapiro-Wilk test	0.0899	NA	0.0153	0.0419	0.1750	NA
Number of observations	135	111	97	115	136	79
Number of observations removed from expanded data	3	6	20	2	0	4
Maximum observation	27000	nc	56	290	1.5	0.41
Mean	11406	nc	16	134	0.67	nc
Standard deviation	4866	nc	10	55	0.28	nc
Coefficient of variation	0.43	nc	0.62	0.41	0.42	nc
99th percentile	22729	10*	59	263	1.3	0.41
Concentrations given in mg/kg						
nc = not calculated						
* 99th percentile = reporting limit because no detects						

Table A-9. Summary Statistics for Ambient Data

Statistic	Chromium	Hex. Chromium	Cobalt	Copper	Iron	Lead
Assumed distribution	lognormal	none	normal	normal	lognormal	lognormal
P-value from Shapiro-Wilk test	0.0211	NA	0.0318	0.0115	0.3609	0.0207
Number of observations	113	135	131	96	137	115
Number of observations removed from expanded data	4	4	6	21	2	1
Maximum observation	260	0.94	28	51	63000	110
Mean	31	nc	12	28	29744	15
Standard deviation	36	nc	4.7	12	12163	17
Coefficient of variation	1.2	nc	0.39	0.43	0.41	1.1
99th percentile	152	0.94	23	55	72596	64
Concentrations given in mg/kg						
nc = not calculated						
* 99th percentile = reporting limit because no detects						

Table A-9. Summary Statistics for Ambient Data

Statistic	Lithium	Manganese	Mercury	Molybdenum	Nickel	Selenium
Assumed distribution	none	lognormal	none	none	lognormal	none
P-value from Shapiro-Wilk test	NA	0.0123	NA	NA	0.0479	NA
Number of observations	68	139	113	115	126	69
Number of observations removed from expanded data	10	0	24	2	11	11
Maximum observation	22	1760	0.10	3.2	140	33
Mean	nc	439	nc	nc	25	nc
Standard deviation	nc	239	nc	nc	20	nc
Coefficient of variation	nc	0.54	nc	nc	0.78	nc
99th percentile	22	1172	0.10	3.2	84	33
Concentrations given in mg/kg						
nc = not calculated						
* 99th percentile = reporting limit because no detects						

Table A-9. Summary Statistics for Ambient Data

Statistic	Silver	Thallium	Vanadium	Zinc
Assumed distribution	none	none	lognormal	normal
P-value from Shapiro-Wilk test	NA	NA	0.0402	0.0243
Number of observations	101	111	136	129
Number of observations removed from expanded data	4	6	3	8
Maximum observation	nc	nc	110	145
Mean	nc	nc	44	63
Standard deviation	nc	nc	20	27
Coefficient of variation	nc	nc	0.46	0.42
99th percentile	1*	0.3*	122	125
Concentrations given in mg/kg				
nc = not calculated				
* 99th percentile = reporting limit because no detects				

Table A-10. Comparison of 99th Percentiles from Ambient Data with 99th Percentile Data from Combined Background Data

Analyte	99th Percentile From Ambient Data	99th Percentile From Combined Background Data	Relative Percent Difference (RPD)	RPD > 25%?
Aluminum	22729	26167	-14	no
Antimony	10	10	0	no
Arsenic	59	32	59	YES
Barium	263	302	-14	no
Beryllium	1.3	1.3	-1	no
Cadmium	0.41	0.41	0	no
Chromium	152	46	107	YES
Hex. Chromium	0.94	0.94	0	no
Cobalt	23	23	-2	no
Copper	55	57	-2	no
Iron	72596	84520	-15	no
Lead	64	103	-47	no
Lithium	22	22	0	no
Manganese	1172	1865	-46	no
Mercury	0.10	0.1	0	no
Molybdenum	3.2	3.2	0	no
Nickel	84	63	29	YES
Selenium	33	33	0	no
Silver	1	1	0	no
Thallium	0.3	0.3	0	no
Vanadium	122	143	-16	no
Zinc	125	130	-4	no

Table A-11. Summary of Ambient Concentration Limits for Soil

Analyte	Ambient Concentration Limit (mg/kg)
Aluminum	22729
Antimony	10
Arsenic	32
Barium	263
Beryllium	1.3
Cadmium	0.41
Chromium	46
Hex. Chromium	0.94
Cobalt	23
Copper	55
Iron	72596
Lead	64
Lithium	22
Manganese	1172
Mercury	0.10
Molybdenum	3.2
Nickel	63
Selenium	33
Silver	1.0
Thallium	0.3
Vanadium	122
Zinc	125

Table A-12. Correlation of Metals Data - Morris Dam Soils

		Aluminum	Arsenic	Barium	Beryllium	Calcium	Chromium	Chromium(VI)	Cobalt	Copper
Correlation Coefficient with Aluminum		1.000	0.342	0.108	0.720	0.081	0.399	-0.137	0.205	0.055
t statistic for correlation with Aluminum		NA	**6.15**	1.43	**30.38**	1.04	**7.87**	-1.42	3.059	0.69
Correlation Coefficient with Arsenic		0.342	1.000	-0.049	0.386	-0.090	0.170	-0.018	0.286	0.049
t statistic for correlation with Arsenic		**6.15**	NA	-0.55	**7.44**	-0.98	2.42	-0.20	**4.75**	0.61
Correlation Coefficient with Barium		0.108	-0.049	1.000	0.113	0.781	0.025	-0.046	-0.052	0.057
t statistic for correlation with Barium		1.43	-0.55	NA	1.51	**42.297**	0.31	-0.52	-0.58	0.72
Correlation Coefficient with Berrylium		0.720	0.386	0.113	1.000	0.088	0.126	-0.210	0.068	-0.047
t statistic for correlation with Beryllium		**30.38**	**7.44**	1.51	NA	1.14	1.70	-2.06	0.86	-0.53
Correlation Coefficient with Calcium		0.081	-0.090	0.781	0.088	1.000	0.211	-0.040	0.011	0.034
t statistic for correlation with Calcium		1.04	-0.98	**42.297**	1.14	NA	3.17	-0.46	0.13	0.42
Correlation Coeffcient with Chromium		0.399	0.170	0.025	0.126	0.211	1.000	0.084	0.346	0.085
t statistic for correlation with Chromium		**7.87**	2.42	0.31	1.70	3.17	NA	1.08	**6.25**	1.10
Correlation Coefficient with Chromium VI		-0.137	-0.018	-0.046	-0.210	-0.040	0.084	1.000	0.014	0.058
t statistic for correlation with Chromium VI		-1.42	-0.20	-0.52	-2.06	-0.46	1.08	NA	0.17	0.73
Correlation Coefficient with Cobalt		0.205	0.286	-0.052	0.068	0.011	0.346	0.014	1.000	0.094
t statistic for correlation with Cobalt		3.059	**4.36**	-0.54	0.79	0.12	**5.74**	0.16	NA	1.12
Correlation Coefficient with Copper		0.055	0.049	0.057	-0.047	0.034	0.085	0.058	0.094	1.000
t statistic for correlation with Copper		0.69	0.61	0.72	-0.53	0.42	1.10	0.73	1.22	NA
Correlation Coefficient with Iron		0.763	0.339	0.177	0.717	-0.011	0.259	-0.083	0.394	0.108
t statistic for correlation with Iron		**38.02**	**6.07**	2.55	**29.92**	-0.13	**4.15**	-0.91	**7.69**	1.43
Correlation Coefficient with Lead		-0.107	0.042	-0.033	-0.191	-0.074	-0.050	0.779	-0.090	0.250
t statistic for correlation with Lead		-1.14	0.52	-0.38	-1.90	-0.81	-0.57	**41.75**	-0.98	**3.95**
Correlation Coefficient with Lithium		0.327	0.408	-0.011	0.217	0.045	0.437	0.341	0.640	0.024
t statistic for correlation with Lithium		**5.74**	**8.16**	-0.13	3.28	0.56	**9.17**	**6.12**	**21.02**	0.29
Correlation Coeffcient with Magnesium		0.314	0.255	-0.004	0.101	0.111	0.464	-0.015	0.778	-0.015
t statistic for correlation with Magnesium		**5.42**	**4.04**	-0.04	1.33	1.47	**10.24**	-0.18	**41.39**	-0.17
Correlation Coeffcient with Manganese		0.442	0.292	0.537	0.434	0.614	0.330	-0.050	0.461	0.049
t statistic for correlation with Manganese		**9.38**	**4.88**	**13.745**	**9.07**	**18.81**	**5.82**	-0.57	**10.11**	0.61
Correlation Coefficient with Nickel		0.107	0.291	-0.071	-0.031	-0.029	0.356	0.082	0.934	0.031
t statistic for correlation with Nickel		1.41	**4.85**	-0.78	-0.35	-0.33	**6.53**	1.06	**167.56**	0.38
Correlation Coefficient with Potassium		0.504	-0.123	0.238	0.182	-0.089	0.088	-0.073	-0.072	0.179
t statistic for correlation with Potassium		**12.02**	-1.29	**3.71**	2.64	-0.97	1.15	-0.80	-0.80	2.58
Correlation Coefficient with Sodium		0.261	0.258	0.038	0.282	-0.143	0.057	0.057	0.237	0.097
t statistic for correlation with Sodium		**4.18**	**4.124**	0.47	**4.65**	-1.48	0.71	0.72	**3.67**	1.27
Correlation Coeffient with Vanadium		0.778	0.172	0.162	0.749	-0.034	0.069	-0.174	0.084	0.108
t statistic for correlation with Vanadium		**41.45**	2.46	2.28	**35.38**	-0.39	0.87	-1.76	1.08	1.44
Correlation Coefficient with Zinc		0.054	0.015	0.029	-0.081	-0.012	0.038	0.769	-0.029	0.221
t statistic for correlation with Zinc		0.68	0.18	0.35	-0.89	-0.14	0.46	**39.48**	-0.33	**3.364**

Critical t Value = 3.360 n = 142, Degrees of Freedom = n-2 = 140
99.9 % Confidence Level

Bolded values are those greater than critical t value indicating correlation between the two values to a 99.9 percent confidence level.

Table A-12. Correlation of Metals Data - Morris Dam Soils

		Iron	Lead	Lithium	Magnesium	Manganese	Nickel	Potassium	Sodium	Vanadium	Zinc
Correlation Coefficient with Aluminum		0.763	-0.107	0.327	0.314	0.442	0.107	0.504	0.261	0.778	0.054
t statistic for correlation with Aluminum		**38.02**	-1.14	**5.74**	**5.42**	**9.38**	1.41	**12.02**	**4.18**	**41.45**	0.68
Correlation Coefficient with Arsenic		0.339	0.042	0.408	0.255	0.292	0.291	-0.123	0.258	0.172	0.015
t statistic for correlation with Arsenic		**6.07**	0.52	**8.16**	**4.04**	**4.88**	**4.85**	-1.29	**4.124**	2.46	0.18
Correlation Coefficient with Barium		0.177	-0.033	-0.011	-0.004	0.537	-0.071	0.238	0.038	0.162	0.029
t statistic for correlation with Barium		2.55	-0.38	-0.13	-0.04	**13.75**	-0.78	**3.71**	0.47	2.28	0.35
Correlation Coefficient with Berrylium		0.717	-0.191	0.217	0.101	0.434	-0.031	0.182	0.282	0.749	-0.081
t statistic for correlation with Beryllium		**29.92**	-1.90	3.28	1.33	**9.07**	-0.35	2.64	**4.65**	**35.38**	-0.89
Correlation Coefficient with Calcium		-0.011	-0.074	0.045	0.111	0.614	-0.029	-0.089	-0.143	-0.034	-0.012
t statistic for correlation with Calcium		-0.13	-0.81	0.56	1.47	**18.81**	-0.33	-0.97	-1.48	-0.39	-0.14
Correlation Coeffcient with Chromium		0.259	-0.050	0.437	0.464	0.330	0.356	0.088	0.057	0.069	0.038
t statistic for correlation with Chromium		**4.15**	-0.57	**9.17**	**10.24**	**5.82**	**6.53**	1.15	0.71	0.87	0.46
Correlation Coefficient with Chromium VI		-0.083	0.779	0.341	-0.015	-0.050	0.082	-0.073	0.057	-0.174	0.769
t statistic for correlation with Chromium VI		-0.91	**41.75**	**6.12**	-0.18	-0.57	1.06	-0.80	0.72	-1.76	**39.48**
Correlation Coefficient with Cobalt		0.394	-0.090	0.640	0.778	0.461	0.934	-0.072	0.237	0.084	-0.029
t statistic for correlation with Cobalt		**7.06**	-0.90	**19.30**	**38.00**	**9.28**	**153.83**	-0.73	**3.37**	1.00	-0.31
Correlation Coefficient with Copper		0.108	0.250	0.024	-0.015	0.049	0.031	0.179	0.097	0.108	0.221
t statistic for correlation with Copper		1.43	**3.95**	0.29	-0.17	0.61	0.38	2.58	1.27	1.44	**3.364**
Correlation Coefficient with Iron		1.000	-0.073	0.468	0.406	0.512	0.345	0.520	0.465	0.809	0.068
t statistic for correlation with Iron		NA	-0.81	**10.39**	**8.08**	**12.42**	**6.23**	**12.81**	**10.30**	**50.05**	0.86
Correlation Coefficient with Lead		-0.073	1.000	0.066	-0.073	-0.071	-0.010	-0.025	-0.038	-0.125	0.691
t statistic for correlation with Lead		-0.81	NA	0.84	-0.81	-0.78	-0.12	-0.28	-0.43	-1.31	**26.415**
Correlation Coefficient with Lithium		0.468	0.066	1.000	0.458	0.382	0.691	-0.076	0.277	0.173	0.178
t statistic for correlation with Lithium		**10.39**	0.84	NA	**9.99**	**7.30**	**26.44**	-0.84	**4.54**	2.48	2.56
Correlation Coeffcient with Magnesium		0.406	-0.073	0.458	1.000	0.489	0.803	-0.019	0.070	0.111	0.013
t statistic for correlation with Magnesium		**8.08**	-0.81	**9.99**	NA	**11.31**	**48.30**	-0.22	0.89	1.48	0.16
Correlation Coeffcient with Manganese		0.512	-0.071	0.382	0.489	1.000	0.421	0.138	0.135	0.347	0.041
t statistic for correlation with Manganese		**12.42**	-0.78	**7.30**	**11.31**	NA	**8.61**	1.899	1.85	**6.29**	0.51
Correlation Coefficient with Nickel		0.345	-0.010	0.691	0.803	0.421	1.000	-0.103	0.303	-0.013	0.008
t statistic for correlation with Nickel		**6.23**	-0.12	**26.44**	**48.30**	**8.61**	NA	-1.11	**5.14**	-0.15	0.09
Correlation Coefficient with Potassium		0.520	-0.025	-0.076	-0.019	0.138	-0.103	1.000	0.189	0.598	0.107
t statistic for correlation with Potassium		**12.81**	-0.28	-0.84	-0.22	1.899	-1.11	NA	2.75	**17.61**	1.42
Correlation Coefficient with Sodium		0.465	-0.038	0.277	0.070	0.135	0.303	0.189	1.000	0.384	0.006
t statistic for correlation with Sodium		**10.30**	-0.43	**4.54**	0.89	1.85	**5.14**	2.75	NA	**7.37**	0.07
Correlation Coeffient with Vanadium		0.809	-0.125	0.173	0.111	0.347	-0.013	0.598	0.384	1.000	0.024
t statistic for correlation with Vanadium		**50.05**	-1.31	2.48	1.48	**6.29**	-0.15	**17.61**	**7.37**	NA	0.29
Correlation Coefficient with Zinc		0.068	0.691	0.178	0.013	0.041	0.008	0.107	0.006	0.024	1.000
t statistic for correlation with Zinc		0.86	**26.415**	2.56	0.16	0.51	0.09	1.42	0.07	0.29	NA

Critical t Value = 3.360 n = 142, Degrees of Freedom = n-2 = 140
99.9 % Confidence Level

Bolded values are those greater than critical t value indicating correlation between the two values to a 99.9 perc confidence level.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-01	Quartz Monzonite	<u>Nonopaque Minerals</u> Plagioclase (30%) Potassium Feldspar (24%) Quartz (12%) Epidote (8%) Chlorite (7%) Calcite (5%) Biotite (5%) Muscovite/sericite (3%) Pyroxene (2%) Clay (2%) Zircon (<1%) Apatite (<1%) Sausserite (<1%)	<u>Opaque Minerals</u> Pyrite (1%) Titanium dioxides (<1%) Ilmenite (<1%) Chalcopyrite (<1%) Millerite (<1%) Iron Oxides (<1%) Pentlandite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Evidence of tectonic stress and mineralogical alteration due to magnetic alteration.
13-RK-02	Quartz Monzonite	<u>Nonopaque Minerals</u> K-feldspar (30%) Plagioclase (25%) Chlorite (15%) Quartz (12%) Biotite (5%) Calcite (5%) Muscovite/sericite (2%) Epidote (1%) Adularia (1%) Clay (<1%) Fluorite (<1%) Zircon (<1%) Apatite (<1%) Xenotime (<1%)	<u>Opaque Minerals</u> Hematite (2%) Pyrite (1%) Ilmenite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Evidence of moderate tectonic(?) stress and late magmatic hydrothermal(?) alteration.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-03	Granite	Nonopaque Minerals Quartz (42%) K-feldspar (40%) Plagioclase (10%) Chlorite (15%) Calcite (5%) Chlorite (2%) Adularia (<1%) Apatite (<<1%) Fluorite (<1%)	Opaque Minerals Iron Oxides (<1%) Titanium Dioxides (<1%) Pyrite (<1%) Chalcopyrite (<<1%) Ilmenite (<<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Metamorphosed subject to relatively intense tectonic stress. Fractured and hydrothermally altered (primary along fractures). Opaque minerals have been oxidized.
13-RK-05	Quartz Monzonite	Nonopaque Minerals K-feldspar (40%) Plagioclase (24%) Quartz (10%) Chlorite (5%) Clay (5%) Muscovite/sericite (5%) Epidote (3%) Calcite (2%) Biotite (1%) Hornblende (1%) Pyroxene (1%) Albite (1%) Apatite (<1%) Zircon (<1%)	Opaque Minerals Iron Oxides (1%) Pyrite (<1%) Ilmenite (<1%) Ti-magnetite (<1%) Pentlandite (<1%) Titanium Dioxides (<1%)	One oxidized ilmenite grain was analyzed and found to have 0.03 wt. percent Cr. One chlorite grain was analyzed and found to have 0.02 wt. percent Ni and no Cr.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Metamorphosed subject to relatively intense tectonic stress. Fractured and hydrothermally altered (primary along fractures). Opaque minerals have been oxidized. Propyllitically altered; very weathered; almost gneiss.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-10	Quartz Monzonite	Nonopaque Minerals Plagioclase (30%) K-feldspar (23%) Quartz (20%) Chlorite (10%) Calcite (5%) Hornblende (3%) Epidote (3%) Pyroxene (2%) Muscovite/sericite (2%) Clay (1%) Albite (<1%) Sausserite (<1%) Biotite (<1%) Apatite (<1%) Corundum (<1%) Sphene (<1%) Fluorite (<1%) Xenotime (<1%)	Opaque Minerals Pyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%) Ilmenite (<1%)	A typical chlorite grain from this sample was analyzed and found to contain 0.04 wt. percent Ni and no Cr.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone mild hydrothermal alteration.
13-RK-11	Granodiorite	Nonopaque Minerals Plagioclase (34%) K-feldspar (20%) Biotite (25%) Quartz (5%) Chlorite (4%) Kaolinite (2%) Muscovite/sericite (2%) Apatite (<1%) Epidote (<1%) Sausserite (<1%) Fluorite (<1%) Rutile (<1%)	Opaque Minerals Pyrite (<1%) Ilmenite (<1%) Chalcopyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%) Magnetite (<1%) Pentlandite (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone minor alteration. Faint schistose texture.
13-RK-11D	Granodiorite	Nonopaque Minerals Plagioclase (40%) Quartz and polycrystalline quartz (20%) K-feldspar (17%) Biotite (12%)	Opaque Minerals Iron Oxides (2%) Titanium Dioxides (<1%) Ilmenite (<1%) Pyrite (<1%) Pentlandite (<1%)	Three typical opaque grains were analyzed and found to be iron oxides with varying amounts	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
		Hornblende (5%) Chlorite (2%) Clay (1%) Pyroxene (<1%) Apatite (<1%) Zircon (<1%) Muscovite/sericite (<1%) Adularia (<1%) Calcite (<1%) Albite (<1%)		of iron.	metamorphorphism and therefore a more appropriate name as gneiss. Schistose texture present and abundant fractures indicate regional metamorphism. Argillized, chloritized, silicified, and oxidized
13-RK-15	Quartz Monzonite	<u>Nonopaque Minerals</u> Plagioclase (30%) K-feldspar (25%) Quartz (20%) Chlorite (10%) Clay (2%) Honblende (<1%) Biotite (<1%) Sausserite (<1%) Epidote (<1%) Sphene (<1%) Apatite (<1%) Zircon (<1%) Calcite (<1%) Muscovite/sericite (1%)	<u>Opaque Minerals</u> Iron Oxides (1%) Manganese oxide mineral (<1%) Arsenic-rich pyrite (<1%) Ilmenite (<1%) Pentlandite (<1%) Ti-magnetite (<1%) Titanium Dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzonite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Undergone mild hydrothermal alteration, possible metamorphism. Possible arsenic replacement of iron in pyrite.
13-RK-17	Biotite Gneiss	<u>Nonopaque Minerals</u> Quartz (30%) Biotite (32%) K-feldspar (25%) Plagioclase (10%) Muscovite/sericite (1%) Talc (<1%) Pyroxene (<1%) Zircon (<1%) Epidote (<1%) Calcite (7%) Clay (<1%)	<u>Opaque Minerals</u> Iron Oxides (1%) Sphalerite (<1%) Galena (<1%) Chalcopyrite (<1%) Ilmenite (<1%) Pyrite(<1%)	Not Analyzed	Regionally metamorphosed; argillized and hydrothermally altered.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-18	Quartz Monzonite	**Nonopaque Minerals** Plagioclase (40%) K-feldspar (28%) Quartz (15%) Clay (5%) Chlorite (5%) Muscovite/sericite (3%) Calcite (2%) Epidote (1%) Biotite (<1%) Pyroxene (<1%) Hornblende (<1%) Zircon (<1%) Apatite (<1%) Albite (<1%)	**Opaque Minerals** Pyrite (<1%) Chalcopyrite (<1%) Iron Oxides (<1%) Titanium Dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Minor argillic alteration and chloritization of biotite and calcite veining. Relatively fresh.
13-RK-21	Cataclastic Quartz Monzonite	**Nonopaque Minerals** K-feldspar (35%) Plagioclase (25%) Quartz (22%) Epidote (7%) Illite (%) Chlorite (3%) Muscovite/sericite (2%) Apatite (<1%)	**Opaque Minerals** Iron Oxides (<1%) Ilmenite (<1%) Pyrite (<1%) Gold (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Highly fractured, subject to intense tectonic stress late magmatic and hydrothermal alteration. Argillization, chloritization, and sericitization observed.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-22	Quartz Monzonite	**Nonopaque Minerals** Plagioclase (30%) K-feldspar (25%) Chlorite (20%) Quartz (15%) Muscovite/sericite (3%) Calcite (2%) Biotite (1%) Apatite (<1%) Zircon (<1%) Albite (<1%)	**Opaque Minerals** Iron Oxides (3%) Ilmenite (<1%) Pentlandite (<1%) Pyrite (<1%) Titanium dioxides (<1%)	Not Analyzed	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Faint gneissic textures. Regionally metamorphosed. Fractured and hydrothermally altered.
13-RK-23	Quartz Monzonite	**Nonopaque Minerals** Quartz (30%) Plagioclase (27%) K-feldspar (20%) Chlorite (12%) Clay (3%) Muscovite/sericite (1%) Calcite (1%) Epidote (1%) Fluorite (<1%) Apatite (<1%) Rutile (<1%)	**Opaque Minerals** Iron Oxides (4%)	Not Analyzed.	Field reconnaissance reveals that compositionally rock can be considered a quartz monzanite compositionally, slight fabric and structural features suggest metamorphorphism and therefore a more appropriate name as gneiss. Loose, numerous wide (1mm) fractures. Undergone strong tectonic stress (faulting?). also slightly metamorphosed. Fractures filled with chlorite opaque minerals, epidote, and calcite.
13-RK-30	Biotite Schist	**Nonopaque Minerals** Quartz (28%) K-feldspar (27%) Plagioclase (25%) Biotite (20%)	**Opaque Minerals** Chalcopyrite (<1%) Titanium Dioxides (<1%) Iron Oxides (<1%)	Seven of eight biotite grains analyzed contained trace amounts of Cr and Ni. Cr	Fresh metamorphosed rock. Very little fractures. Regionally metamorphosed plutonic rock (granulate grade).

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
		Calcite (<1%) Chlorite (<1%) Sausserite (<1%) Clay (<1%) Zircon (<1%) Apatite (<1%) Epidote (<1%) Fluorite (<1%)		varied from 0.02 to 0.07 wt. percent; Ni varied from 0 to 0.05 wt. percent. Cobalt was present in three grains up to 0.02 wt. percent. Muscovite grains analyzed had no Cr, Ni or Co.	
13-RK-34	Chlorite Schist	<u>Nonopaque Minerals</u> Calcite (48%) Chlorite (25%) K-feldspar (8%) Plagioclase (8%) Quartz (5%) Adularia (2%) Muscovite/sericite (2%) Biotite (1%) Fluorite (<1%) Hornblende (<1%) Apatite (<1%) Talc (<1%)	<u>Opaque Minerals</u> Pyrite (<1%) Chalcocite Covellite (<1%) Iron Oxides (<1%)	Three typical opaque grains analyzed were found to be iron oxide. Chlorite grains analyzed were found not to contain Cr or Ni.	Almost total alteration to chlorite and calcite. Hydrothermally altered and metamorphosed.
13-RK-38	Amphibolite	<u>Nonopaque Minerals</u> Hornblende (66%) Biotite (18%) Plagioclase (8%) Muscovite/sericite(3%) Chlorite (3%) Quartz (1%) Apatite (<1%) Sphene (<1%)	<u>Opaque Minerals</u> Ilmenite (<1%) Heazlewoodite (<<1%) Chromite (<1%) Magnetite (<1%) Pyrite (<<1%) Leucoxene (<<1%)	Not Analyzed	Relatively fresh; heazlewoodite possibly introduced through hydrothermal alteration.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-42	Mica Schist	**Nonopaque Minerals** Quartz (34%) Biotite (20%) Chlorite (14%) Muscovite (10%) K-feldspar (10%) Plagioclase (5%) Talc (3%) Calcite (2%) Adularia (1%) Corundum (<1%) Zircon (<1%) Sausserite (<1%) Fluorite (<1%) Rutile (<1%)	**Opaque Minerals** Iron oxides (<1%) Magnetite (<1%) Pyrite (<1%) Chalcopyrite (<1%) Covellite (<1%) Malachite (<<1%)	Three muscovite grains analyzed were found to contain from 0 to 0.02 wt. percent Cr and from 0 to 0.02 wt. percent Ni. Four chlorite grains analyzed were found to contain from 0 to 0.02 wt. percent Cr and from 0 to 0.01 wt. percent Ni.	Small fractures stained with iron oxides cut across grains but not porphyroblasts copper introduced along fractures along hydrothermal alteration.
13-RK-42D	Amphibolite	**Nonopaque Minerals** Hornblende (70%) Quartz (8%) Epidote (5%) Carbonate (3%) Plagioclase (1%) Actinolite (1%) Muscovite/sericite(<1%) Sausserite (<1%) Pyroxene (<1%) Apatite (<1%) Zircon (<1%)	**Opaque Minerals** Ilmenite (8%) Pyrite (3%) Chalcopyrite (<1%) Covellite (<1%) Iron oxides (<1%) Titanium dioxides (<1%)	Not Analyzed	Nickel may have been introduced through hydrothermal alteration along fractures.
13-RK-46	Gneiss	**Nonopaque Minerals** Quartz (40%) Plagioclase (24%) K-feldspar (20%) Biotite (5%) Clay (5%) Muscovite/sericite(3%) Chlorite (2%) Zircon (<1%) Epidote (<1%) Albite (<1%)	**Opaque Minerals** Iron oxides (<1%) Titanium dioxides (<1%)	Not Analyzed	Fresh small amounts of alteration, chloritization of biotite.

Table A-13. Summary of Results from Mineralogical Analysis – Background Area 2 (Objective 13)

Sample Identification	Description	Minerals Present (Approximate Abundance)		Microprobe Analysis Results	Comments
13-RK-47	Cataclastic Granite	**Nonopaque Minerals** Quartz (40%) K-feldspar (28%) Chlorite (10%) Biotite (10%) Plagioclase (5%) Clay (2%) Muscovite/sericite (1%) Fluorite (1%) Zircon (<1%) Amphibole (<1%) Adularia (<1%) Corundum (<1%) Epidote (<1%)	**Opaque Minerals** Iron and manganese oxides (3%) Titanium dioxides (<1%) Pyrite (<1%) Gold (<1%)	Not Analyzed	Totally broken up by fractures; fractures filled with chlorite and iron oxides. Undergone intense tectonic stress and hydrothermal alteration.
13-RK-53	Peridotite or Pyroxenite	**Nonopaque Minerals** Serpentine (55%) Clinopyroxene (augite) (17%) Olivine (8%) Chlorite (5%) Orthopyroxene (2%) Quartz (<1%) Biotite (<1%) Rutile (<1%)	**Opaque Minerals** Iron Oxides (5%) Fe-rich spinel (5%) Pentlandite (2%) Pyrrhotite (<1%) Chromite (<1%) Picotite (<1%) Chalcopyrite (<1%) Heazlewoodite (<1%) Iron, nickel sulfite (<1%)	Twelve typical opaque grains were analyzed. Cr ranged from 0 to 12.18 wt. percent. Ni ranged from 0.10 to 32.85 wt. percent. As ranged from 0 to 0.03 wt. percent.	Highly fractured grains of clinopyroxene and olivine replaced by serpentine complex. Extensive serpentinization. Very high in chromium and nickel.
13-RK-54	Mica Schist	**Nonopaque Minerals** Quartz (35%) K-feldspar (20%) Plagioclase (10%) Phlogopite (10%) Biotite (87%) Clay (5%) Muscovite/sericite (5%) Chlorite (1%) Andalusite (<1%) Apatite (<1%) Adularia (<1%) Zircon (<1%)	**Opaque Minerals** Iron and manganese oxides (5%)	Not Analyzed	Strong schistocity, relatively fresh, but weathered on surface. Iron and manganese oxides along cleavage planes. Little evidence of hydrothermal alteration.

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a1]	Sample Location	Depth (ft)	Ratios: Aluminum w/ Al	Aluminum w/ Fe	Aluminum w/ Mn	Aluminum w/ Mg	Aluminum w/ Na	Arsenic w/ Al	Arsenic w/ Fe	Arsenic w/ Mn	Arsenic w/ Mg	Arsenic w/ Na	Barium w/ Al	Barium w/ Fe	Barium w/ Mn	Barium w/ Mg	Barium w/ Na
[a1] = 2 or more cations w/ ratios > 3																	
	01A1B1	1	1.00	1.08	0.94	0.83	0.68	0.480	0.52	0.45	0.40	0.33	1.34	1.45	1.26	1.12	0.92
	01A1B1	2	1.00	1.00	0.96	0.83	0.61	0.385	0.39	0.37	0.32	0.24	1.53	1.53	1.47	1.26	0.94
	01A2B1	1	1.00	1.17	1.08	0.84	0.78	0.531	0.62	0.57	0.45	0.42	1.61	1.88	1.74	1.35	1.26
	01A2B1	3	1.00	1.08	1.06	0.88	0.86	0.189	0.20	0.20	0.17	0.16	1.33	1.44	1.42	1.18	1.14
	01A2B2	1	1.00	0.95	1.05	0.85	0.81	0.618	0.59	0.65	0.52	0.50	1.73	1.64	1.82	1.47	1.41
	01A2B3	1	1.00	1.10	1.09	0.89	0.70	0.531	0.59	0.58	0.48	0.37	1.31	1.45	1.43	1.18	0.92
	01A2B3	2	1.00	1.13	1.06	0.92	0.65	0.658	0.74	0.70	0.61	0.43	1.31	1.48	1.39	1.21	0.85
	01A2B4	1	1.00	1.15	1.17	0.88	0.70	0.728	0.84	0.85	0.64	0.51	1.58	1.81	1.84	1.39	1.10
	01A2B4	3	1.00	1.03	1.09	0.82	0.84	0.862	0.89	0.94	0.71	0.72	1.96	2.02	2.15	1.52	1.64
	02A1B1	5	1.00	0.83	0.72	0.88	0.37	2.005	1.67	1.45	1.77	0.73	0.50	0.42	0.37	0.45	0.18
As, Cr, Cr (VI), Co, Cu, Mn, Ni	02A2B1	5	1.00	0.63	0.25	0.22	0.80	**13.070**	**8.18**	**3.26**	2.94	**10.40**	0.57	0.35	0.14	0.13	0.45
Zn	03A1B1	1	1.00	1.04	1.15	0.83	0.75	0.812	0.85	0.94	0.67	0.61	1.18	1.23	1.36	0.98	0.88
	03A1B1	3	1.00	1.19	1.24	0.76	0.72	0.855	1.01	1.06	0.65	0.62	1.70	2.02	2.11	1.29	1.22
Cu, Pb, Zn	03A1B2	1	1.00	0.95	1.22	0.88	1.01	1.562	1.49	1.91	1.37	1.58	1.40	1.33	1.71	1.23	1.41
Li, Zn	03A2B1	1	1.00	1.19	1.10	1.02	0.87	1.283	1.52	1.41	1.31	1.12	1.02	1.21	1.12	1.04	0.89
Li, Zn	03A2B1	2	1.00	1.16	0.84	1.15	1.35	1.891	2.20	1.58	2.18	2.56	1.04	1.21	0.87	1.20	1.41
	04A1B1	1	1.00	1.21	1.33	1.07	0.70	0.184	0.22	0.24	0.20	0.13	1.10	1.33	1.45	1.18	0.77
	04A2B1	16	1.00	1.00	0.99	0.87	0.71	0.463	0.46	0.46	0.40	0.33	1.21	1.22	1.20	1.06	0.86
	04A2B1	5	1.00	1.04	1.40	1.07	1.26	0.223	0.23	0.31	0.24	0.28	0.96	1.00	1.34	1.02	1.21
	04A2B1	10	1.00	1.04	1.10	1.30	1.33	0.297	0.31	0.33	0.39	0.39	0.99	1.03	1.09	1.29	1.31
	04A2B1	15	1.00	1.15	0.89	1.13	0.97	0.405	0.46	0.36	0.46	0.39	0.94	1.08	0.83	1.06	0.91
	04A2B2	10	1.00	1.14	1.20	1.27	1.22	0.489	0.56	0.59	0.62	0.60	0.91	1.04	1.09	1.16	1.11
	04A2B2	15	1.00	1.06	1.10	0.99	0.23	0.463	0.49	0.51	0.46	0.11	1.04	1.10	1.14	1.03	0.24
Cr, Ni	04A2B2	20	1.00	1.08	1.14	0.51	0.41	1.380	1.49	1.57	0.71	0.57	0.81	0.87	0.92	0.41	0.33
	04A2B2	5	1.00	1.23	1.58	1.34	1.10	0.223	0.27	0.35	0.30	0.25	0.74	0.91	1.17	1.00	0.82
	04A3B1	1	1.00	0.95	0.98	0.80	0.24	0.262	0.25	0.26	0.21	0.06	1.37	1.29	1.35	1.10	0.33
	04A3B2	3	1.00	1.00	1.30	0.88	0.77	0.527	0.53	0.69	0.47	0.40	1.26	1.25	1.64	1.11	0.96
	04A3B2	1	1.00	1.00	1.14	0.82	0.71	0.500	0.50	0.57	0.41	0.35	1.32	1.33	1.51	1.08	0.94
	04A3B3	1	1.00	0.78	1.00	0.90	0.31	0.891	0.70	0.89	0.80	0.28	1.28	1.00	1.28	1.14	0.40
	04A3B3	3	1.00	0.79	1.19	1.04	0.55	1.042	0.82	1.24	1.09	0.58	1.05	0.82	1.25	1.09	0.58
	04A3B4	1	1.00	1.18	1.38	1.31	0.89	0.509	0.60	0.70	0.67	0.45	0.97	1.14	1.34	1.27	0.87
	04A3B4	2	1.00	1.06	1.28	0.96	0.39	0.603	0.64	0.77	0.58	0.24	1.24	1.32	1.59	1.19	0.49
	04A4B1	1	1.00	1.06	1.05	0.95	0.49	0.633	0.67	0.66	0.60	0.31	0.75	0.80	0.79	0.72	0.37
	04A4B1	3	1.00	0.99	0.96	1.05	0.76	0.648	0.64	0.62	0.68	0.49	0.93	0.92	0.89	0.97	0.70
	04A4B2	1	1.00	1.04	1.15	0.95	0.69	0.817	0.85	0.94	0.77	0.56	0.97	1.02	1.12	0.92	0.67
	04A4B2	3	1.00	0.99	1.34	0.83	0.63	0.811	0.80	1.09	0.67	0.51	1.07	1.06	1.44	0.89	0.67
As, Cr (VI)	04A5B1	1	1.00	1.03	1.01	0.88	0.33	0.471	0.48	0.48	0.42	0.16	1.13	1.17	1.15	1.00	0.38
Cr, Li, Ni	04A5B1	3	1.00	0.65	1.01	0.46	0.71	0.808	0.53	0.82	0.37	0.57	2.55	1.66	2.58	1.18	1.81
Cr, Co, Li, Ni	04A5B1	3	1.00	0.22	0.19	0.05	0.07	**4.502**	0.97	0.87	0.21	0.30	1.39	0.30	0.27	0.06	0.09
Cr, Cr (VI), Co, Li, Ni	04A5B1	1	1.00	0.99	0.74	0.28	0.36	**4.277**	**4.22**	**3.16**	1.18	1.55	0.67	0.66	0.49	0.18	0.24
	05A1B1	3	1.00	1.53	0.86	0.57	1.11	1.365	2.09	1.18	0.78	1.52	0.90	1.39	0.78	0.52	1.01
	05A1B1	1	1.00	1.51	0.96	0.65	1.01	1.426	2.15	1.37	0.92	1.44	0.93	1.40	0.89	0.60	0.94
As	05A1B2	1	1.00	1.12	0.80	0.66	1.21	1.758	1.97	1.41	1.16	2.13	1.86	2.09	1.50	1.23	2.25
	05A1B2	3	1.00	1.17	0.71	0.65	0.99	1.505	1.77	1.06	0.99	1.50	1.13	1.33	0.80	0.74	1.13
Ba	05A1B3	1	1.00	0.97	0.36	0.87	1.01	1.604	1.55	0.58	1.39	1.62	**5.67**	**5.48**	2.07	**4.90**	**5.73**
	05A1B3	3	1.00	1.08	0.73	0.81	1.43	1.632	1.77	1.18	1.31	2.34	2.15	2.33	1.56	1.73	**3.08**
	05A1B4	1	1.00	1.01	0.98	0.65	1.07	1.690	1.71	1.66	1.09	1.81	1.23	1.24	1.21	0.79	1.31
As	05A1B5	3	1.00	1.71	1.62	1.20	1.02	2.580	**4.42**	**4.17**	**3.09**	2.64	0.16	0.27	0.26	0.19	0.16

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Ratios: Aluminum w/ Al	Aluminum w/ Fe	Aluminum w/ Mn	Aluminum w/ Mg	Aluminum w/ Na	Arsenic w/ Al	Arsenic w/ Fe	Arsenic w/ Mn	Arsenic w/ Mg	Arsenic w/ Na	Barium w/ Al	Barium w/ Fe	Barium w/ Mn	Barium w/ Mg	Barium w/ Na
[a] = 4 or more cations w/ ratios > 5																	
As	05A1B5	1	1.00	1.23	1.04	0.68	0.91	**5.792**	**7.11**	**6.04**	**3.94**	**5.30**	0.31	0.38	0.33	0.21	0.29
	05A2B1	10	1.00	1.48	1.68	1.66	2.17	0.170	0.25	0.29	0.28	0.37	0.57	0.84	0.95	0.94	1.23
	05A2B1	5	1.00	1.50	1.14	1.84	2.62	0.188	0.28	0.21	0.35	0.49	0.67	1.01	0.77	1.24	1.76
As, Cr, Li, Ni	0601B10	3	1.00	1.79	2.19	0.41	1.98	**3.275**	**5.85**	**7.17**	1.34	**6.48**	0.30	0.53	0.65	0.12	0.59
As, Cr, Li, Ni	0601B10	5	1.00	1.57	1.33	0.40	1.66	**5.065**	**7.97**	**6.73**	2.05	**8.39**	0.25	0.39	0.33	0.10	0.41
As, Li	0601B10	1	1.00	0.98	1.75	0.85	1.66	**4.610**	**4.51**	**8.06**	**3.90**	**7.64**	0.74	0.72	1.29	0.62	1.22
As	06A1B1	5	1.00	0.82	1.11	0.91	0.29	**4.15**	**3.40**	**4.62**	**3.77**	1.22	1.31	1.08	1.46	1.19	0.39
	06A1B1	1	1.00	0.99	1.21	1.00	0.35	0.78	0.77	0.94	0.78	0.27	1.24	1.22	1.50	1.23	0.43
	06A1B1	3	1.00	0.95	1.04	0.99	0.75	0.83	0.79	0.86	0.82	0.62	1.07	1.02	1.12	1.06	0.80
As, Be, Cr (VI), Co, Cu, Mn, Pb	06A1B11	1	1.00	0.75	0.28	1.88	0.31	**11.26**	**8.45**	**3.17**	**21.12**	**3.54**	1.07	0.81	0.30	2.01	0.34
As, Cr (VI), Cu, Pb	06A1B11	3	1.00	1.06	1.29	1.28	0.56	**5.59**	**5.92**	**7.23**	**7.14**	**3.11**	0.94	1.00	1.22	1.20	0.52
As, Cr (VI), Co, Cu, Pb	06A1B11	5	1.00	1.18	0.49	1.12	0.33	**9.67**	**11.39**	**4.74**	**10.85**	**3.16**	1.46	1.72	0.71	1.63	0.48
As	06A1B2	3	1.00	0.85	0.74	1.19	0.25	**4.54**	**3.86**	**3.34**	**5.38**	1.14	1.06	0.90	0.78	1.26	0.27
As	06A1B2	5	1.00	1.01	1.14	0.82	1.30	**4.37**	**4.42**	**4.96**	**3.57**	**5.68**	0.89	0.90	1.01	0.73	1.16
	06A1B2	1	1.00	0.98	1.17	1.63	0.51	0.83	0.81	0.98	1.36	0.43	0.66	0.65	0.78	1.08	0.34
As	06A1B3	5	1.00	0.79	0.86	1.06	1.18	**4.56**	**3.61**	**3.90**	**4.85**	**5.40**	0.94	0.74	0.80	0.99	1.11
	06A1B3	1	1.00	0.84	1.19	1.52	0.63	1.01	0.84	1.20	1.53	0.63	0.80	0.67	0.95	1.21	0.50
	06A1B3	3	1.00	0.92	1.22	1.55	0.90	1.01	0.93	1.23	1.57	0.91	0.72	0.66	0.87	1.11	0.64
As	06A1B4	5	1.00	1.16	1.92	0.68	0.29	**4.32**	**5.01**	**8.32**	2.94	1.26	1.17	1.35	2.25	0.80	0.34
	06A1B4	3	1.00	1.81	**4.47**	1.59	0.77	0.48	0.87	2.15	0.76	0.37	0.55	1.00	2.48	0.88	0.43
As, Cr, Cu	06A1B4	1	1.00	0.97	1.66	1.43	0.66	**6.68**	**6.48**	**11.12**	**9.54**	**4.43**	0.96	0.93	1.59	1.36	0.63
As, Cr	06A1B5	5	1.00	1.06	0.79	0.87	0.74	**4.51**	**4.80**	**3.54**	**3.94**	**3.33**	1.30	1.39	1.02	1.14	0.96
Cr	06A1B5	1	1.00	1.15	1.09	1.36	0.79	0.94	1.08	1.02	1.28	0.74	0.72	0.82	0.78	0.98	0.56
Cr	06A1B5	3	1.00	0.94	1.09	1.21	0.78	0.96	0.91	1.05	1.16	0.75	0.75	0.71	0.82	0.90	0.59
As	06A1B6	5	1.00	0.82	0.83	0.82	1.12	**4.37**	**3.59**	**3.61**	**3.61**	**4.91**	0.97	0.79	0.80	0.80	1.08
	06A1B6	1	1.00	0.71	1.36	1.21	0.28	1.25	0.89	1.69	1.51	0.35	0.92	0.65	1.25	1.11	0.26
	06A1B6	3	1.00	0.89	1.56	1.22	0.90	0.93	0.83	1.46	1.14	0.84	0.63	0.56	0.98	0.76	0.56
	06A1B7	1	1.00	0.94	1.33	1.63	1.10	0.99	0.93	1.32	1.62	1.09	0.71	0.66	0.94	1.16	0.78
	06A1B7	3	1.00	0.76	1.25	1.31	0.41	1.22	0.93	1.53	1.60	0.51	0.97	0.74	1.22	1.27	0.40
As	06A1B7	5	1.00	0.99	0.81	0.79	0.58	1.96	1.95	1.59	1.55	1.13	1.38	1.37	1.12	1.09	0.80
As, Cr, Cr(VI), Ni	06A1B8	5	1.00	0.75	0.38	0.51	0.17	**7.68**	**5.78**	2.95	**3.94**	1.27	0.58	0.44	0.22	0.30	0.10
Cr, Ni, Zn	06A1B8	1	1.00	0.92	0.92	0.80	0.48	1.31	1.20	1.21	1.04	0.63	0.92	0.85	0.85	0.74	0.45
Cr, Cr(VI), Ni, Zn	06A1B8	2	1.00	1.08	0.89	0.75	0.41	1.37	1.47	1.21	1.03	0.55	0.85	0.92	0.75	0.64	0.34
As	06A1B9	3	1.00	0.78	0.75	0.92	0.42	**4.46**	**3.49**	**3.36**	**4.08**	1.87	1.15	0.90	0.87	1.05	0.48
As	06A1B9	5	1.00	0.87	0.77	0.76	0.58	**4.28**	**3.72**	**3.29**	**3.25**	2.48	1.70	1.48	1.31	1.29	0.99
	06A1B9	1	1.00	1.07	1.39	0.92	0.43	1.03	1.10	1.43	0.95	0.44	0.92	0.98	1.27	0.84	0.39
	06A2B1	1	1.00	1.03	1.99	0.93	0.67	0.43	0.44	0.85	0.40	0.29	1.64	1.69	**3.27**	1.53	1.10
	06A2B2	1	1.00	1.06	1.65	0.96	0.83	0.48	0.50	0.78	0.46	0.39	1.53	1.62	2.52	1.48	1.27
	06A2B3	1	1.00	1.04	1.92	0.85	0.34	0.39	0.41	0.75	0.33	0.13	1.57	1.64	**3.03**	1.34	0.53
Cr, Cr(VI), Cu, Pb, Zn	07A1S1	Surface	1.00	0.55	0.47	0.85	0.33	1.09	0.60	0.51	0.92	0.36	2.98	1.63	1.39	2.53	0.99
Cr, Cr(VI), Cu, Pb, Zn	07A1S2	Surface	1.00	0.52	0.85	0.89	0.33	1.39	0.73	1.18	1.24	0.46	1.78	0.93	1.51	1.59	0.59
Cr, Cr(VI), Cu, Pb, Zn	07A1S3	Surface	1.00	0.63	0.87	0.90	0.33	1.15	0.72	0.99	1.04	0.38	1.77	1.11	1.53	1.60	0.59
As	07A2B1	1	1.00	0.90	0.92	0.87	1.49	1.94	1.74	1.79	1.69	2.90	1.00	0.90	0.92	0.87	1.50
	07A2B1	3	1.00	0.86	0.83	0.75	2.01	1.66	1.43	1.37	1.25	**3.33**	1.09	0.94	0.90	0.82	2.18
	07A2B1	5	1.00	0.94	0.93	0.75	0.83	1.86	1.76	1.73	1.40	1.54	0.94	0.89	0.87	0.71	0.78
As, Zn	07A2B2	1	1.00	0.84	0.54	1.00	1.49	1.90	1.59	1.03	1.89	2.84	2.46	2.06	1.33	2.44	**3.66**
	07A2B2	3	1.00	1.13	0.63	1.15	[illegible]	1.37	1.55	0.86	1.58	2.36	0.69	0.78	0.43	.79	1.18
As, Pb	07A2B2	5	1.00	1.10	0.89	1.24	[illegible]	1.59	1.76	1.41	1.97	**4.02**	0.76	0.84	0.67	.94	1.92

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [(a)]	Sample Location	Depth (ft)	Ratios: Aluminum w/ Al	Aluminum w/ Fe	Aluminum w/ Mn	Aluminum w/ Mg	Aluminum w/ Na	Arsenic w/ Al	Arsenic w/ Fe	Arsenic w/ Mn	Arsenic w/ Mg	Arsenic w/ Na	Barium w/ Al	Barium w/ Fe	Barium w/ Mn	Barium w/ Mg	Barium w/ Na
(a) = 2 or more cations w/ ratios > 3																	
As	07A2B3	3	1.00	0.94	0.79	1.02	**3.57**	**5.60**	**5.24**	**4.44**	**5.71**	**19.99**	0.97	0.91	0.77	0.99	**3.47**
As	07A2B3	5	1.00	1.20	1.65	1.23	1.66	1.54	1.86	2.55	1.90	2.56	0.85	1.02	1.40	1.04	1.41
As	07A2B3	1	1.00	0.84	1.56	1.20	2.57	1.92	1.60	2.98	2.29	**4.92**	1.01	0.84	1.56	1.20	2.58
As	07A2B4	1	1.00	0.85	0.99	0.73	1.21	1.89	1.61	1.88	1.38	2.29	1.39	1.18	1.38	1.02	1.68
As	07A2B4	3	1.00	0.82	0.74	0.83	1.20	1.90	1.57	1.42	1.58	2.28	1.09	0.90	0.81	0.90	1.31
Mn	07A2B4	5	1.00	1.08	0.31	0.71	1.21	1.45	1.57	0.44	1.03	1.76	1.50	1.62	0.46	1.06	1.81
	07A2B5	1	1.00	1.24	1.17	0.78	0.63	1.41	1.74	1.65	1.09	0.89	1.00	1.23	1.16	0.77	0.63
	07A2B5	3	1.00	1.24	1.28	0.84	0.35	1.35	1.66	1.73	1.14	0.47	1.32	1.63	1.70	1.12	0.46
	07A2B5	5	1.00	1.17	1.04	0.71	0.30	1.45	1.70	1.51	1.03	0.43	1.10	1.29	1.14	0.78	0.33
	10A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1D	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	12A1B1	1	1.00	1.25	0.78	1.05	0.69	0.44	0.55	0.34	0.46	0.30	0.99	1.24	0.78	1.04	0.68
	12A1B2	1	1.00	0.54	0.93	1.00	0.74	0.49	0.27	0.46	0.49	0.37	0.98	0.53	0.91	0.98	0.73
	12A1B3	1	1.00	0.75	0.86	1.09	0.76	0.65	0.49	0.56	0.71	0.50	0.99	0.74	0.85	1.08	0.76
	12A1B4	1	1.00	0.66	0.73	1.07	0.70	0.92	0.60	0.67	0.99	0.64	1.37	0.90	1.00	1.47	0.96
	12A1B5	1	1.00	0.75	0.77	0.86	0.75	1.78	1.33	1.37	1.54	1.34	1.19	0.89	0.92	1.03	0.90
Cr(VI), Co	12A2B1	1	1.00	0.91	1.57	1.81	0.43	0.86	0.78	1.35	1.55	0.37	1.37	1.25	2.15	2.48	0.59
Cr(VI), Pb	12A2B2	1	1.00	0.91	1.54	1.53	0.58	0.98	0.89	1.51	1.50	0.56	1.38	1.25	2.13	2.11	0.80
Cr(VI)	12A2B3	1	1.00	1.08	0.94	1.42	0.56	0.18	0.20	0.17	0.26	0.10	1.32	1.43	1.25	1.38	0.74
	12A2B4	1	1.00	1.04	1.99	1.53	0.36	0.41	0.43	0.81	0.63	0.15	0.85	0.89	1.69	1.30	0.31
Cr(VI)	12A2B5	1	1.00	1.06	1.25	1.47	0.34	0.39	0.42	0.49	0.58	0.13	1.24	1.32	1.55	1.82	0.42
	12A3B1	1	1.00	1.48	1.23	1.22	2.35	0.67	0.99	0.83	0.82	1.58	0.90	1.33	1.11	1.10	2.11
	12A3B2	1	1.00	1.20	1.17	1.00	2.71	0.71	0.86	0.84	0.71	1.93	0.94	1.14	1.11	0.94	2.56
	12A3B3	1	1.00	1.25	1.02	1.06	**4.19**	0.24	0.30	0.25	0.26	1.01	0.85	1.06	0.86	0.90	**3.56**
	12A3B4	1	1.00	1.30	1.03	1.04	2.71	0.31	0.41	0.32	0.32	0.85	1.18	1.54	1.22	1.22	**3.20**
Pb	12A3B5	1	1.00	1.46	1.24	1.44	2.25	0.26	0.37	0.32	0.37	0.57	1.30	1.89	1.61	1.87	2.92

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [1a]	Sample Location	Depth (ft)	Beryllium w/ Al	Beryllium w/ Fe	Beryllium w/ Mn	Beryllium w/ Mg	Beryllium w/ Na	Chromium w/ Al	Chromium w/ Fe	Chromium w/ Mn	Chromium w/ Mg	Chromium w/ Na	Chromium(VI) w/ Al	Chromium(VI) w/ Fe	Chromium(VI) w/ Mn	Chromium(VI) w/ Mg	Chromium(VI) w/ Na
	01A1B1	1	0.83	0.89	0.78	0.69	0.57	1.14	1.23	1.07	0.95	0.78	0.95	1.02	0.89	0.79	0.65
	01A1B1	2	0.99	1.00	0.96	0.82	0.61	1.60	1.60	1.54	1.32	0.98	0.55	0.55	0.53	0.45	0.34
	01A2B1	1	0.99	1.16	1.07	0.83	0.78	1.08	1.26	1.17	0.91	0.85	1.06	1.24	1.14	0.89	0.83
	01A2B1	3	0.97	1.05	1.03	0.86	0.83	1.03	1.12	1.10	0.91	0.89	0.66	0.72	0.71	0.59	0.57
	01A2B2	1	1.01	0.96	1.06	0.86	0.82	1.11	1.05	1.16	0.94	0.90	0.56	0.53	0.59	0.48	0.46
	01A2B3	1	0.92	1.01	1.00	0.82	0.64	1.14	1.26	1.24	1.02	0.80	0.45	0.50	0.49	0.41	0.32
	01A2B3	2	0.83	0.94	0.88	0.76	0.54	1.40	1.59	1.49	1.29	0.92	0.92	1.04	0.98	0.85	0.60
	01A2B4	1	1.11	1.28	1.30	0.98	0.78	1.82	2.10	2.13	1.60	1.27	0.93	1.07	1.08	0.82	0.65
	01A2B4	3	0.94	0.97	1.03	0.78	0.79	1.19	1.23	1.30	0.98	1.00	0.49	0.51	0.54	0.41	0.41
	02A1B1	5	0.78	0.65	0.56	0.69	0.28	0.41	0.34	0.30	0.36	0.15	0.41	0.34	0.29	0.36	0.15
As, Cr, Cr (VI), Co, Cu, Mn, Ni	02A2B1	5	1.00	0.62	0.25	0.22	0.79	**28.52**	**17.85**	**7.12**	**6.41**	**22.68**	**15.22**	**9.53**	**3.80**	**3.42**	**12.11**
Zn	03A1B1	1	0.97	1.02	1.13	0.81	0.73	1.11	1.16	1.28	0.92	0.83	1.25	1.30	1.44	1.04	0.93
	03A1B1	3	0.80	0.95	1.00	0.61	0.58	0.97	1.15	1.20	0.73	0.70	0.45	0.53	0.56	0.34	0.32
Cu, Pb, Zn	03A1B2	1	0.70	0.67	0.86	0.62	0.71	2.66	2.53	**3.24**	2.33	2.68	0.36	0.34	0.44	0.31	0.36
Li, Zn	03A2B1	1	0.96	1.14	1.05	0.98	0.84	0.97	1.15	1.07	0.99	0.85	0.31	0.36	0.34	0.31	0.27
Li, Zn	03A2B1	2	0.96	1.12	0.81	1.11	1.30	0.99	1.15	0.83	1.14	1.34	0.32	0.37	0.27	0.37	0.44
	04A1B1	1	0.85	1.03	1.12	0.91	0.59	0.98	1.19	1.30	1.05	0.69	0.59	0.72	0.78	0.63	0.41
	04A2B1	16	0.80	0.80	0.79	0.70	0.57	1.04	1.04	1.02	0.90	0.74	1.10	1.11	1.09	0.96	0.78
	04A2B1	5	0.91	0.95	1.27	0.97	1.15	0.93	0.97	1.30	0.99	1.17	0.22	0.23	0.31	0.23	0.28
	04A2B1	10	1.11	1.16	1.22	1.45	1.47	1.14	1.19	1.25	1.48	1.51	0.15	0.15	0.16	0.19	0.19
	04A2B1	15	0.84	0.96	0.75	0.95	0.81	1.04	1.19	0.92	1.17	1.01	0.74	0.85	0.66	0.34	0.72
	04A2B2	10	0.98	1.12	1.17	1.24	1.19	1.51	1.72	1.80	1.91	1.84	0.93	1.06	1.11	1.18	1.13
	04A2B2	15	0.73	0.78	0.81	0.73	0.17	1.78	1.88	1.95	1.76	0.41	1.95	2.06	2.14	1.93	0.45
Cr, Ni	04A2B2	20	0.66	0.71	0.75	0.34	0.27	**5.43**	**5.85**	**6.17**	2.78	2.23	1.86	2.00	2.11	0.95	0.76
	04A2B2	5	0.95	1.17	1.50	1.28	1.05	0.93	1.14	1.46	1.24	1.02	0.25	0.31	0.40	0.34	0.28
	04A3B1	1	0.96	0.91	0.95	0.77	0.23	1.31	1.24	1.29	1.05	0.32	1.73	1.63	1.70	1.38	0.41
	04A3B2	3	0.97	0.97	1.27	0.86	0.75	1.17	1.16	1.52	1.03	0.90	0.51	0.51	0.67	0.45	0.39
	04A3B2	1	0.91	0.92	1.04	0.75	0.65	1.78	1.78	2.03	1.46	1.26	0.65	0.65	0.74	0.53	0.46
	04A3B3	1	1.08	0.85	1.09	0.97	0.34	1.09	0.86	1.10	0.98	0.34	0.54	0.42	0.54	0.49	0.17
	04A3B3	3	1.24	0.98	1.47	1.29	0.68	1.62	1.28	1.93	1.69	0.90	0.69	0.55	0.83	0.72	0.38
	04A3B4	1	0.88	1.04	1.22	1.16	0.79	0.94	1.10	1.29	1.23	0.84	0.36	0.42	0.49	0.47	0.32
	04A3B4	2	0.95	1.00	1.22	0.91	0.37	1.27	1.35	1.63	1.22	0.50	0.38	0.41	0.49	0.37	0.15
	04A4B1	1	1.26	1.34	1.32	1.20	0.62	1.11	1.18	1.16	1.05	0.54	0.66	0.71	0.70	0.63	0.33
	04A4B1	3	1.31	1.29	1.26	1.37	0.99	1.24	1.23	1.20	1.30	0.95	0.68	0.67	0.66	0.72	0.52
	04A4B2	1	1.32	1.38	1.52	1.25	0.91	1.07	1.12	1.23	1.01	0.74	0.73	0.76	0.84	0.69	0.50
	04A4B2	3	1.42	1.40	1.90	1.17	0.89	1.31	1.29	1.76	1.09	0.82	0.69	0.68	0.92	0.57	0.43
As, Cr (VI)	04A5B1	1	1.05	1.08	1.06	0.93	0.35	2.28	2.35	2.31	2.01	0.76	**3.97**	**4.09**	**4.02**	**3.50**	1.32
Cr, Li, Ni	04A5B1	3	1.26	0.82	1.27	0.58	0.89	**5.70**	**3.72**	**5.78**	2.63	**4.05**	2.00	1.30	2.03	0.92	1.42
Cr, Co, Li, Ni	04A5B1	3	0.45	0.10	0.09	0.02	0.03	**39.02**	**8.41**	**7.51**	1.78	2.64	**9.48**	2.04	1.82	0.43	0.64
Cr, Cr (VI), Co, Li, Ni	04A5B1	1	0.92	0.90	0.68	0.25	0.33	**17.92**	**17.69**	**13.23**	**4.96**	**6.50**	**3.93**	**3.88**	2.90	1.09	1.43
	05A1B1	3	1.06	1.62	0.91	0.60	1.18	0.97	1.49	0.84	0.55	1.08	0.27	0.41	0.23	0.15	0.30
	05A1B1	1	1.15	1.74	1.11	0.75	1.17	0.73	1.10	0.70	0.47	0.74	0.29	0.43	0.28	0.19	0.29
As	05A1B2	1	1.27	1.42	1.02	0.84	1.53	0.78	0.87	0.63	0.52	0.95	1.10	1.23	0.88	0.73	1.33
	05A1B2	3	1.12	1.32	0.79	0.73	1.12	0.95	1.12	0.67	0.62	0.95	0.15	0.18	0.11	0.10	0.15
Ba	05A1B3	1	2.28	2.21	0.83	1.98	2.31	0.67	0.64	0.24	0.58	0.67	0.56	0.54	0.20	0.48	0.56
	05A1B3	3	1.57	1.70	1.14	1.26	2.25	0.76	0.82	0.55	0.61	1.08	0.33	0.36	0.24	0.27	0.48
	05A1B4	1	0.99	1.00	0.97	0.64	1.06	2.29	2.32	2.25	1.48	2.46	0.62	0.63	0.61	.40	0.66
As	05A1B5	3	0.98	1.67	1.58	1.17	1.0	0.18	0.31	0.29	0.22	0.19	0.05	0.09	0.08	.06	0.05

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Beryllium w/ Al	Beryllium w/ Fe	Beryllium w/ Mn	Beryllium w/ Mg	Beryllium w/ Na	Chromium w/ Al	Chromium w/ Fe	Chromium w/ Mn	Chromium w/ Mg	Chromium w/ Na	Chromium(VI) w/ Al	Chromium(VI) w/ Fe	Chromium(VI) w/ Mn	Chromium(VI) w/ Mg	Chromium(VI) w/ Na
[a] = 2 or more cations w/ ratios > 3																	
As	05A1B5	1	0.99	1.22	1.04	0.68	0.91	0.22	0.27	0.23	0.15	0.20	0.11	0.13	0.11	0.07	0.10
	05A2B1	10	0.90	1.33	1.51	1.49	1.95	0.65	0.96	1.10	1.08	1.42	0.50	0.74	0.84	0.83	1.09
	05A2B1	5	0.86	1.30	0.99	1.59	2.27	0.72	1.08	0.82	1.33	1.89	0.37	0.55	0.42	0.68	0.97
As, Cr, Li, Ni	0601B10	3	0.65	1.16	1.42	0.27	1.28	**11.56**	**20.66**	**25.32**	**4.73**	**22.86**	0.23	0.41	0.50	0.09	0.45
As, Cr, Li, Ni	0601B10	5	0.68	1.06	0.90	0.27	1.12	**4.35**	**6.85**	**5.79**	1.76	**7.21**	0.62	0.97	0.82	0.25	1.03
As, Li	0601B10	1	1.05	1.03	1.84	0.89	1.74	0.80	0.78	1.40	0.68	1.32	0.31	0.30	0.54	0.26	0.51
As	06A1B1	5	0.86	0.70	0.95	0.78	0.25	0.73	0.59	0.81	0.66	0.21	0.22	0.18	0.25	0.20	0.07
	06A1B1	1	0.96	0.95	1.17	0.96	0.34	0.78	0.77	0.94	0.78	0.27	0.32	0.31	0.39	0.32	0.11
	06A1B1	3	1.32	1.25	1.37	1.30	0.99	1.20	1.14	1.25	1.19	0.90	0.53	0.50	0.55	0.52	0.39
As, Be, Cr (VI), Co, Cu, Mn, Pb	06A1B11	1	**3.06**	2.30	0.86	**5.75**	0.96	1.62	1.22	0.46	**3.04**	0.51	**5.16**	**3.88**	1.45	**9.68**	1.63
As, Cr (VI), Cu, Pb	06A1B11	3	1.20	1.28	1.56	1.54	0.67	1.36	1.44	1.76	1.73	0.76	**3.11**	**3.30**	**4.03**	**3.98**	1.73
As, Cr (VI), Co, Cu, Pb	06A1B11	5	1.59	1.87	0.78	1.78	0.52	1.55	1.82	0.76	1.74	0.51	**78.64**	**92.61**	**38.51**	**88.23**	**25.69**
As	06A1B2	3	1.42	1.21	1.05	1.69	0.36	1.88	1.60	1.38	2.23	0.47	1.76	1.50	1.30	2.09	0.44
As	06A1B2	5	1.02	1.03	1.16	0.83	1.33	1.47	1.49	1.67	1.20	1.91	1.61	1.63	1.83	1.32	2.10
	06A1B2	1	1.05	1.02	1.23	1.71	0.54	1.84	1.80	2.16	3.00	0.95	0.64	0.63	0.75	1.04	0.33
As	06A1B3	5	1.27	1.00	1.08	1.35	1.50	1.71	1.35	1.46	1.82	2.03	0.80	0.63	0.68	0.85	0.95
	06A1B3	1	1.11	0.93	1.32	1.68	0.69	1.95	1.63	2.31	2.95	1.22	0.97	0.81	1.16	1.47	0.61
	06A1B3	3	0.99	0.91	1.21	1.53	0.89	1.89	1.74	2.30	2.92	1.70	1.32	1.21	1.60	2.03	1.18
As	06A1B4	5	0.82	0.95	1.58	0.56	0.24	1.92	2.23	**3.70**	1.31	0.56	0.56	0.65	1.08	0.38	0.16
	06A1B4	3	0.44	0.79	1.96	0.69	0.34	1.29	2.33	**5.75**	2.04	1.00	0.48	0.86	2.13	0.76	0.37
As, Cr, Cu	06A1B4	1	0.91	0.88	1.51	1.30	0.60	2.14	2.08	**3.56**	**3.05**	1.42	1.75	1.70	2.91	2.50	1.16
As, Cr	06A1B5	5	1.15	1.23	0.91	1.01	0.85	**3.26**	**3.47**	2.56	2.85	2.41	2.25	2.39	1.77	1.96	1.66
Cr	06A1B5	1	0.90	1.04	0.98	1.23	0.71	**3.00**	**3.46**	**3.28**	**4.10**	2.36	0.76	0.88	0.83	1.04	0.60
Cr	06A1B5	3	1.00	0.94	1.09	1.20	0.78	**4.36**	**4.11**	**4.75**	**5.26**	**3.41**	1.12	1.06	1.22	1.35	0.88
As	06A1B6	5	1.42	1.16	1.17	1.17	1.59	1.17	0.96	0.96	0.96	1.31	0.53	0.43	0.44	0.44	0.59
	06A1B6	1	1.57	1.12	2.13	1.89	0.45	1.43	1.01	1.94	1.72	0.41	0.92	0.65	1.25	1.11	0.26
	06A1B6	3	1.24	1.10	1.93	1.51	1.11	1.18	1.06	1.85	1.44	1.06	0.62	0.55	0.96	0.75	0.55
	06A1B7	1	1.24	1.16	1.65	2.02	1.37	0.95	0.89	1.27	1.55	1.05	0.33	0.31	0.44	0.54	0.37
	06A1B7	3	1.47	1.12	1.84	1.93	0.61	1.18	0.90	1.48	1.55	0.49	0.25	0.19	0.31	0.33	0.10
As	06A1B7	5	1.45	1.45	1.18	1.15	0.84	1.07	1.06	0.87	0.84	0.62	0.53	0.53	0.43	0.42	0.31
As, Cr, Cr(VI), Ni	06A1B8	5	1.30	0.98	0.50	0.67	0.22	**13.16**	**9.91**	**5.06**	**6.76**	2.18	**5.39**	**4.06**	2.07	2.77	0.89
Cr, Ni, Zn	06A1B8	1	0.87	0.80	0.80	0.70	0.42	**6.65**	**6.12**	**6.14**	**5.32**	**3.23**	1.88	1.73	1.73	1.50	0.91
Cr, Cr(VI), Ni, Zn	06A1B8	2	0.81	0.88	0.72	0.61	0.33	**6.18**	**6.67**	**5.49**	**4.66**	2.51	**3.75**	**4.05**	**3.33**	2.33	1.52
As	06A1B9	3	1.34	1.05	1.01	1.22	0.56	1.07	0.84	0.81	0.98	0.45	0.25	0.20	0.19	0.23	0.10
As	06A1B9	5	1.30	1.13	1.00	0.98	0.75	1.14	0.99	0.88	0.87	0.66	0.36	0.31	0.28	0.27	0.21
	06A1B9	1	1.35	1.44	1.87	1.24	0.58	1.01	1.08	1.40	0.93	0.43	0.33	0.36	0.46	0.31	0.14
	06A2B1	1	0.78	0.80	1.54	0.72	0.52	1.98	2.04	**3.94**	1.84	1.33	0.60	0.62	1.20	0.56	0.40
	06A2B2	1	0.63	0.66	1.04	0.61	0.52	2.43	2.57	**4.01**	2.35	2.02	0.43	0.46	0.72	0.42	0.36
	06A2B3	1	0.49	0.51	0.94	0.41	0.16	2.57	2.68	**4.94**	2.18	0.87	0.70	0.73	1.35	0.60	0.24
Cr, Cr(VI), Cu, Pb, Zn	07A1S1	Surface	0.86	0.47	0.40	0.73	0.28	**3.99**	2.19	1.86	**3.40**	1.32	**101.46**	**55.70**	**47.32**	**86.31**	**33.62**
Cr, Cr(VI), Cu, Pb, Zn	07A1S2	Surface	0.77	0.40	0.66	0.69	0.26	**4.35**	2.27	**3.70**	**3.88**	1.44	**36.70**	**19.14**	**31.22**	**32.78**	**12.16**
Cr, Cr(VI), Cu, Pb, Zn	07A1S3	Surface	0.81	0.51	0.70	0.73	0.27	**6.02**	**3.77**	**5.21**	**5.45**	2.00	**64.08**	**40.11**	**55.48**	**57.98**	**21.24**
As	07A2B1	1	1.49	1.34	1.37	1.30	2.23	1.02	0.91	0.94	0.88	1.52	0.63	0.56	0.58	0.55	0.94
	07A2B1	3	0.84	0.72	0.69	0.63	1.68	0.36	0.31	0.30	0.28	0.73	0.19	0.17	0.16	0.14	0.39
	07A2B1	5	1.24	1.17	1.15	0.93	1.03	0.88	0.83	0.81	0.66	0.73	0.28	0.27	0.26	0.21	0.24
As, Zn	07A2B2	1	1.29	1.08	0.70	1.29	1.93	0.52	0.44	0.28	0.52	0.77	1.11	0.93	0.60	1.11	1.66
	07A2B2	3	1.22	1.38	0.76	1.40	2.10	0.22	0.25	0.14	0.25	0.38	1.73	1.96	1.08	1.99	2.99
As, Pb	07A2B2	5	1.17	1.29	1.04	1.45	2.95	0.47	0.52	0.42	0.58	1.19	0.86	0.94	0.76	1.06	2.16

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [(a)]	Sample Location	Depth (ft)	Beryllium w/ Al	Beryllium w/ Fe	Beryllium w/ Mn	Beryllium w/ Mg	Beryllium w/ Na	Chromium w/ Al	Chromium w/ Fe	Chromium w/ Mn	Chromium w/ Mg	Chromium w/ Na	Chromium(VI) w/ Al	Chromium(VI) w/ Fe	Chromium(VI) w/ Mn	Chromium(VI) w/ Mg	Chromium(VI) w/ Na
As	07A2B3	3	0.97	0.90	0.77	0.98	**3.45**	1.14	1.07	0.90	1.16	**4.07**	0.13	0.12	0.10	0.13	0.45
As	07A2B3	5	0.97	1.17	1.60	1.19	1.61	0.38	0.46	0.63	0.47	0.64	0.88	1.05	1.44	1.08	1.45
As	07A2B3	1	1.29	1.08	2.00	1.54	**3.31**	0.92	0.77	1.43	1.10	2.36	0.46	0.39	0.72	0.55	1.19
As	07A2B4	1	1.26	1.07	1.25	0.92	1.52	0.77	0.65	0.76	0.56	0.93	0.86	0.73	0.85	0.63	1.04
As	07A2B4	3	1.23	1.01	0.91	1.02	1.47	0.56	0.46	0.42	0.47	0.67	0.73	0.60	0.55	0.61	0.88
Mn	07A2B4	5	1.17	1.27	0.36	0.83	1.42	0.99	1.08	0.30	0.71	1.20	1.02	1.10	0.31	0.72	1.23
	07A2B5	1	1.06	1.31	1.24	0.82	0.67	0.90	1.12	1.05	0.70	0.57	0.30	0.37	0.35	0.23	0.19
	07A2B5	3	0.97	1.20	1.24	0.82	0.34	0.56	0.69	0.72	0.47	0.19	0.27	0.34	0.35	0.23	0.09
	07A2B5	5	1.17	1.38	1.22	0.83	0.35	1.05	1.23	1.09	0.74	0.31	0.79	0.92	0.82	0.56	0.23
	10A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1D	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	12A1B1	1	1.21	1.52	0.95	1.28	0.83	0.86	1.07	0.67	0.90	0.59	0.63	0.78	0.49	0.66	0.43
	12A1B2	1	1.15	0.62	1.06	1.14	0.85	0.83	0.45	0.77	0.83	0.62	0.46	0.25	0.43	0.46	0.34
	12A1B3	1	1.17	0.87	1.00	1.27	0.89	0.86	0.64	0.73	0.93	0.65	0.88	0.65	0.75	0.95	0.67
	12A1B4	1	1.51	0.99	1.10	1.62	1.06	0.80	0.52	0.58	0.85	0.56	0.75	0.49	0.55	0.81	0.53
	12A1B5	1	1.39	1.03	1.07	1.20	1.04	0.91	0.68	0.70	0.79	0.69	1.05	0.78	0.81	0.91	0.79
Cr(VI), Co	12A2B1	1	1.68	1.53	2.63	**3.03**	0.72	1.04	0.95	1.63	1.87	0.44	2.66	2.42	**4.17**	**4.30**	1.13
Cr(VI), Pb	12A2B2	1	1.26	1.15	1.94	1.93	0.73	1.85	1.68	2.85	2.83	1.07	**5.88**	**5.33**	**9.05**	**8.97**	**3.39**
Cr(VI)	12A2B3	1	1.24	1.34	1.17	1.76	0.69	1.37	1.49	1.30	1.95	0.77	**4.82**	**5.22**	**4.55**	**6.85**	2.69
	12A2B4	1	1.18	1.23	2.34	1.80	0.43	1.50	1.56	2.97	2.28	0.54	1.44	1.50	2.86	2.19	0.52
Cr(VI)	12A2B5	1	1.25	1.33	1.56	1.84	0.42	1.40	1.49	1.76	2.06	0.47	2.43	2.57	**3.03**	**3.56**	0.82
	12A3B1	1	0.59	0.88	0.73	0.73	1.39	0.57	0.84	0.70	0.70	1.34	0.10	0.15	0.12	0.12	0.23
	12A3B2	1	0.65	0.78	0.76	0.64	1.75	0.73	0.88	0.86	0.73	1.98	0.06	0.07	0.07	0.06	0.15
	12A3B3	1	0.66	0.83	0.67	0.70	2.77	0.35	0.43	0.35	0.37	1.45	0.09	0.12	0.10	0.10	0.39
	12A3B4	1	0.77	1.00	0.80	0.80	2.09	0.57	0.74	0.59	0.59	1.55	0.20	0.26	0.20	0.20	0.54
Pb	12A3B5	1	0.61	0.89	0.76	0.88	1.38	0.69	1.01	0.86	0.99	1.55	0.30	0.44	0.38	0.44	0.68

(a) = 2 or more cations w/ ratios > 4

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Cobalt w/ Al	Cobalt w/ Fe	Cobalt w/ Mn	Cobalt w/ Mg	Cobalt w/ Na	Copper w/ Al	Copper w/ Fe	Copper w/ Mn	Copper w/ Mg	Copper w/ Na	Iron w/ Al	Iron w/ Fe	Iron w/ Mn	Iron w/ Mg	Iron w/ Na
	01A1B1	1	0.91	0.98	0.85	0.76	0.62	1.33	1.43	1.25	1.11	0.91	0.93	1.00	0.87	0.77	0.64
	01A1B1	2	1.52	1.52	1.46	1.25	0.93	1.79	1.80	1.72	1.48	1.10	1.00	1.00	0.96	0.82	0.61
	01A2B1	1	0.92	1.08	0.99	0.77	0.72	2.44	2.87	2.65	2.06	1.92	0.85	1.00	0.92	0.72	0.67
	01A2B1	3	0.98	1.07	1.05	0.87	0.85	2.45	2.66	2.61	2.17	2.11	0.92	1.00	0.98	0.82	0.79
	01A2B2	1	1.07	1.01	1.12	0.90	0.87	1.75	1.65	1.83	1.48	1.42	1.06	1.00	1.11	0.89	0.86
	01A2B3	1	0.95	1.05	1.03	0.85	0.67	2.30	2.53	2.49	2.05	1.61	0.91	1.00	0.98	0.81	0.64
	01A2B3	2	0.88	0.99	0.93	0.81	0.57	1.60	1.81	1.70	1.47	1.04	0.88	1.00	0.94	0.82	0.58
	01A2B4	1	1.18	1.35	1.37	1.03	0.82	1.47	1.69	1.71	1.29	1.03	0.87	1.00	1.01	0.76	0.61
	01A2B4	3	1.04	1.08	1.14	0.86	0.87	1.48	1.52	1.62	1.22	1.24	0.97	1.00	1.06	0.80	0.81
	02A1B1	5	0.70	0.58	0.51	0.62	0.26	0.39	0.32	0.28	0.34	0.14	1.20	1.00	0.87	1.06	0.44
As, Cr, Cr (VI), Co, Cu, Mn, Ni	02A2B1	5	**26.53**	**16.60**	**6.62**	**5.97**	**21.10**	**18.67**	**11.69**	**4.66**	**4.20**	**14.85**	1.60	1.00	0.40	0.36	1.27
Zn	03A1B1	1	1.07	1.12	1.23	0.89	0.80	2.43	2.54	2.81	2.02	1.81	0.96	1.00	1.11	0.80	0.71
	03A1B1	3	1.14	1.35	1.42	0.86	0.82	2.44	2.90	**3.03**	1.85	1.76	0.84	1.00	1.05	0.64	0.61
Cu, Pb, Zn	03A1B2	1	1.03	0.98	1.26	0.90	1.04	**23.44**	**22.31**	**28.62**	**20.57**	**23.63**	1.05	1.00	1.28	0.92	1.06
Li, Zn	03A2B1	1	0.85	1.00	0.93	0.87	0.74	1.47	1.74	1.61	1.50	1.28	0.84	1.00	0.93	0.86	0.74
Li, Zn	03A2B1	2	0.88	1.03	0.74	1.02	1.19	1.33	1.55	1.11	1.53	1.80	0.86	1.00	0.72	0.99	1.16
	04A1B1	1	0.96	1.16	1.27	1.03	0.67	0.96	1.17	1.28	1.03	0.68	0.82	1.00	1.09	0.88	0.58
	04A2B1	16	1.36	1.36	1.34	1.18	0.96	1.01	1.01	0.99	0.87	0.71	1.00	1.00	0.98	0.87	0.71
	04A2B1	5	0.83	0.87	1.16	0.89	1.05	1.15	1.20	1.60	1.22	1.45	0.96	1.00	1.34	1.02	1.21
	04A2B1	10	0.95	0.99	1.04	1.24	1.26	0.75	0.78	0.82	0.97	0.99	0.96	1.00	1.05	1.25	1.27
	04A2B1	15	0.86	0.99	0.77	0.98	0.84	0.83	0.96	0.74	0.94	0.81	0.87	1.00	0.78	0.99	0.85
	04A2B2	10	1.29	1.47	1.54	1.64	1.57	0.81	0.93	0.98	1.03	0.99	0.88	1.00	1.05	1.11	1.07
	04A2B2	15	0.86	0.91	0.95	0.86	0.20	0.90	0.95	0.99	0.89	0.21	0.95	1.00	1.04	0.94	0.22
Cr, Ni	04A2B2	20	1.69	1.82	1.92	0.86	0.69	1.31	1.42	1.49	0.67	0.54	0.93	1.00	1.05	0.47	0.38
	04A2B2	5	0.83	1.02	1.31	1.11	0.92	0.81	1.00	1.29	1.09	0.90	0.81	1.00	1.29	1.09	0.90
	04A3B1	1	1.09	1.03	1.08	0.88	0.26	1.45	1.37	1.43	1.16	0.35	1.06	1.00	1.04	0.85	0.25
	04A3B2	3	0.98	0.98	1.28	0.87	0.75	1.57	1.57	2.05	1.39	1.21	1.00	1.00	1.31	0.89	0.77
	04A3B2	1	1.05	1.05	1.20	0.86	0.74	1.59	1.59	1.81	1.30	1.13	1.00	1.00	1.14	0.82	0.71
	04A3B3	1	1.03	0.81	1.03	0.92	0.32	2.17	1.70	2.18	1.95	0.68	1.28	1.00	1.28	1.15	0.40
	04A3B3	3	1.02	0.81	1.22	1.07	0.57	1.44	1.14	1.72	1.50	0.80	1.27	1.00	1.51	1.32	0.70
	04A3B4	1	0.81	0.96	1.13	1.07	0.73	1.05	1.23	1.45	1.37	0.93	0.85	1.00	1.17	1.11	0.76
	04A3B4	2	0.73	0.77	0.94	0.70	0.29	1.13	1.20	1.45	1.08	0.44	0.94	1.00	1.21	0.90	0.37
	04A4B1	1	1.36	1.45	1.42	1.29	0.67	0.83	0.89	0.87	0.79	0.41	0.94	1.00	0.98	0.89	0.46
	04A4B1	3	1.21	1.20	1.16	1.27	0.92	0.85	0.84	0.82	0.89	0.65	1.01	1.00	0.97	1.06	0.77
	04A4B2	1	1.09	1.14	1.26	1.03	0.75	1.06	1.11	1.22	1.01	0.73	0.96	1.00	1.11	0.91	0.66
	04A4B2	3	1.20	1.19	1.61	1.00	0.75	1.12	1.11	1.50	0.93	0.70	1.01	1.00	1.36	0.84	0.64
As, Cr (VI)	04A5B1	1	0.70	0.72	0.71	0.61	0.23	0.65	0.67	0.66	0.58	0.22	0.97	1.00	0.98	0.86	0.32
Cr, Li, Ni	04A5B1	3	1.33	0.87	1.35	0.61	0.94	1.55	1.01	1.57	0.71	1.10	1.53	1.00	1.55	0.71	1.09
Cr, Co, Li, Ni	04A5B1	3	**25.01**	**5.39**	**4.81**	1.14	1.69	**3.97**	0.85	0.76	0.18	0.27	**4.64**	1.00	0.89	0.21	0.31
Cr, Cr (VI), Co, Li, Ni	04A5B1	1	**3.19**	**3.15**	2.35	0.88	1.16	1.57	1.55	1.16	0.43	0.57	1.01	1.00	0.75	0.28	0.37
	05A1B1	3	1.52	2.32	1.31	0.87	1.69	0.23	0.35	0.19	0.13	0.25	0.65	1.00	0.56	0.37	0.73
	05A1B1	1	1.38	2.09	1.33	0.89	1.40	0.37	0.56	0.36	0.24	0.38	0.66	1.00	0.64	0.43	0.67
As	05A1B2	1	1.08	1.21	0.87	0.71	1.31	0.89	1.00	0.72	0.59	1.08	0.89	1.00	0.72	0.59	1.08
	05A1B2	3	1.37	1.61	0.97	0.90	1.36	0.72	0.85	0.51	0.47	0.72	0.85	1.00	0.60	0.56	0.85
Ba	05A1B3	1	1.72	1.66	0.63	1.49	1.73	1.70	1.64	0.62	1.47	1.72	1.03	1.00	0.38	0.89	1.04
	05A1B3	3	1.14	1.24	0.83	0.92	1.64	1.47	1.59	1.07	1.19	2.11	0.92	1.00	0.67	0.74	1.32
	05A1B4	1	0.85	0.86	0.84	0.55	0.91	1.89	1.91	1.86	1.22	2.03	0.99	1.00	0.97	0.64	1.06
As	05A1B5	3	0.50	0.85	0.80	0.60	0.51	0.72	1.23	1.16	0.86	0.73	0.58	1.00	0.94	0.70	0.60

[a] = 2 or more cations w/ ratios ≥ 3

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth	Cobalt					Copper					Iron				
[a] = 1 or more cations w/ ratios > 1		(ft)	w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na	w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na	w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na
As	05A1B5	1	0.53	0.65	0.55	0.36	0.48	1.32	1.62	1.38	0.90	1.21	0.81	1.00	0.85	0.55	0.74
	05A2B1	10	0.54	0.80	0.91	0.90	1.18	0.52	0.78	0.88	0.87	1.14	0.68	1.00	1.14	1.12	1.47
	05A2B1	5	0.80	1.20	0.91	1.48	2.10	0.51	0.77	0.59	0.95	1.35	0.67	1.00	0.76	1.23	1.75
As, Cr, Li, Ni	0601B10	3	0.77	1.38	1.69	0.32	1.52	0.12	0.22	0.27	0.05	0.24	0.56	1.00	1.23	0.23	1.11
As, Cr, Li, Ni	0601B10	5	1.50	2.36	1.99	0.61	2.49	0.56	0.88	0.74	0.23	0.92	0.64	1.00	0.85	0.26	1.05
As, Li	0601B10	1	0.54	0.53	0.94	0.46	0.89	0.49	0.48	0.86	0.41	0.81	1.02	1.00	1.79	0.87	1.69
As	06A1B1	5	0.54	0.45	0.61	0.49	0.16	1.33	1.09	1.49	1.21	0.39	1.22	1.00	1.36	1.11	0.36
	06A1B1	1	0.67	0.67	0.81	0.67	0.24	1.37	1.36	1.66	1.37	0.48	1.01	1.00	1.22	1.01	0.35
	06A1B1	3	1.30	1.24	1.36	1.29	0.97	0.99	0.94	1.03	0.98	0.74	1.05	1.00	1.10	1.04	0.79
As, Be, Cr (VI), Co, Cu, Mn, Pb	06A1B11	1	**4.00**	**3.00**	1.13	**7.51**	1.26	**6.00**	**4.51**	1.69	**11.26**	1.89	1.33	1.00	0.37	2.50	0.42
As, Cr (VI), Cu, Pb	06A1B11	3	1.03	1.09	1.33	1.31	0.57	**4.95**	**5.25**	**6.41**	**6.34**	2.76	0.94	1.00	1.22	1.21	0.53
As, Cr (VI), Co, Cu, Pb	06A1B11	5	**4.21**	**4.96**	2.06	**4.72**	1.38	**8.44**	**9.94**	**4.13**	**9.47**	2.76	0.85	1.00	0.42	0.95	0.28
As	06A1B2	3	1.51	1.28	1.11	1.79	0.38	1.02	0.87	0.75	1.21	0.26	1.18	1.00	0.87	1.40	0.30
As	06A1B2	5	1.04	1.05	1.18	0.85	1.36	0.72	0.73	0.82	0.59	0.94	0.99	1.00	1.12	0.81	1.29
	06A1B2	1	0.79	0.77	0.93	1.29	0.41	1.15	1.13	1.35	1.88	0.59	1.02	1.00	1.20	1.67	0.53
As	06A1B3	5	1.24	0.98	1.06	1.31	1.46	0.98	0.77	0.84	1.04	1.16	1.27	1.00	1.08	1.35	1.50
	06A1B3	1	0.78	0.65	0.93	1.19	0.49	1.17	0.98	1.40	1.78	0.74	1.20	1.00	1.42	1.81	0.75
	06A1B3	3	0.85	0.78	1.04	1.31	0.76	1.18	1.08	1.44	1.82	1.06	1.09	1.00	1.33	1.68	0.98
As	06A1B4	5	0.77	0.89	1.49	0.53	0.22	0.41	0.47	0.78	0.28	0.12	0.86	1.00	1.66	0.59	0.25
	06A1B4	3	0.38	0.68	1.68	0.60	0.29	0.29	0.53	1.31	0.47	0.23	0.55	1.00	2.47	0.88	0.43
As, Cr, Cu	06A1B4	1	1.31	1.27	2.17	1.86	0.87	**4.33**	**4.20**	**7.20**	**6.18**	2.87	1.03	1.00	1.71	1.47	0.68
As, Cr	06A1B5	5	1.26	1.34	0.99	1.10	0.93	1.41	1.50	1.11	1.24	1.04	0.94	1.00	0.74	0.82	0.69
Cr	06A1B5	1	1.05	1.21	1.15	1.43	0.83	1.97	2.27	2.15	2.69	1.55	0.87	1.00	0.95	1.18	0.68
Cr	06A1B5	3	1.01	0.95	1.10	1.21	0.79	1.15	1.08	1.25	1.39	0.90	1.06	1.00	1.16	1.28	0.83
As	06A1B6	5	1.62	1.33	1.34	1.34	1.82	0.83	0.68	0.69	0.69	0.93	1.22	1.00	1.01	1.01	1.37
	06A1B6	1	1.03	0.73	1.40	1.24	0.29	1.56	1.11	2.12	1.88	0.44	1.41	1.00	1.91	1.70	0.40
	06A1B6	3	1.10	0.98	1.71	1.34	0.98	1.38	1.23	2.16	1.68	1.24	1.12	1.00	1.75	1.37	1.01
	06A1B7	1	0.95	0.89	1.27	1.55	1.05	1.27	1.19	1.69	2.07	1.40	1.07	1.00	1.42	1.74	1.18
	06A1B7	3	0.68	0.52	0.85	0.89	0.28	1.66	1.26	2.08	2.18	0.69	1.31	1.00	1.65	1.73	0.54
As	06A1B7	5	1.54	1.53	1.25	1.22	0.89	0.81	0.81	0.66	0.64	0.47	1.01	1.00	0.82	0.80	0.58
As, Cr, Cr(VI), Ni	06A1B8	5	2.34	1.76	0.90	1.20	0.39	1.88	1.42	0.72	0.97	0.31	1.33	1.00	0.51	0.68	0.22
Cr, Ni, Zn	06A1B8	1	2.14	1.97	1.97	1.71	1.04	2.21	2.03	2.04	1.76	1.07	1.09	1.00	1.00	0.87	0.53
Cr, Cr(VI), Ni, Zn	06A1B8	2	2.22	2.39	1.97	1.67	0.90	1.83	1.98	1.63	1.38	0.74	0.93	1.00	0.82	0.70	0.38
As	06A1B9	3	1.48	1.16	1.12	1.36	0.62	0.85	0.66	0.64	0.78	0.36	1.28	1.00	0.96	1.17	0.54
As	06A1B9	5	1.63	1.42	1.25	1.24	0.94	0.87	0.76	0.67	0.66	0.51	1.15	1.00	0.89	0.87	0.67
	06A1B9	1	1.16	1.24	1.61	1.07	0.49	0.86	0.92	1.19	0.79	0.37	0.94	1.00	1.30	0.86	0.40
	06A2B1	1	0.89	0.91	1.77	0.83	0.60	1.09	1.12	2.16	1.01	0.73	0.97	1.00	1.93	0.91	0.65
	06A2B2	1	0.89	0.94	1.46	0.86	0.73	1.71	1.81	2.82	1.65	1.42	0.95	1.00	1.56	0.91	0.78
	06A2B3	1	0.67	0.69	1.28	0.57	0.22	1.36	1.42	2.63	1.16	0.46	0.96	1.00	1.84	0.82	0.32
Cr, Cr(VI), Cu, Pb, Zn	07A1S1	Surface	1.28	0.70	0.60	1.09	0.43	**5.80**	**3.19**	2.71	**4.94**	1.92	1.82	1.00	0.85	1.55	0.60
Cr, Cr(VI), Cu, Pb, Zn	07A1S2	Surface	1.24	0.65	1.06	1.11	0.41	**5.82**	**3.04**	**4.95**	**5.20**	1.93	1.92	1.00	1.63	1.71	0.64
Cr, Cr(VI), Cu, Pb, Zn	07A1S3	Surface	1.27	0.79	1.10	1.15	0.42	**6.45**	**4.04**	**5.58**	**5.84**	2.14	1.60	1.00	1.38	1.45	0.53
As	07A2B1	1	1.09	0.98	1.00	0.95	1.63	1.41	1.26	1.29	1.22	2.10	1.12	1.00	1.03	0.97	1.67
	07A2B1	3	0.84	0.72	0.69	0.63	1.69	1.18	1.02	0.98	0.89	2.38	1.16	1.00	0.96	0.88	2.33
	07A2B1	5	1.29	1.21	1.19	0.96	1.07	0.94	0.89	0.87	0.70	0.78	1.06	1.00	0.98	0.80	0.88
As, Zn	07A2B2	1	0.84	0.71	0.46	0.84	1.26	0.00	0.00	0.00	0.00	0.00	1.19	1.00	0.65	1.19	1.78
	07A2B2	3	0.73	0.83	0.46	0.84	1.2[illegible]	0.51	0.58	0.32	0.59	0.88	0.88	1.00	0.55	[illegible]	1.53
As, Pb	07A2B2	5	0.54	0.59	0.48	0.66	1.[illegible]	1.55	1.71	1.38	1.92	**3.92**	0.91	1.00	0.80	[illegible]	2.29

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Cobalt w/ Al	Cobalt w/ Fe	Cobalt w/ Mn	Cobalt w/ Mg	Cobalt w/ Na	Copper w/ Al	Copper w/ Fe	Copper w/ Mn	Copper w/ Mg	Copper w/ Na	Iron w/ Al	Iron w/ Fe	Iron w/ Mn	Iron w/ Mg	Iron w/ Na
[a] = 2 or more cations w/ ratios > 4																	
As	07A2B3	3	0.56	0.53	0.45	0.57	2.01	0.25	0.23	0.20	0.25	0.88	1.07	1.00	0.85	1.09	**3.81**
As	07A2B3	5	0.67	0.80	1.10	0.82	1.10	0.51	0.61	0.84	0.63	0.84	0.83	1.00	1.37	1.02	1.38
As	07A2B3	1	0.67	0.56	1.05	0.81	1.73	0.88	0.73	1.36	1.05	2.25	1.20	1.00	1.86	1.43	**3.07**
As	07A2B4	1	1.22	1.04	1.21	0.89	1.48	1.16	0.99	1.16	0.85	1.41	1.17	1.00	1.16	0.86	1.42
As	07A2B4	3	1.24	1.02	0.92	1.02	1.48	2.44	2.01	1.82	2.03	2.93	1.21	1.00	0.90	1.01	1.45
Mn	07A2B4	5	1.20	1.30	0.37	0.85	1.45	1.66	1.80	0.51	1.18	2.01	0.92	1.00	0.28	0.66	1.12
	07A2B5	1	1.11	1.38	1.30	0.87	0.70	1.02	1.26	1.19	0.79	0.64	0.81	1.00	0.94	0.63	0.51
	07A2B5	3	1.27	1.57	1.63	1.07	0.44	0.95	1.17	1.22	0.80	0.33	0.81	1.00	1.04	0.68	0.28
	07A2B5	5	0.90	1.05	0.93	0.64	0.27	1.06	1.24	1.10	0.75	0.32	0.85	1.00	0.89	0.61	0.25
	10A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1D	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	12A1B1	1	1.03	1.29	0.81	1.08	0.71	0.88	1.10	0.69	0.93	0.61	0.80	1.00	0.63	0.84	0.55
	12A1B2	1	0.95	0.51	0.88	0.95	0.71	0.85	0.46	0.78	0.84	0.63	1.86	1.00	1.72	1.86	1.38
	12A1B3	1	0.95	0.71	0.81	1.03	0.73	0.92	0.68	0.78	1.00	0.70	1.34	1.00	1.15	1.46	1.03
	12A1B4	1	1.12	0.74	0.82	1.20	0.79	0.83	0.55	0.61	0.89	0.58	1.53	1.00	1.11	1.63	1.07
	12A1B5	1	1.05	0.78	0.80	0.90	0.79	1.26	0.94	0.97	1.09	0.95	1.34	1.00	1.03	1.16	1.01
Cr(VI), Co	12A2B1	1	**4.07**	**3.72**	**6.40**	**7.36**	1.74	1.33	1.21	2.09	2.40	0.57	1.10	1.00	1.72	1.98	0.47
Cr(VI), Pb	12A2B2	1	1.03	0.94	1.59	1.58	0.60	1.48	1.34	2.27	2.25	0.85	1.10	1.00	1.70	1.68	0.64
Cr(VI)	12A2B3	1	1.50	1.62	1.41	2.13	0.84	0.83	0.90	0.78	1.18	0.46	0.92	1.00	0.87	1.31	0.52
	12A2B4	1	0.59	0.62	1.18	0.91	0.22	0.79	0.82	1.57	1.20	0.29	0.96	1.00	1.90	1.46	0.35
Cr(VI)	12A2B5	1	0.95	1.01	1.19	1.39	0.32	0.85	0.90	1.06	1.24	0.28	0.94	1.00	1.18	1.38	0.32
	12A3B1	1	0.73	1.07	0.90	0.89	1.71	0.86	1.27	1.06	1.05	2.03	0.68	1.00	0.84	0.83	1.59
	12A3B2	1	0.90	1.08	1.05	0.89	2.43	0.97	1.17	1.14	0.97	2.64	0.83	1.00	0.98	0.83	2.25
	12A3B3	1	0.74	0.93	0.76	0.79	**3.11**	0.76	0.95	0.77	0.81	**3.19**	0.80	1.00	0.81	0.85	**3.35**
	12A3B4	1	0.63	0.83	0.65	0.66	1.72	1.00	1.30	1.03	1.03	2.70	0.77	1.00	0.79	0.80	2.08
Pb	12A3B5	1	0.85	1.24	1.05	1.22	1.91	1.09	1.59	1.35	1.57	2.46	0.69	1.00	0.85	0.99	1.54

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [1a]	Sample Location	Depth (ft)	Lead					Lithium					Manganese				
[1a] = 2 or more cations w/ ratios > 3			w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na	w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na	w/ Al	w/ Fe	w/ Mn	w/ Mg	w/ Na
	01A1B1	1	0.48	0.51	0.45	0.40	0.33	0.00	0.00	0.00	0.00	0.00	1.07	1.15	1.00	0.89	0.73
	01A1B1	2	0.69	0.69	0.67	0.57	0.42	0.00	0.00	0.00	0.00	0.00	1.04	1.04	1.00	0.86	0.64
	01A2B1	1	1.09	1.28	1.18	0.92	0.85	1.03	1.20	1.11	0.87	0.81	0.92	1.08	1.00	0.78	0.73
	01A2B1	3	0.53	0.58	0.57	0.47	0.46	0.82	0.89	0.87	0.72	0.70	0.94	1.02	1.00	0.83	0.81
	01A2B2	1	1.31	1.24	1.37	1.10	1.06	1.14	1.08	1.19	0.96	0.92	0.95	0.90	1.00	0.81	0.78
	01A2B3	1	0.62	0.69	0.68	0.56	0.44	0.00	0.00	0.00	0.00	0.00	0.92	1.02	1.00	0.82	0.65
	01A2B3	2	0.93	1.05	0.99	0.85	0.60	0.00	0.00	0.00	0.00	0.00	0.94	1.06	1.00	0.87	0.61
	01A2B4	1	1.47	1.69	1.72	1.30	1.03	0.81	0.93	0.95	0.71	0.57	0.86	0.99	1.00	0.75	0.60
	01A2B4	3	1.32	1.36	1.45	1.09	1.11	0.85	0.88	0.93	0.70	0.71	0.91	0.94	1.00	0.75	0.77
	02A1B1	5	0.59	0.49	0.43	0.52	0.21	1.44	1.20	1.05	1.28	0.53	1.38	1.15	1.00	1.22	0.50
As, Cr, Cr (VI), Co, Cu, Mn, Ni	02A2B1	5	1.57	0.98	0.39	0.35	1.25	2.83	1.77	0.71	0.64	2.25	**4.01**	2.51	1.00	0.90	**3.19**
Zn	03A1B1	1	2.82	2.94	**3.26**	2.34	2.10	1.19	1.24	1.37	0.99	0.89	0.87	0.90	1.00	0.72	0.65
	03A1B1	3	1.58	1.87	1.96	1.20	1.14	1.63	1.93	2.02	1.23	1.17	0.81	0.95	1.00	0.61	0.58
Cu, Pb, Zn	03A1B2	1	**11.34**	**10.79**	**13.84**	**9.95**	**11.43**	1.51	1.43	1.84	1.32	1.52	0.82	0.78	1.00	0.72	0.83
Li, Zn	03A2B1	1	1.05	1.25	1.16	1.08	0.92	**5.43**	**6.44**	**5.97**	**5.56**	**4.74**	0.91	1.08	1.00	0.93	0.79
Li, Zn	03A2B1	2	1.15	1.34	0.96	1.33	1.56	**4.30**	**4.99**	**3.60**	**4.95**	**5.81**	1.19	1.39	1.00	1.38	1.61
	04A1B1	1	0.71	0.86	0.94	0.76	0.50	0.85	1.03	1.12	0.91	0.59	0.75	0.91	1.00	0.81	0.53
	04A2B1	16	0.35	0.35	0.35	0.31	0.25	1.08	1.08	1.06	0.93	0.76	1.01	1.02	1.00	0.88	0.72
	04A2B1	5	0.42	0.44	0.59	0.45	0.53	0.73	0.76	1.02	0.78	0.92	0.71	0.75	1.00	0.76	0.90
	04A2B1	10	0.52	0.54	0.57	0.68	0.69	0.57	0.59	0.62	0.74	0.75	0.91	0.95	1.00	1.18	1.21
	04A2B1	15	0.27	0.31	0.24	0.31	0.27	0.77	0.89	0.69	0.87	0.75	1.12	1.29	1.00	1.27	1.09
	04A2B2	10	0.34	0.39	0.41	0.44	0.42	0.55	0.63	0.66	0.70	0.68	0.84	0.95	1.00	1.06	1.02
	04A2B2	15	0.38	0.40	0.42	0.38	0.09	0.88	0.93	0.97	0.87	0.20	0.91	0.96	1.00	0.90	0.21
Cr, Ni	04A2B2	20	0.41	0.44	0.47	0.21	0.17	1.10	1.18	1.24	0.56	0.45	0.88	0.95	1.00	0.45	0.36
	04A2B2	5	0.56	0.69	0.89	0.76	0.62	0.67	0.82	1.06	0.90	0.74	0.63	0.78	1.00	0.85	0.70
	04A3B1	1	0.95	0.90	0.94	0.76	0.23	1.42	1.34	1.40	1.14	0.34	1.02	0.96	1.00	0.81	0.24
	04A3B2	3	1.54	1.54	2.00	1.36	1.18	1.31	1.31	1.71	1.16	1.01	0.77	0.77	1.00	0.68	0.59
	04A3B2	1	0.94	0.94	1.07	0.77	0.66	1.29	1.29	1.47	1.05	0.91	0.88	0.88	1.00	0.72	0.62
	04A3B3	1	0.88	0.69	0.88	0.79	0.27	1.70	1.33	1.70	1.52	0.53	1.00	0.78	1.00	0.89	0.31
	04A3B3	3	0.87	0.68	1.03	0.90	0.48	2.72	2.14	**3.23**	2.83	1.50	0.84	0.66	1.00	0.87	0.46
	04A3B4	1	0.81	0.95	1.11	1.06	0.72	0.97	1.14	1.34	1.27	0.87	0.72	0.85	1.00	0.95	0.65
	04A3B4	2	0.58	0.61	0.74	0.55	0.23	1.25	1.33	1.61	1.20	0.49	0.78	0.83	1.00	0.75	0.31
	04A4B1	1	0.60	0.64	0.63	0.57	0.29	0.79	0.84	0.83	0.75	0.39	0.95	1.02	1.00	0.91	0.47
	04A4B1	3	0.64	0.64	0.62	0.67	0.49	0.78	0.77	0.75	0.82	0.59	1.04	1.03	1.00	1.09	0.79
	04A4B2	1	0.52	0.54	0.60	0.49	0.36	0.71	0.74	0.82	0.67	0.49	0.87	0.90	1.00	0.82	0.60
	04A4B2	3	0.54	0.54	0.73	0.45	0.34	0.78	0.77	1.05	0.65	0.49	0.75	0.74	1.00	0.62	0.47
As, Cr (VI)	04A5B1	1	0.46	0.47	0.47	0.41	0.15	2.26	2.33	2.29	2.00	0.75	0.99	1.02	1.00	0.87	0.33
Cr, Li, Ni	04A5B1	3	0.65	0.43	0.66	0.30	0.46	**10.86**	**7.08**	**11.00**	**5.01**	**7.71**	0.99	0.64	1.00	0.46	0.70
Cr, Co, Li, Ni	04A5B1	3	0.26	0.06	0.05	0.01	0.02	**89.33**	**19.24**	**17.19**	**4.08**	**6.05**	**5.20**	1.12	1.00	0.24	0.35
Cr, Cr (VI), Co, Li, Ni	04A5B1	1	1.61	1.59	1.19	0.45	0.58	**16.49**	**16.27**	**12.17**	**4.56**	**5.98**	1.36	1.34	1.00	0.37	0.49
	05A1B1	3	0.48	0.74	0.41	0.27	0.53	0.00	0.00	0.00	0.00	0.00	1.16	1.78	1.00	0.66	1.29
	05A1B1	1	0.39	0.59	0.38	0.25	0.39	0.00	0.00	0.00	0.00	0.00	1.04	1.57	1.00	0.67	1.05
As	05A1B2	1	1.03	1.15	0.83	0.68	1.25	0.00	0.00	0.00	0.00	0.00	1.25	1.40	1.00	0.82	1.51
	05A1B2	3	0.48	0.57	0.34	0.32	0.48	0.00	0.00	0.00	0.00	0.00	1.41	1.66	1.00	0.93	1.41
Ba	05A1B3	1	1.04	1.01	0.38	0.90	1.06	0.00	0.00	0.00	0.00	0.00	2.74	2.65	1.00	2.37	2.77
	05A1B3	3	0.57	0.62	0.41	0.46	0.82	0.00	0.00	0.00	0.00	0.00	1.38	1.49	1.00	1.11	1.97
	05A1B4	1	0.85	0.86	0.84	0.55	0.9[illegible]	0.00	0.00	0.00	0.00	0.00	1.02	1.03	1.00	[illegible]	1.09
As	05A1B5	3	0.54	0.92	0.87	0.64	0.[illegible]	0.00	0.00	0.00	0.00	0.00	0.62	1.06	1.00	[illegible]	0.63

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Lead w/ Al	Lead w/ Fe	Lead w/ Mn	Lead w/ Mg	Lead w/ Na	Lithium w/ Al	Lithium w/ Fe	Lithium w/ Mn	Lithium w/ Mg	Lithium w/ Na	Manganese w/ Al	Manganese w/ Fe	Manganese w/ Mn	Manganese w/ Mg	Manganese w/ Na
[a] = 2 or more cations w/ ratios > 4																	
As	05A1B5	1	0.61	0.75	0.64	0.42	0.56	0.00	0.00	0.00	0.00	0.00	0.96	1.18	1.00	0.65	0.88
	05A2B1	10	0.33	0.49	0.56	0.55	0.72	0.52	0.77	0.87	0.86	1.13	0.59	0.88	1.00	0.99	1.29
	05A2B1	5	0.34	0.51	0.39	0.63	0.89	0.41	0.62	0.47	0.76	1.09	0.88	1.31	1.00	1.61	2.30
As, Cr, Li, Ni	0601B10	3	0.45	0.80	0.98	0.18	0.88	**4.04**	**7.21**	**8.84**	1.65	**7.98**	0.46	0.82	1.00	0.19	0.90
As, Cr, Li, Ni	0601B10	5	0.89	1.40	1.18	0.36	1.48	**4.65**	**7.31**	**6.18**	1.88	**7.70**	0.75	1.18	1.00	0.30	1.25
As, Li	0601B10	1	0.38	0.37	0.67	0.32	0.63	2.17	2.12	**3.80**	1.84	**3.60**	0.57	0.56	1.00	0.48	0.95
As	06A1B1	5	0.43	0.35	0.48	0.39	0.13	2.10	1.72	2.34	1.91	0.62	0.90	0.74	1.00	0.82	0.26
	06A1B1	1	0.55	0.54	0.66	0.55	0.19	0.00	0.00	0.00	0.00	0.00	0.83	0.82	1.00	0.82	0.29
	06A1B1	3	0.65	0.62	0.68	0.64	0.49	0.00	0.00	0.00	0.00	0.00	0.96	0.91	1.00	0.95	0.72
As, Be, Cr (VI), Co, Cu, Mn, Pb	06A1B11	1	**22.17**	**16.65**	**6.24**	**41.60**	**6.98**	0.00	0.00	0.00	0.00	0.00	**3.56**	2.67	1.00	**6.67**	1.12
As, Cr (VI), Cu, Pb	06A1B11	3	**4.47**	**4.74**	**5.79**	**5.72**	2.49	0.00	0.00	0.00	0.00	0.00	0.77	0.82	1.00	0.99	0.43
As, Cr (VI), Co, Cu, Pb	06A1B11	5	**24.72**	**29.11**	**12.11**	**27.73**	**8.08**	0.00	0.00	0.00	0.00	0.00	2.04	2.40	1.00	2.29	0.67
As	06A1B2	3	0.84	0.71	0.62	0.99	0.21	0.77	0.66	0.57	0.92	0.19	1.36	1.15	1.00	1.61	0.34
As	06A1B2	5	1.03	1.04	1.17	0.84	1.34	1.29	1.31	1.47	1.05	1.68	0.88	0.89	1.00	0.72	1.14
	06A1B2	1	0.59	0.57	0.69	0.95	0.30	0.00	0.00	0.00	0.00	0.00	0.85	0.83	1.00	1.39	0.44
As	06A1B3	5	0.46	0.36	0.39	0.49	0.54	0.68	0.54	0.58	0.72	0.80	1.17	0.92	1.00	1.24	1.38
	06A1B3	1	0.75	0.63	0.89	1.14	0.47	0.00	0.00	0.00	0.00	0.00	0.84	0.70	1.00	1.27	0.53
	06A1B3	3	0.59	0.54	0.72	0.92	0.53	0.00	0.00	0.00	0.00	0.00	0.82	0.75	1.00	1.27	0.74
As	06A1B4	5	0.45	0.52	0.86	0.30	0.13	1.02	1.18	1.96	0.69	0.30	0.52	0.60	1.00	0.35	0.15
	06A1B4	3	0.28	0.51	1.25	0.44	0.22	0.00	0.00	0.00	0.00	0.00	0.22	0.40	1.00	0.35	0.17
As, Cr, Cu	06A1B4	1	1.36	1.32	2.27	1.95	0.90	0.00	0.00	0.00	0.00	0.00	0.60	0.58	1.00	0.86	0.40
As, Cr	06A1B5	5	1.34	1.42	1.05	1.17	0.99	1.39	1.48	1.09	1.21	1.02	1.27	1.36	1.00	1.11	0.94
Cr	06A1B5	1	0.55	0.64	0.60	0.76	0.44	0.00	0.00	0.00	0.00	0.00	0.92	1.06	1.00	1.25	0.72
Cr	06A1B5	3	0.66	0.63	0.72	0.80	0.52	0.00	0.00	0.00	0.00	0.00	0.92	0.87	1.00	1.11	0.72
As	06A1B6	5	0.69	0.57	0.57	0.57	0.78	0.86	0.71	0.71	0.71	0.97	1.21	0.99	1.00	1.00	1.36
	06A1B6	1	1.07	0.76	1.45	1.29	0.30	0.00	0.00	0.00	0.00	0.00	0.74	0.52	1.00	0.89	0.21
	06A1B6	3	0.69	0.62	1.09	0.85	0.62	0.00	0.00	0.00	0.00	0.00	0.64	0.57	1.00	0.78	0.57
	06A1B7	1	0.63	0.59	0.84	1.02	0.69	0.00	0.00	0.00	0.00	0.00	0.75	0.70	1.00	1.22	0.83
	06A1B7	3	0.81	0.61	1.01	1.06	0.33	0.00	0.00	0.00	0.00	0.00	0.80	0.61	1.00	1.05	0.33
As	06A1B7	5	0.61	0.61	0.50	0.48	0.35	0.00	0.00	0.00	0.00	0.00	1.23	1.23	1.00	0.98	0.71
As, Cr, Cr(VI), Ni	06A1B8	5	2.89	2.18	1.11	1.49	0.48	2.30	1.73	0.88	1.18	0.38	2.60	1.96	1.00	1.33	0.43
Cr, Ni, Zn	06A1B8	1	1.88	1.73	1.74	1.50	0.91	1.81	1.67	1.67	1.45	0.88	1.08	1.00	1.00	0.87	0.53
Cr, Cr(VI), Ni, Zn	06A1B8	2	1.63	1.76	1.45	1.23	0.66	1.70	1.83	1.51	1.28	0.69	1.13	1.22	1.00	0.85	0.46
As	06A1B9	3	0.62	0.48	0.47	0.57	0.26	0.92	0.72	0.69	0.84	0.38	1.33	1.04	1.00	1.21	0.56
As	06A1B9	5	0.68	0.59	0.52	0.51	0.39	1.13	0.98	0.87	0.85	0.65	1.30	1.13	1.00	0.99	0.75
	06A1B9	1	0.33	0.35	0.45	0.30	0.14	0.75	0.80	1.05	0.70	0.32	0.72	0.77	1.00	0.67	0.31
	06A2B1	1	0.75	0.77	1.50	0.70	0.51	0.00	0.00	0.00	0.00	0.00	0.50	0.52	1.00	0.47	0.34
	06A2B2	1	0.75	0.80	1.24	0.73	0.62	1.54	1.63	2.54	1.48	1.28	0.61	0.64	1.00	0.58	0.50
	06A2B3	1	0.45	0.47	0.87	0.38	0.15	0.81	0.85	1.57	0.69	0.28	0.52	0.54	1.00	0.44	0.18
Cr, Cr(VI), Cu, Pb, Zn	07A1S1	Surface	**37.61**	**20.65**	**17.54**	**32.00**	**12.47**	0.00	0.00	0.00	0.00	0.00	2.14	1.18	1.00	1.82	0.71
Cr, Cr(VI), Cu, Pb, Zn	07A1S2	Surface	**35.82**	**18.68**	**30.47**	**32.00**	**11.87**	0.00	0.00	0.00	0.00	0.00	1.18	0.61	1.00	1.05	0.39
Cr, Cr(VI), Cu, Pb, Zn	07A1S3	Surface	**41.79**	**26.16**	**36.19**	**37.82**	**13.85**	0.00	0.00	0.00	0.00	0.00	1.16	0.72	1.00	1.05	0.38
As	07A2B1	1	0.92	0.82	0.84	0.80	1.37	0.00	0.00	0.00	0.00	0.00	1.09	0.97	1.00	0.94	1.62
	07A2B1	3	0.57	0.49	0.47	0.43	1.14	0.00	0.00	0.00	0.00	0.00	1.21	1.04	1.00	0.91	2.43
	07A2B1	5	0.62	0.59	0.58	0.47	0.52	0.00	0.00	0.00	0.00	0.00	1.08	1.02	1.00	0.81	0.89
As, Zn	07A2B2	1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.85	1.55	1.00	1.84	2.76
	07A2B2	3	1.03	1.16	0.64	1.18	1.77	0.00	0.00	0.00	0.00	0.00	1.60	1.81	1.00	1.84	2.76
As, Pb	07A2B2	5	**10.89**	**11.99**	**9.65**	**13.46**	**27.42**	0.00	0.00	0.00	0.00	0.00	1.13	1.24	1.00	1.39	2.84

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Lead w/ Al	Lead w/ Fe	Lead w/ Mn	Lead w/ Mg	Lead w/ Na	Lithium w/ Al	Lithium w/ Fe	Lithium w/ Mn	Lithium w/ Mg	Lithium w/ Na	Manganese w/ Al	Manganese w/ Fe	Manganese w/ Mn	Manganese w/ Mg	Manganese w/ Na
[a] = 2 or more cations w/ ratios > 5																	
As	07A2B3	3	0.46	0.43	0.37	0.47	1.65	0.00	0.00	0.00	0.00	0.00	1.26	1.18	1.00	1.29	**4.50**
As	07A2B3	5	0.47	0.57	0.78	0.58	0.78	0.00	0.00	0.00	0.00	0.00	0.61	0.73	1.00	0.75	1.00
As	07A2B3	1	0.81	0.68	1.26	0.97	2.08	0.00	0.00	0.00	0.00	0.00	0.64	0.54	1.00	0.77	1.65
As	07A2B4	1	0.78	0.67	0.78	0.57	0.95	0.00	0.00	0.00	0.00	0.00	1.01	0.86	1.00	0.74	1.22
As	07A2B4	3	0.63	0.52	0.47	0.52	0.75	0.00	0.00	0.00	0.00	0.00	1.34	1.11	1.00	1.11	1.61
Mn	07A2B4	5	1.20	1.30	0.37	0.85	1.45	0.00	0.00	0.00	0.00	0.00	**3.27**	**3.54**	1.00	2.33	**3.96**
	07A2B5	1	0.50	0.63	0.59	0.39	0.32	0.00	0.00	0.00	0.00	0.00	0.85	1.06	1.00	0.67	0.54
	07A2B5	3	0.55	0.68	0.71	0.47	0.19	0.00	0.00	0.00	0.00	0.00	0.78	0.96	1.00	0.66	0.27
	07A2B5	5	0.70	0.82	0.72	0.50	0.21	0.00	0.00	0.00	0.00	0.00	0.96	1.13	1.00	0.68	0.29
	10A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1D	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	12A1B1	1	0.53	0.66	0.41	0.55	0.36	0.97	1.22	0.76	1.02	0.67	1.28	1.60	1.00	1.35	0.88
	12A1B2	1	0.75	0.40	0.70	0.75	0.56	1.15	0.62	1.06	1.15	0.85	1.08	0.58	1.00	1.08	0.80
	12A1B3	1	0.88	0.65	0.75	0.95	0.67	1.12	0.83	0.96	1.22	0.86	1.17	0.87	1.00	1.27	0.89
	12A1B4	1	1.13	0.74	0.83	1.21	0.79	0.73	0.48	0.53	0.78	0.51	1.37	0.90	1.00	1.47	0.96
	12A1B5	1	2.41	1.79	1.85	2.08	1.81	1.26	0.94	0.97	1.09	0.95	1.30	0.97	1.00	1.12	0.98
Cr(VI), Co	12A2B1	1	0.63	0.57	0.99	1.14	0.27	1.39	1.26	2.18	2.50	0.59	0.64	0.58	1.00	1.15	0.27
Cr(VI), Pb	12A2B2	1	1.97	1.79	**3.04**	**3.01**	1.14	0.85	0.77	1.31	1.29	0.49	0.65	0.59	1.00	0.99	0.37
Cr(VI)	12A2B3	1	0.78	0.85	0.74	1.11	0.44	1.26	1.36	1.19	1.79	0.70	1.06	1.15	1.00	1.51	0.59
	12A2B4	1	0.52	0.54	1.03	0.79	0.19	0.56	0.58	1.11	0.85	0.20	0.50	0.53	1.00	0.77	0.18
Cr(VI)	12A2B5	1	0.69	0.74	0.87	1.02	0.23	0.72	0.76	0.90	1.06	0.24	0.80	0.85	1.00	1.17	0.27
	12A3B1	1	1.95	2.88	2.40	2.38	**4.57**	0.71	1.05	0.88	0.87	1.67	0.81	1.20	1.00	0.99	1.90
	12A3B2	1	1.17	1.41	1.37	1.16	**3.17**	1.28	1.54	1.51	1.28	**3.48**	0.85	1.03	1.00	0.85	2.31
	12A3B3	1	0.69	0.86	0.70	0.73	2.88	1.30	1.62	1.32	1.38	**5.44**	0.98	1.23	1.00	1.04	**4.12**
	12A3B4	1	1.67	2.18	1.73	1.73	**4.53**	1.28	1.67	1.33	1.33	**3.48**	0.97	1.26	1.00	1.00	2.62
Pb	12A3B5	1	2.57	**3.75**	**3.19**	**3.70**	**5.79**	0.86	1.25	1.06	1.23	1.93	0.81	1.18	1.00	1.16	1.81

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [1] (at = 2 or more cations w/ ratios > 3)	Sample Location	Depth (ft)	Nickel w/ Al	Nickel w/ Fe	Nickel w/ Mn	Nickel w/ Mg	Nickel w/ Na	Vanadium w/ Al	Vanadium w/ Fe	Vanadium w/ Mn	Vanadium w/ Mg	Vanadium w/ Na	Zinc w/ Al	Zinc w/ Fe	Zinc w/ Mn	Zinc w/ Mg	Zinc w/ Na
	01A1B1	1	0.91	0.98	0.86	0.76	0.62	0.95	1.02	0.89	0.79	0.65	1.35	1.45	1.26	1.13	0.92
	01A1B1	2	1.09	1.10	1.05	0.90	0.67	1.03	1.03	0.99	0.85	0.63	1.44	1.45	1.39	1.19	0.89
	01A2B1	1	0.76	0.89	0.82	0.64	0.60	0.86	1.00	0.93	0.72	0.67	1.91	2.24	2.06	1.61	1.50
	01A2B1	3	0.88	0.95	0.94	0.78	0.76	1.02	1.10	1.09	0.90	0.88	1.44	1.55	1.53	1.27	1.23
	01A2B2	1	1.07	1.01	1.12	0.91	0.87	1.10	1.04	1.15	0.93	0.89	1.27	1.20	1.33	1.08	1.03
	01A2B3	1	0.83	0.92	0.90	0.74	0.58	0.98	1.08	1.06	0.88	0.69	1.17	1.29	1.26	1.04	0.82
	01A2B3	2	0.88	0.99	0.93	0.81	0.57	0.93	1.05	0.99	0.85	0.61	1.39	1.57	1.48	1.28	0.91
	01A2B4	1	1.18	1.35	1.37	1.03	0.82	1.08	1.25	1.26	0.95	0.76	1.56	1.80	1.82	1.37	1.09
	01A2B4	3	0.95	0.98	1.04	0.79	0.80	1.16	1.19	1.26	0.95	0.97	1.39	1.43	1.52	1.15	1.16
	02A1B1	5	0.49	0.41	0.36	0.44	0.18	0.52	0.43	0.38	0.46	0.19	1.66	1.39	1.21	1.47	0.61
As, Cr, Cr (VI), Co, Cu, Mn, Ni	02A2B1	5	**49.43**	**30.93**	**12.34**	**11.12**	**39.31**	1.18	0.74	0.29	0.26	0.94	1.13	0.71	0.28	0.25	0.90
Zn	03A1B1	1	1.20	1.26	1.39	1.00	0.90	1.03	1.08	1.19	0.86	0.77	**3.51**	**3.66**	**4.05**	2.91	2.62
	03A1B1	3	0.91	1.08	1.13	0.69	0.66	1.18	1.40	1.46	0.89	0.85	1.23	1.46	1.52	0.93	0.88
Cu, Pb, Zn	03A1B2	1	1.44	1.37	1.76	1.26	1.45	0.88	0.84	1.07	0.77	0.89	**6.68**	**6.36**	**8.16**	**5.86**	**6.73**
Li, Zn	03A2B1	1	0.68	0.81	0.75	0.70	0.60	1.13	1.34	1.24	1.16	0.98	**6.14**	**7.28**	**6.75**	**6.29**	**5.35**
Li, Zn	03A2B1	2	0.79	0.92	0.66	0.91	1.07	1.15	1.34	0.97	1.33	1.56	**3.69**	**4.28**	**3.09**	**4.25**	**4.99**
	04A1B1	1	0.69	0.83	0.91	0.74	0.48	0.91	1.10	1.21	0.98	0.64	0.95	1.15	1.26	1.02	0.67
	04A2B1	16	0.65	0.65	0.64	0.57	0.46	0.97	0.97	0.95	0.84	0.68	0.98	0.99	0.97	0.86	0.70
	04A2B1	5	0.60	0.62	0.84	0.64	0.76	0.88	0.92	1.23	0.94	1.11	0.95	0.99	1.33	1.01	1.20
	04A2B1	10	0.65	0.67	0.71	0.84	0.86	0.94	0.98	1.03	1.22	1.25	0.69	0.72	0.76	0.90	0.92
	04A2B1	15	0.73	0.83	0.65	0.82	0.71	0.93	1.07	0.83	1.06	0.91	0.74	0.85	0.66	0.84	0.72
	04A2B2	10	0.72	0.82	0.86	0.91	0.88	0.86	0.98	1.03	1.09	1.05	0.70	0.79	0.83	0.88	0.85
	04A2B2	15	1.96	2.07	2.15	1.94	0.45	0.97	1.02	1.06	0.96	0.22	0.84	0.89	0.93	0.84	0.20
Cr, Ni	04A2B2	20	**5.74**	**6.19**	**6.52**	2.94	2.36	0.95	1.03	1.08	0.49	0.39	0.82	0.88	0.93	0.42	0.34
	04A2B2	5	0.60	0.73	0.95	0.80	0.66	0.83	1.02	1.32	1.12	0.92	0.72	0.89	1.14	0.97	0.80
	04A3B1	1	0.94	0.89	0.93	0.76	0.23	1.03	0.98	1.02	0.83	0.25	2.91	2.75	2.86	2.33	0.70
	04A3B2	3	0.88	0.88	1.15	0.78	0.68	1.05	1.05	1.37	0.93	0.81	1.85	1.84	2.41	1.63	1.42
	04A3B2	1	1.01	1.01	1.15	0.82	0.71	1.03	1.04	1.18	0.85	0.73	1.62	1.62	1.84	1.32	1.15
	04A3B3	1	0.80	0.62	0.80	0.72	0.25	1.20	0.94	1.20	1.07	0.37	1.40	1.09	1.40	1.25	0.43
	04A3B3	3	0.91	0.72	1.09	0.95	0.50	1.26	1.00	1.50	1.32	0.70	1.07	0.84	1.27	1.11	0.59
	04A3B4	1	0.65	0.77	0.90	0.86	0.58	0.84	0.99	1.16	1.11	0.75	0.94	1.11	1.30	1.24	0.84
	04A3B4	2	1.05	1.12	1.35	1.01	0.41	1.05	1.11	1.34	1.00	0.41	1.14	1.21	1.46	1.09	0.45
	04A4B1	1	0.65	0.69	0.68	0.62	0.32	1.15	1.23	1.21	1.10	0.57	0.90	0.96	0.95	0.86	0.44
	04A4B1	3	0.71	0.70	0.68	0.74	0.54	1.12	1.11	1.08	1.17	0.85	0.85	0.84	0.82	0.90	0.65
	04A4B2	1	0.67	0.69	0.77	0.63	0.46	1.10	1.14	1.26	1.04	0.76	0.98	1.02	1.13	0.93	0.68
	04A4B2	3	0.79	0.78	1.05	0.65	0.49	1.18	1.16	1.58	0.98	0.74	1.08	1.06	1.45	0.90	0.68
As, Cr (VI)	04A5B1	1	2.22	2.29	2.25	1.96	0.74	0.89	0.92	0.90	0.78	0.29	1.07	1.10	1.08	0.95	0.36
Cr, Li, Ni	04A5B1	3	**3.35**	2.18	**3.39**	1.54	2.38	1.64	1.07	1.66	0.76	1.17	1.56	1.02	1.58	0.72	1.11
Cr, Co, Li, Ni	04A5B1	3	**111.66**	**24.05**	**21.48**	**5.10**	**7.56**	1.69	0.36	0.32	0.08	0.11	1.71	0.37	0.33	0.08	0.12
Cr, Cr (VI), Co, Li, Ni	04A5B1	1	**13.04**	**12.86**	**9.62**	**3.60**	**4.73**	0.59	0.58	0.43	0.16	0.21	0.92	0.90	0.68	0.25	0.33
	05A1B1	3	0.73	1.12	0.63	0.42	0.81	0.90	1.38	0.78	0.51	1.00	1.11	1.71	0.96	0.64	1.24
	05A1B1	1	0.66	1.00	0.64	0.43	0.67	0.91	1.37	0.88	0.59	0.92	0.94	1.41	0.90	0.61	0.95
As	05A1B2	1	0.69	0.77	0.55	0.45	0.83	0.81	0.91	0.65	0.53	0.98	1.09	1.22	0.87	0.72	1.32
	05A1B2	3	0.71	0.83	0.50	0.46	0.71	0.88	1.04	0.62	0.58	0.88	1.14	1.34	0.81	0.75	1.14
Ba	05A1B3	1	0.90	0.87	0.33	0.78	0.91	0.86	0.83	0.31	0.74	0.86	1.20	1.17	0.44	1.04	1.22
	05A1B3	3	0.71	0.77	0.52	0.58	1.02	0.83	0.90	0.61	0.67	1.20	1.04	1.13	0.76	0.84	1.50
	05A1B4	1	1.18	1.19	1.16	0.76	1.26	0.85	0.86	0.83	0.55	0.91	1.04	1.05	1.02	0.67	1.12
As	05A1B5	3	0.30	0.52	0.49	0.36	0.31	0.49	0.84	0.79	0.59	0.50	0.64	1.09	1.03	0.76	0.65

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [(a)]	Sample Location	Depth (ft)	Nickel w/ Al	Nickel w/ Fe	Nickel w/ Mn	Nickel w/ Mg	Nickel w/ Na	Vanadium w/ Al	Vanadium w/ Fe	Vanadium w/ Mn	Vanadium w/ Mg	Vanadium w/ Na	Zinc w/ Al	Zinc w/ Fe	Zinc w/ Mn	Zinc w/ Mg	Zinc w/ Na
(a) = 2 or more cations w/ ratios > x																	
As	05A1B5	1	0.71	0.87	0.74	0.49	0.65	1.23	1.52	1.29	0.84	1.13	1.09	1.34	1.14	0.75	1.00
	05A2B1	10	0.65	0.96	1.10	1.08	1.42	0.90	1.34	1.52	1.50	1.97	0.46	0.67	0.77	0.76	0.99
	05A2B1	5	0.50	0.76	0.58	0.93	1.32	0.78	1.18	0.89	1.44	2.05	0.43	0.64	0.49	0.79	1.12
As, Cr, Li, Ni	0601B10	3	**3.08**	**5.51**	**6.75**	1.26	**6.10**	0.52	0.93	1.14	0.21	1.03	0.78	1.40	1.71	0.32	1.54
As, Cr, Li, Ni	0601B10	5	**4.44**	**6.99**	**5.91**	1.80	**7.36**	0.43	0.68	0.57	0.17	0.72	0.76	1.20	1.01	0.31	1.26
As, Li	0601B10	1	1.13	1.10	1.97	0.95	1.86	0.70	0.69	1.23	0.59	1.16	0.70	0.68	1.22	0.59	1.16
As	06A1B1	5	0.87	0.71	0.97	0.79	0.26	0.98	0.80	1.09	0.89	0.29	1.38	1.13	1.54	1.25	0.41
	06A1B1	1	0.79	0.78	0.95	0.79	0.28	1.00	0.99	1.21	1.00	0.35	1.30	1.28	1.57	1.29	0.45
	06A1B1	3	1.06	1.01	1.10	1.05	0.79	1.11	1.06	1.16	1.10	0.83	1.03	0.98	1.07	1.02	0.77
As, Be, Cr (VI), Co, Cu, Mn, Pb	06A1B11	1	1.92	1.44	0.54	**3.60**	0.60	1.08	0.81	0.30	2.03	0.34	1.05	0.78	0.29	1.96	0.33
As, Cr (VI), Cu, Pb	06A1B11	3	0.75	0.80	0.97	0.96	0.42	0.51	0.54	0.66	0.65	0.28	0.88	0.93	1.14	1.12	0.49
As, Cr (VI), Co, Cu, Pb	06A1B11	5	1.30	1.54	0.64	1.46	0.43	0.73	0.86	0.36	0.82	0.24	1.23	1.44	0.60	1.37	0.40
As	06A1B2	3	0.93	0.79	0.69	1.11	0.23	1.28	1.09	0.94	1.52	0.32	0.70	0.59	0.51	0.83	0.18
As	06A1B2	5	0.81	0.82	0.92	0.66	1.05	1.03	1.05	1.18	0.84	1.35	0.96	0.97	1.09	0.78	1.25
	06A1B2	1	1.27	1.24	1.49	2.07	0.65	1.18	1.16	1.39	1.93	0.61	0.66	0.65	0.78	1.08	0.34
As	06A1B3	5	0.87	0.69	0.74	0.92	1.03	1.15	0.91	0.99	1.23	1.37	0.79	0.63	0.68	0.84	0.94
	06A1B3	1	1.29	1.08	1.53	1.95	0.81	1.33	1.11	1.58	2.01	0.83	0.74	0.62	0.88	1.13	0.47
	06A1B3	3	1.20	1.10	1.46	1.86	1.08	1.15	1.05	1.40	1.77	1.03	0.77	0.71	0.94	1.19	0.69
As	06A1B4	5	1.23	1.42	2.36	0.83	0.36	1.15	1.34	2.22	0.79	0.34	0.70	0.81	1.35	0.48	0.20
	06A1B4	3	0.69	1.25	**3.08**	1.09	0.53	0.66	1.19	2.94	1.04	0.51	0.46	0.84	2.07	0.73	0.36
As, Cr, Cu	06A1B4	1	1.17	1.13	1.95	1.67	0.77	0.72	0.70	1.20	1.03	0.48	1.35	1.31	2.25	1.93	0.90
As, Cr	06A1B5	5	1.40	1.49	1.10	1.22	1.03	0.99	1.06	0.78	0.87	0.73	0.85	0.90	0.67	0.74	0.63
Cr	06A1B5	1	1.37	1.58	1.49	1.87	1.08	0.80	0.92	0.87	1.09	0.63	0.91	1.05	1.00	1.24	0.72
Cr	06A1B5	3	1.85	1.75	2.02	2.23	1.45	0.91	0.85	0.99	1.09	0.71	0.83	0.78	0.90	1.00	0.65
As	06A1B6	5	0.78	0.64	0.64	0.64	0.87	1.17	0.96	0.96	0.96	1.31	0.94	0.77	0.78	0.78	1.06
	06A1B6	1	1.10	0.78	1.50	1.33	0.31	1.60	1.14	2.18	1.93	0.46	1.25	0.89	1.70	1.51	0.35
	06A1B6	3	0.70	0.63	1.10	0.86	0.63	1.30	1.16	2.04	1.59	1.17	0.90	0.81	1.41	1.10	0.81
	06A1B7	1	0.86	0.81	1.15	1.41	0.95	1.23	1.15	1.63	2.00	1.35	0.92	0.87	1.23	1.51	1.02
	06A1B7	3	1.04	0.79	1.31	1.37	0.43	1.39	1.06	1.74	1.83	0.58	0.90	0.69	1.13	1.18	0.37
As	06A1B7	5	0.68	0.68	0.55	0.54	0.39	1.03	1.02	0.83	0.81	0.59	1.06	1.05	0.86	0.84	0.61
As, Cr, Cr(VI), Ni	06A1B8	5	**11.58**	**8.72**	**4.46**	**5.95**	1.92	0.81	0.61	0.31	0.42	0.13	0.88	0.66	0.34	0.45	0.15
Cr, Ni, Zn	06A1B8	1	**5.70**	**5.25**	**5.27**	**4.56**	2.77	0.79	0.73	0.73	0.63	0.38	**4.21**	**3.88**	**3.89**	**3.37**	2.04
Cr, Cr(VI), Ni, Zn	06A1B8	2	**5.32**	**5.74**	**4.73**	**4.01**	2.16	0.73	0.78	0.65	0.55	0.29	**3.31**	**3.57**	2.94	2.50	1.34
As	06A1B9	3	0.67	0.52	0.50	0.61	0.28	1.10	0.86	0.83	1.00	0.46	0.92	0.72	0.69	0.84	0.39
As	06A1B9	5	0.85	0.74	0.65	0.64	0.49	1.03	0.89	0.79	0.78	0.60	1.14	0.99	0.87	0.86	0.66
	06A1B9	1	0.66	0.70	0.91	0.61	0.28	1.11	1.19	1.54	1.02	0.47	0.96	1.03	1.33	0.89	0.41
	06A2B1	1	1.13	1.16	2.24	1.05	0.76	0.87	0.90	1.74	0.81	0.59	0.91	0.94	1.82	0.85	0.61
	06A2B2	1	1.16	1.22	1.91	1.11	0.96	0.77	0.81	1.27	0.74	0.64	0.95	1.01	1.57	0.92	0.79
	06A2B3	1	1.32	1.38	2.55	1.13	0.45	1.04	1.08	2.00	0.88	0.35	0.99	1.04	1.91	0.84	0.34
Cr, Cr(VI), Cu, Pb, Zn	07A1S1	Surface	2.28	1.25	1.06	1.94	0.76	1.28	0.70	0.60	1.09	0.43	**49.66**	**27.26**	**23.16**	**42.24**	**16.46**
Cr, Cr(VI), Cu, Pb, Zn	07A1S2	Surface	2.61	1.36	2.22	2.33	0.86	1.28	0.67	1.09	1.15	0.43	**15.48**	**8.07**	**13.17**	**13.83**	**5.13**
Cr, Cr(VI), Cu, Pb, Zn	07A1S3	Surface	1.77	1.11	1.54	1.61	0.59	1.14	0.71	0.99	1.03	0.38	**13.04**	**8.16**	**11.29**	**11.80**	**4.32**
As	07A2B1	1	0.68	0.61	0.63	0.59	1.02	1.26	1.13	1.16	1.09	1.88	0.98	0.88	0.91	0.86	1.47
	07A2B1	3	0.38	0.33	0.32	0.29	0.77	0.98	0.85	0.81	0.74	1.98	0.99	0.85	0.82	0.74	1.98
	07A2B1	5	0.64	0.60	0.59	0.48	0.53	1.34	1.26	1.24	1.00	1.11	0.94	0.89	0.87	0.71	0.78
As, Zn	07A2B2	1	0.41	0.34	0.22	0.40	0.60	0.86	0.72	0.46	0.85	1.28	**10.83**	**9.08**	**5.86**	**10.78**	**16.16**
	07A2B2	3	0.35	0.40	0.22	0.40	0.6[illegible]	0.69	0.78	0.43	0.79	1.19	1.15	1.29	0.72	[illegible]	1.97
As, Pb	07A2B2	5	0.30	0.33	0.27	0.37	0.7[illegible]	0.84	0.93	0.75	1.04	2.13	1.26	1.39	1.12	[illegible]	**3.17**

Table A-14. Calculated Enrichment Ratios for Each Soil Sample and Metals with Greater Than 80 Percent Detections

Enriched Metals [a]	Sample Location	Depth (ft)	Nickel w/ Al	Nickel w/ Fe	Nickel w/ Mn	Nickel w/ Mg	Nickel w/ Na	Vanadium w/ Al	Vanadium w/ Fe	Vanadium w/ Mn	Vanadium w/ Mg	Vanadium w/ Na	Zinc w/ Al	Zinc w/ Fe	Zinc w/ Mn	Zinc w/ Mg	Zinc w/ Na
[a] = 2 or more cations w/ ratios > 5																	
As	07A2B3	3	0.72	0.67	0.57	0.73	2.56	1.21	1.13	0.96	1.23	**4.32**	0.84	0.78	0.66	0.85	2.99
As	07A2B3	5	0.29	0.34	0.47	0.35	0.47	0.94	1.13	1.55	1.16	1.56	0.56	0.67	0.92	0.68	0.92
As	07A2B3	1	0.45	0.38	0.70	0.54	1.16	1.35	1.13	2.10	1.62	**3.47**	0.62	0.52	0.97	0.74	1.60
As	07A2B4	1	0.53	0.45	0.53	0.39	0.64	0.99	0.85	0.99	0.73	1.21	1.18	1.00	1.17	0.86	1.43
As	07A2B4	3	0.56	0.46	0.41	0.46	0.66	1.11	0.92	0.83	0.92	1.33	1.05	0.87	0.78	0.87	1.26
Mn	07A2B4	5	0.93	1.01	0.28	0.66	1.12	1.24	1.34	0.38	0.88	1.49	1.04	1.12	0.32	0.74	1.25
	07A2B5	1	0.66	0.82	0.77	0.51	0.42	1.05	1.30	1.22	0.81	0.66	0.90	1.12	1.06	0.70	0.57
	07A2B5	3	0.66	0.81	0.85	0.56	0.23	0.91	1.13	1.17	0.77	0.32	0.80	0.99	1.03	0.68	0.28
	07A2B5	5	0.77	0.90	0.80	0.55	0.23	0.95	1.12	0.99	0.68	0.28	1.04	1.22	1.08	0.74	0.31
	10A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	10A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B1D	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B2	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	11A1B3	1	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**	**Not Calc.**
	12A1B1	1	0.68	0.86	0.54	0.72	0.47	0.90	1.12	0.70	0.95	0.62	0.95	1.19	0.74	1.00	0.65
	12A1B2	1	0.63	0.34	0.59	0.63	0.47	0.91	0.49	0.84	0.91	0.67	0.92	0.49	0.85	0.92	0.68
	12A1B3	1	0.76	0.57	0.65	0.83	0.58	0.94	0.70	0.80	1.02	0.72	1.10	0.82	0.94	1.19	0.84
	12A1B4	1	0.64	0.42	0.47	0.68	0.45	1.05	0.69	0.77	1.12	0.73	1.13	0.74	0.82	1.21	0.79
	12A1B5	1	0.68	0.51	0.53	0.59	0.52	0.92	0.69	0.71	0.80	0.70	1.37	1.02	1.06	1.19	1.03
Cr(VI), Co	12A2B1	1	1.02	0.93	1.61	1.85	0.44	0.99	0.91	1.56	1.80	0.43	0.88	0.81	1.39	1.60	0.38
Cr(VI), Pb	12A2B2	1	1.20	1.09	1.84	1.83	0.69	0.93	0.84	1.43	1.42	0.54	0.99	0.90	1.53	1.51	0.57
Cr(VI)	12A2B3	1	0.83	0.90	0.78	1.18	0.46	1.09	1.18	1.03	1.55	0.61	0.77	0.83	0.73	1.09	0.43
	12A2B4	1	1.00	1.04	1.98	1.52	0.36	1.30	1.35	2.58	1.98	0.47	0.59	0.61	1.17	0.90	0.21
Cr(VI)	12A2B5	1	1.02	1.08	1.27	1.49	0.34	1.32	1.40	1.65	1.94	0.45	0.64	0.68	0.80	0.94	0.22
	12A3B1	1	0.59	0.87	0.73	0.72	1.39	0.89	1.32	1.10	1.09	2.09	0.85	1.26	1.05	1.04	1.99
	12A3B2	1	0.76	0.92	0.89	0.76	2.06	1.08	1.30	1.27	1.08	2.94	0.79	0.95	0.93	0.79	2.15
	12A3B3	1	0.87	1.09	0.89	0.93	**3.66**	1.06	1.32	1.08	1.12	**4.44**	0.71	0.89	0.73	0.76	2.99
	12A3B4	1	1.09	1.42	1.13	1.13	2.96	1.03	1.34	1.06	1.06	2.78	1.10	1.44	1.14	1.14	2.99
Pb	12A3B5	1	0.60	0.87	0.74	0.86	1.35	0.99	1.44	1.22	1.42	2.22	0.86	1.26	1.07	1.24	1.94

Table A-15. Summary of Final Ambient Concentration Limits

Analyte	Ambient Concentration Limit (mg/kg)	Method Used to Determine Limit	Rationale and Comments
Aluminum	22,729	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Ranked data plots and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Antimony	10	Reporting limit	No detects in ambient data. 99th percentile of ambient data equal to one-half the reporting limit.
Arsenic	32	99th percentile of the Combined Background data	Used 99th percentile of the Combined Background data as best representation of the ambient threshold. There is more than 25% relative difference between 99th percentile of ambient data (59 mg/kg) and 99th percentile of (32 mg/kg) the Combined Background data. The Combined Background data provides a lower, more conservative value, and geochemical evidence suggests that the 99th percentile of ambient data may not be representative of ambient conditions.
Barium	263	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Ranked data plots and geochemical relationships generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Beryllium	1.3	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Geochemical relationships and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Cadmium	0.41	99th percentile of ambient data	Less than 80 percent detects in expanded data.
Chromium	46	99th percentile of data from The Combined Background data	Used 99th percentile of the Combined Background data as best representation of ambient threshold. There is more than 25% relative difference between 99th percentile of ambient data (152 mg/kg) and 99th percentile of the Combined Background data (46 mg/kg). The Combined Background data provides a lower, more conservative value. Geochemical relationships, especially with regard to rock samples, suggest sources exist for very high naturally occurring concentrations of this metal. Risk management decisions regarding this metal should not proceed with remedies unless additional information suggests that an actual release at a location has occurred.
Hexavalent Chromium	0.94	99th percentile of ambient data	Less than 80 percent detects in expanded data.

Table A-15. Summary of Final Ambient Concentration Limits

Analyte	Ambient Concentration Limit (mg/kg)	Method Used to Determine Limit	Rationale and Comments
Cobalt	23	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Ranked data plots, geochemical relationships, and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Copper	55	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold Geochemical relationships generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Lead	64	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold Although greater than 25% relative difference exists between the 99th percentile of ambient data and 99th percentile of the Combined Background data, the percentile calculated from ambient data is more conservative (e.g. lower). Little correlation exists between this metal and cations, although some correlation exists with other metals. Geochemical correlation with other metals suggests that the 99th percentile of the ambient data is an appropriate value for the ambient concentration limit.
Lithium	22	99th percentile of ambient data	Less than 80 percent detects in expanded data.
Manganese	1172	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Although greater than 25% relative difference exists between the 99th percentile of ambient data and 99th percentile of the Combined Background data, the percentile calculated from ambient data is more conservative (e.g. lower). Geochemical relationships and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Mercury	0.10	99th percentile of ambient data	Less than 80 percent detects in expanded data.
Molybdenum	3.2	99th percentile of ambient data	Less than 80 percent detects in expanded data.

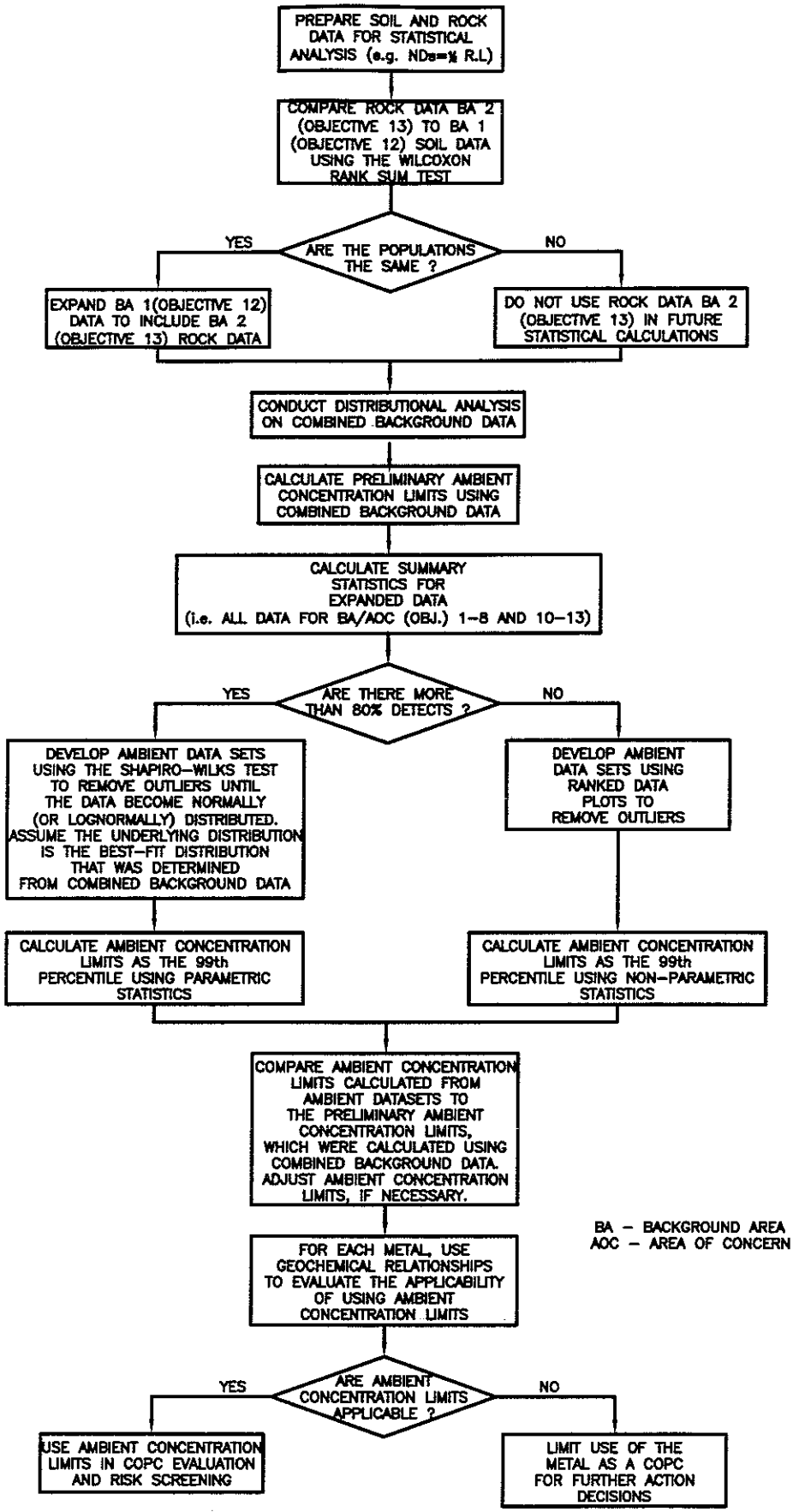
Table A-15. Summary of Final Ambient Concentration Limits

Analyte	Ambient Concentration Limit (mg/kg)	Method Used to Determine Limit	Rationale and Comments
Nickel	63	99th percentile of the Combined Background data	Used 99th percentile of the Combined Background data as best representation of ambient threshold There is more than 25% relative difference between 99th percentile of ambient data (84 mg/kg) and 99th percentile of the Combined Background data (63 mg/kg) The Combined Background data provides a lower, more conservative value. Geochemical relationships, especially with regard to rock samples, suggest sources exist for very high naturally occurring concentrations of this metal. Risk management decisions regarding this metal should not proceed with remedies unless additional information suggests that an actual release at a location has occurred.
Selenium	33	99th percentile of ambient data	Less than 80 percent detects in expanded data
Silver	1 0	Reporting limit	No detects in ambient data 99th percentile of ambient data equal to one-half the reporting limit.
Thallium	0 30	Reporting limit	No detects in ambient data. 99th percentile of ambient data equal to one-half the reporting limit.
Vanadium	122	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Ranked data plots, geochemical relationships, and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.
Zinc	125	99th percentile of ambient data	Used 99th percentile of ambient data as best representation of the ambient threshold. Ranked data plots and rock sample results generally support this concentration limit, although maximum concentrations in rock suggest higher values may be naturally occurring.

Table A-16. Comparison of Different Data Sources.

Metal	Statistical Ambient Concentration Limit (mg/kg)	Maximum Concentration in Ambient Data Set (mg/kg)	Maximum Concentation in Rock (mg/kg)
Aluminum	22,729	27,000	41,400
Antimony	10	N/C	9.53
Arsenic	32	56	14.7
Barium	263	290	1,770
Beryllium	1.3	1.5	1.43
Cadmium	0.41	0.41	0.502 U
Chromium	46	260	967
Hex. Chromium	0.94	0.94	0.702
Cobalt	23	28	94.6
Copper	55	51	263
Lead	64	110	24.8
Lithium	22	22	84.5
Manganese	1,172	1760	1,760
Mercury	0.10	0.10	0.166
Molybdenum	3.2	3.2	11.4
Nickel	63	140	820
Selenium	33	33	105
Silver	1.0	N/C	2.01 U
Thallium	0.30	N/C	2.01 U
Vanadium	122	110	94
Zinc	125	145	252

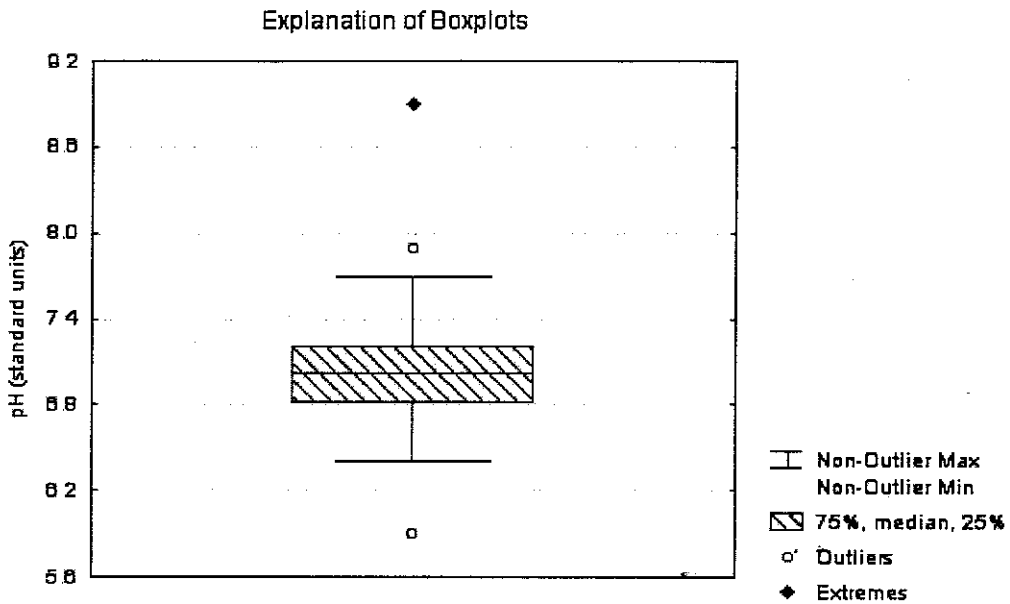
N/C = Not calculated



DATE	PROJECT NUMBER	APPROACH FOR DETERMINING AMBIENT CONCENTRATION LIMITS FOR METALS IN SOIL	
FEB. 2002	14796		
BROWN AND CALDWELL SAN DIEGO, CALIFORNIA		PROJECT LOCATION: NCCOSC MORRIS DAM R & D FACILITY AZUSA, CALIFORNIA	FIGURE A-1

LAF 14796001.DWG

Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data



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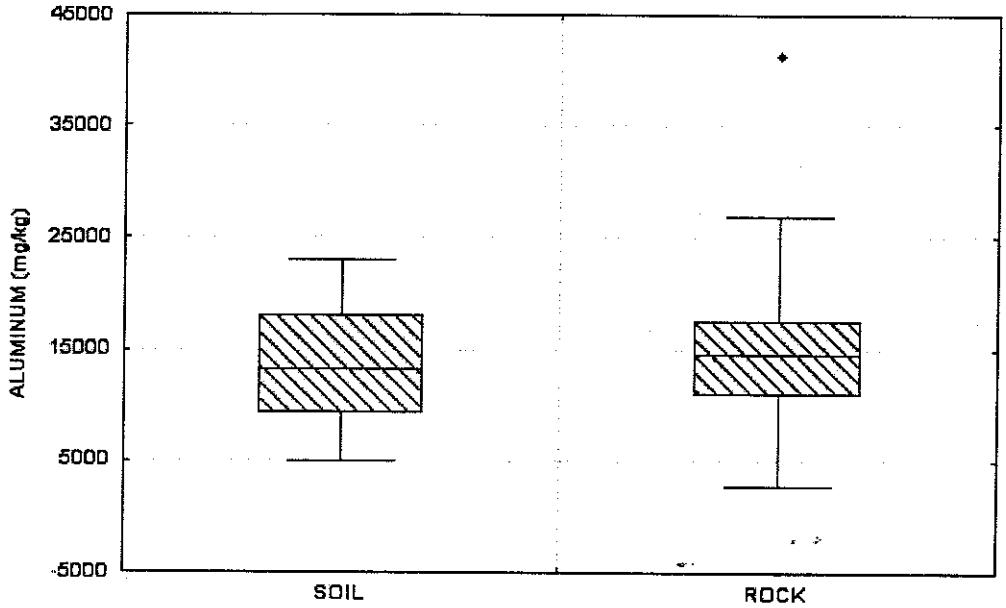

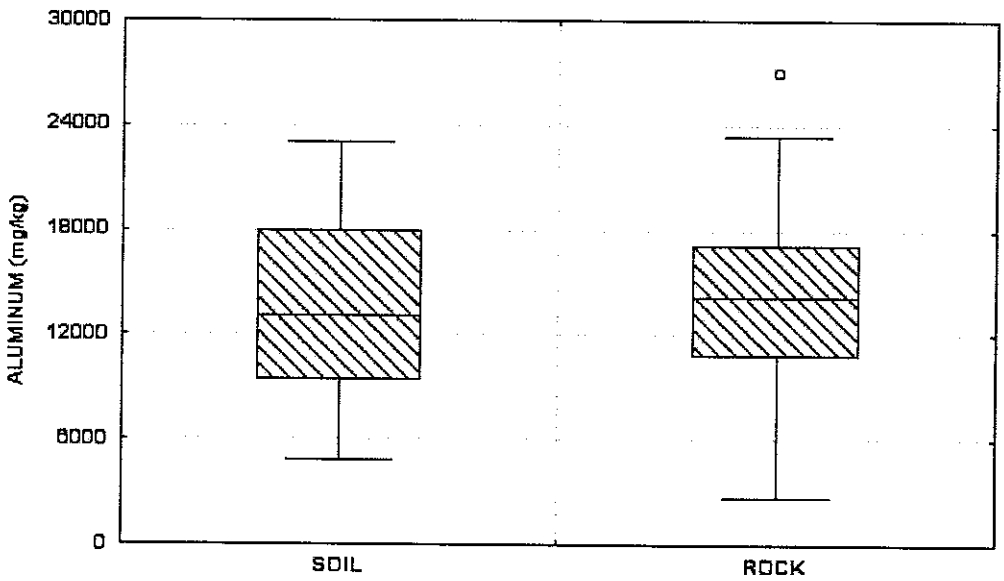

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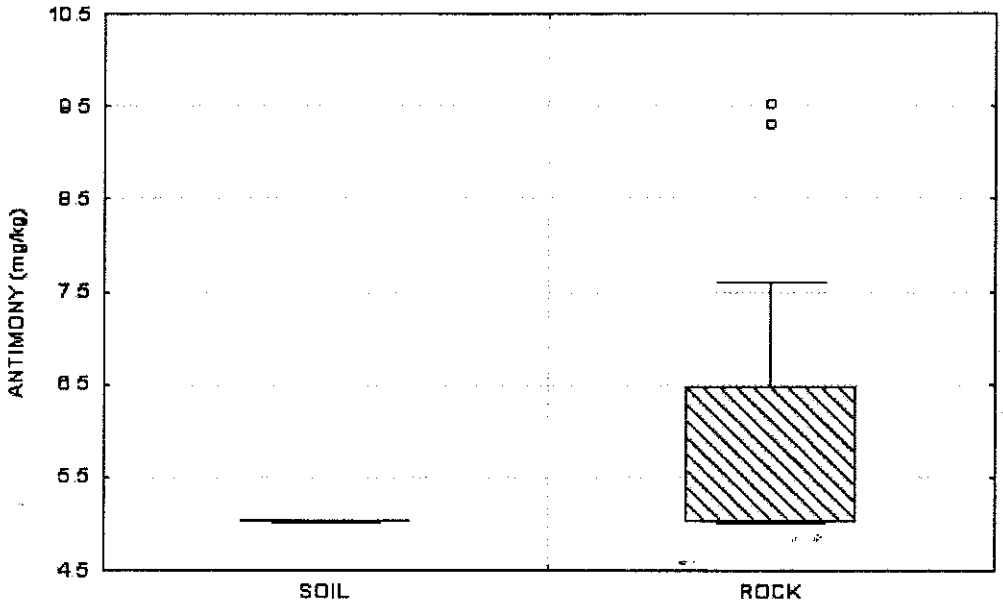

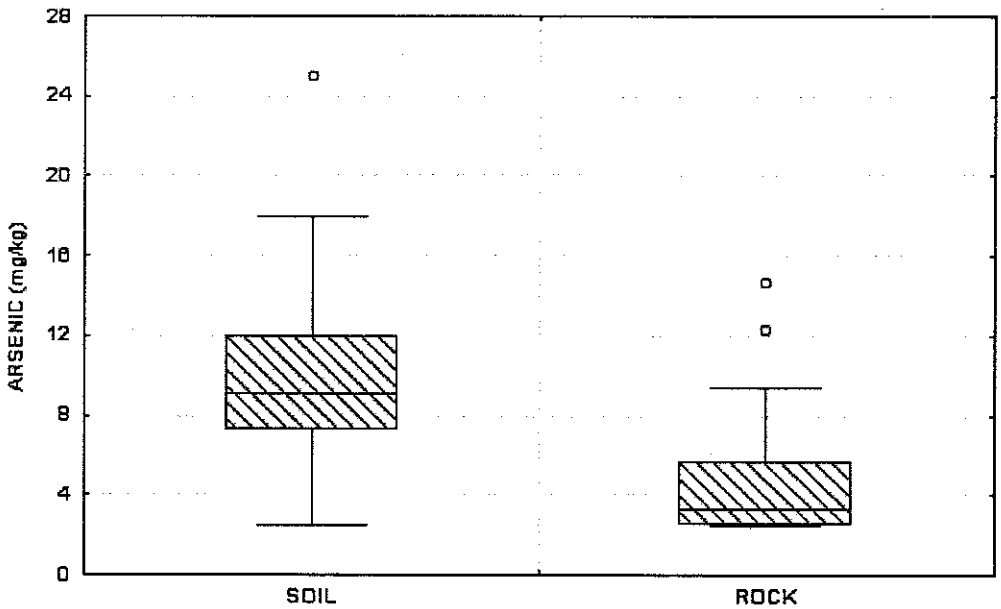

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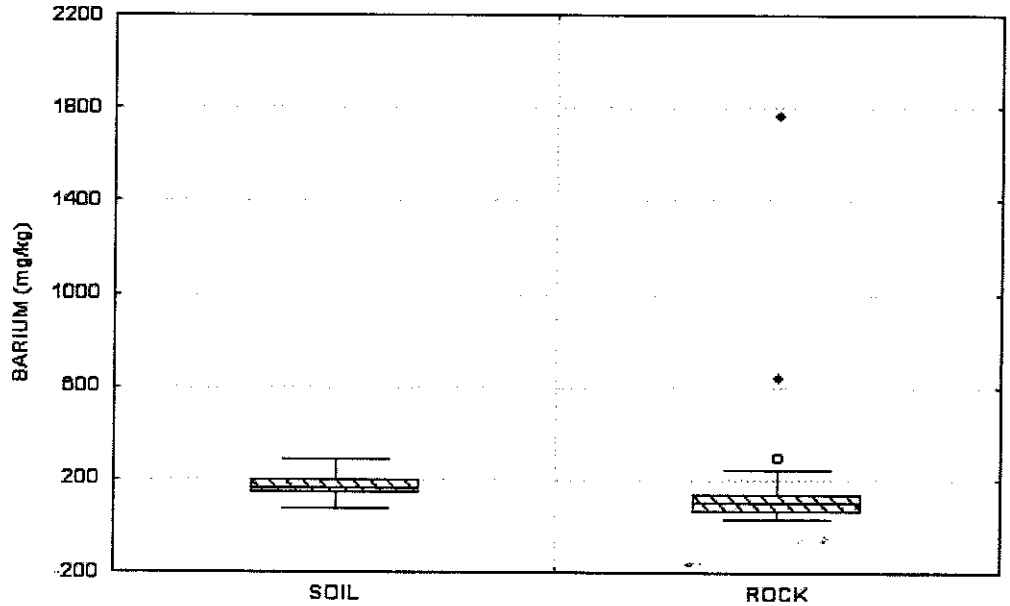

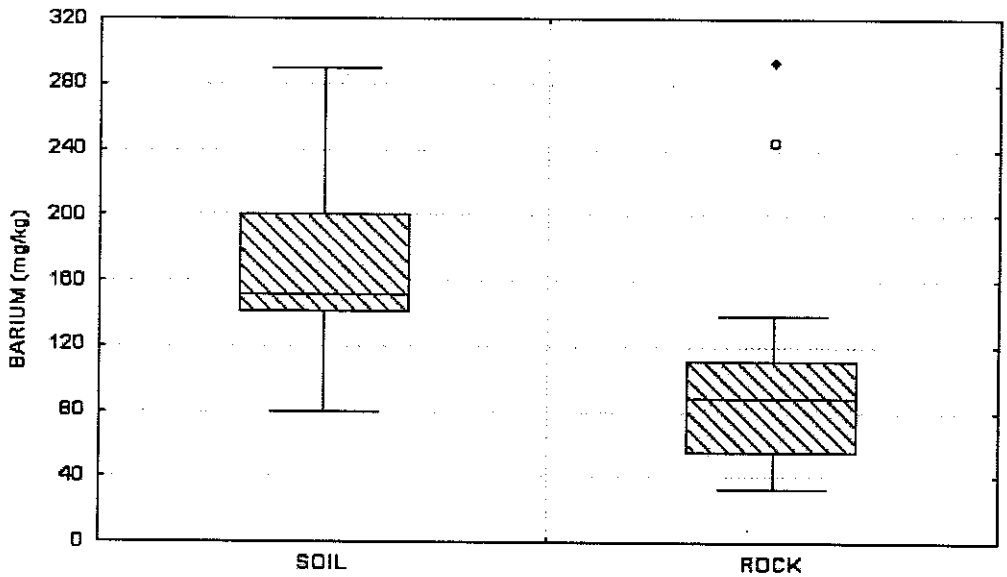

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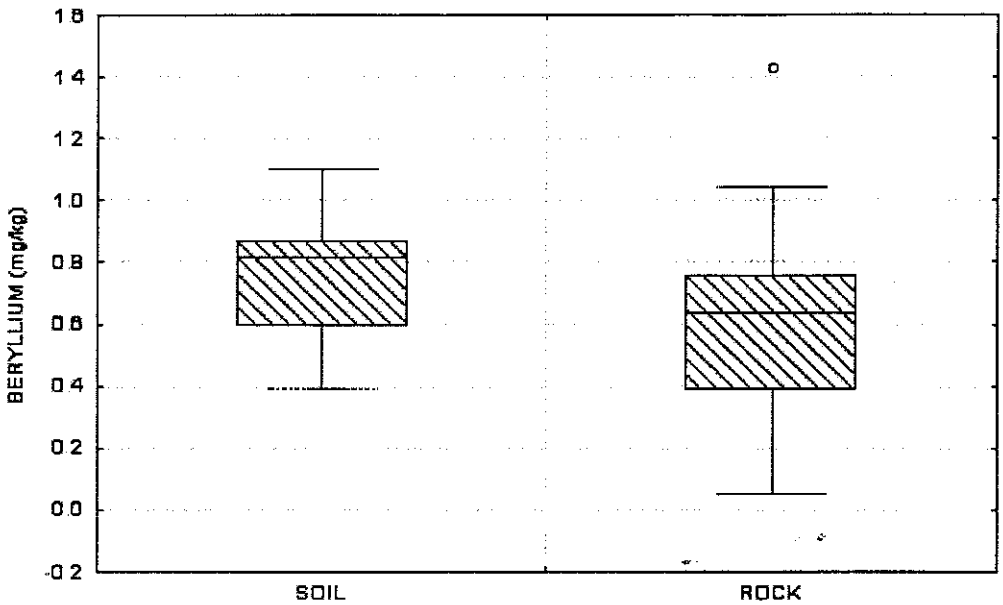
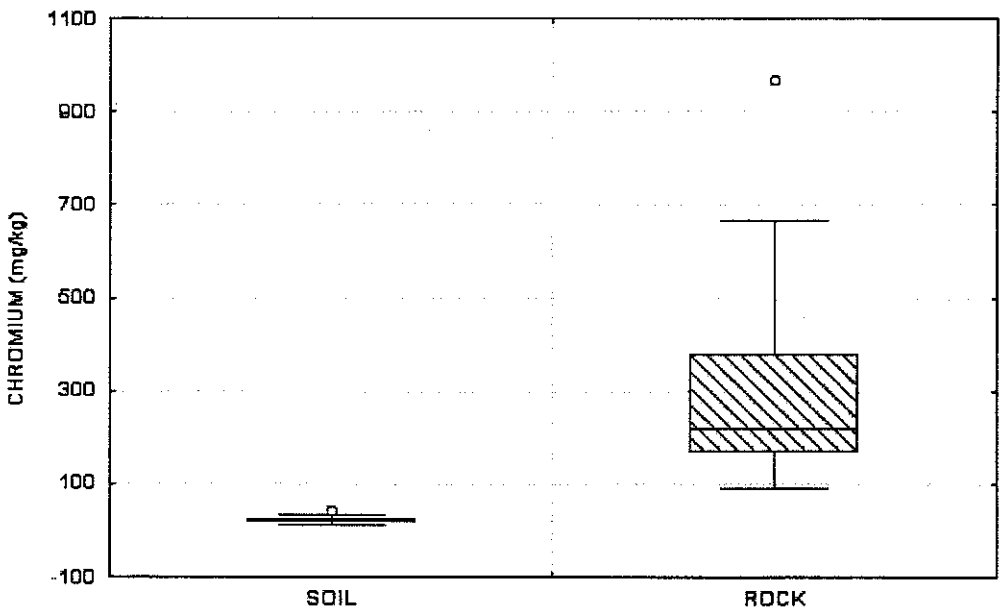
Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data





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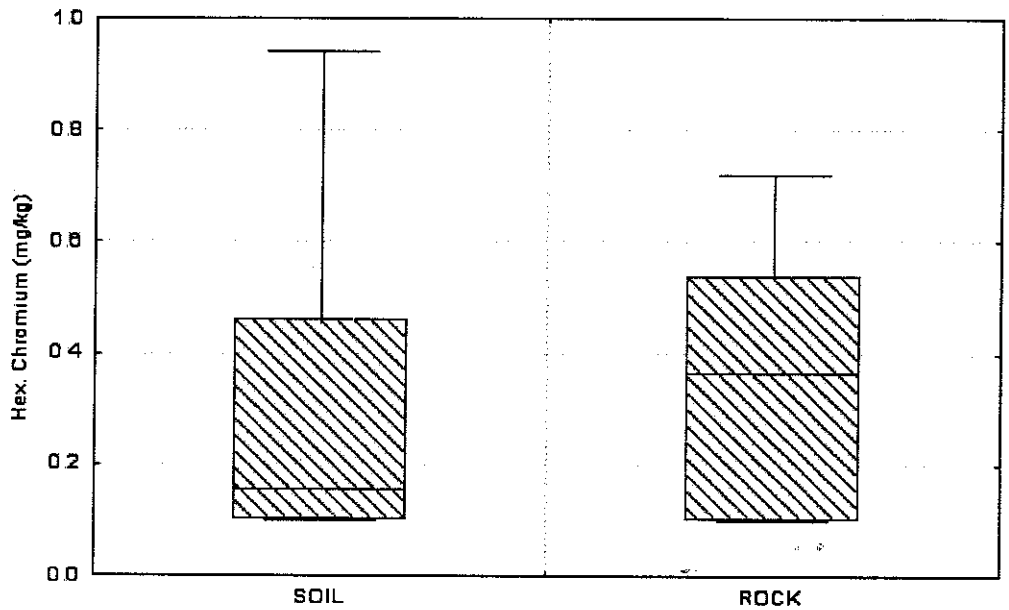


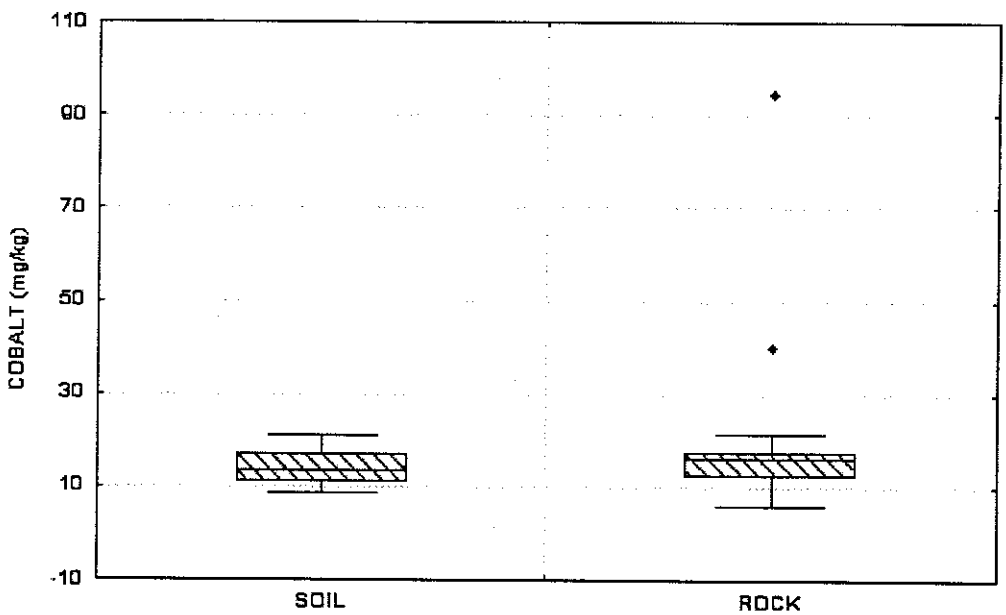
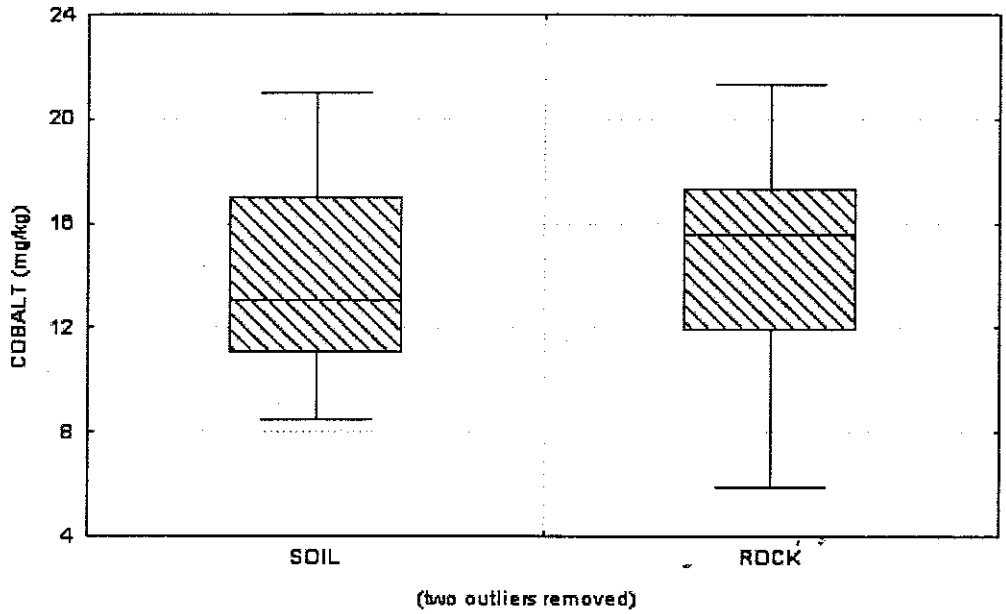
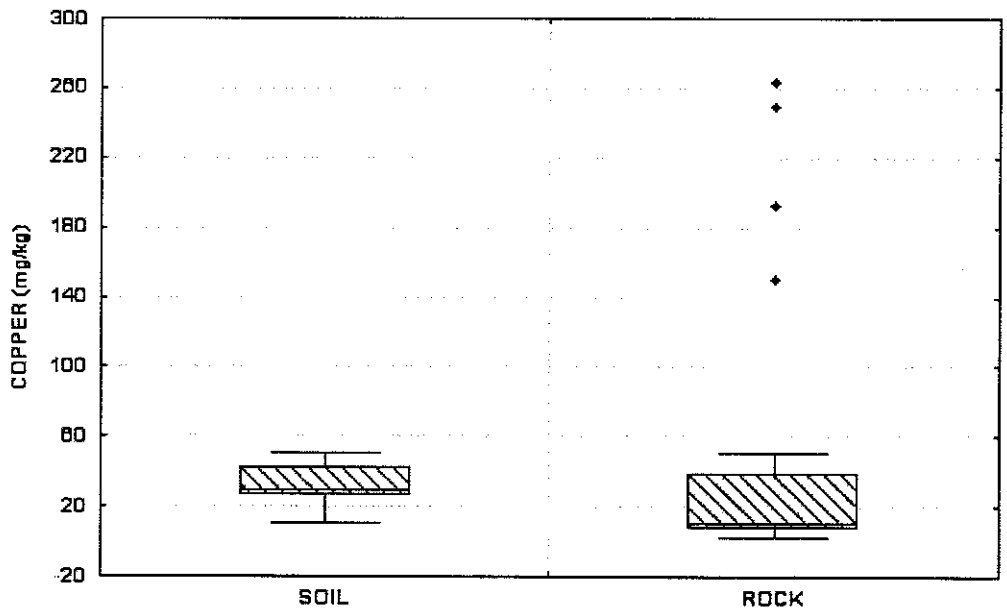


Figure A-2 Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data





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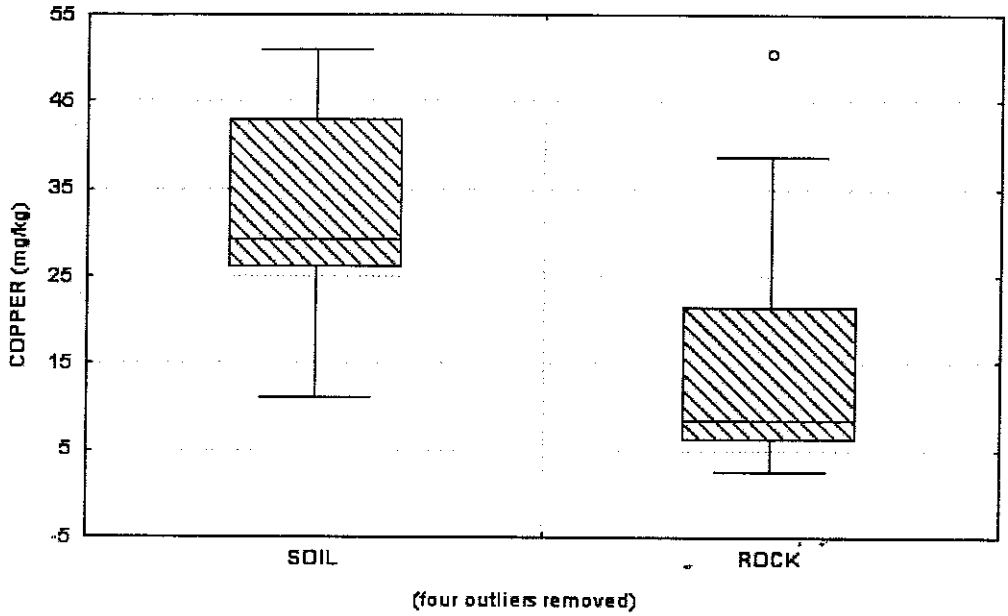

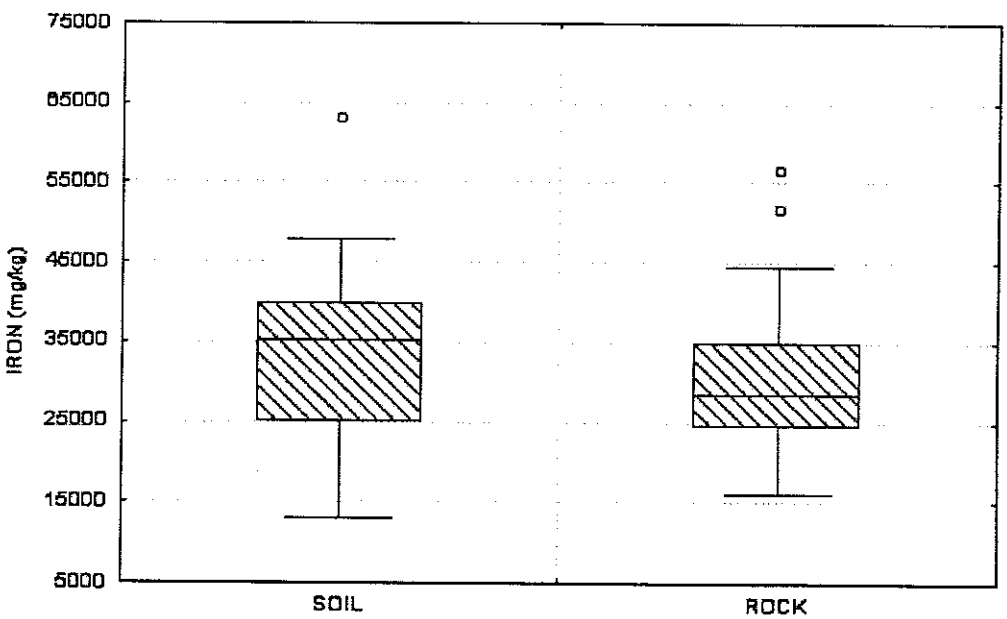

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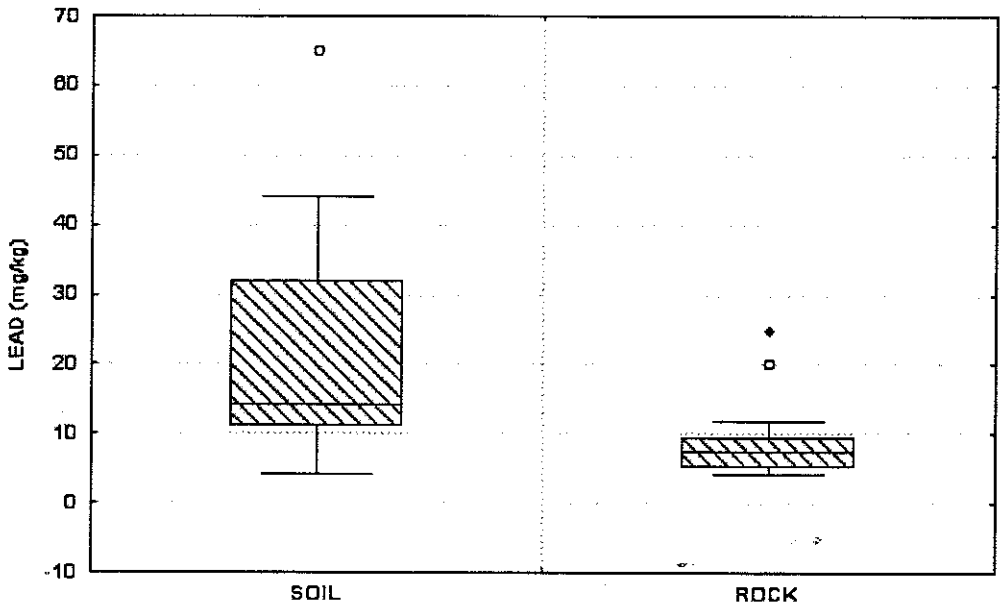

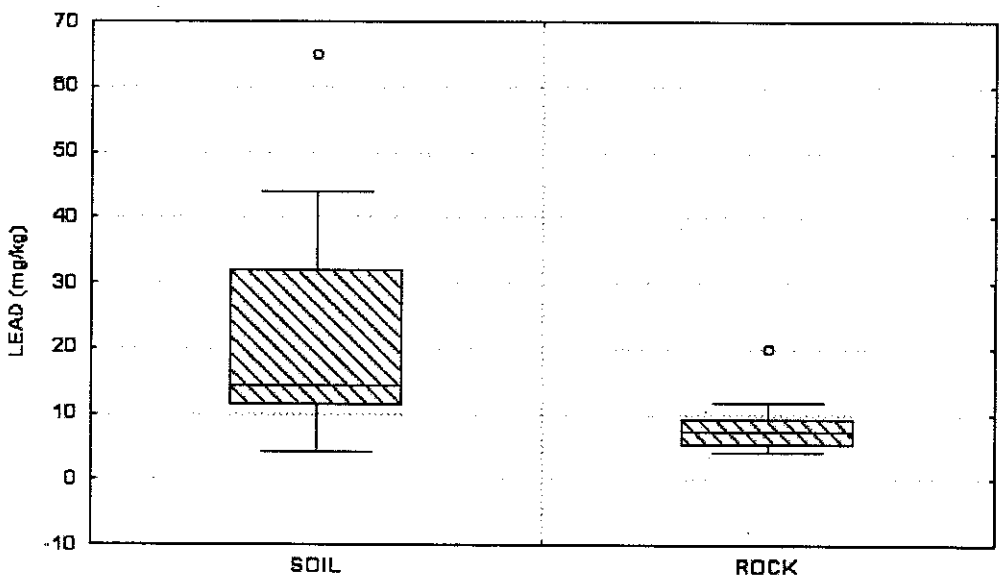

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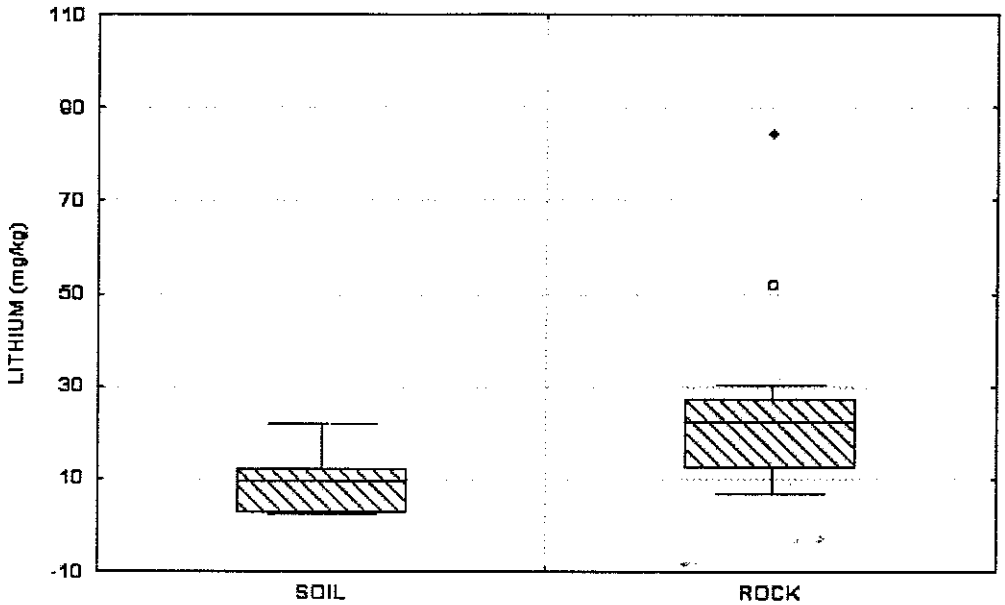
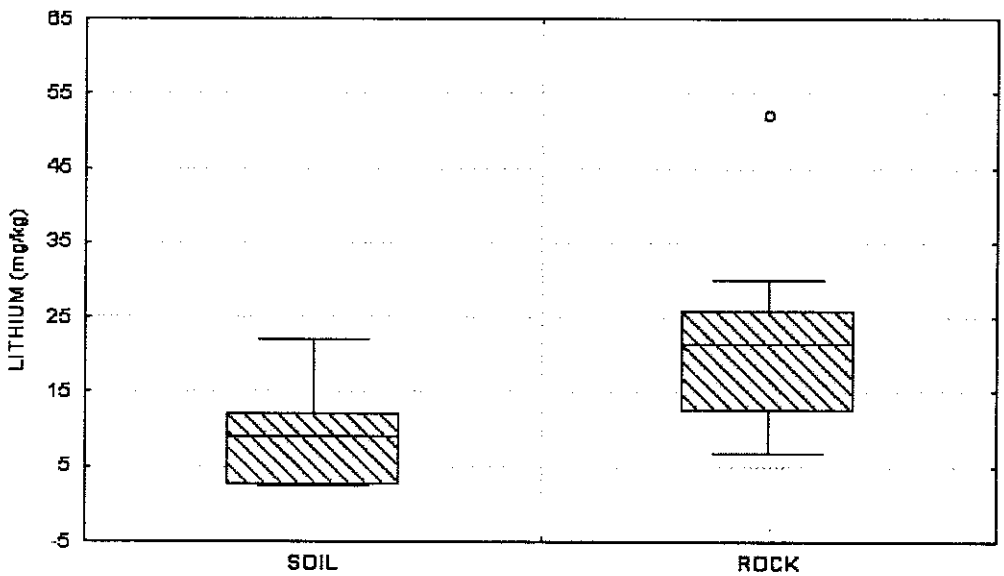
Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data





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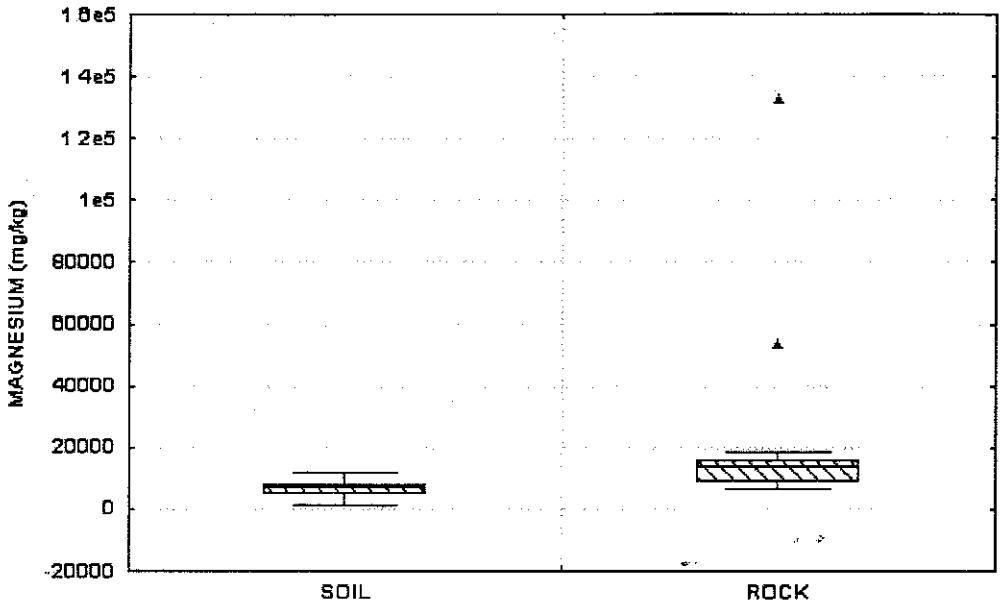

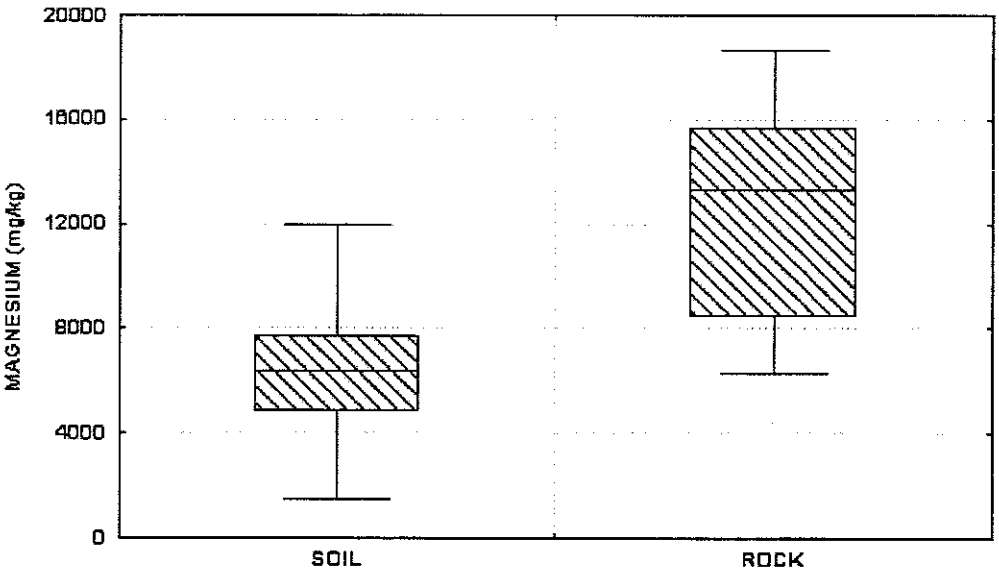

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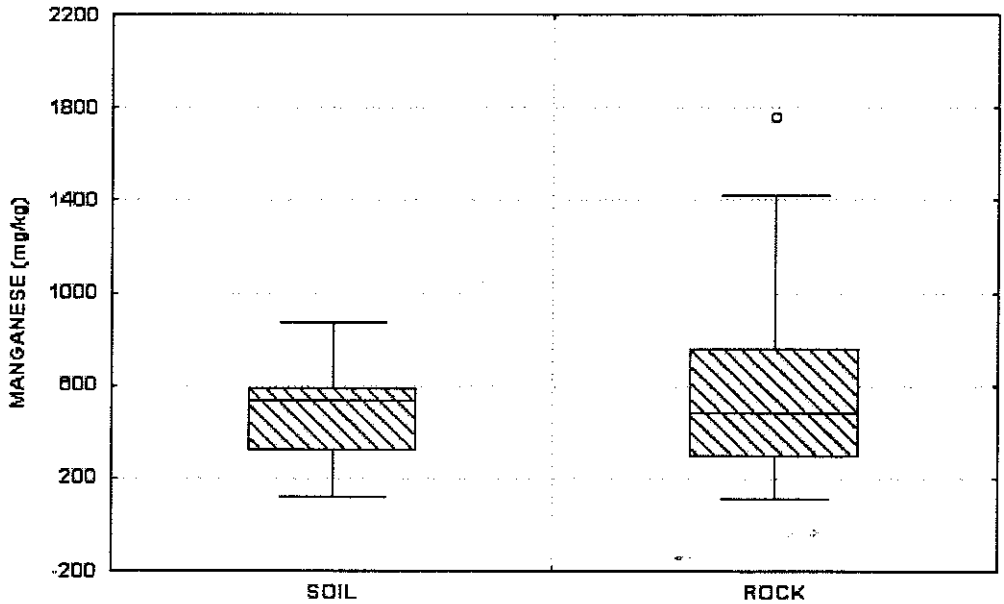
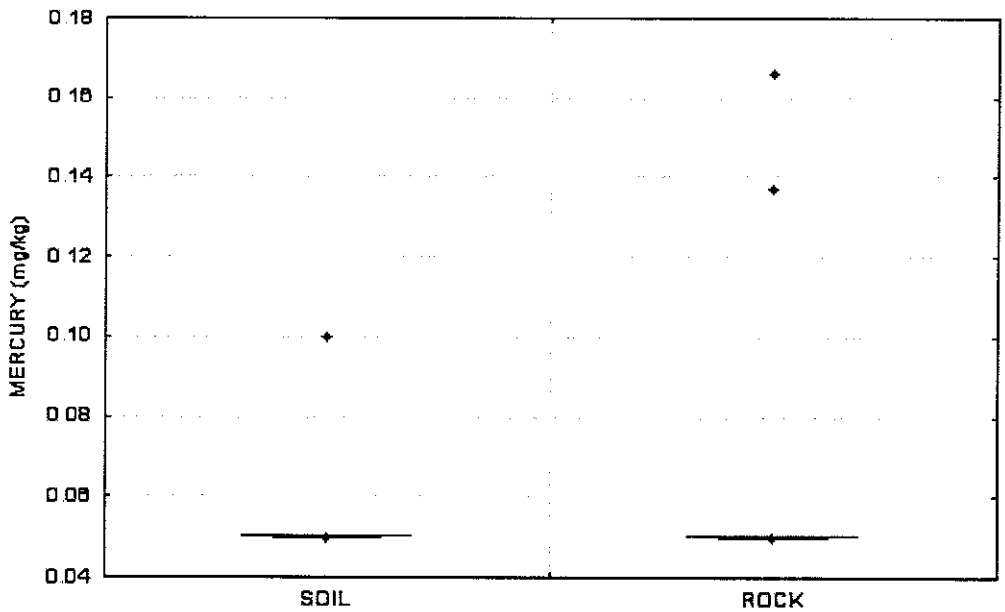
Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data





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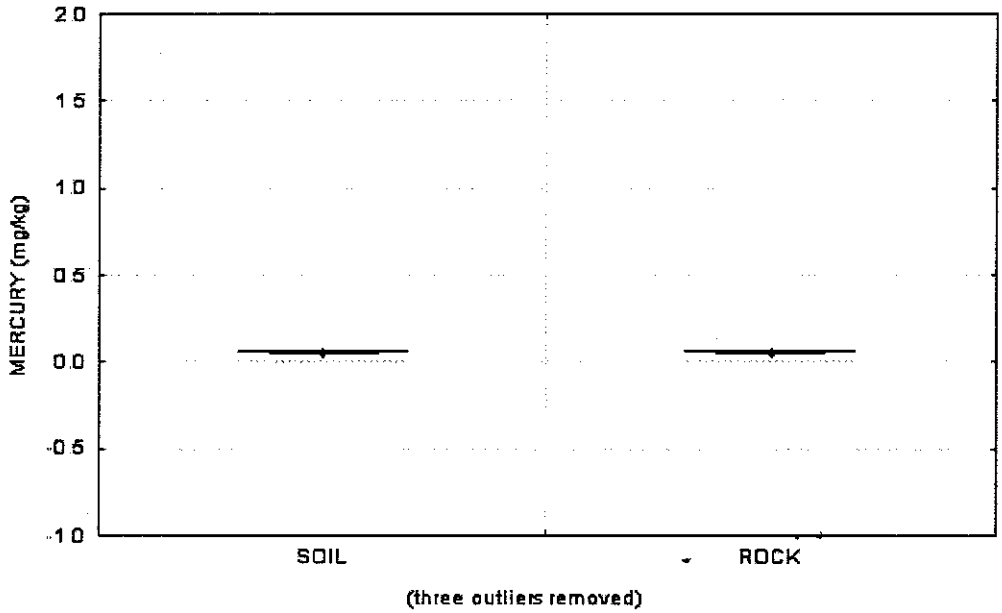

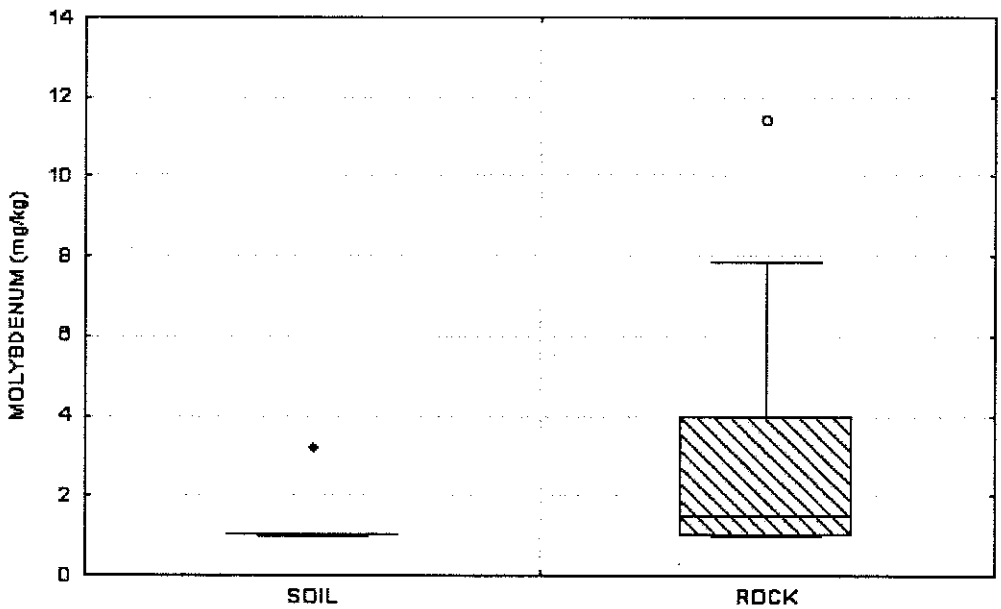

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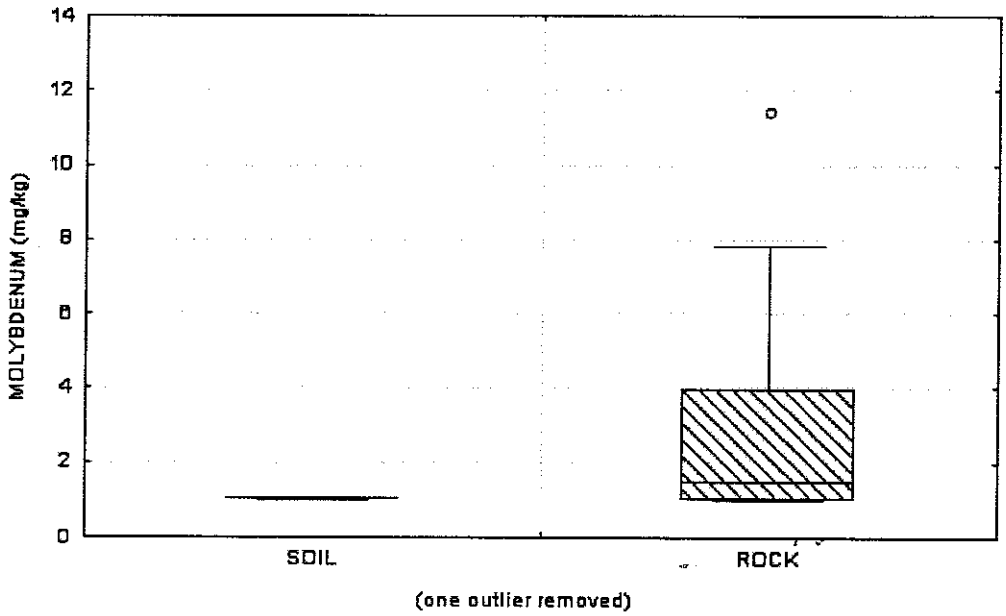

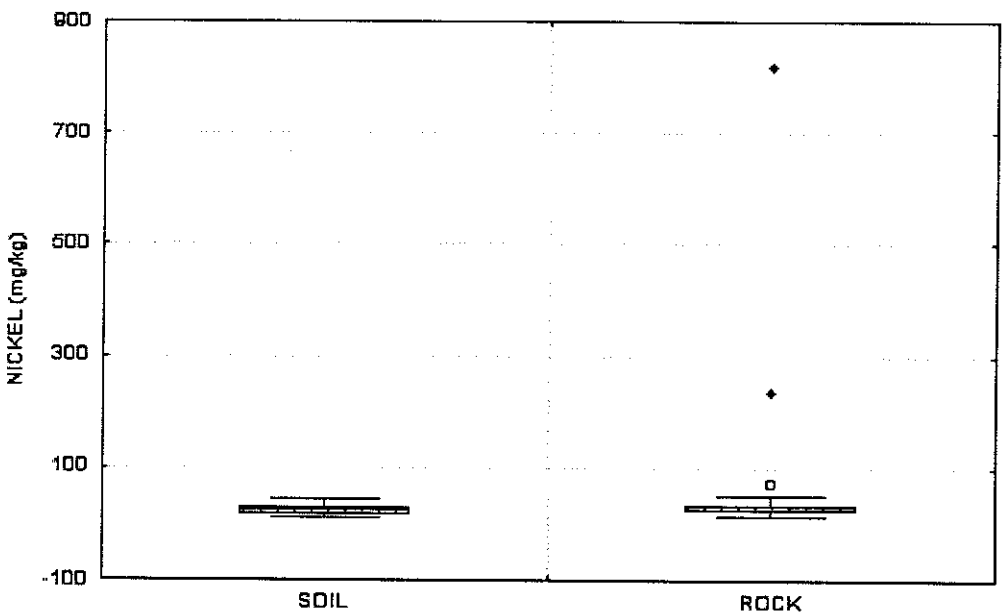

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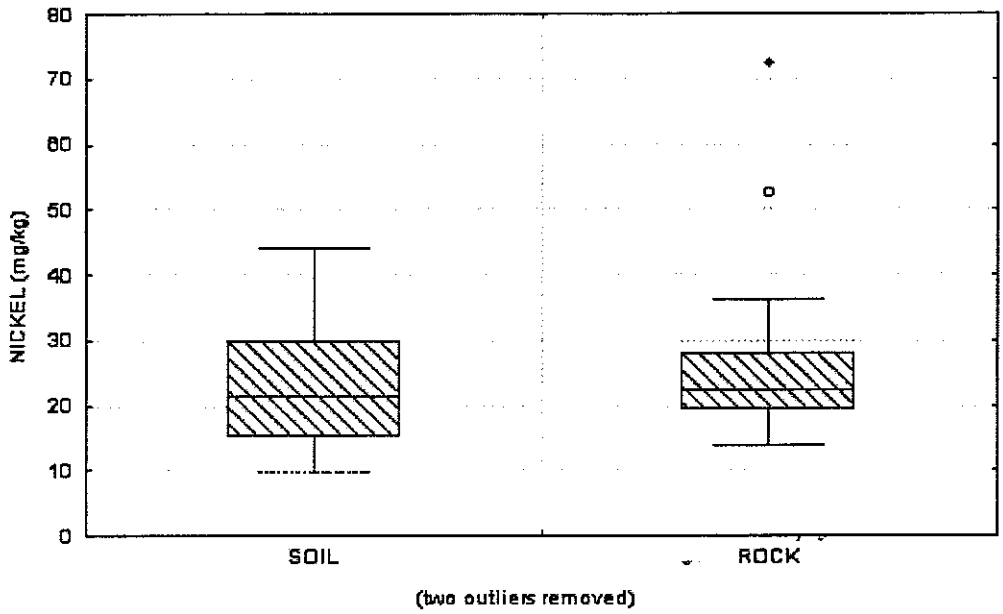

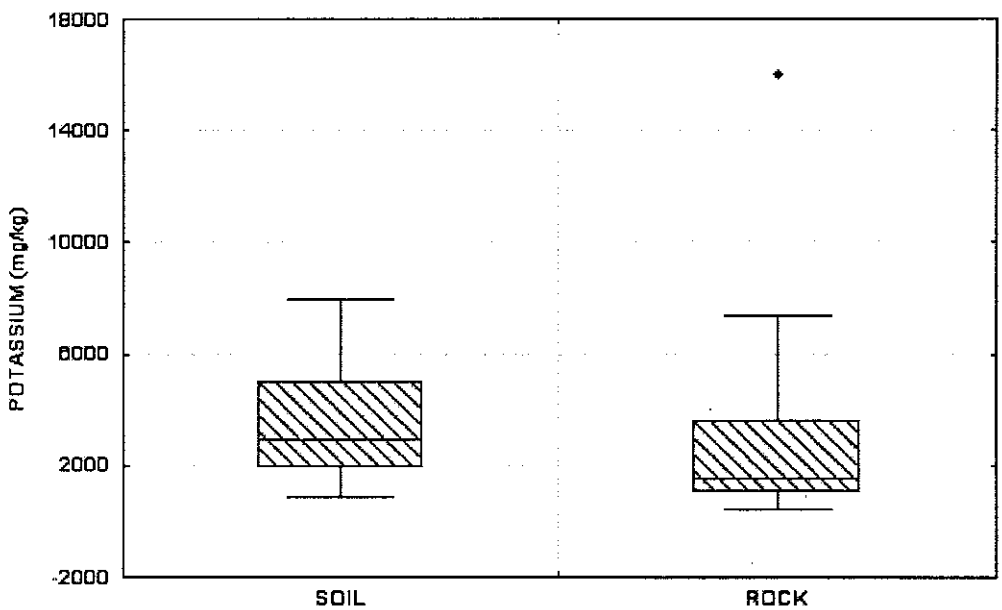

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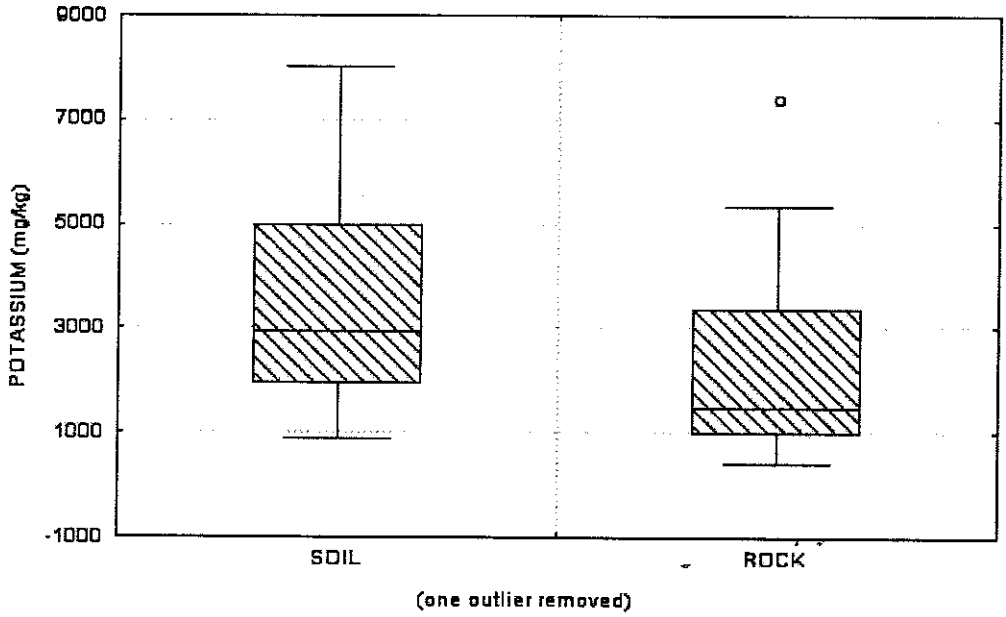


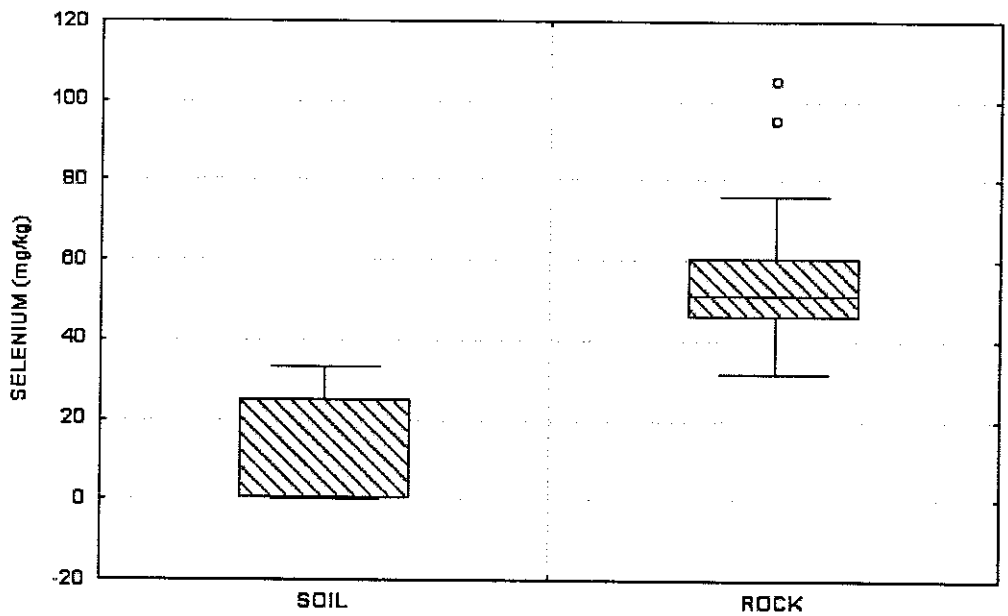
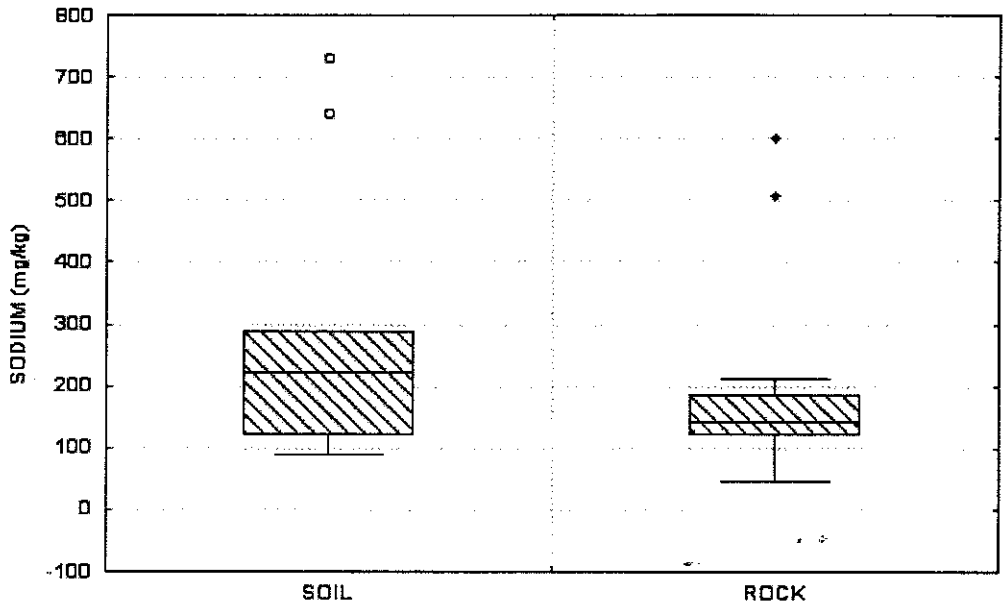
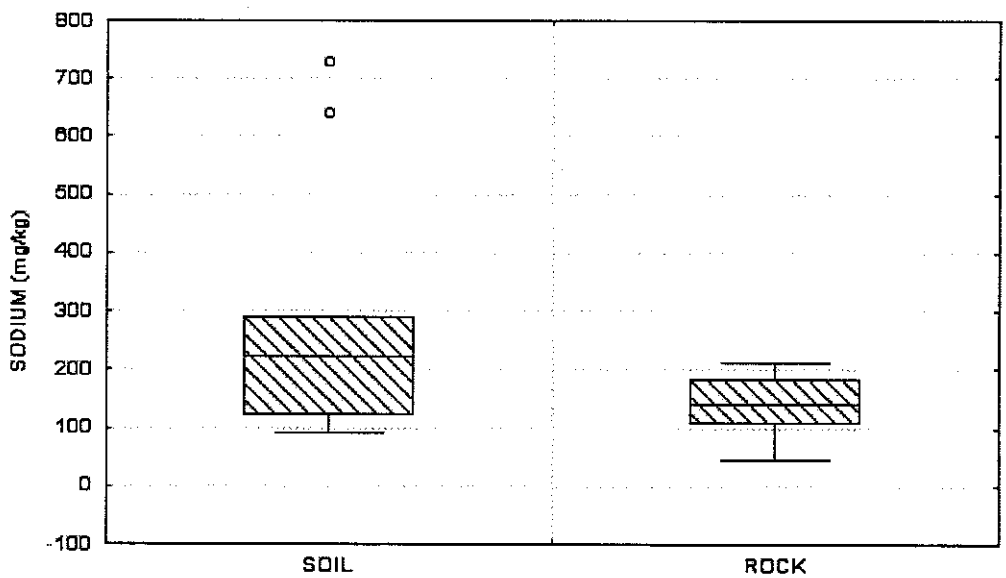


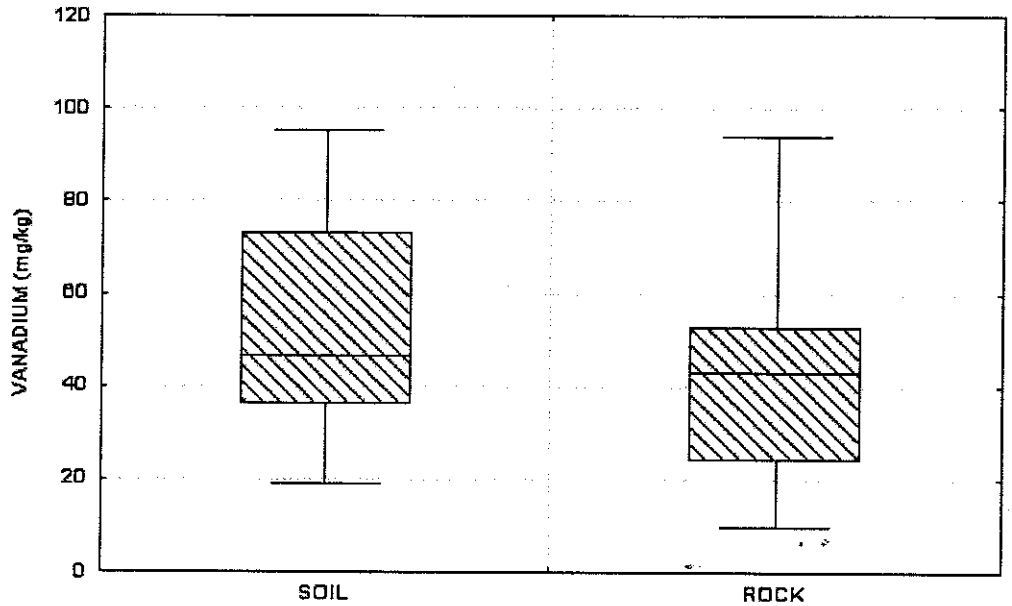
Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data





(two outliers removed)

Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data



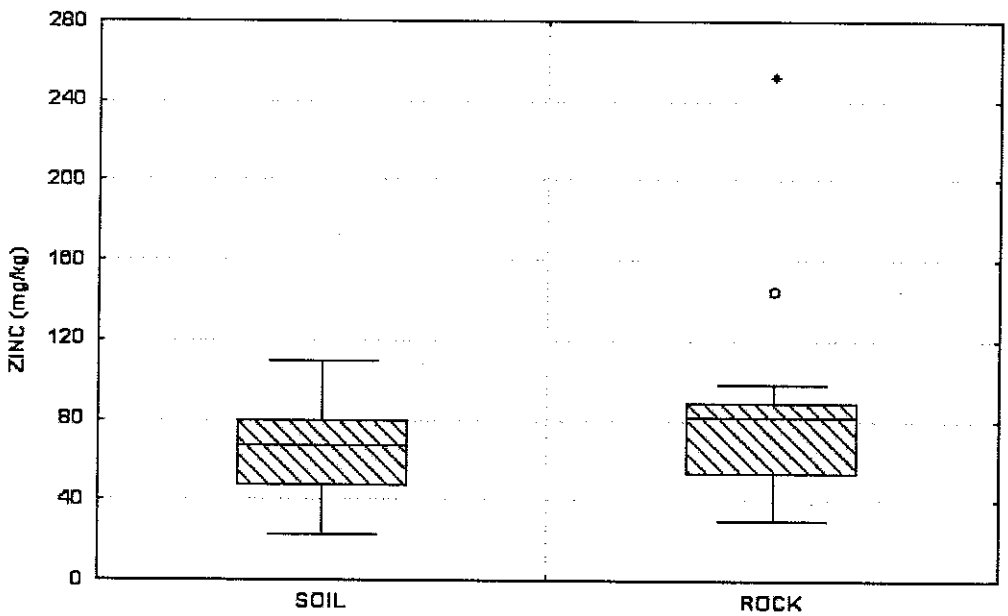


Figure A-2. Boxplots of Area of Interest (Objective) 12 - Soil Data and Rock Data

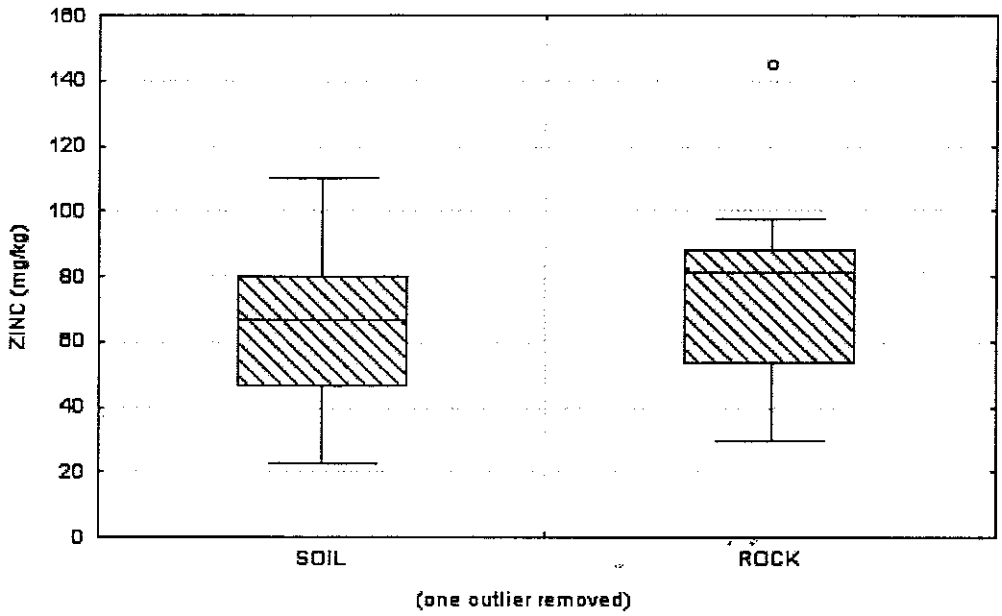
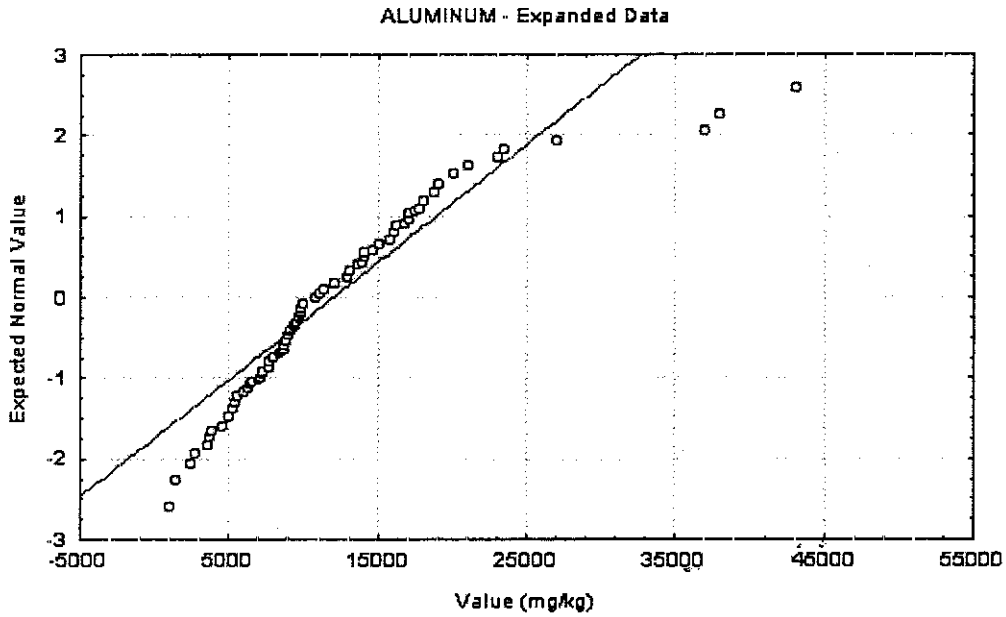


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



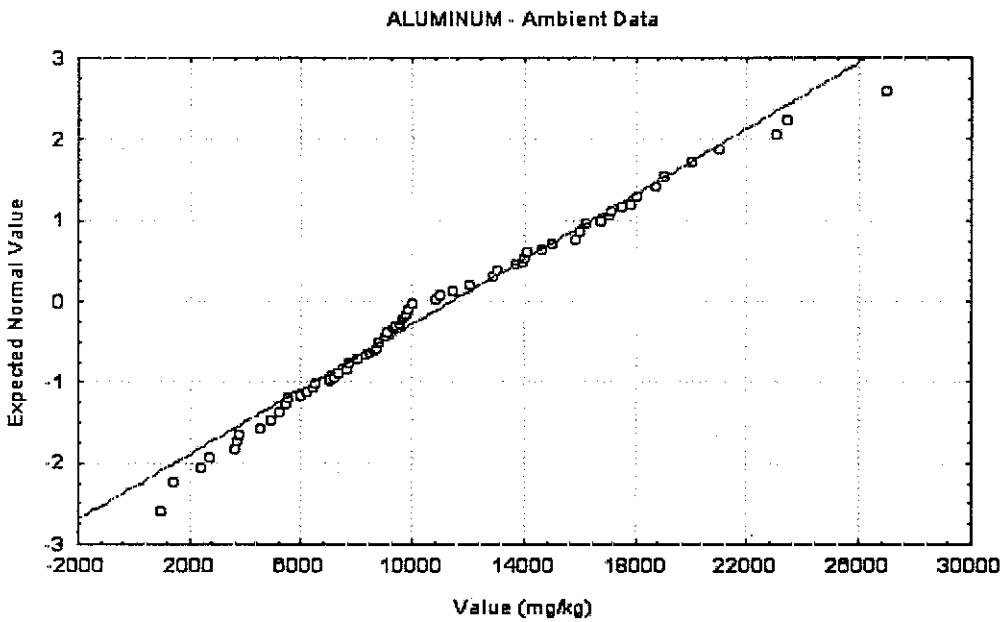
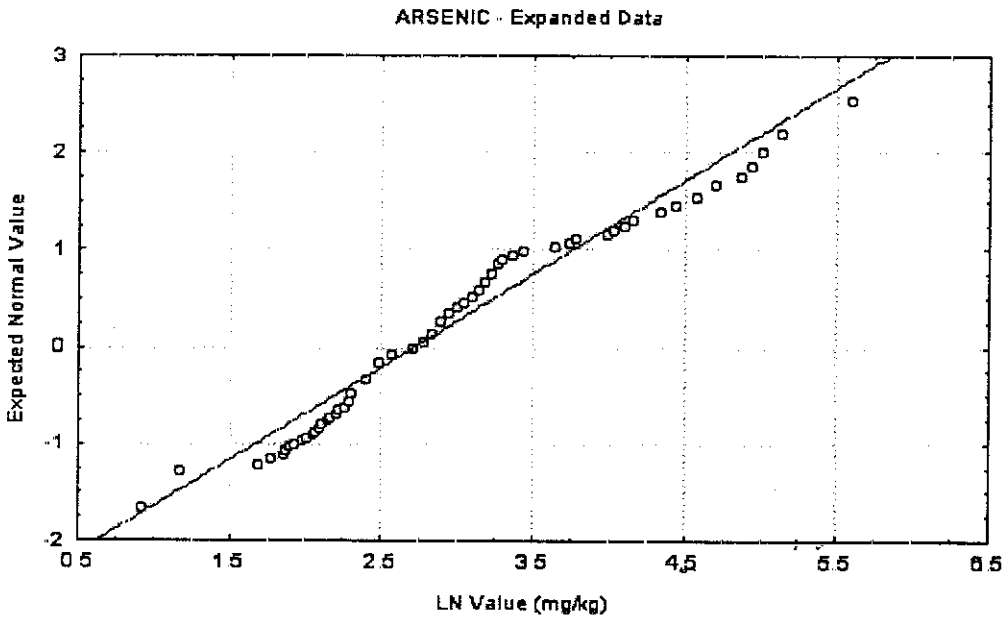


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



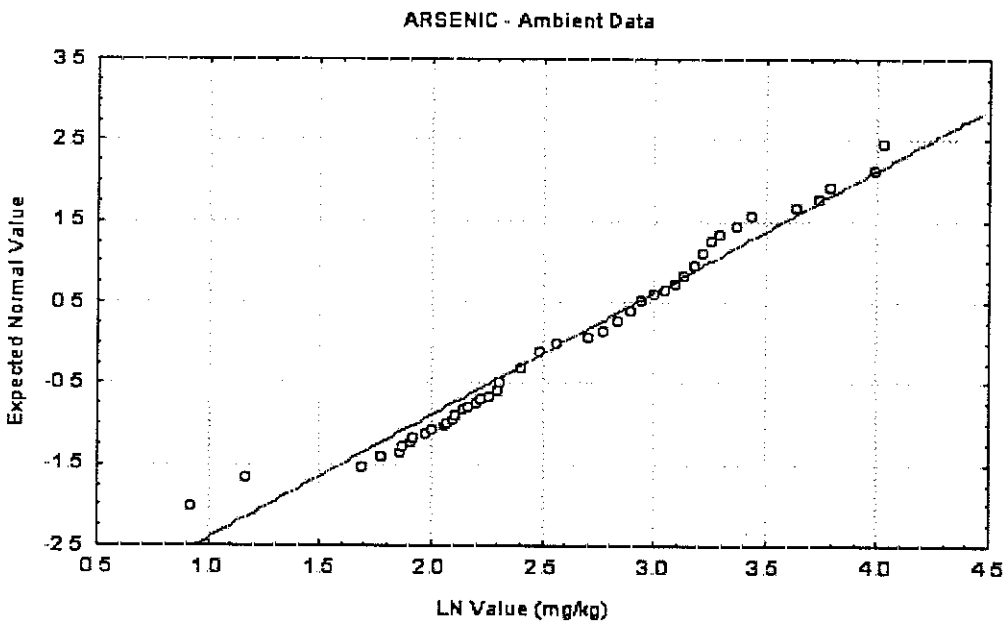
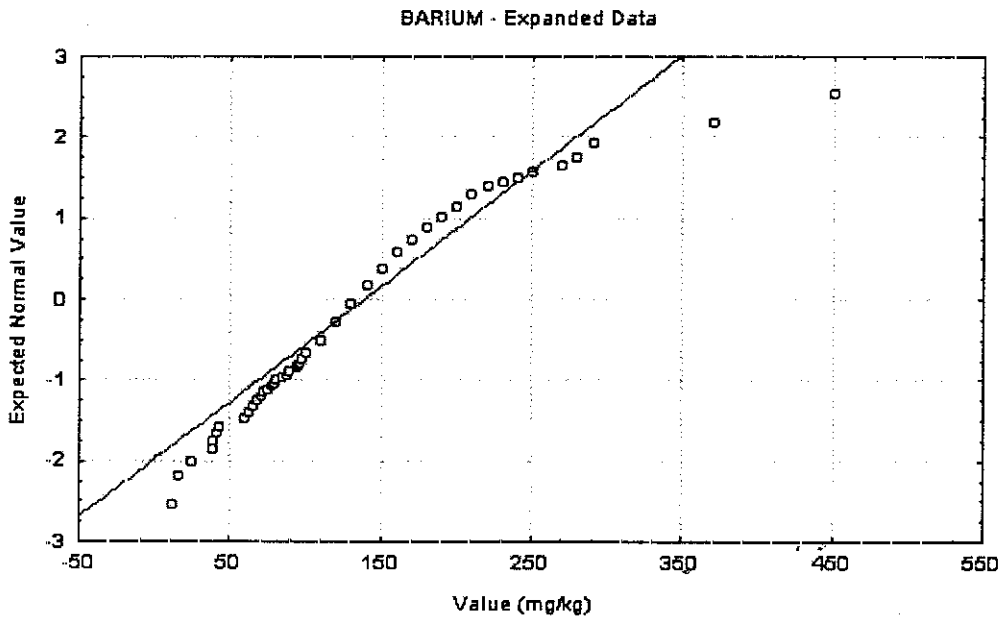


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



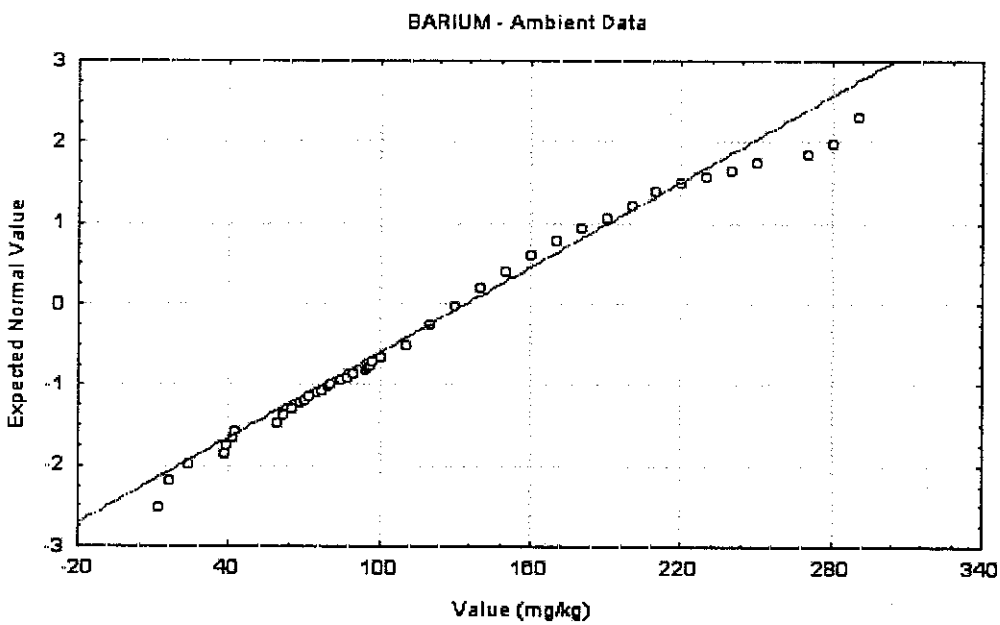
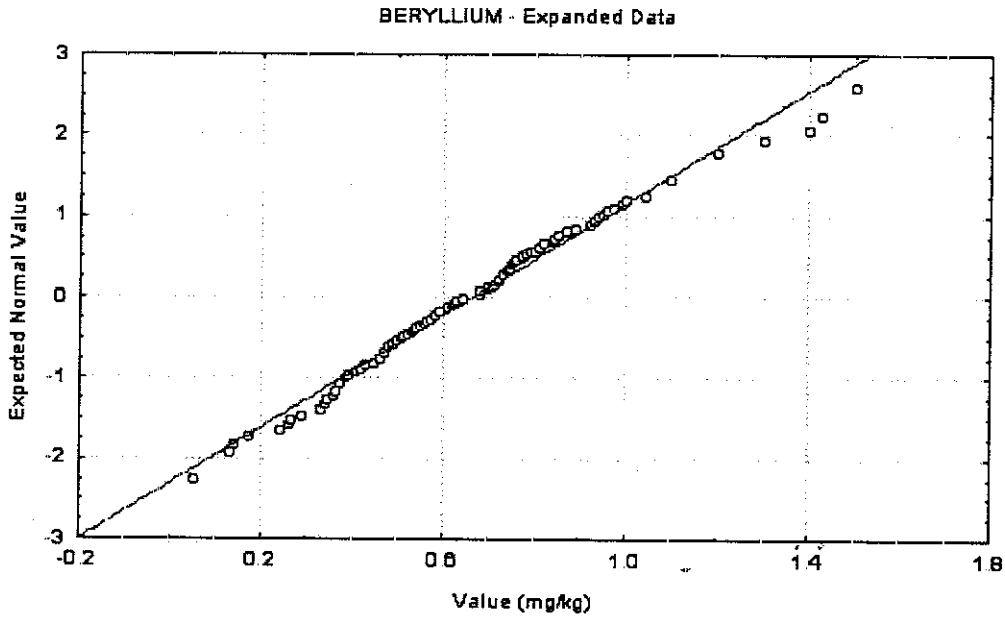


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



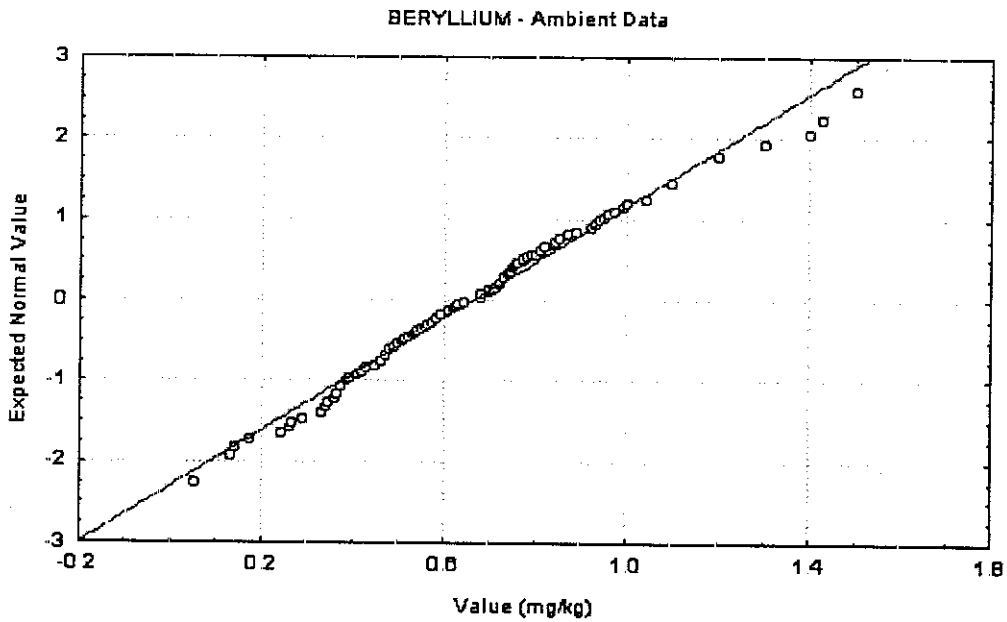
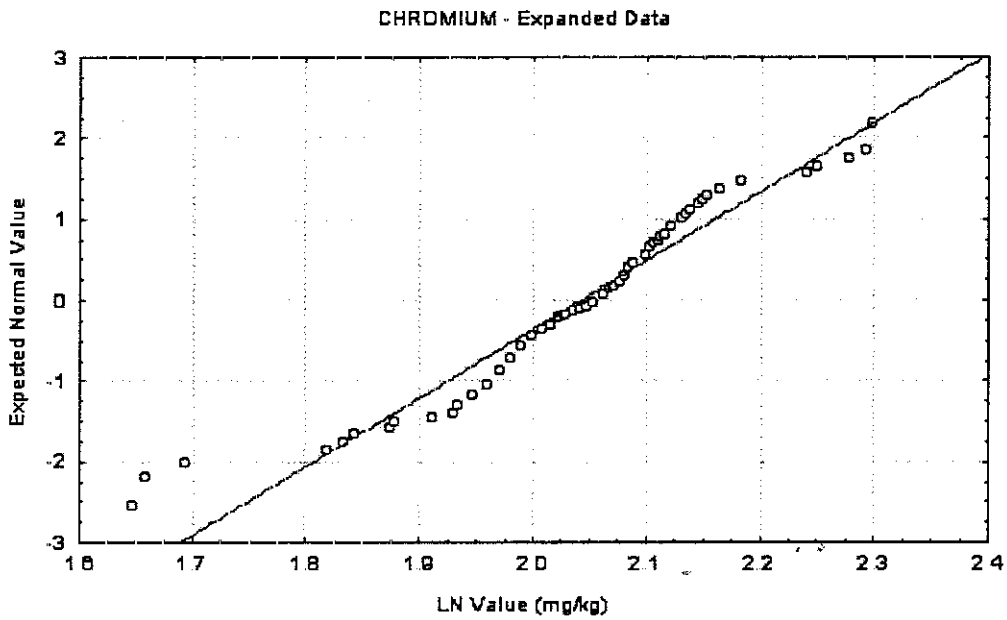


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



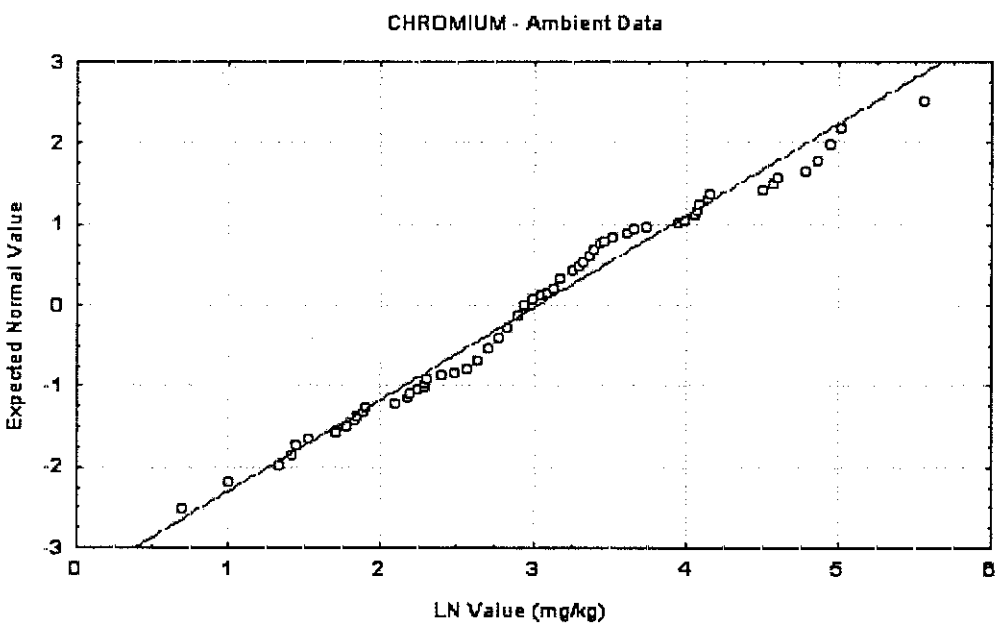
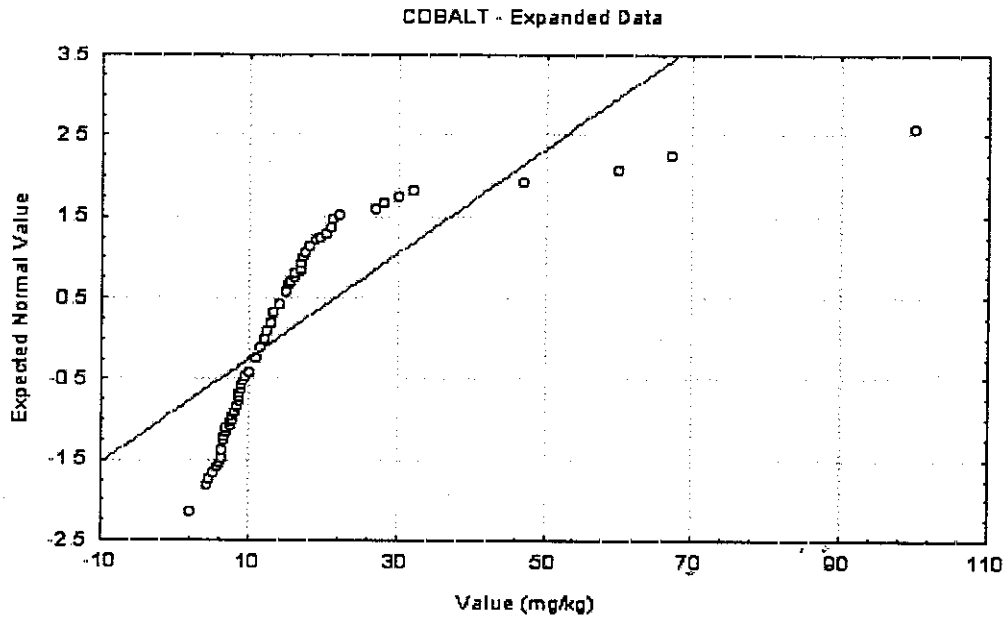


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



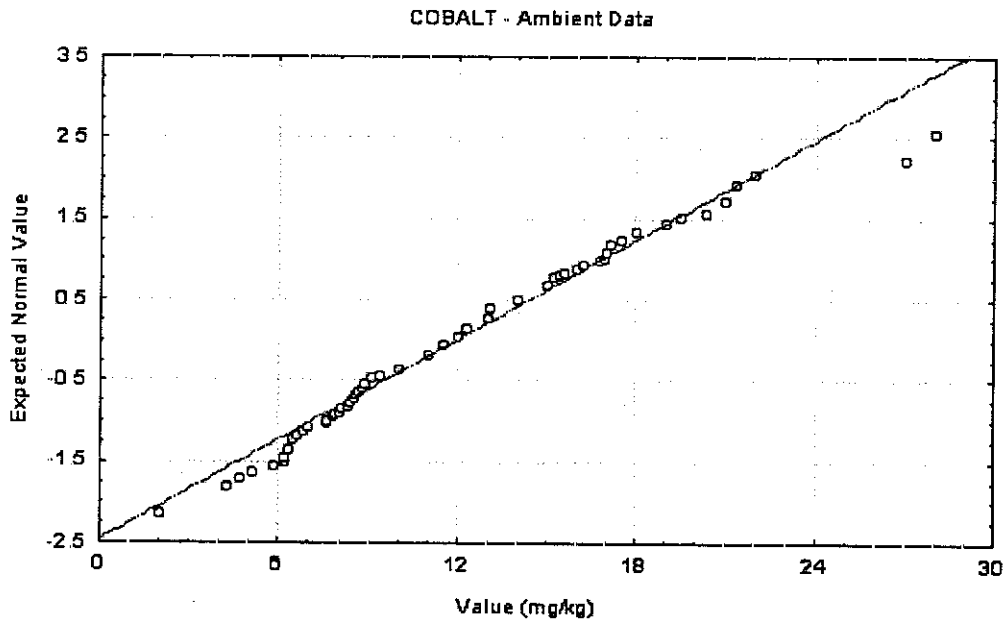
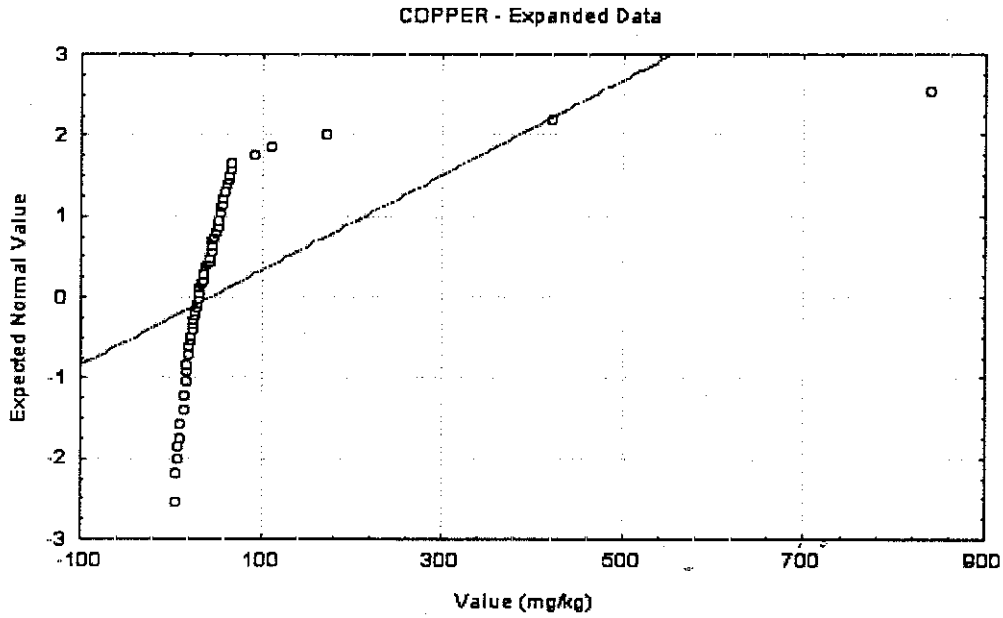


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



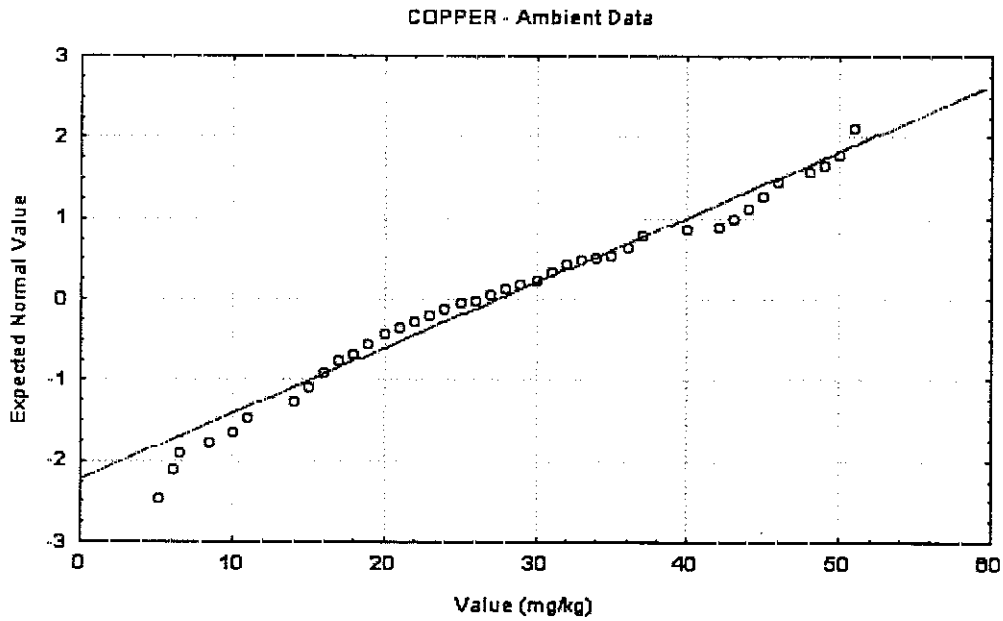
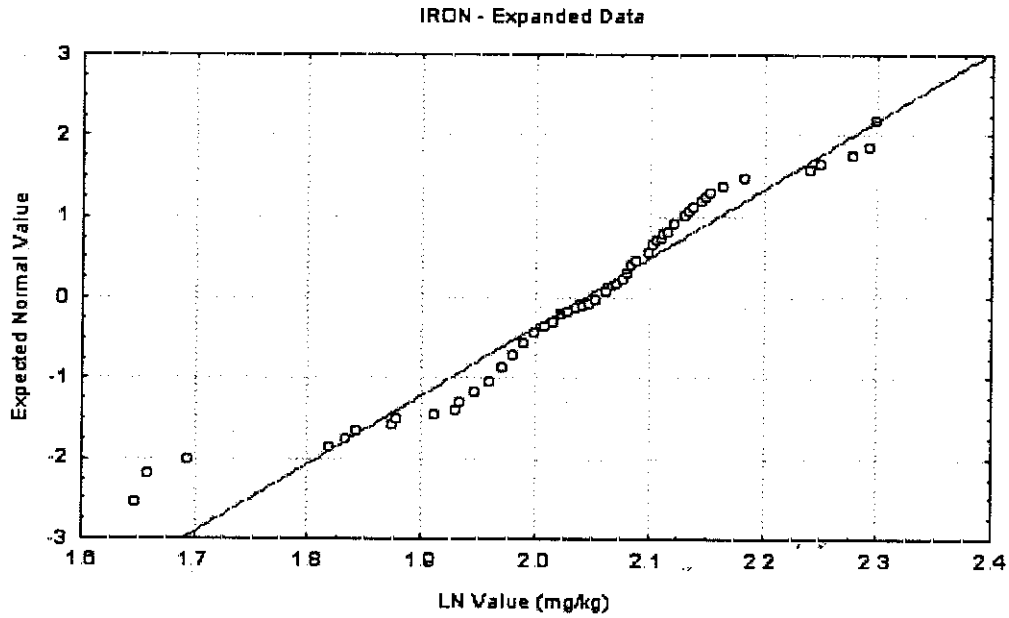


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



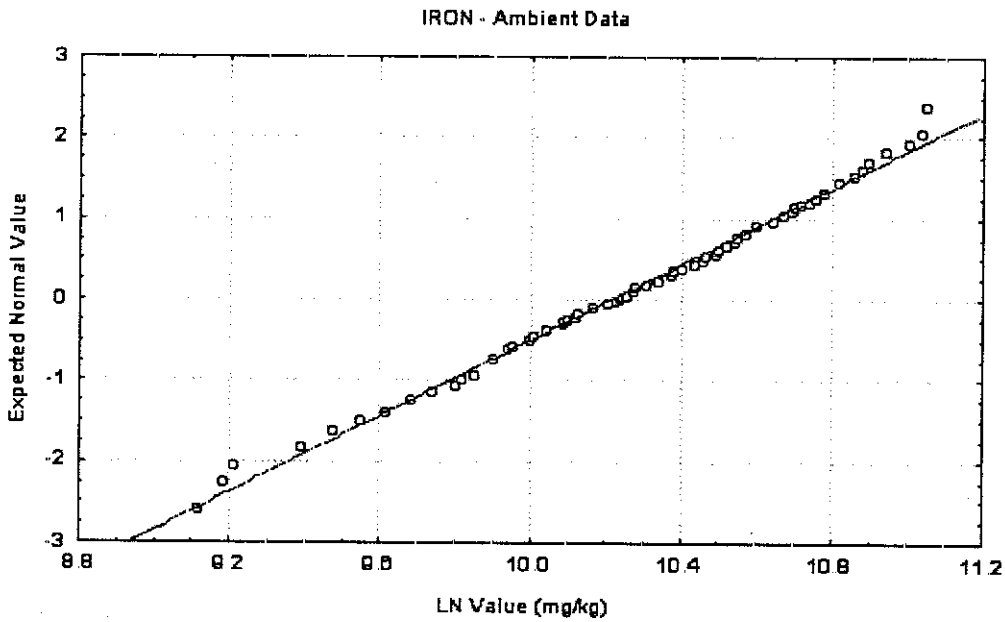
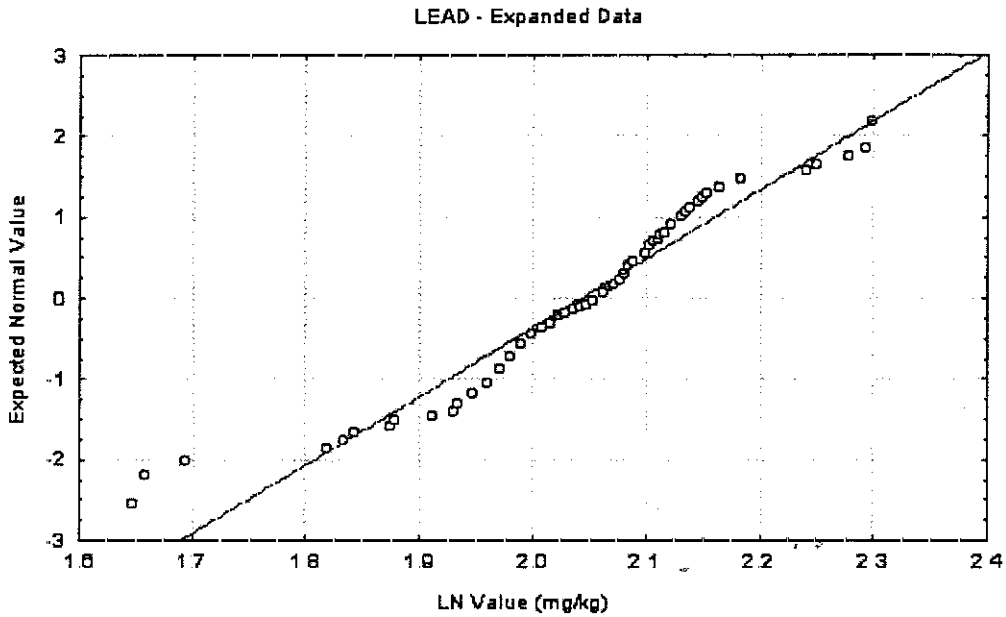


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



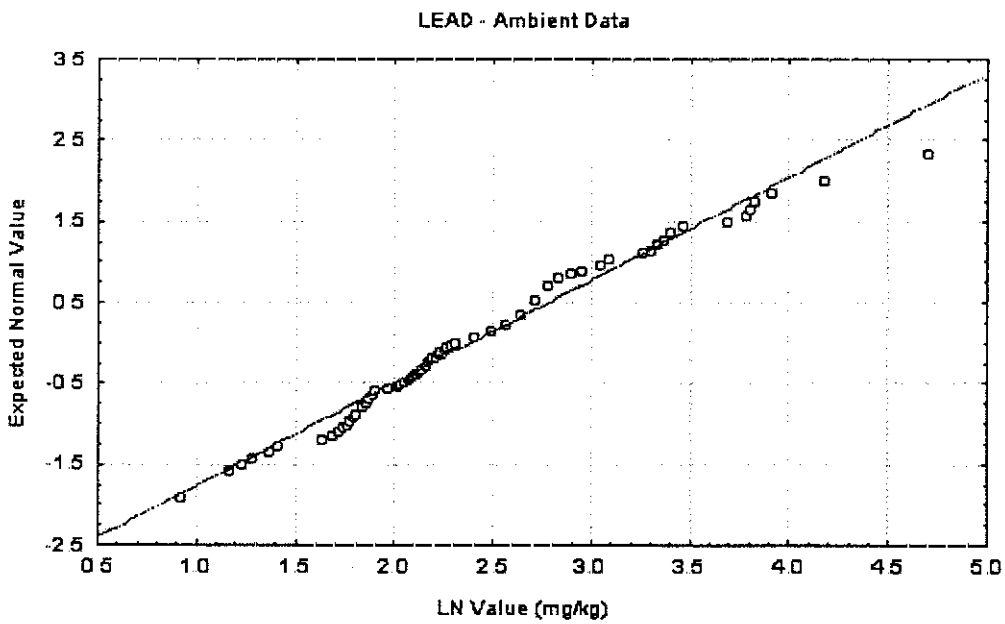
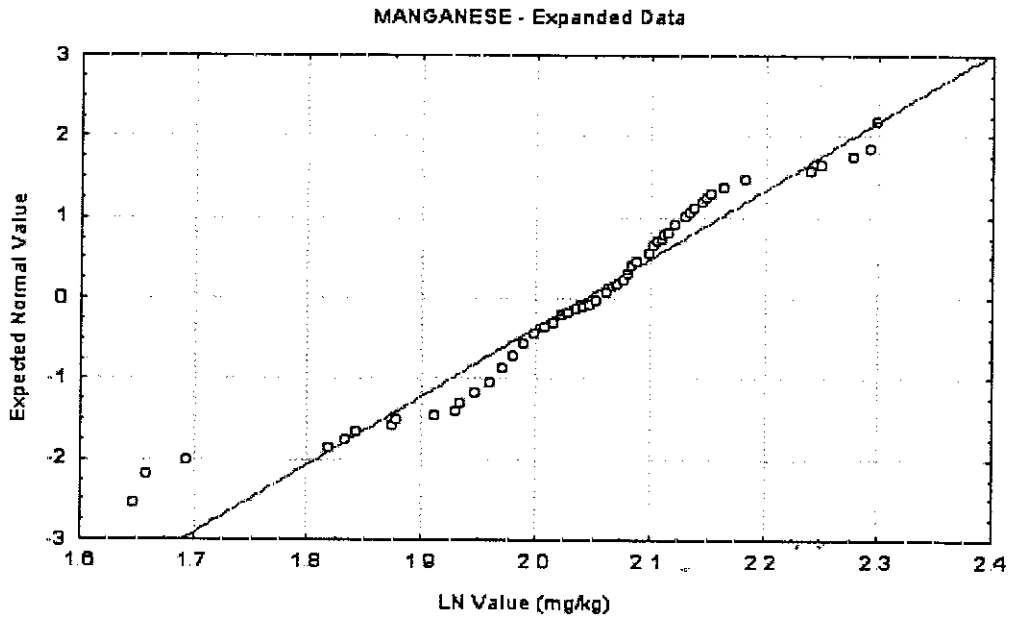


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



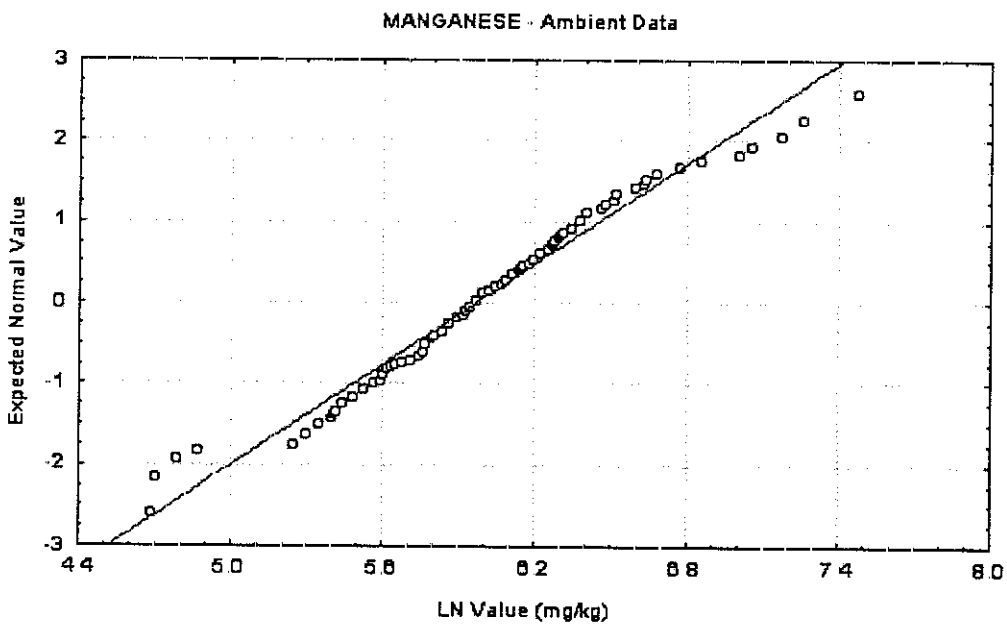
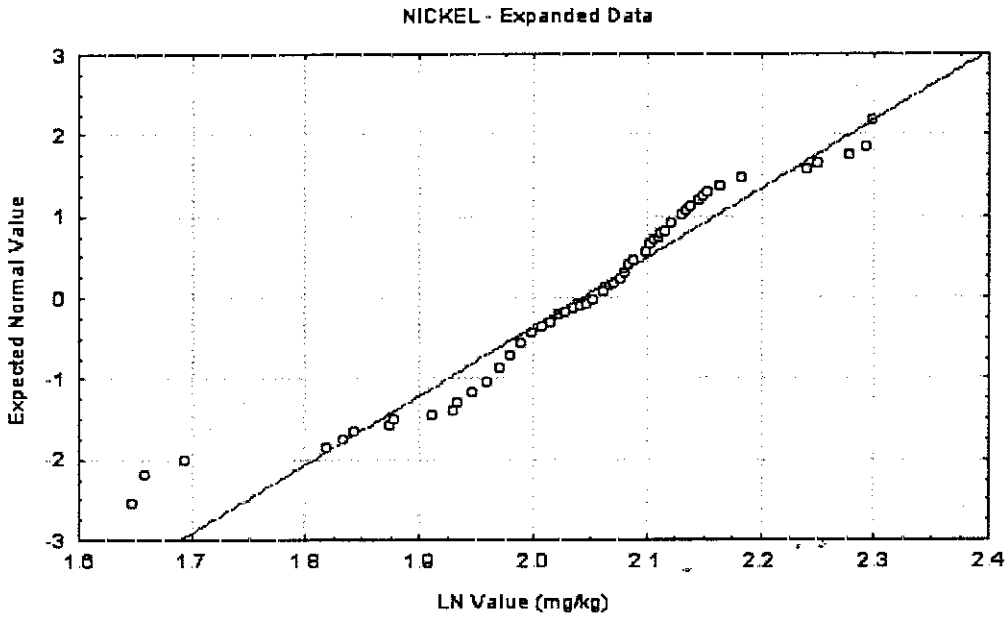


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



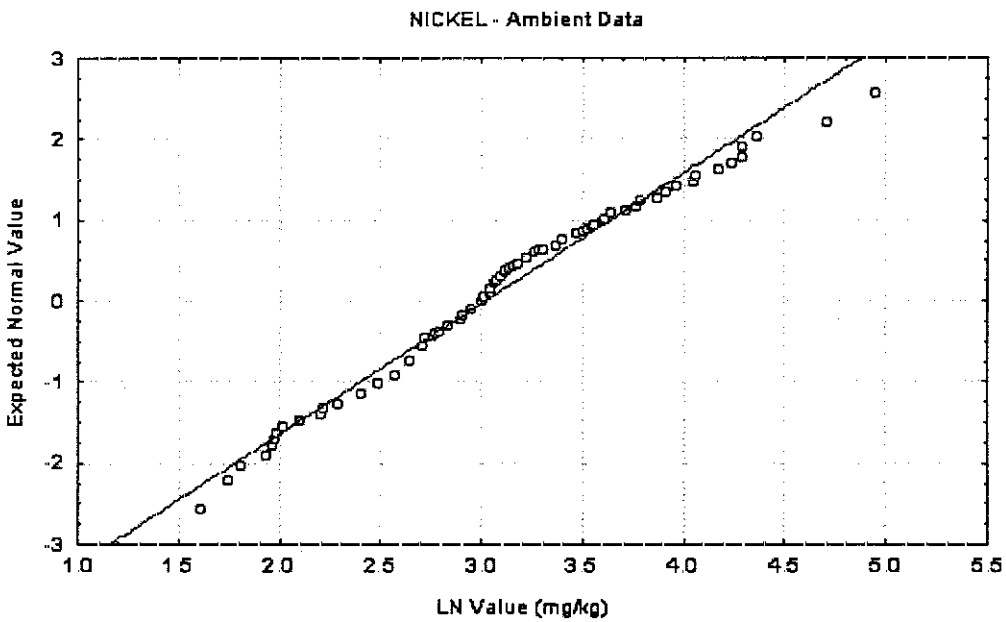
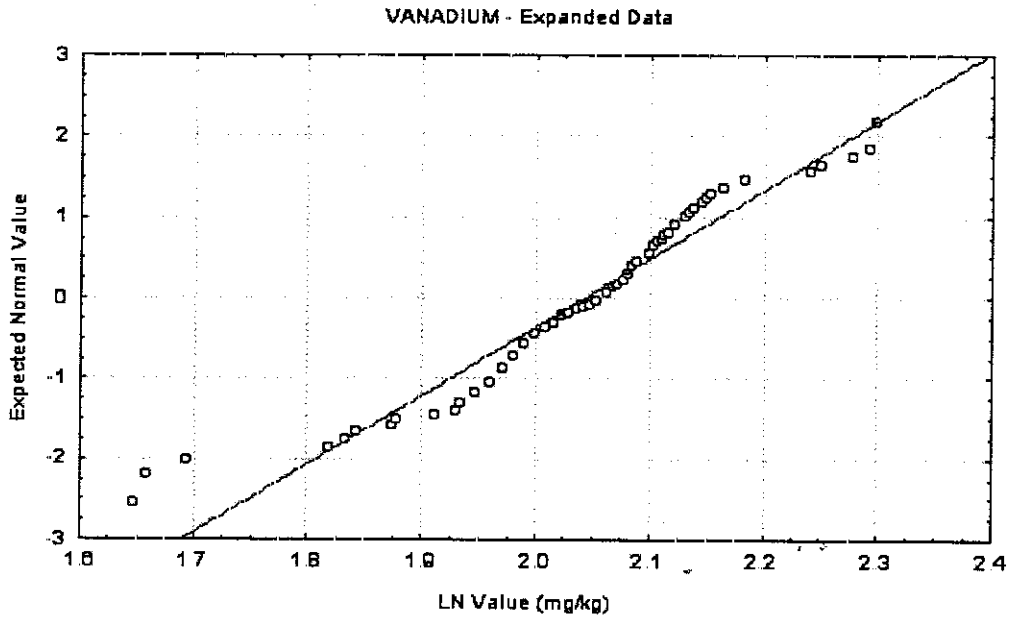


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



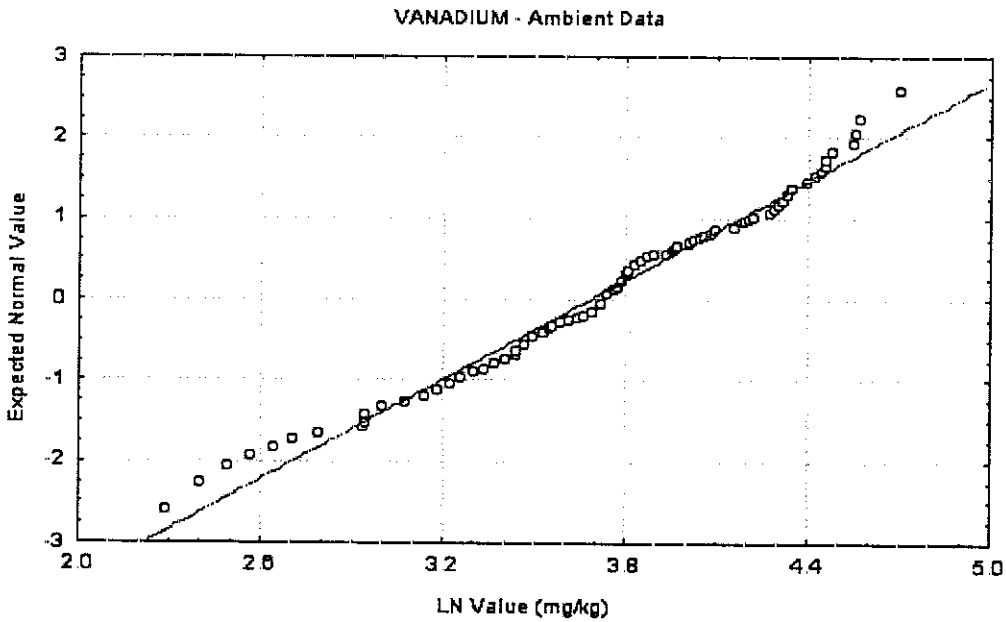
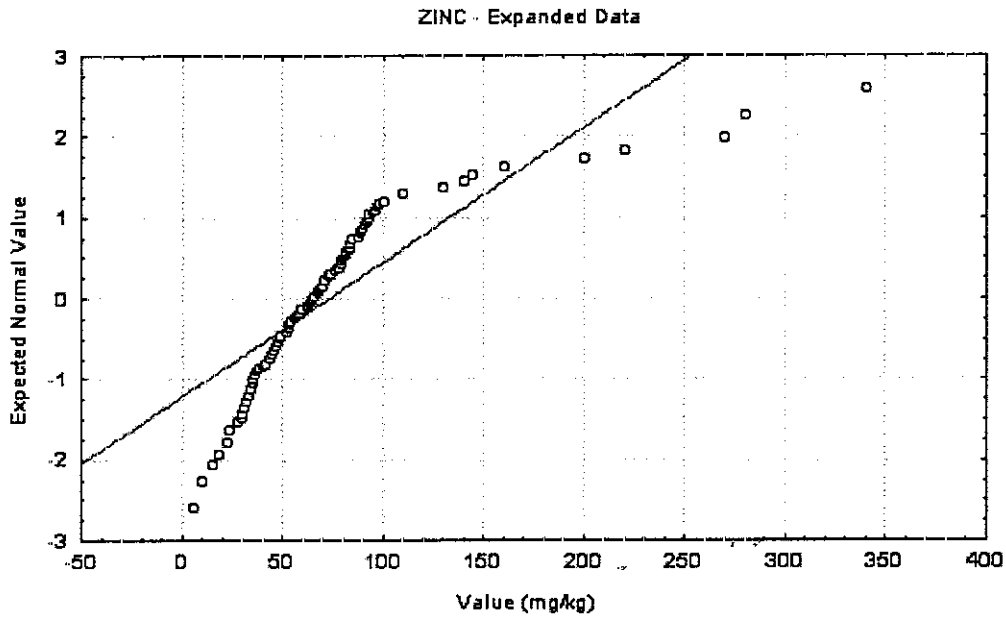


Figure A-3. Normal Probability Plots for Expanded and Ambient Data



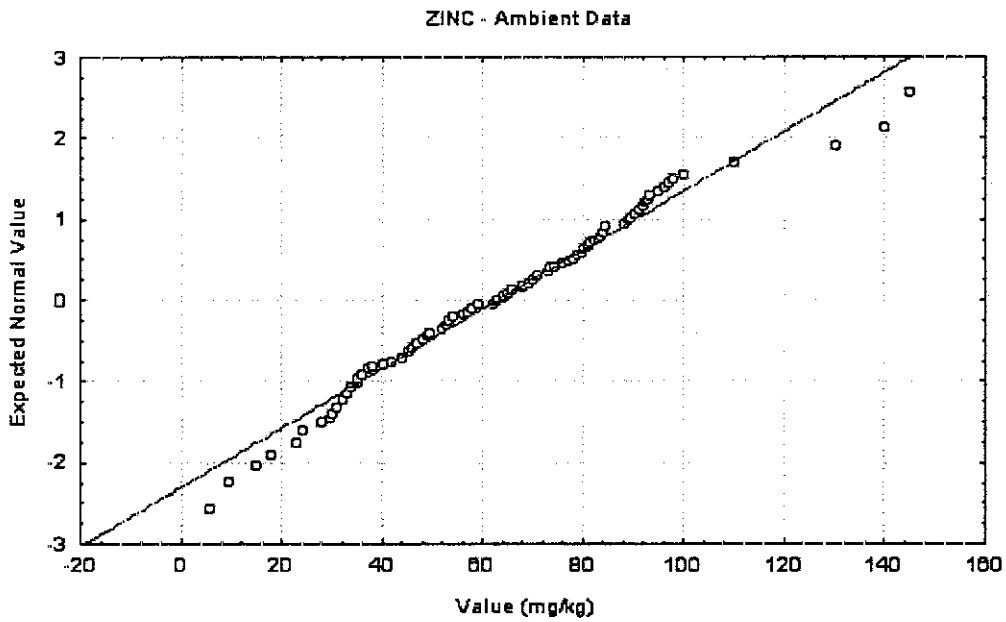
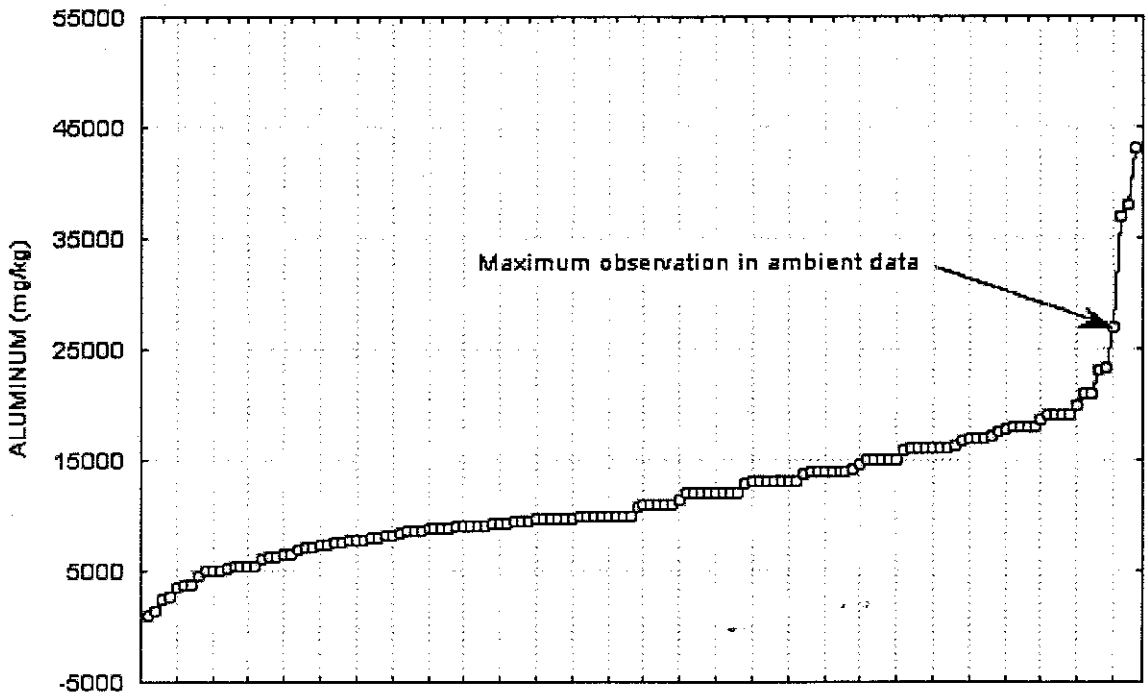
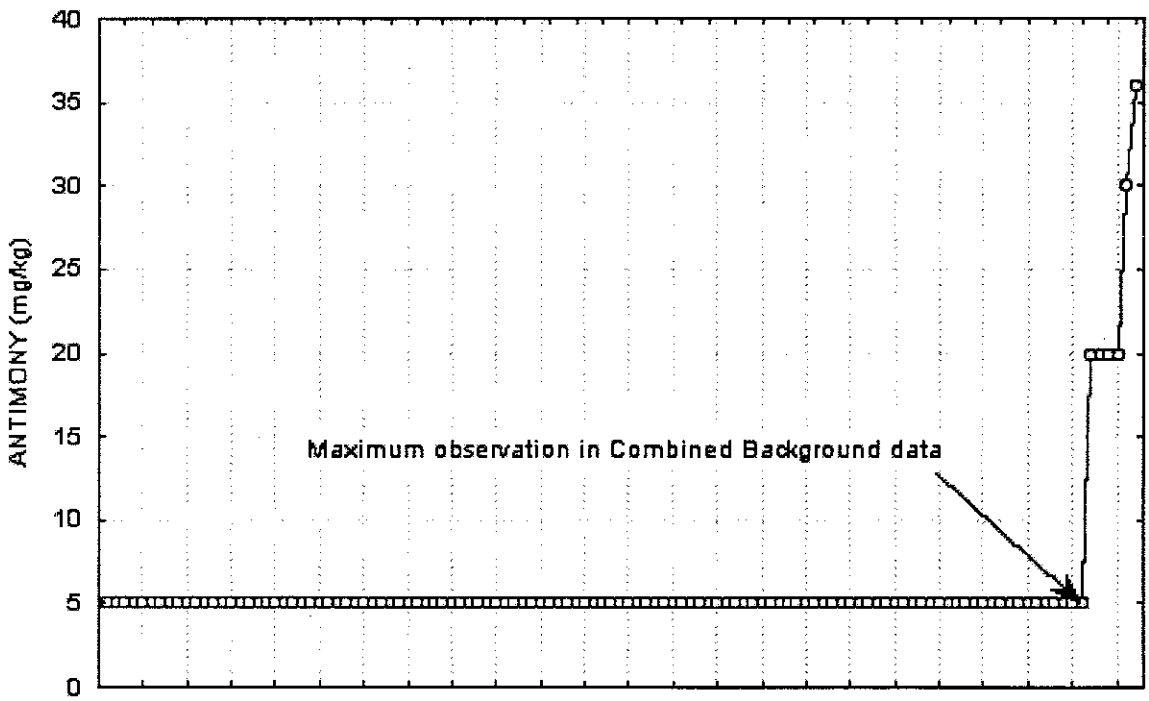


Figure A-4. Ranked Data Plots for Expanded Data





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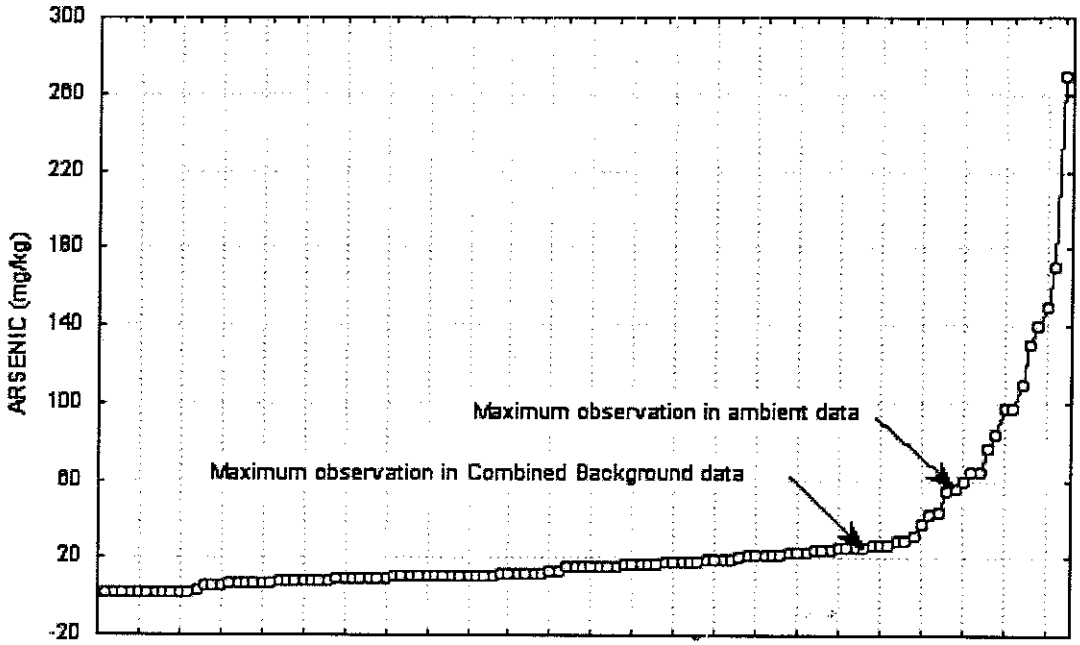

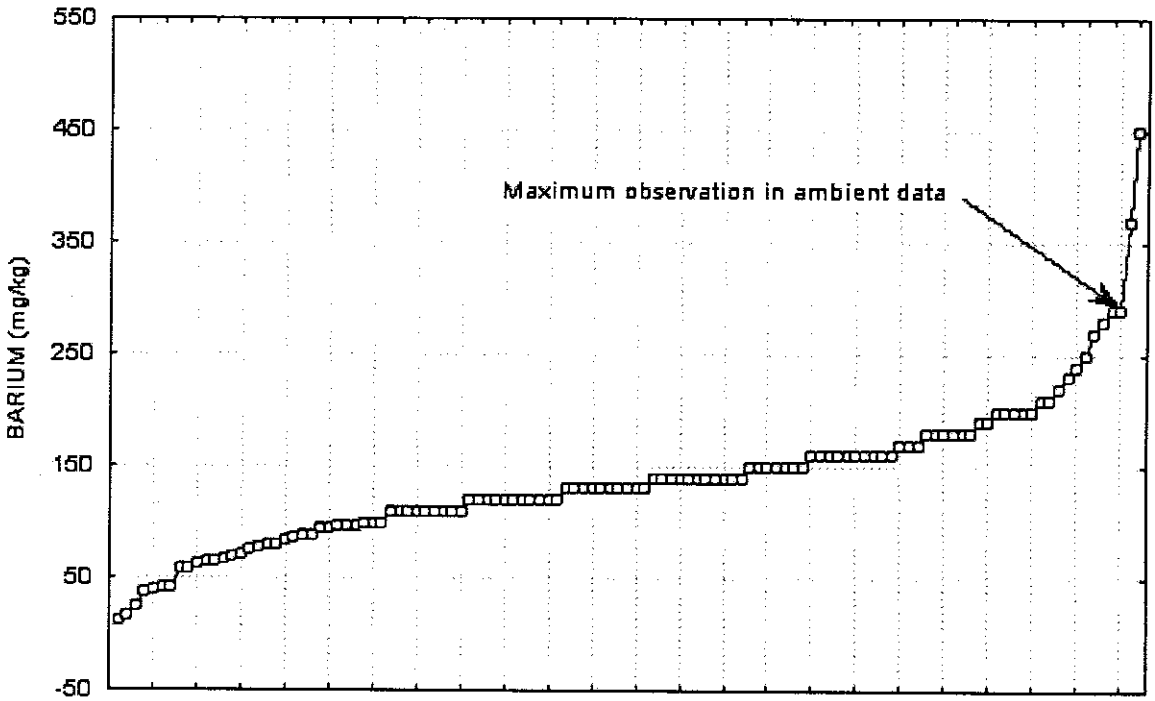

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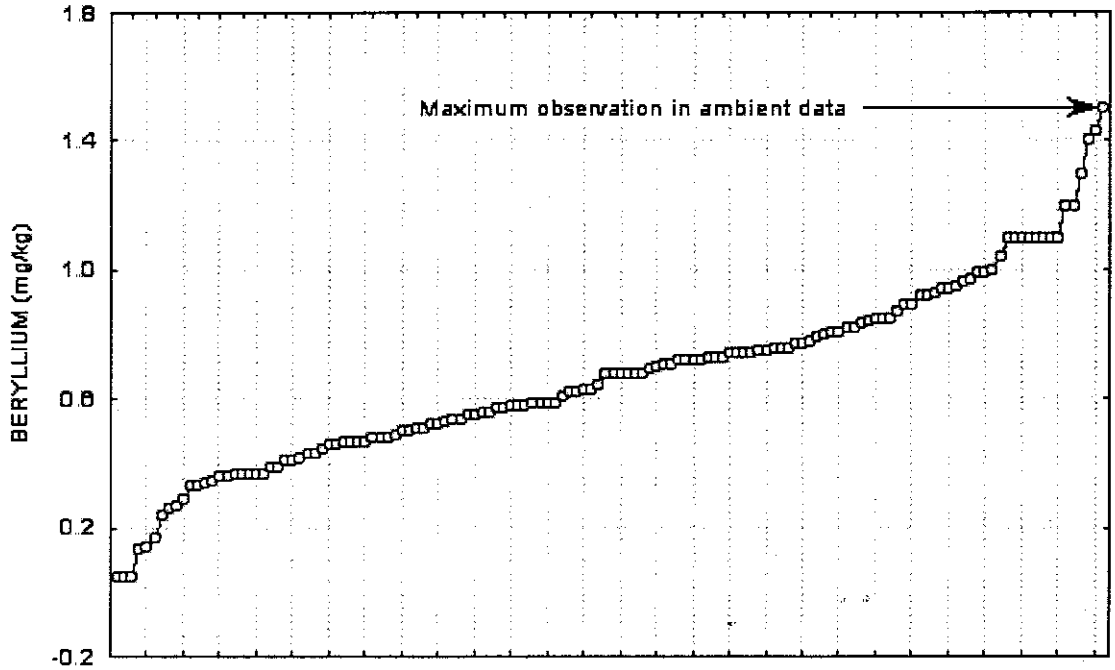


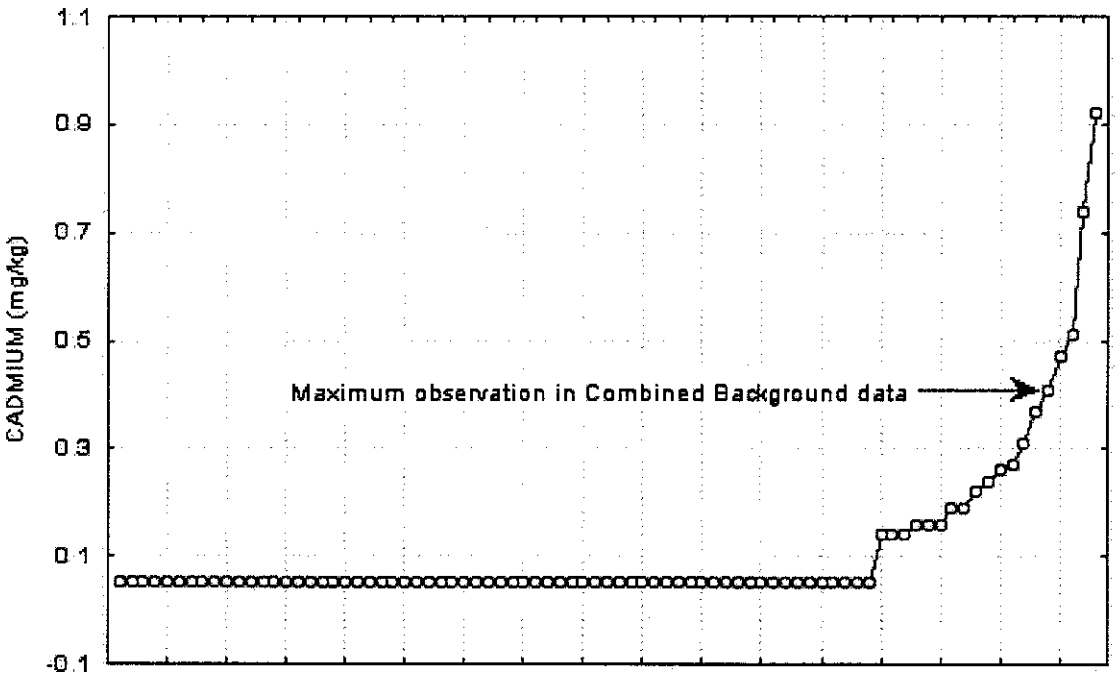
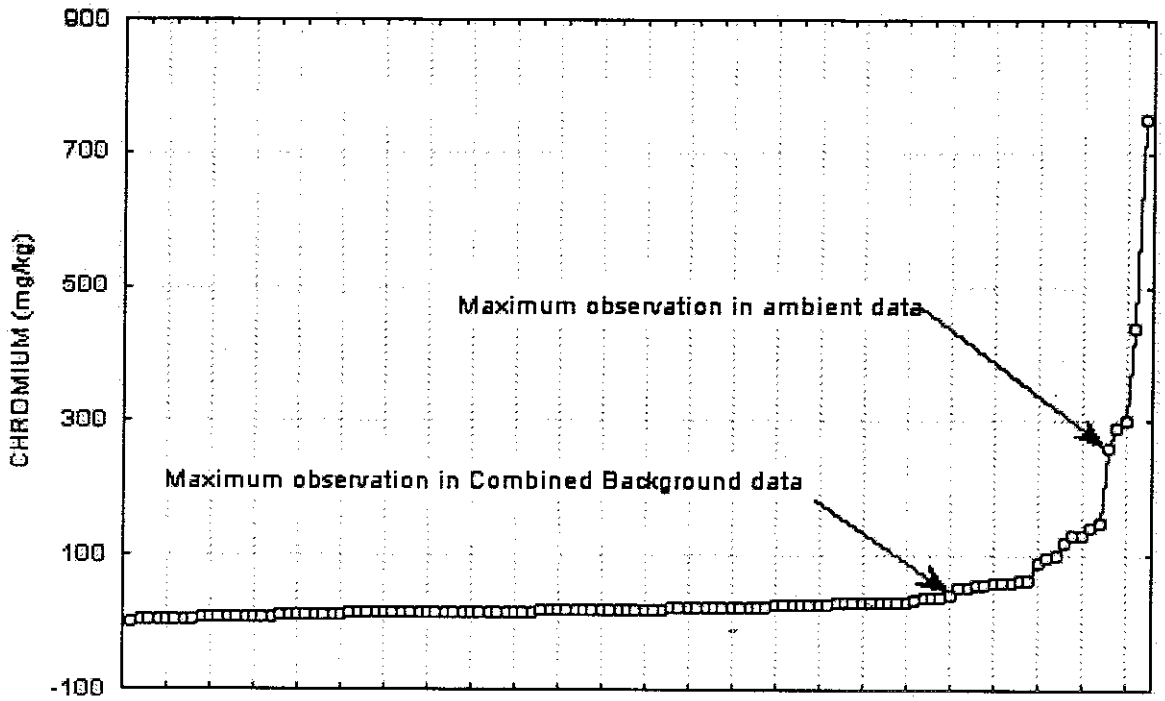


Figure A-4. Ranked Data Plots for Expanded Data



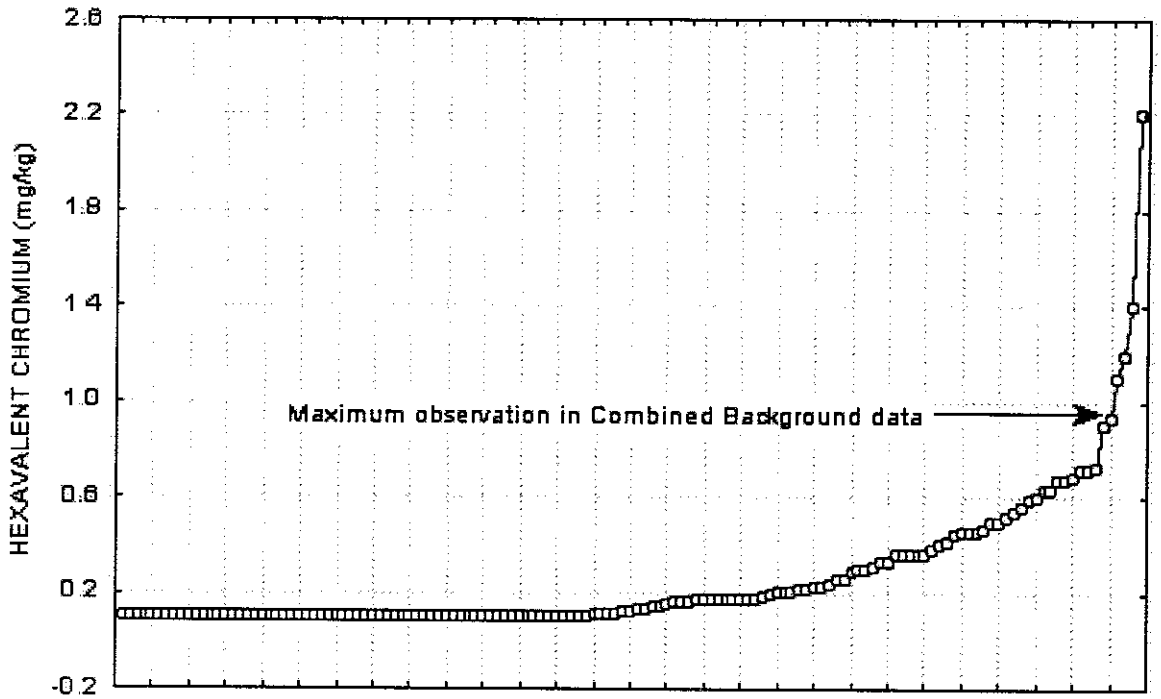
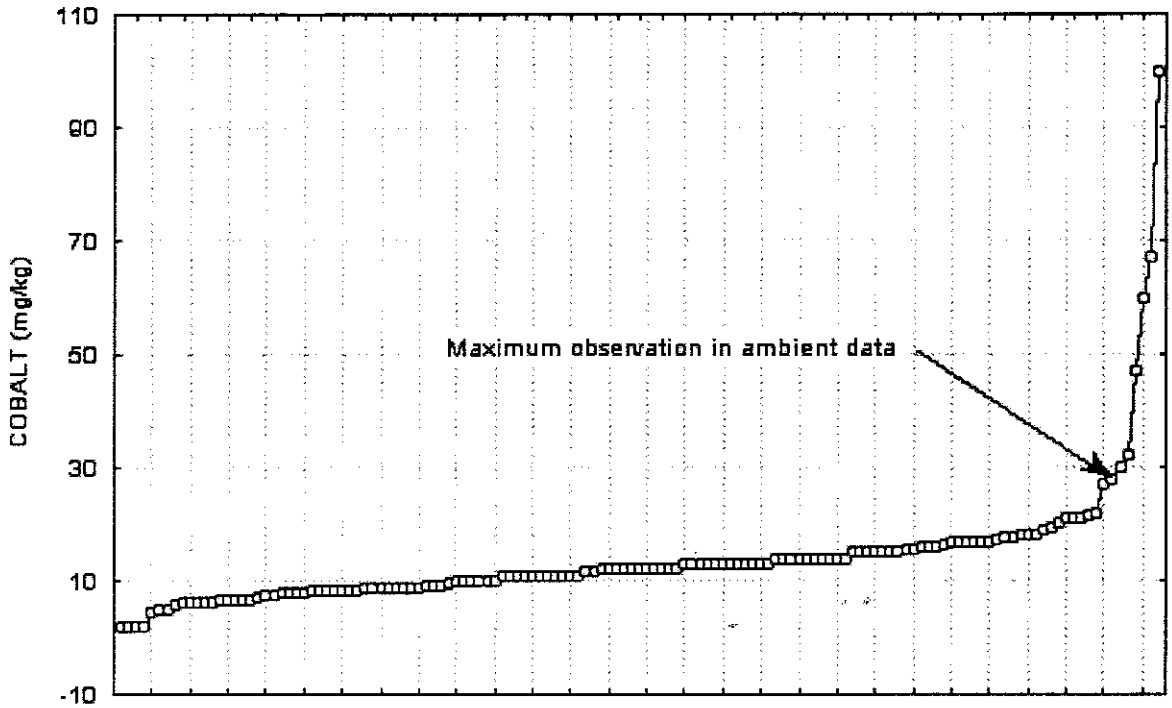


Figure A-4. Ranked Data Plots for Expanded Data



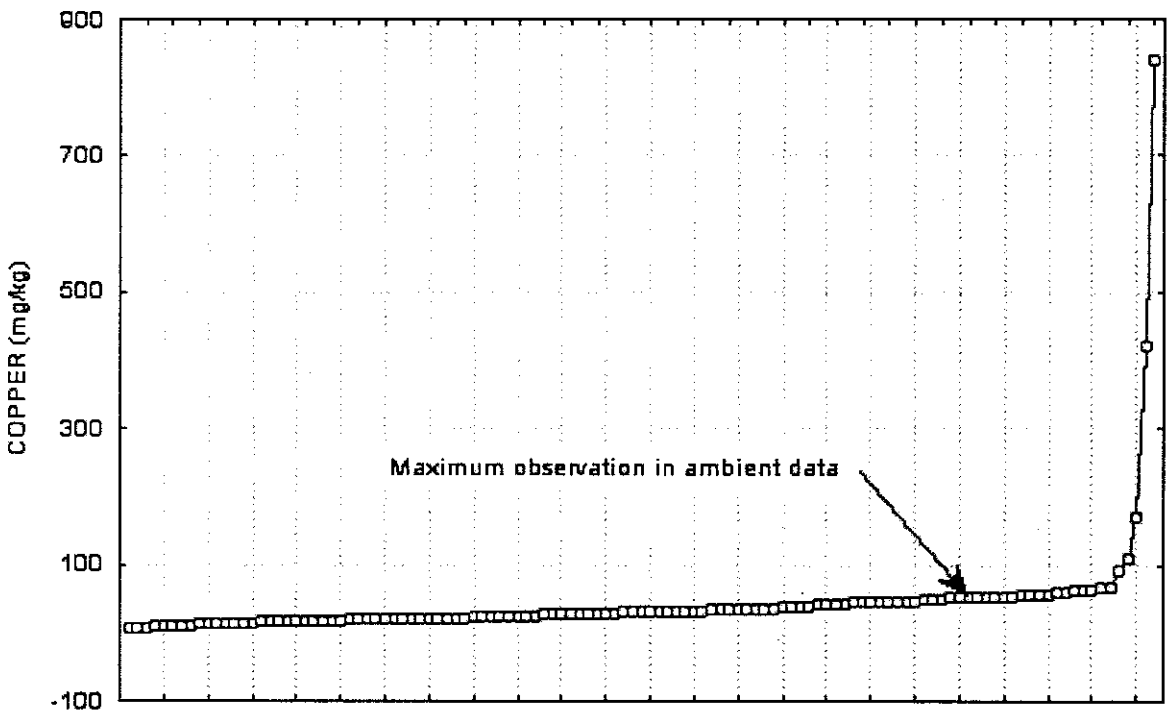
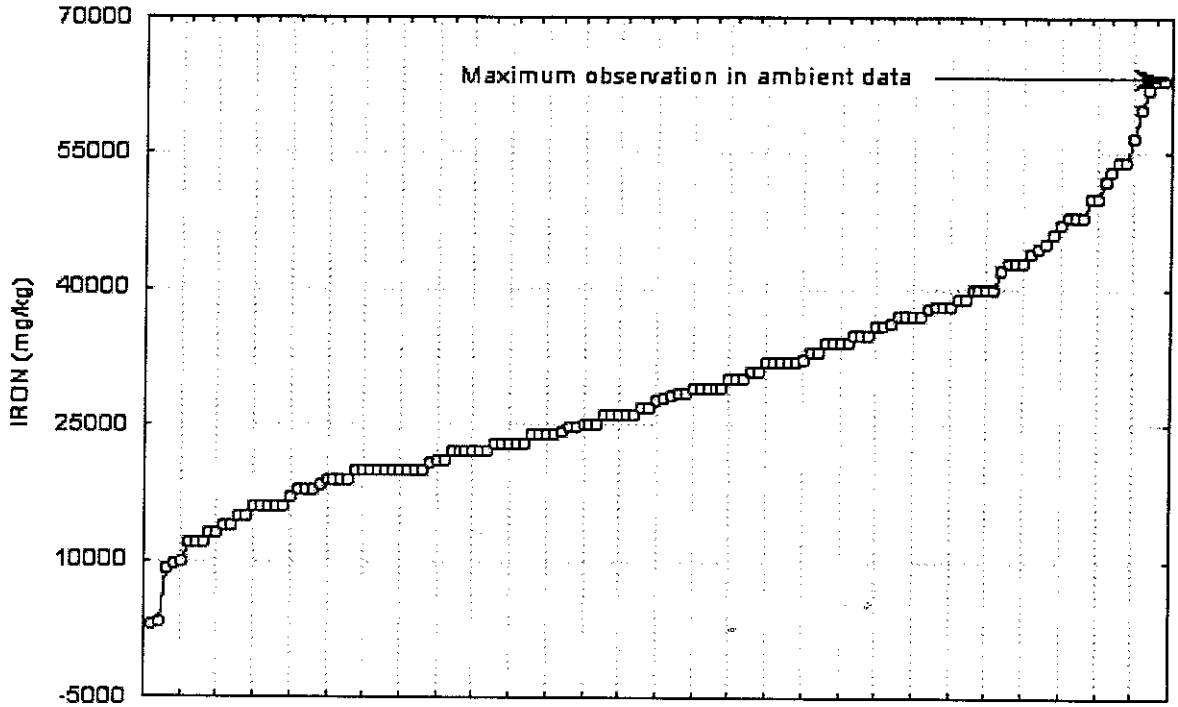


Figure A-4. Ranked Data Plots for Expanded Data



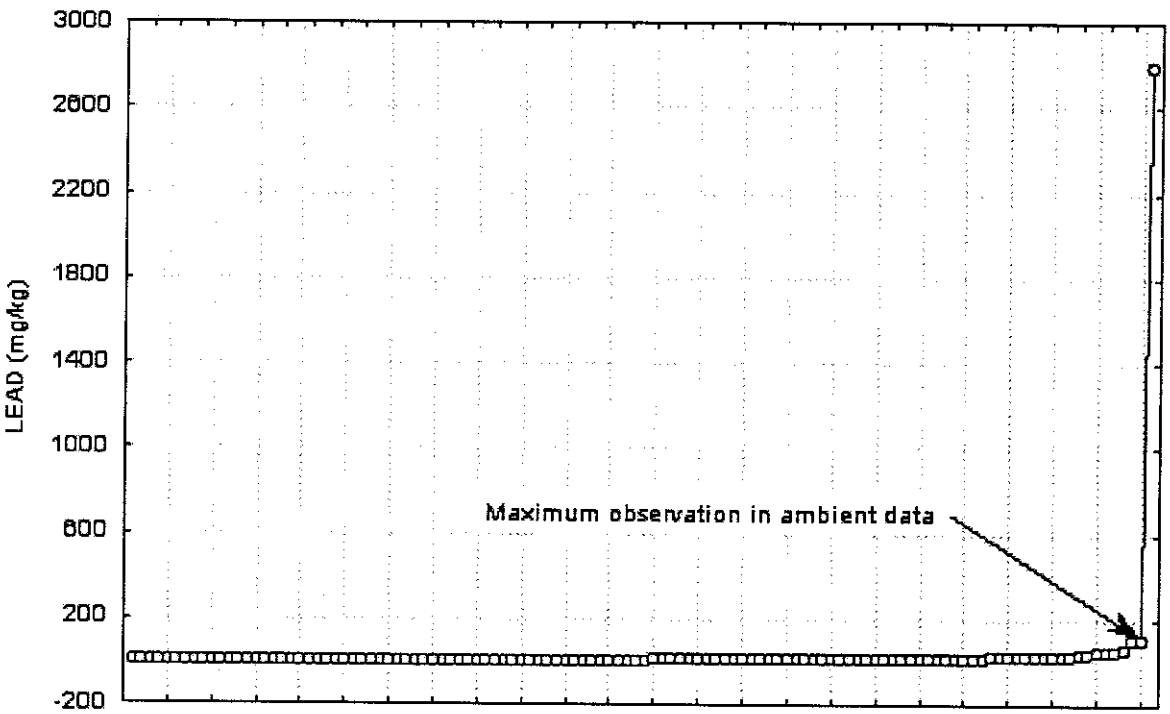
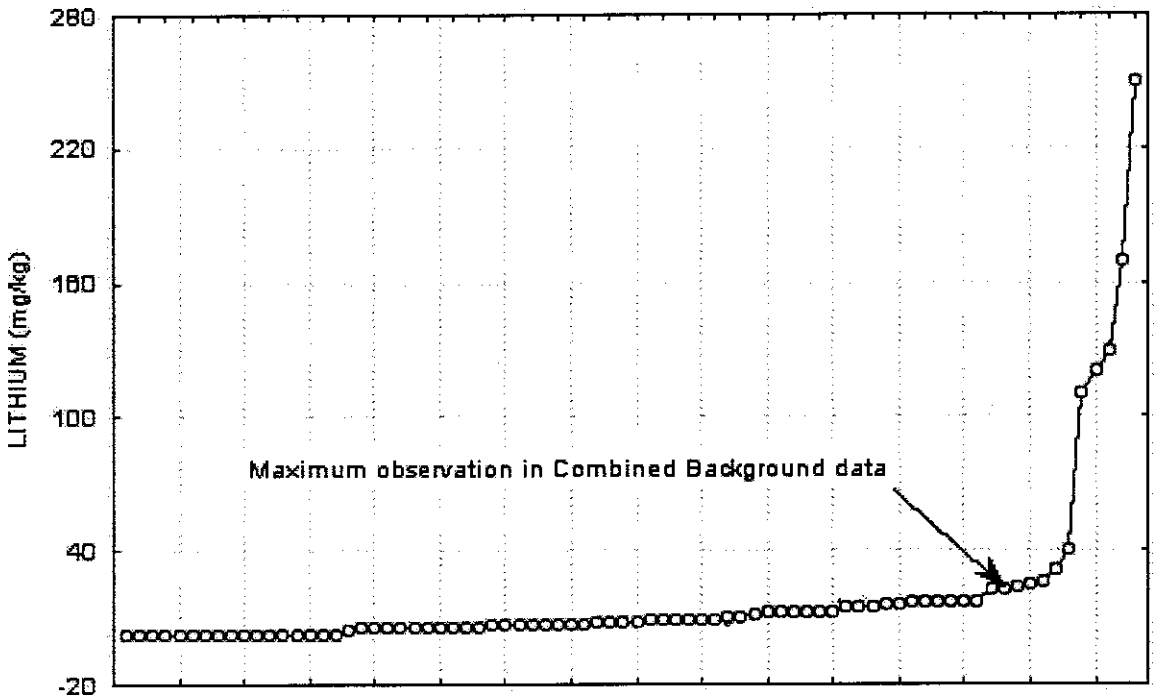


Figure A-4 Ranked Data Plots for Expanded Data



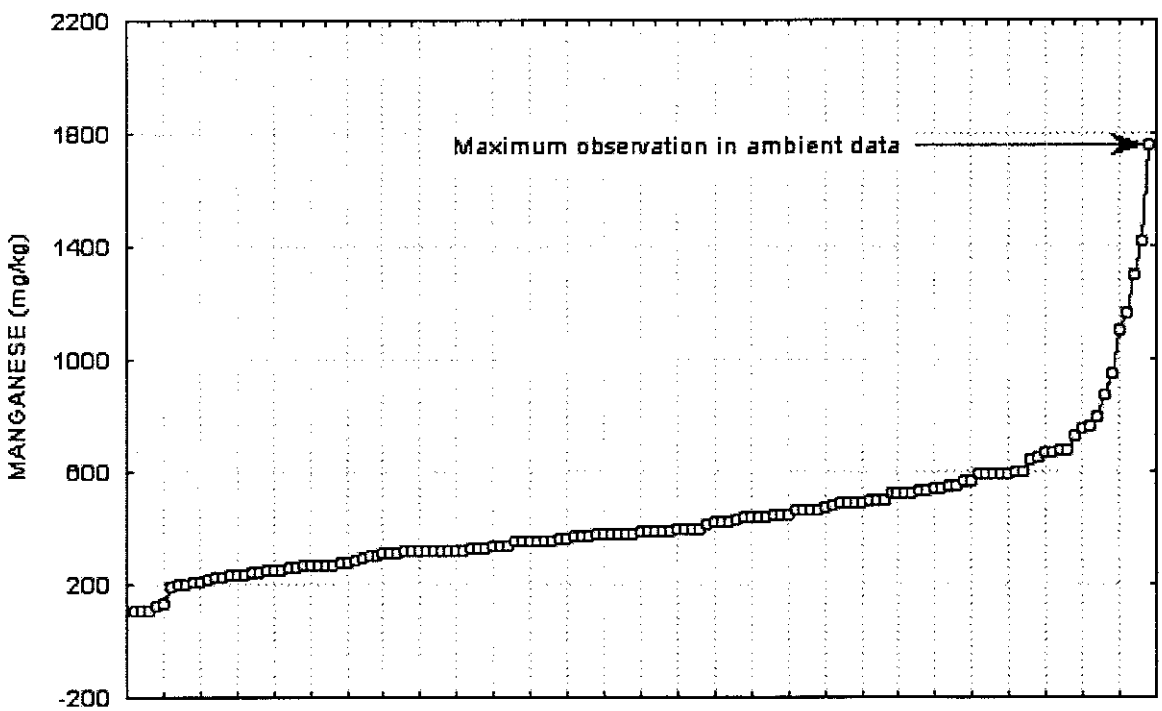
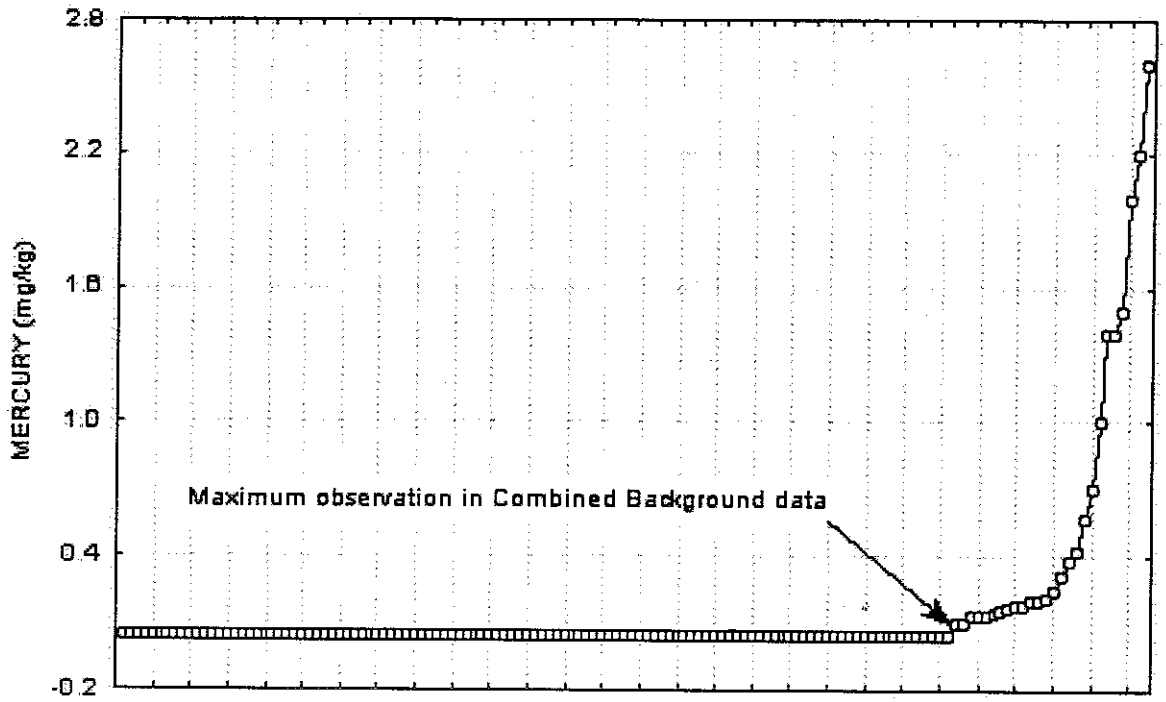


Figure A-4. Ranked Data Plots for Expanded Data



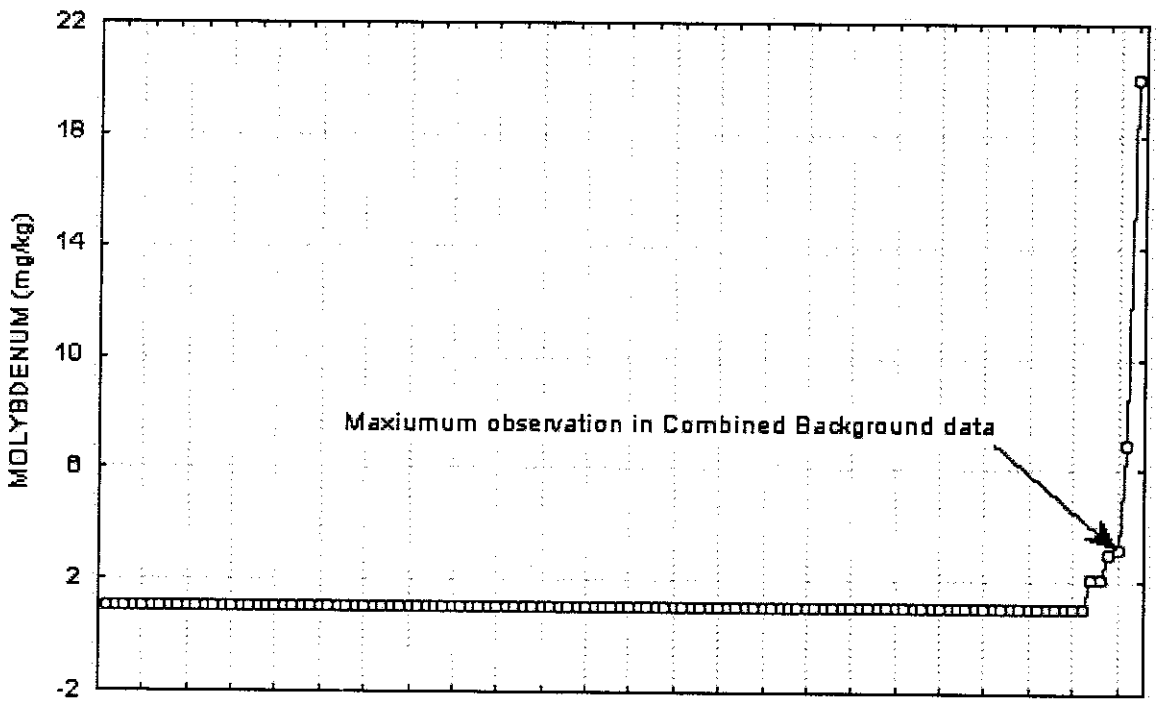
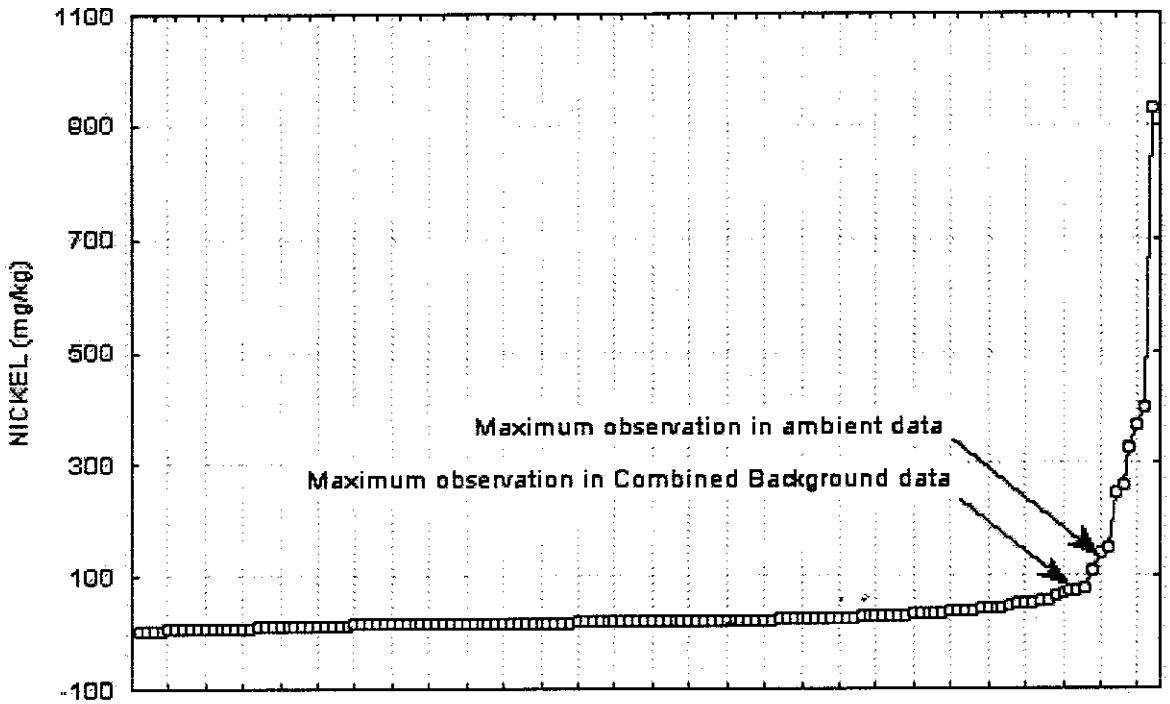
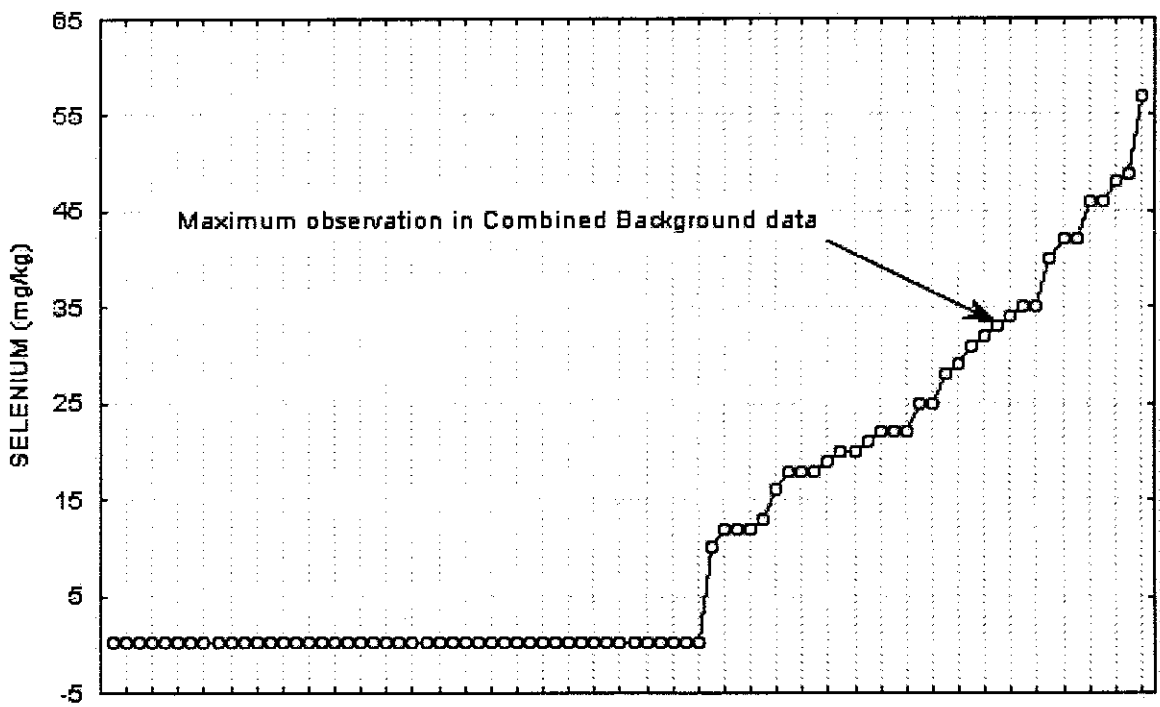


Figure A-4. Ranked Data Plots for Expanded Data





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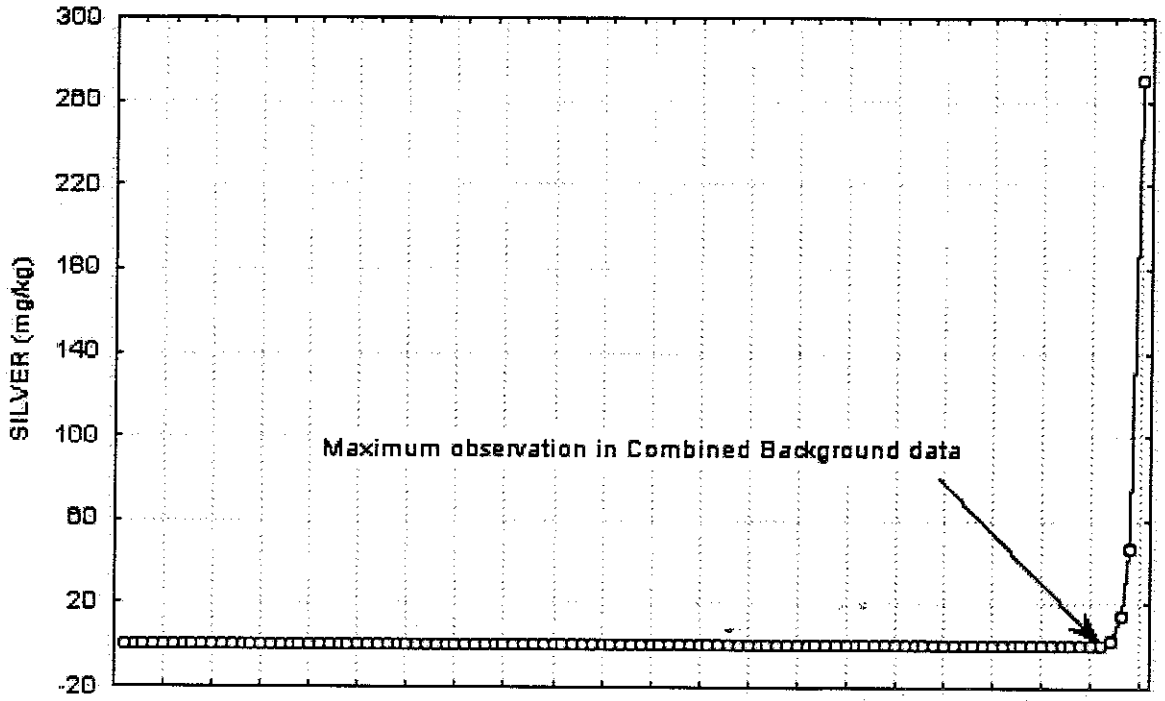


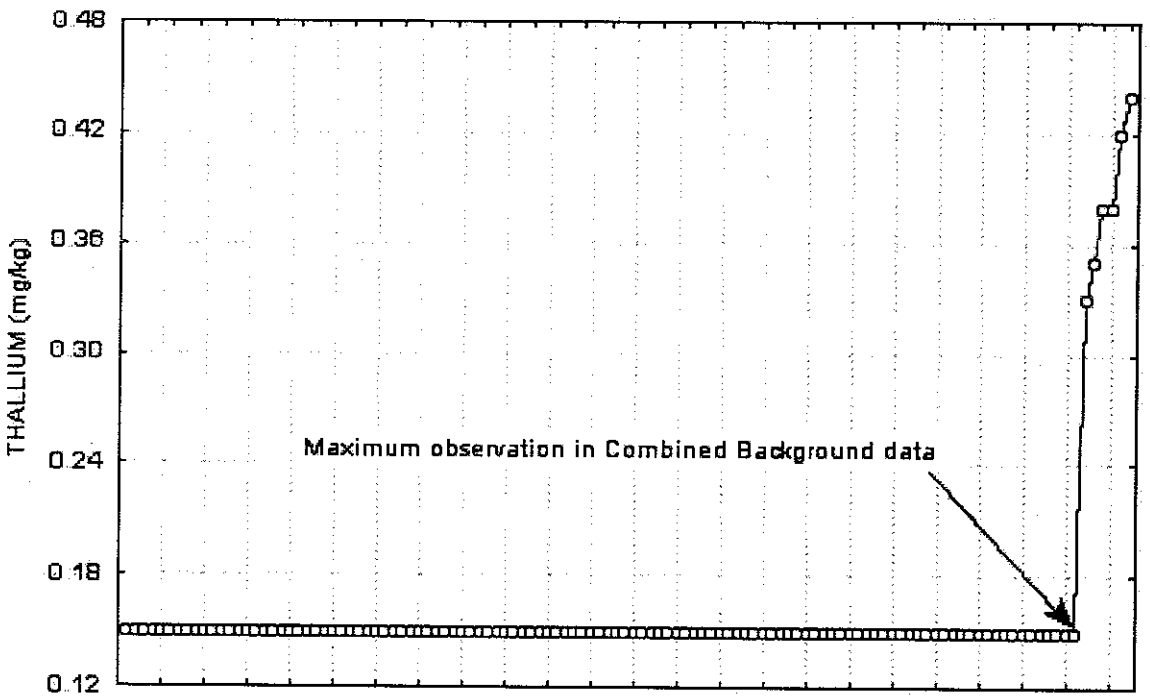
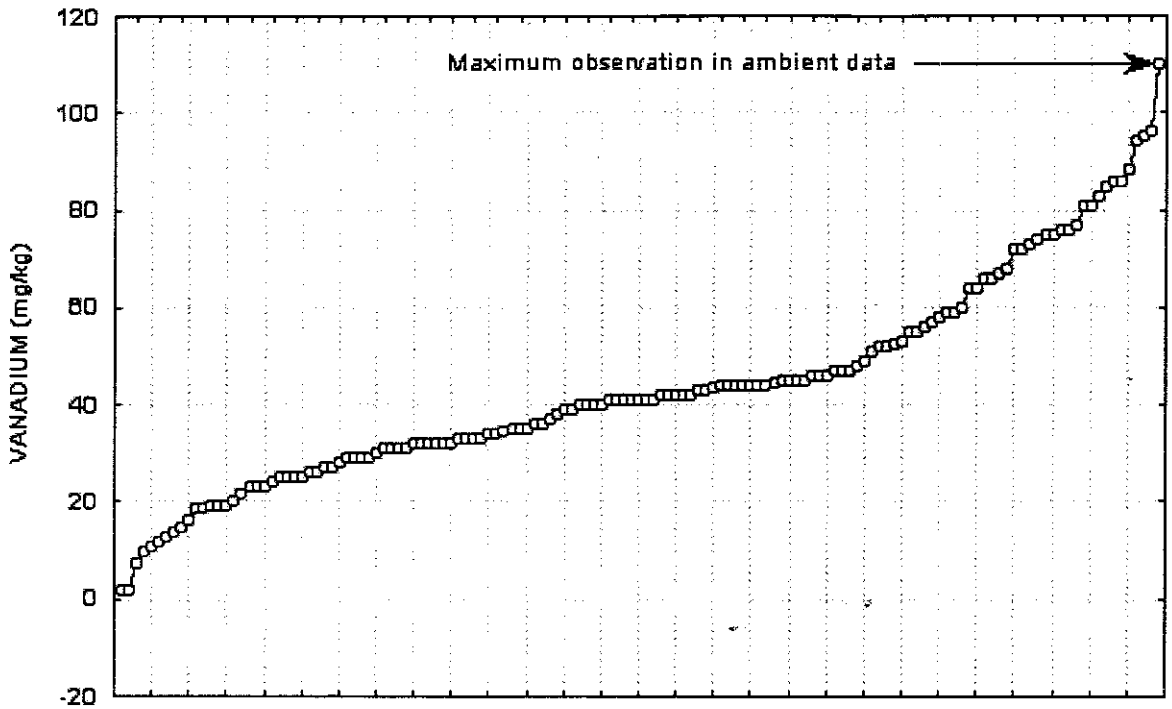


Figure A-4. Ranked Data Plots for Expanded Data



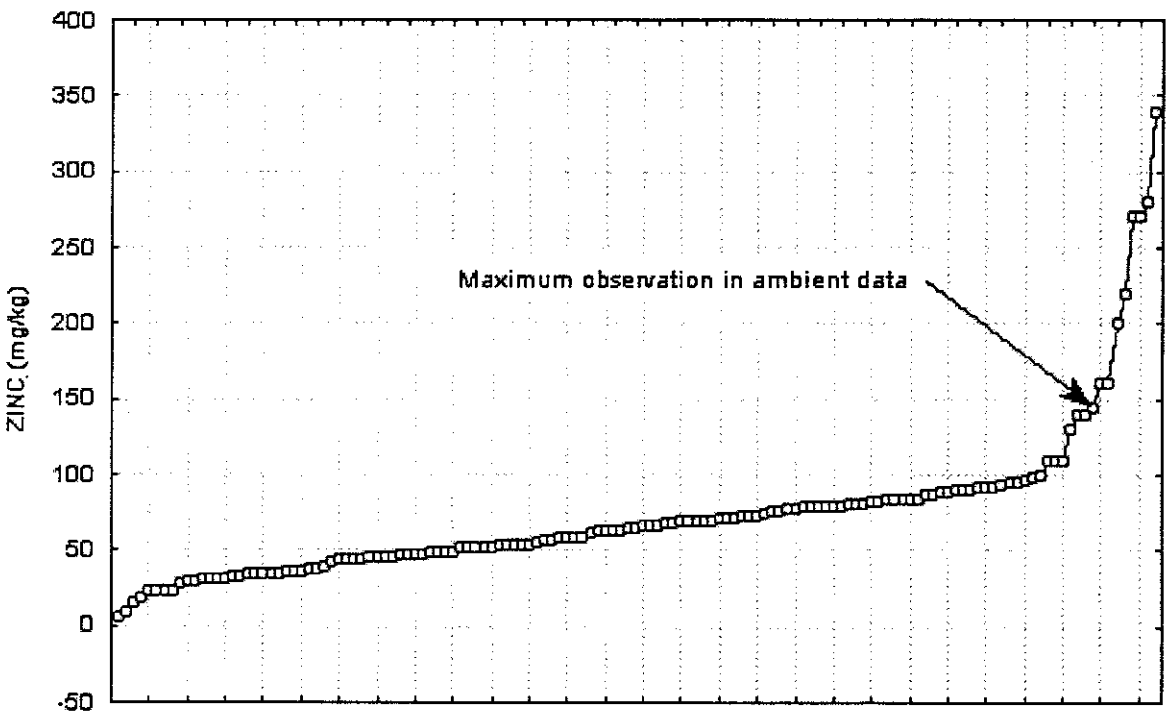


Figure A-5. Correlation of Aluminum and Iron

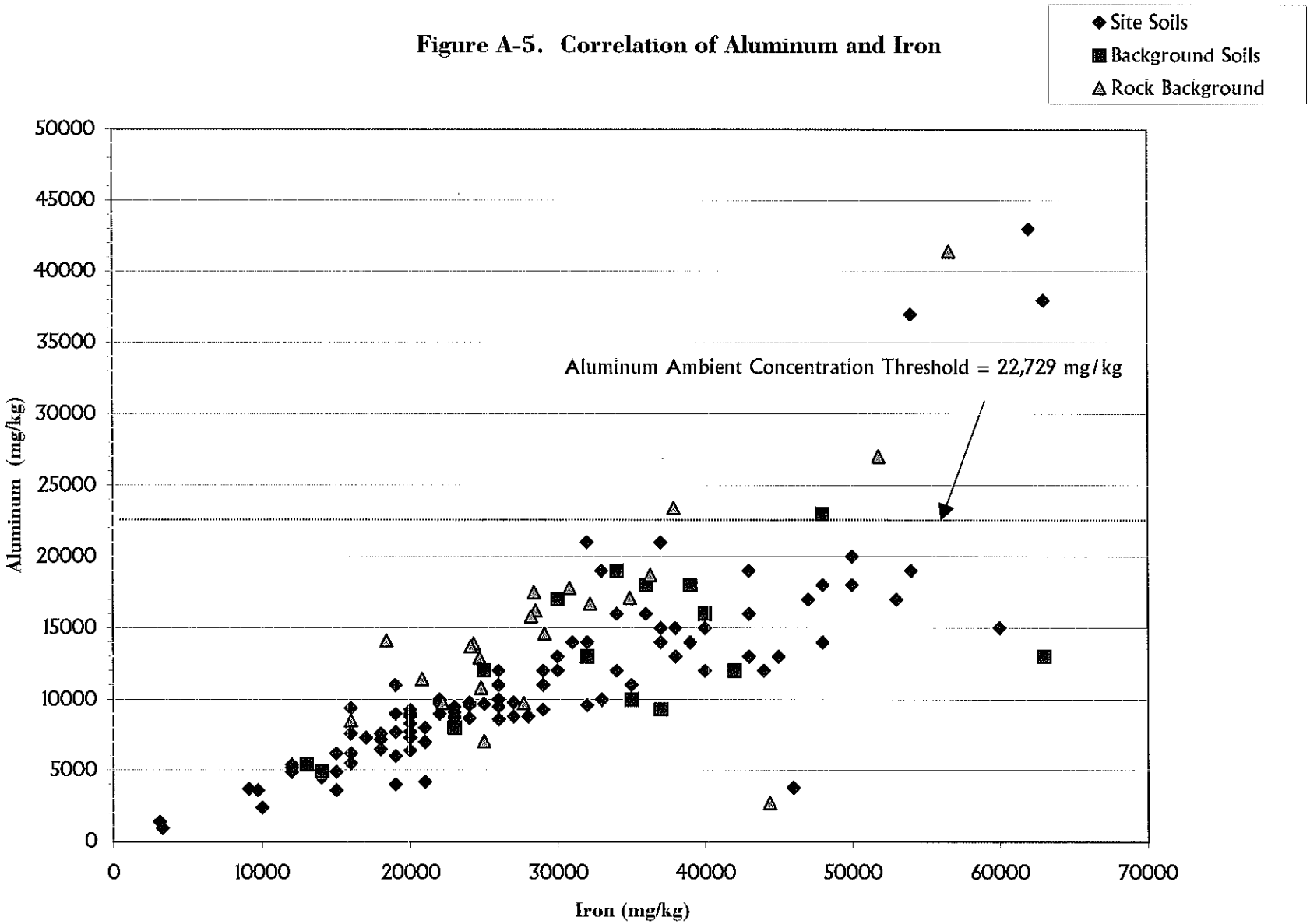


Figure A-6. Correlation of Iron and Magnesium

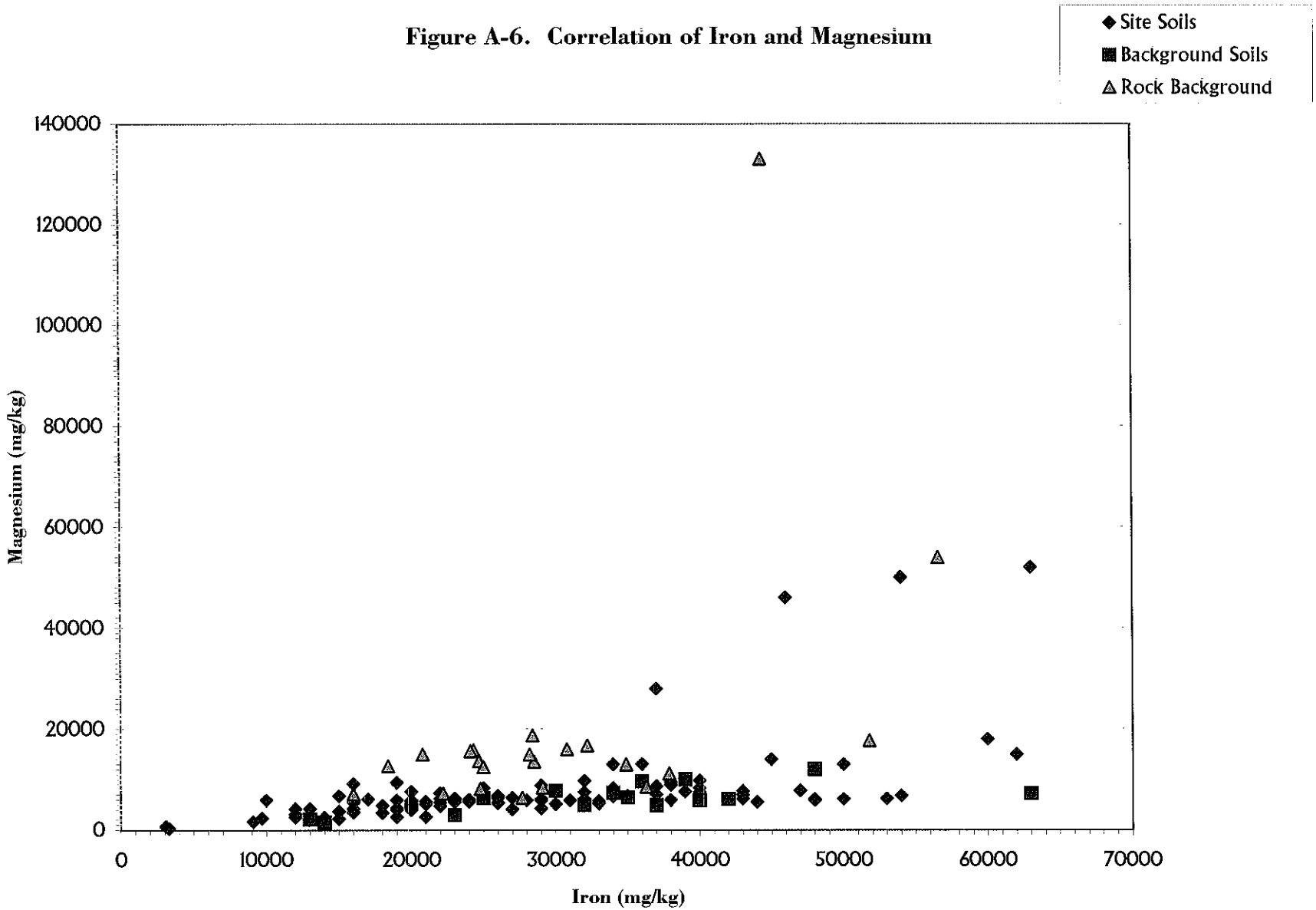


Figure A-7. Correlation of Arsenic and Iron

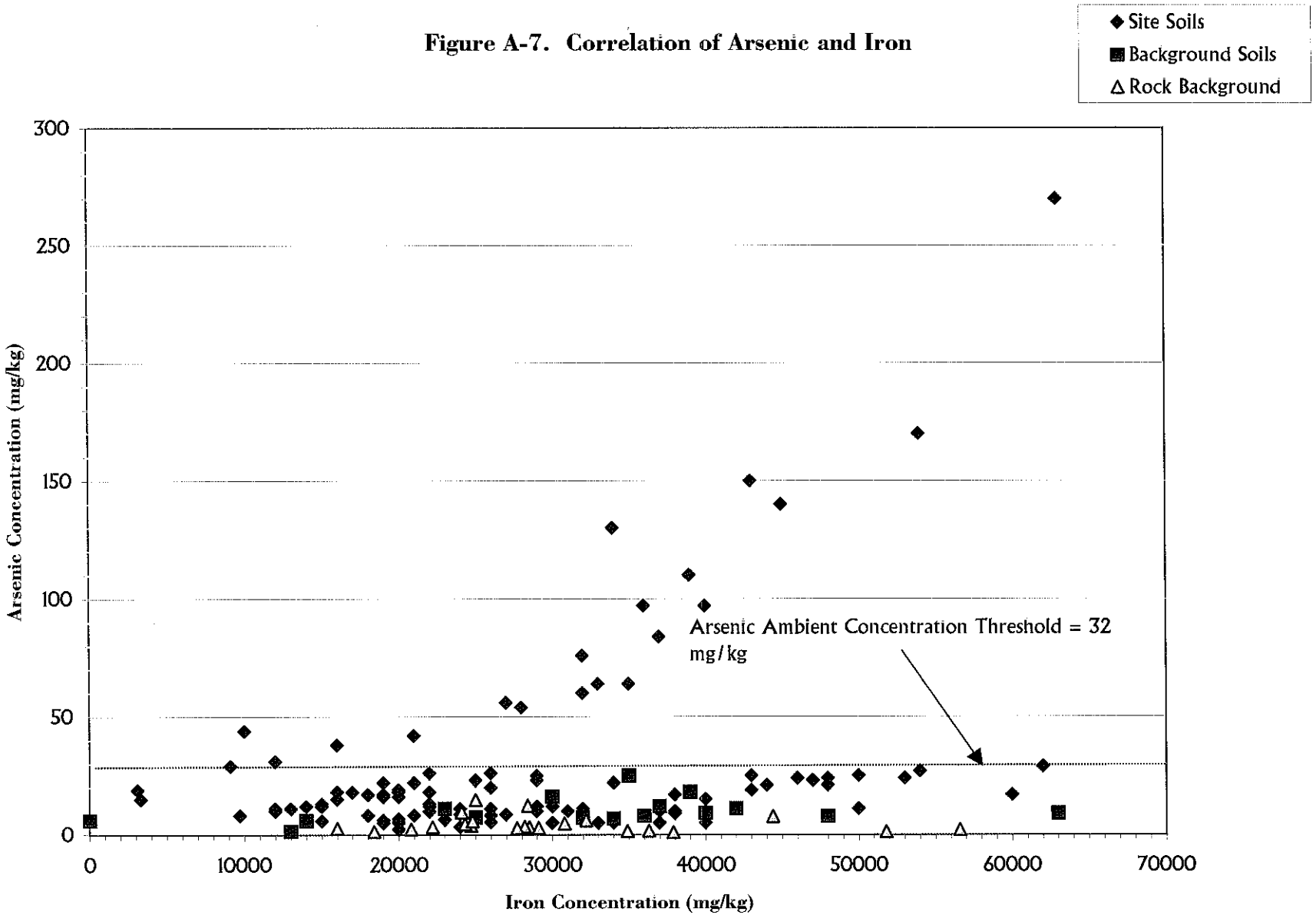


Figure A-8. Correlation of Iron and Barium

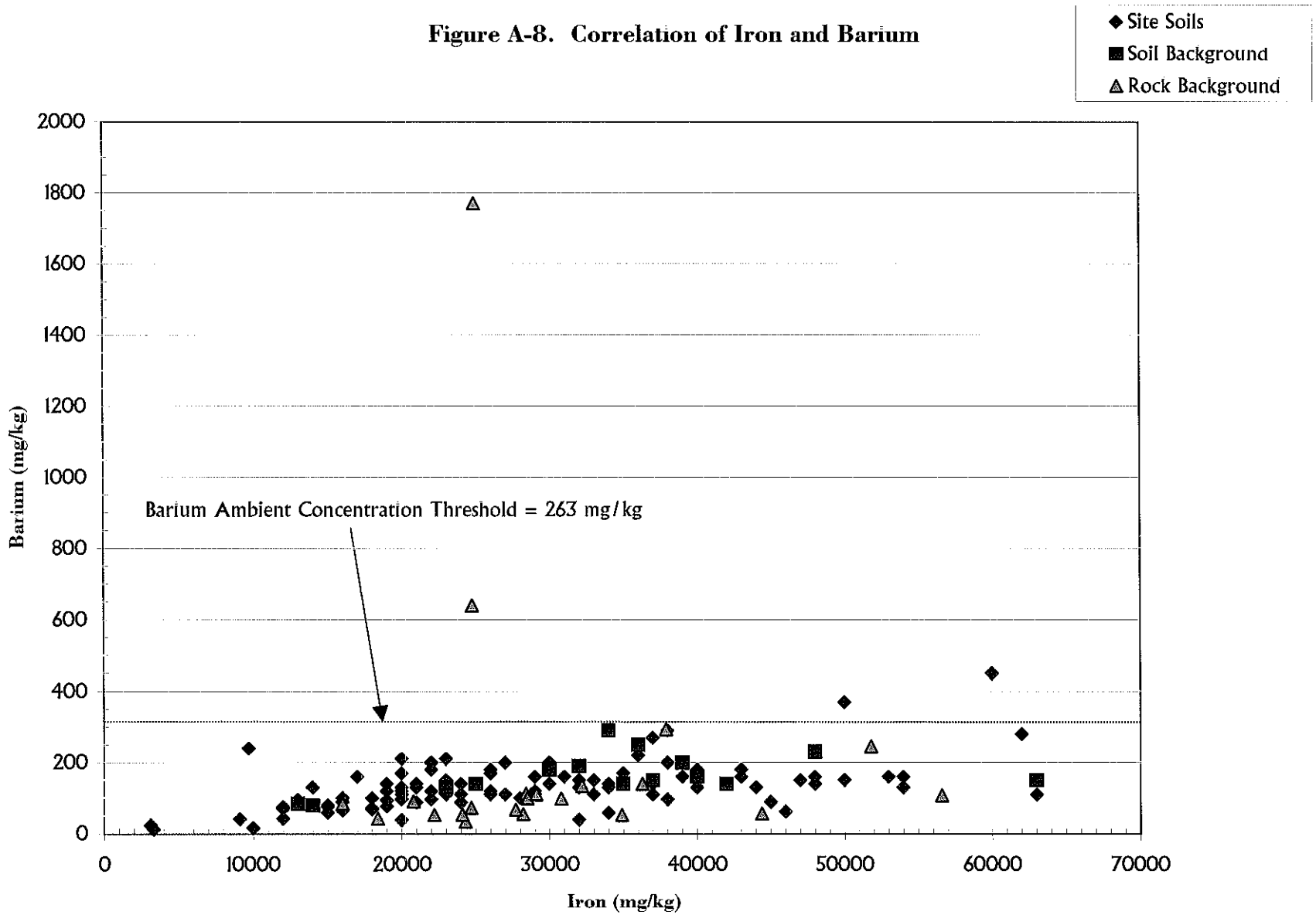


Figure A-9. Correlation of Iron and Beryllium

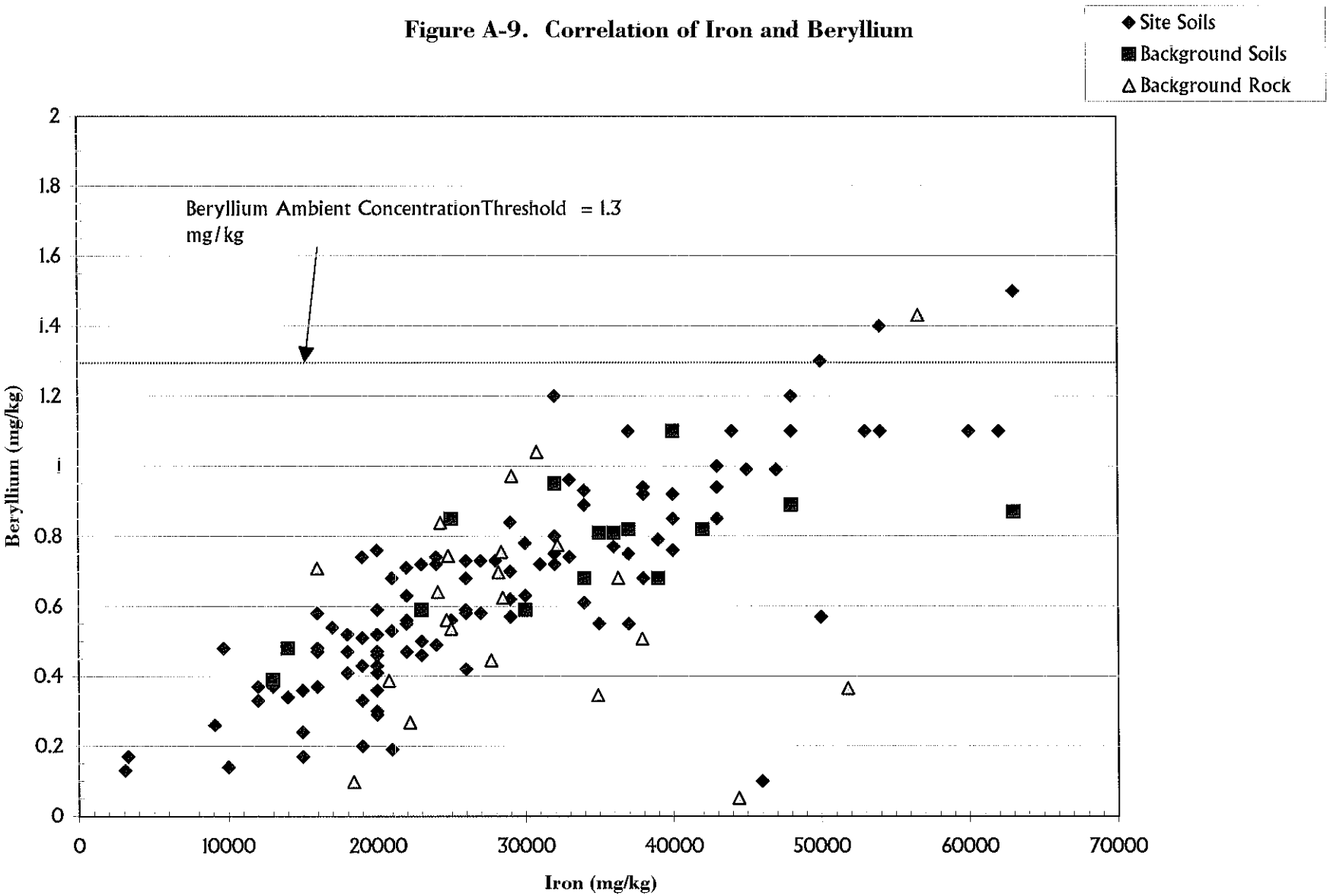


Figure A-10. Correlation of Iron and Chromium

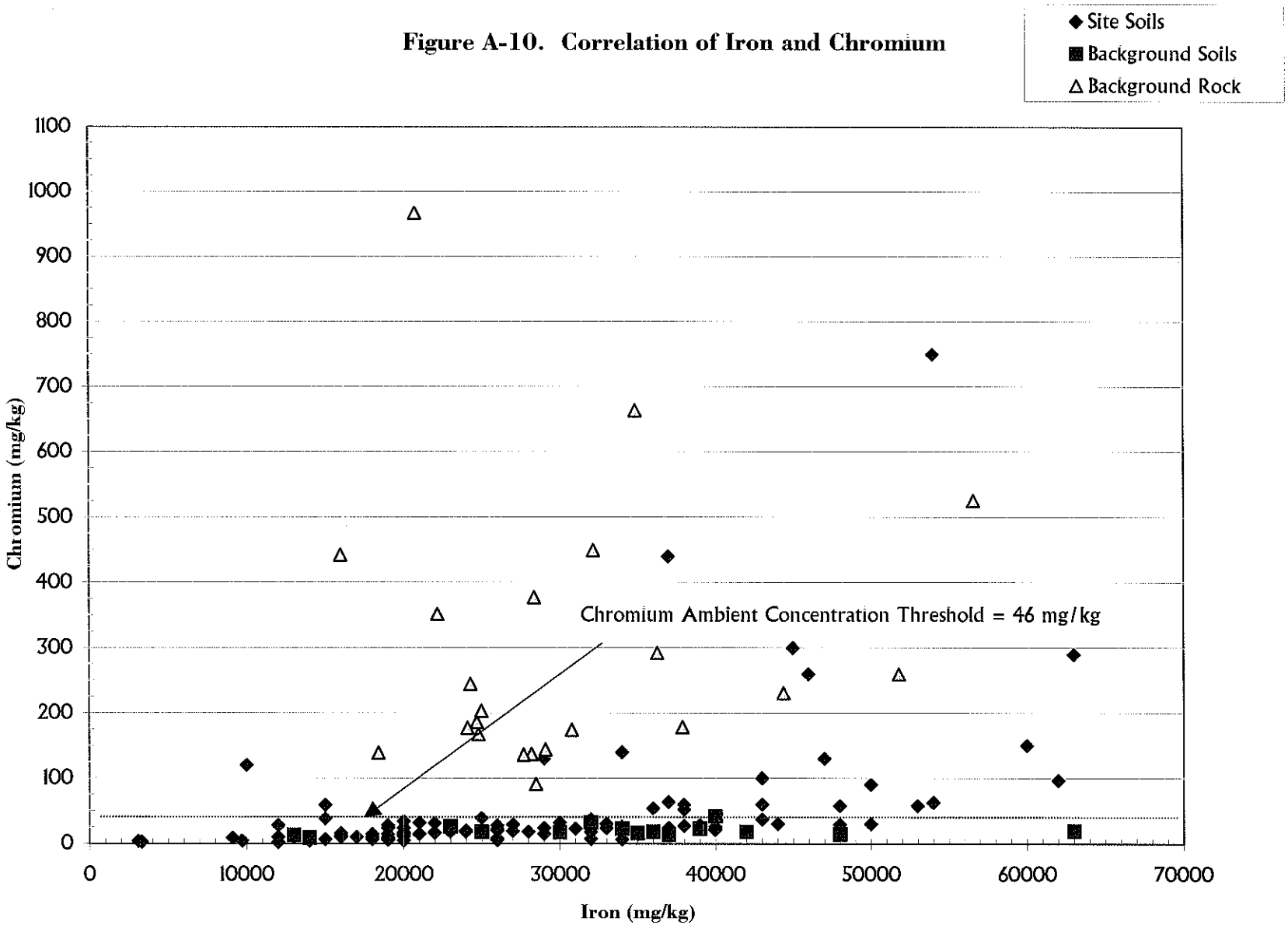


Figure A-11. Correlation of Iron and Cobalt

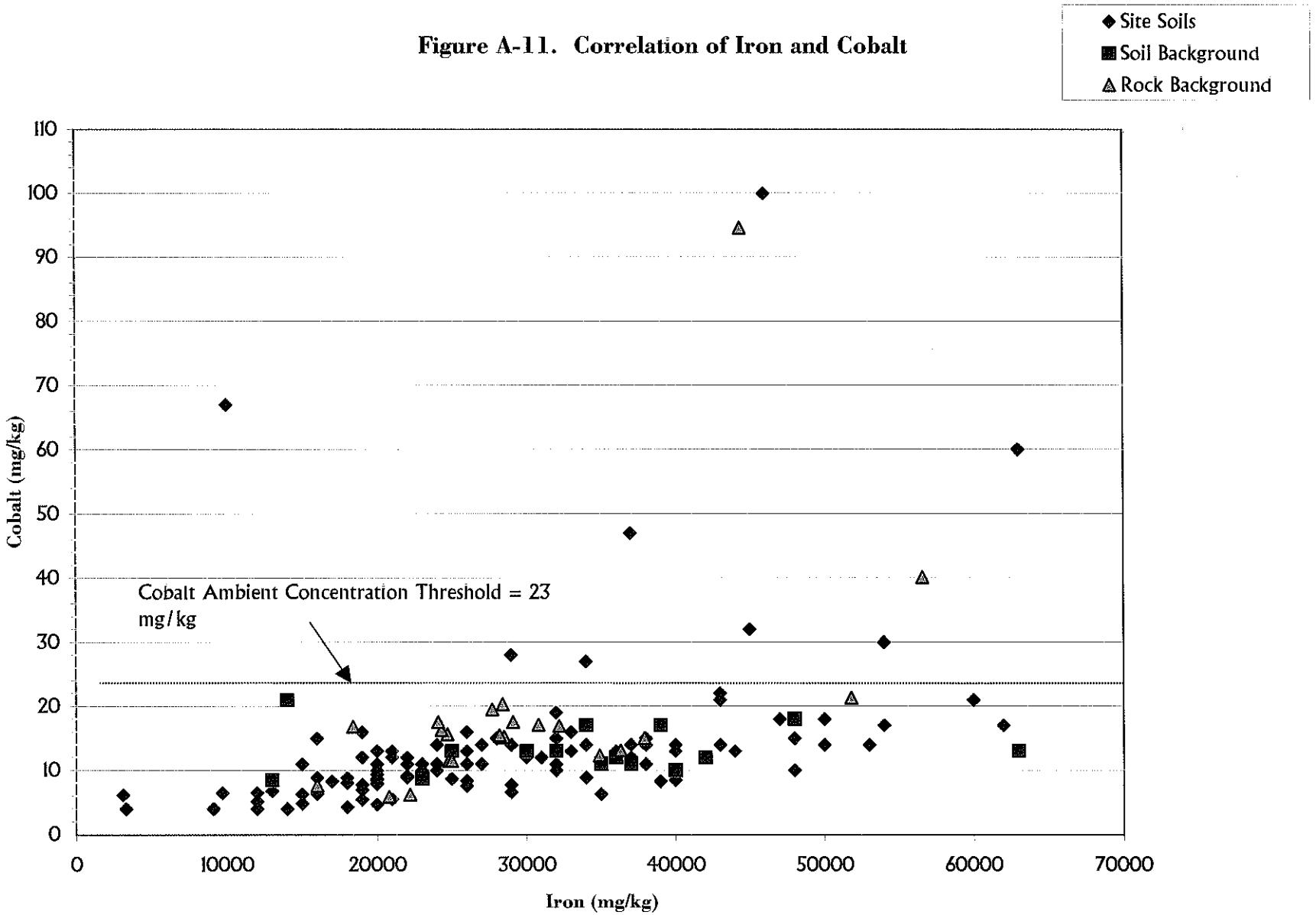


Figure A-12. Correlation of Magnesium and Lithium

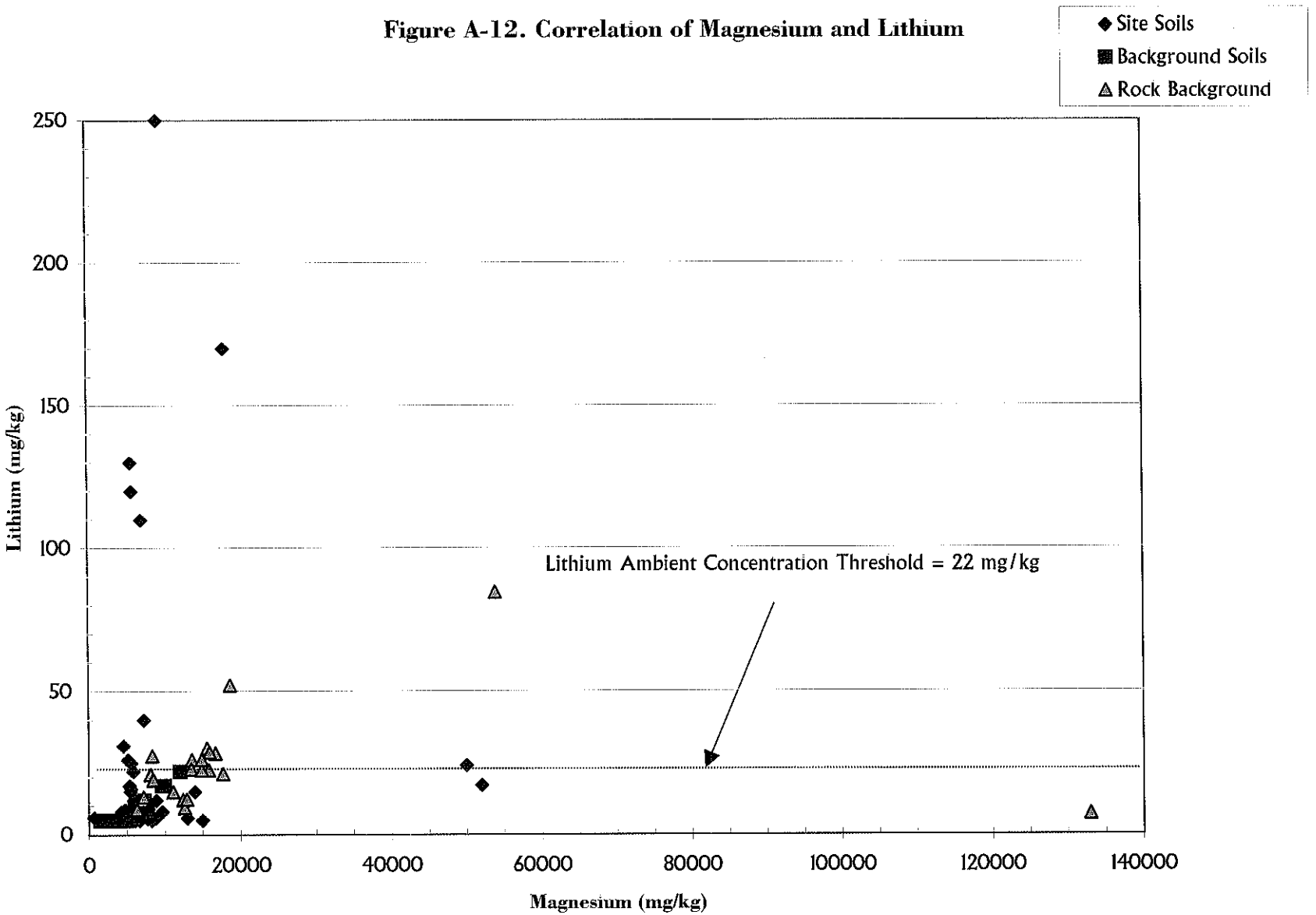


Figure A-13. Correlation of Iron and Manganese

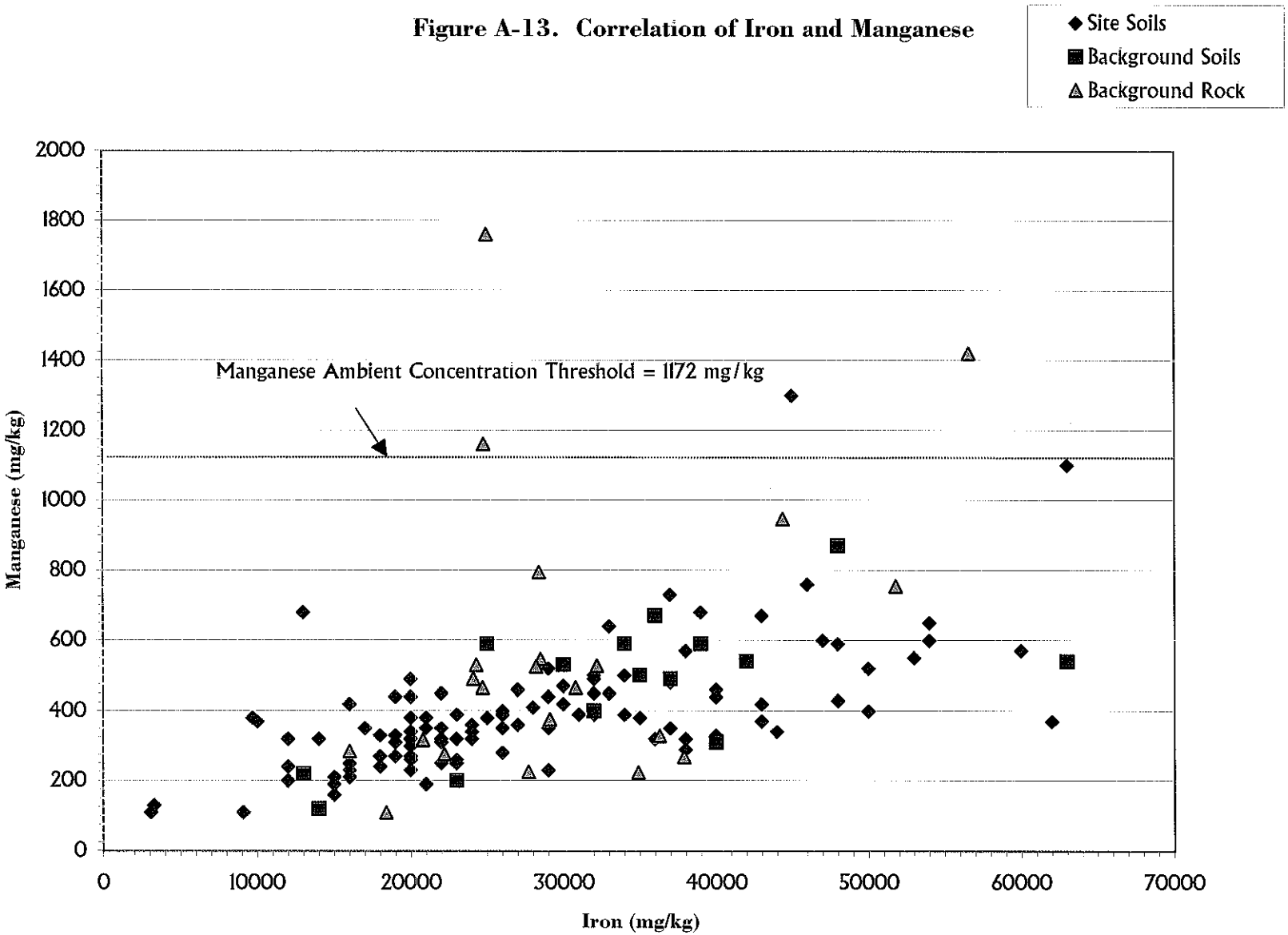


Figure A-14. Corrrelation of Iron and Nickel

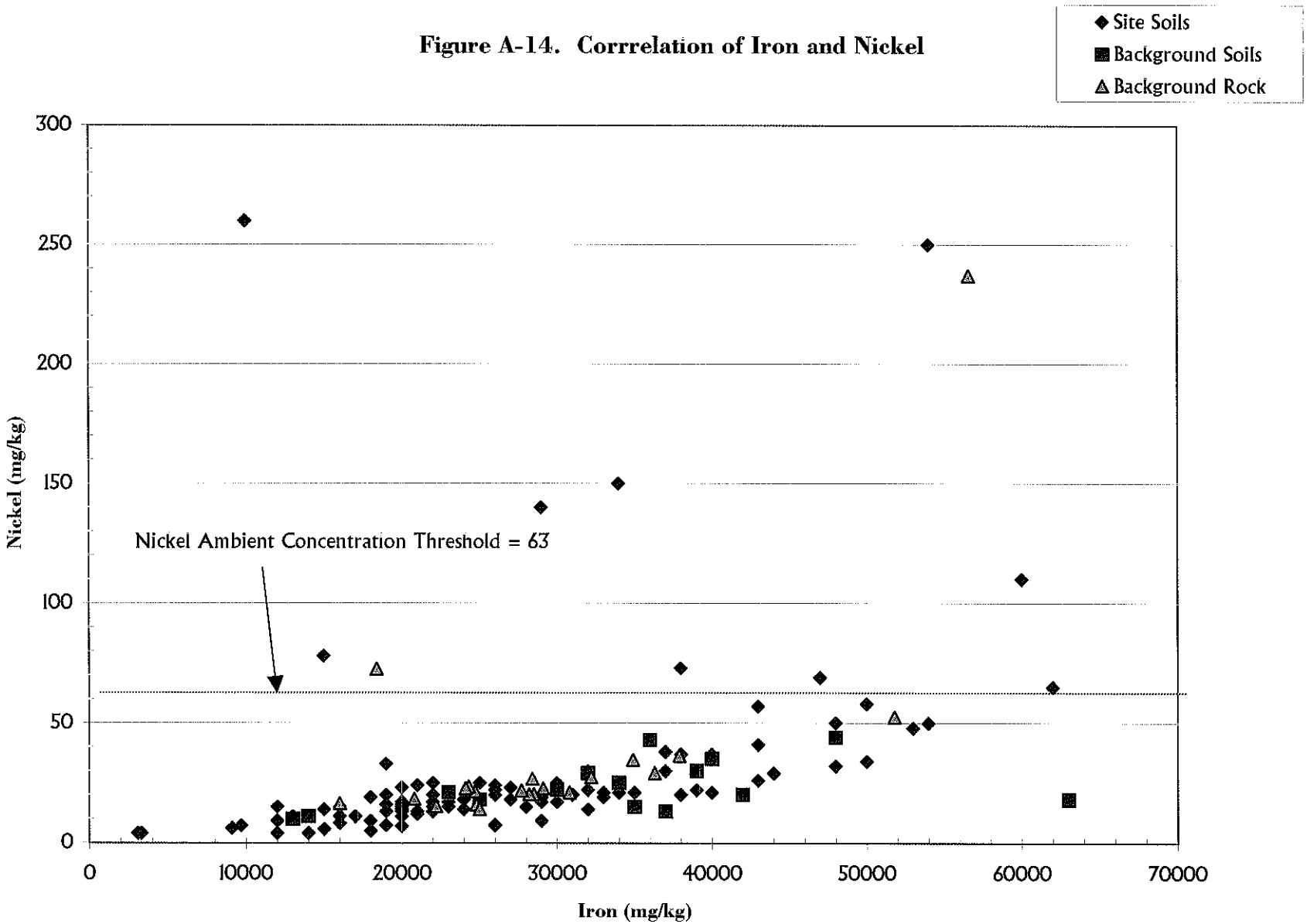


Figure A-15. Correlation of Iron and Vanadium

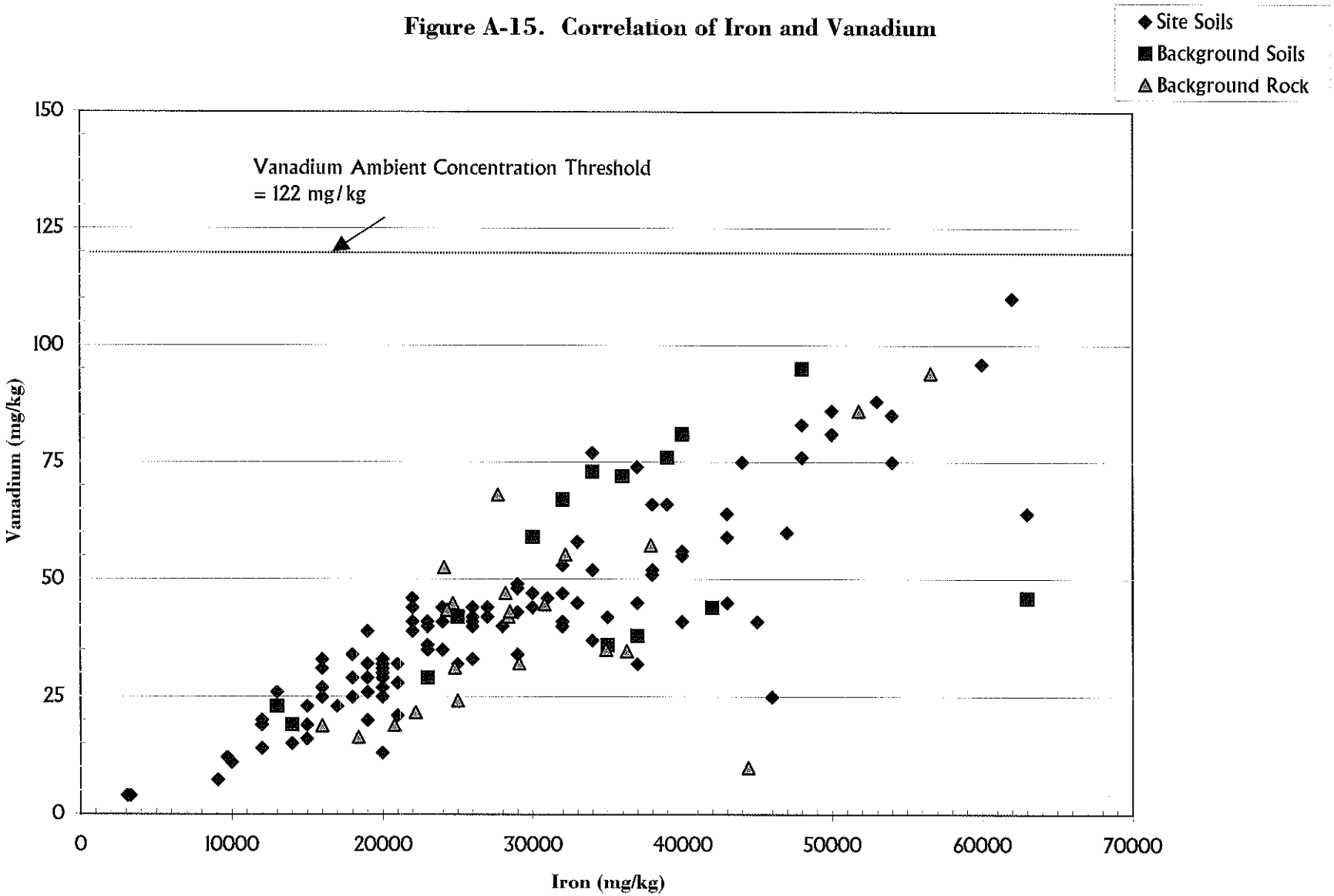


Figure A-16. Correlation Between Nickel and Chromium

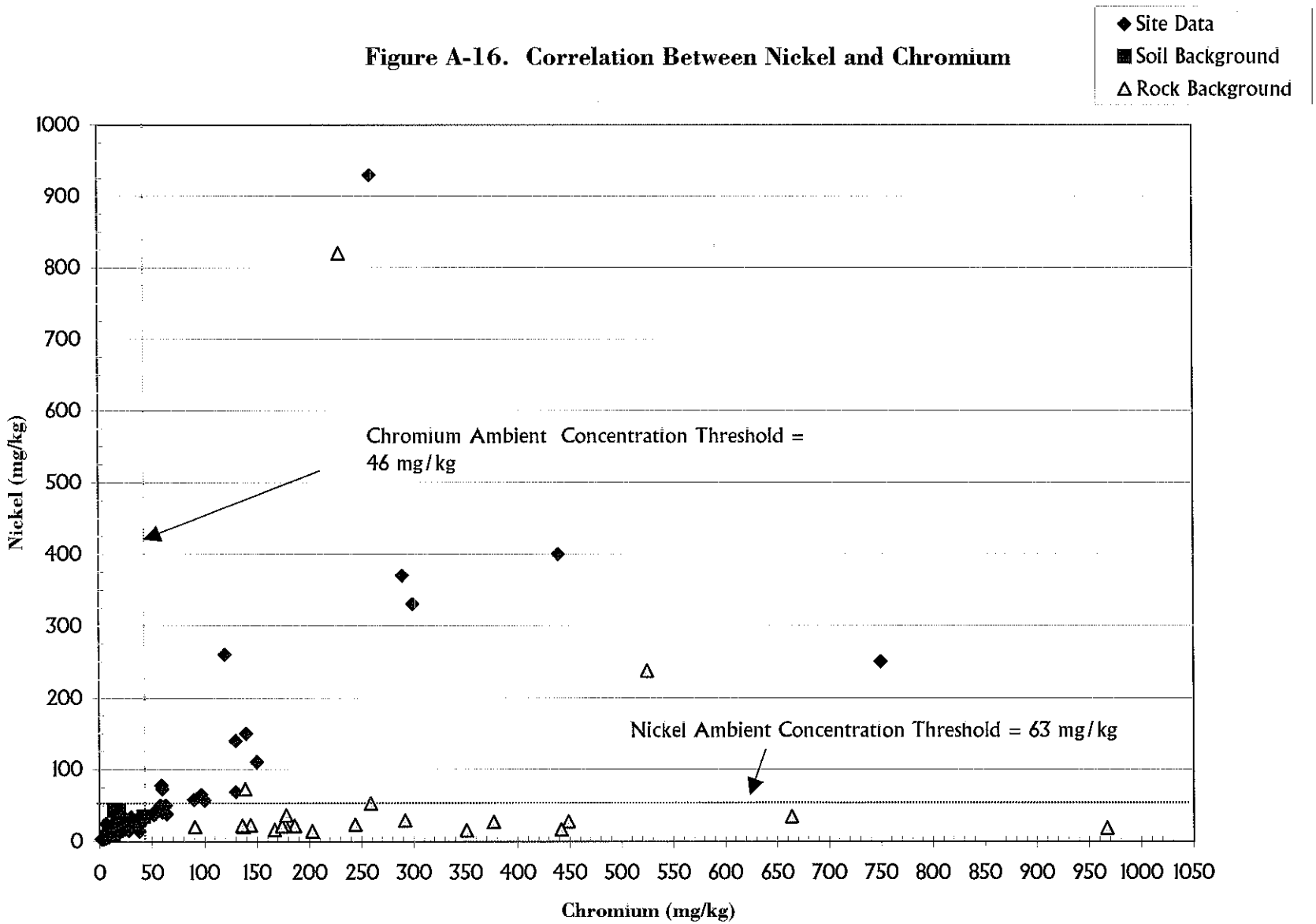


Figure A-17. Correlation of Magnesium and Copper

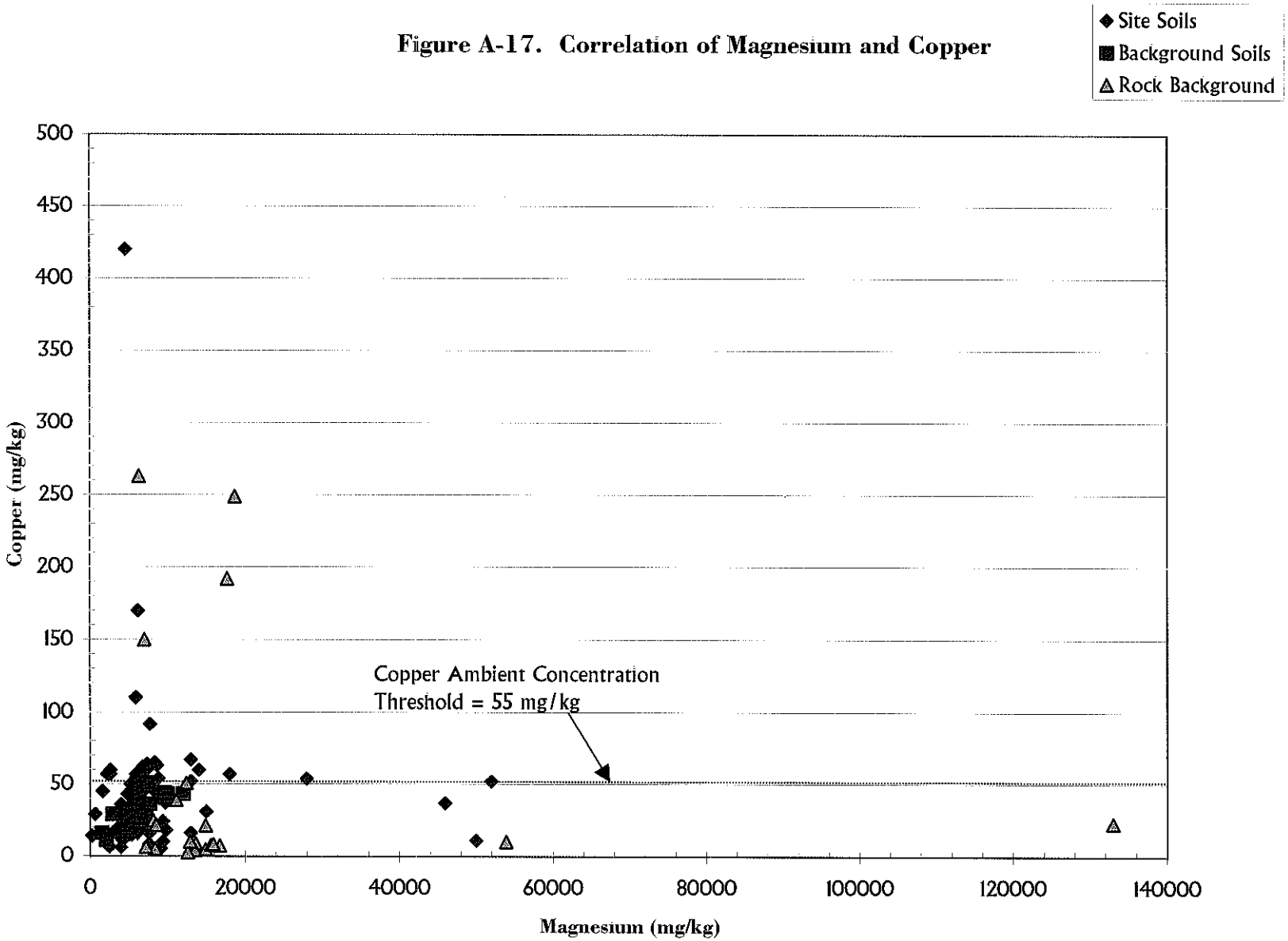


Figure A-18. Correlation of Lead and Copper

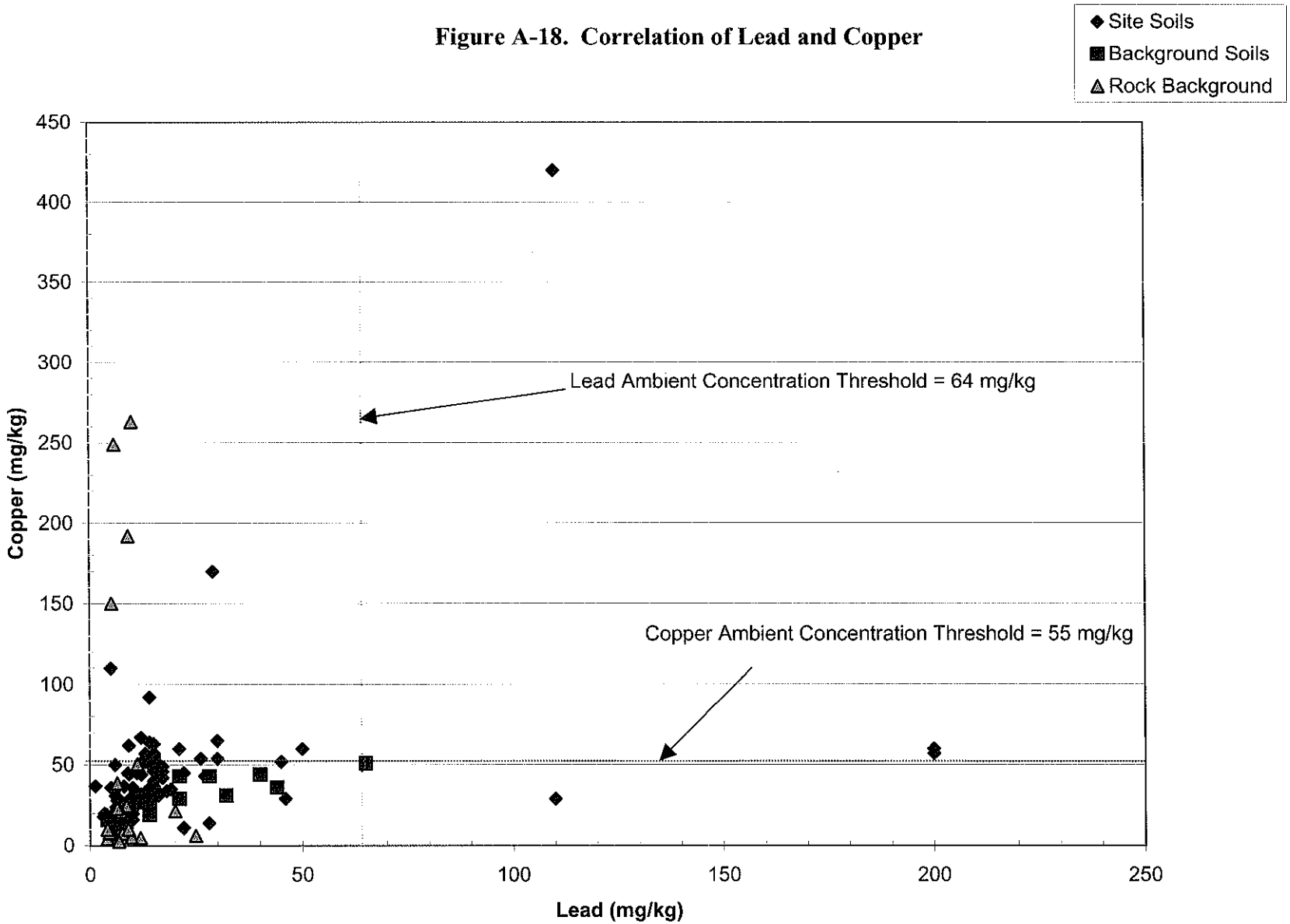


Figure A-19. Correlation of Lead and Zinc

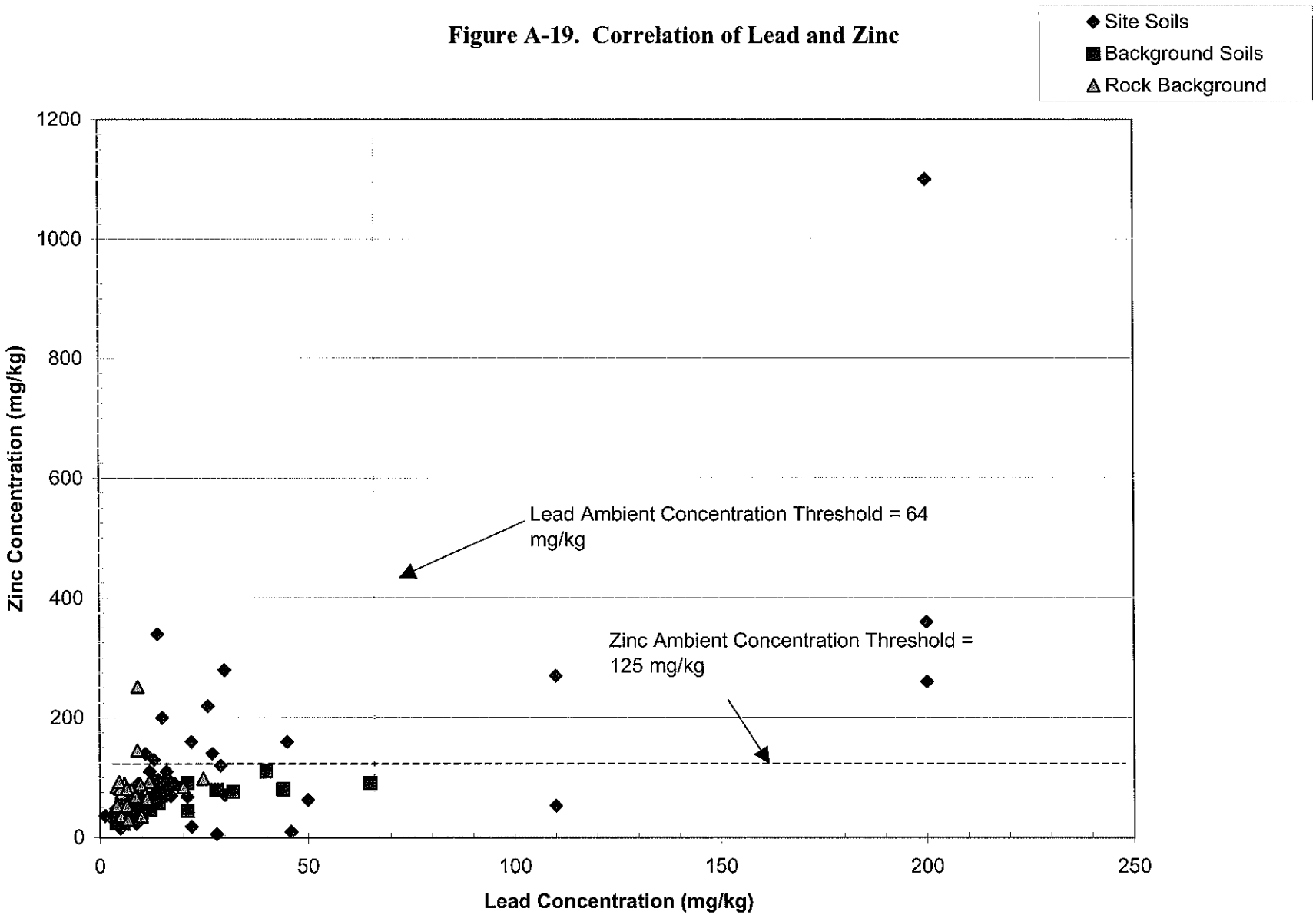
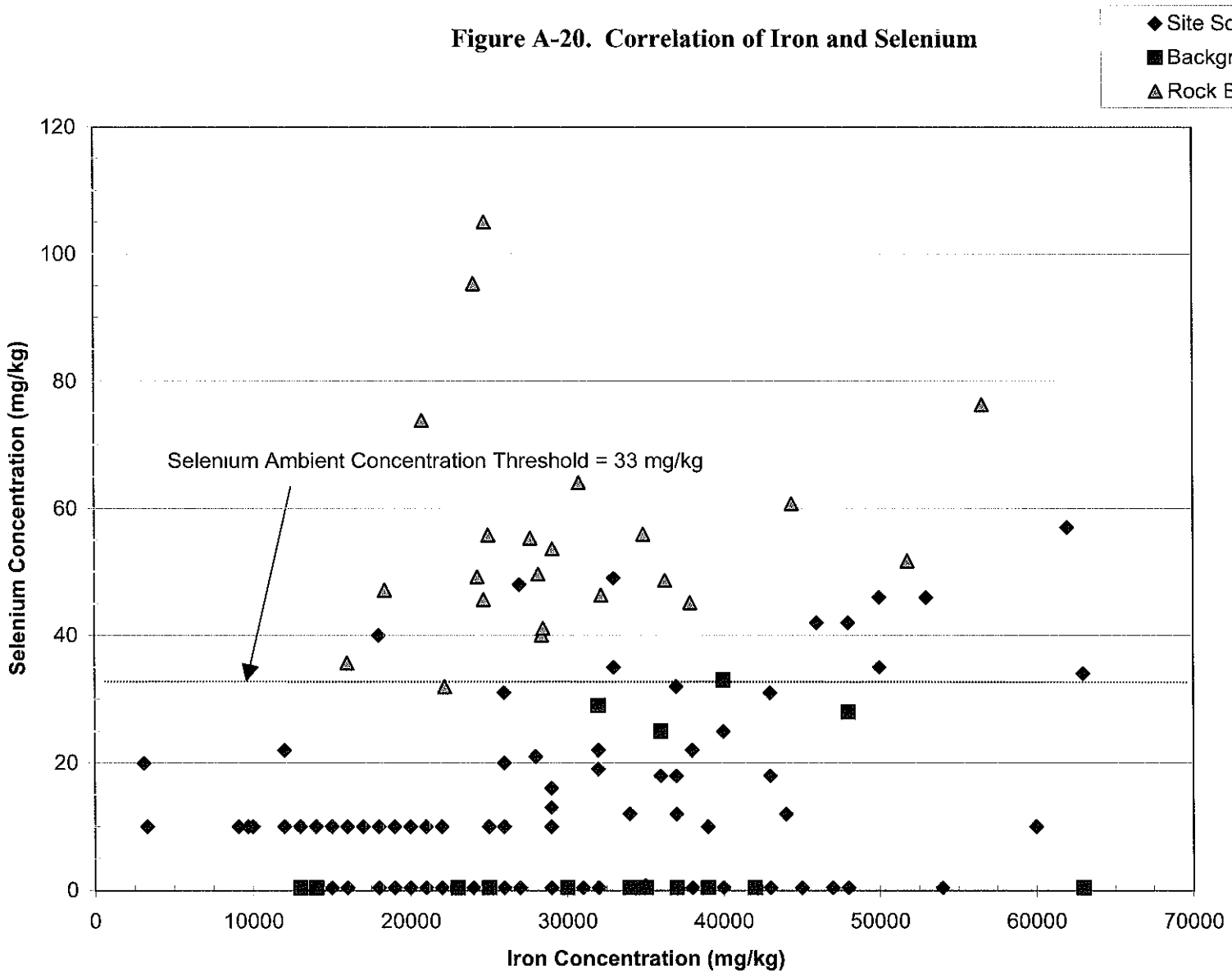


Figure A-20. Correlation of Iron and Selenium



APPENDIX B

SUMMARY OF SAMPLING ACTIVITIES

APPENDIX B

FIELD METHODS AND PROCEDURES

This section describes the field methods and procedures used during the SI field activities.

B.1. UTILITY SURVEY PREPARATION AND GEOPHYSICAL SURVEY

It was assumed that all utilities that may have once existed at the Morris Dam R&D facility were no longer active due to demolition activities. Therefore no formal utility survey was conducted. However, as a precaution underground Service Alert (USA) (800) 422-4133 was contacted to identify underground public utility lines, cables, etc., that might still be live coming into the facility.

A geophysical survey was performed adjacent to the sewer septic tank and leach field lines. The geophysical survey utilized electromagnetic induction, utility locators, and ground penetrating radar (GPR) to determine the location, size, and configuration of the tank and leach lines. A description of this survey and the results are discussed further in Section 4 and Appendix D.

B.2. DRILLING METHODS

Due to the soil/bedrock nature of subsurface material at the subject facility, several different drilling and sample collection methods were utilized as necessary during the SI field activities. Specific options were based on the soil and sampling conditions that existed at each location. Drilling and sampling methods, discussed in detail below, included hand augering, air rotary, and Resonant Sonic advancement methods. In general, most soil sampling was initiated using the hand augering method. If this method failed to allow collection of samples at the targeted depths, a mechanical drilling method was used to collect the samples, as described below. Monitoring wells were advanced by a combination of coring and air rotary techniques.

B.2.1 Hand Auger

A hand auger was used, where possible, when shallow (0 to 5 feet bgs) soil samples were collected. After advancing a boring to the specified depth using the hand auger, a discrete soil sample was collected by driving a clean, brass or stainless steel tube (2-inch diameter and 6-inch length) into the undisturbed soil, using a hand-operated slide hammer. Sections 6.7 through 6.12 discuss the standard procedures for sample storage, preservation, holding times, documentation, handling, shipment, equipment decontamination, field QA/QC samples, and disposal of contaminated materials.

B.2.2 Additional Subsurface Drilling Methods

In the event that soil sampling at depths greater than 5 feet bgs requires a drilling alternative

other than the hand auger method, or if the hand auger method failed to reach the necessary depths for sampling, a truck-mounted drill rig equipped with a Resonant Sonic drilling mechanism was used for soil/rock sampling. The drilling system consists of a hydraulically-activated unit that imparts high frequency sinusoidal wave vibrations into the drill string to effectuate a cutting action at the bit face. The system is successful through most types of formations, including consolidated bedrock. No fluids were required for the advancement of the drill string. The "ResonantSonic" drill method provided a continuous core of relatively undisturbed subsurface materials, which allowed accurate lithologic description and high quality analytical samples. Core sizes can be varied in accordance with the needs of the project. At the Morris Dam facility, a nominal 4-inch diameter boring was used for the soil/rock sampling. The only cuttings associated with this method were those obtained from the core; therefore, investigation-derived waste was minimized.

Because of the depth of the monitoring wells, a second drilling method was utilized for installation of the three wells. A field decision was made to attempt to collect core samples of rock during initial advancement of the borehole. Core samples were collected with a 3-inch diameter, 10-foot long PQ core barrel. Core samples were collected, where possible during advancement of the casing. In general, PQ cores were obtained between 30 and 70 feet bg of MW-1. The top 30 feet of material was too loose to obtain core, and below 70 feet bg, the core could not be advanced due to the hardness of the rock material. No PQ core could be advanced below the fill material (approximately 20 feet bg) in MW-2 or MW-3.

An air rotary system was used which allowed the advancement through the rock matrix below 70 feet bg in MW-1 and below 20 feet bg in MW-2 and MW-3. This method consists of drilling action provided by a down-hole hammer with an oversized tungsten carbide insert bit. Formation cuttings were removed by either dual-wall reverse circulation or by conventional direct rotary circulation flow. Return air and cuttings were discharged either up the face of the drill bit then up the center of the drill pipe or up the sides of the borehole. The unconsolidated portion of the borehole (between 0 to 30 feet bg in MW-1 and 0 to 20 feet in MW-2 and MW-3) was stabilized by a heavy duty high tensile threaded casing driven by the percussion action of the external casing driving system. Samples for lithologic descriptions were collected from a cyclone which collects the cuttings discharged from the borehole. Upon completion of drilling, the bit was removed and well completion materials were installed through the driven steel casing. The steel casing was removed incrementally as the materials for well installation were added.

B.3. BORING LOGS

Soil borings were logged using the Unified Soil Classification System (USCS), which is described in the American Society of Testing Materials (ASTM) Standard D-2888-84. For rock cores and cuttings standard rock descriptions were used. The logs present a description of the soil classification, sample intervals, sampling blow counts for drive sampling, depth to groundwater, field screening measurements, monitoring well construction information, and other pertinent drilling and sampling information.

Borings and samples were logged in the field by a qualified field geologist using standard boring log forms.

Soil classification included a minimum of the following: USCS or rock group symbol, soil or rock name, including visual identification of mineralogy, if possible, color, moisture content, grain size distribution, drive sample blow counts, relative density (from recorded blow counts, or time required for drilling), and unusual odors, if present. Boring information also contains the following types of data:

- Boring number and location;
- Structural features (such as fractures, fault gouge, solution channels, buried streams, or valleys) and discontinuity;
- Degree of weathering;
- Depth and vertical extent of water bearing unit(s);
- Depth at termination of boring;
- Depth, and description of any staining encountered;
- Presence of carbonate;
- Drilling observations;
- Type of drilling equipment, driller, and drilling company;
- Drilling and sampling times; and
- Type of samples taken, and depths at which samples were taken.

Additional soil/rock sampling or drilling activities was documented on the drilling log form, or in the drilling logbook. Monitoring data for inorganic vapors and radiation counts were logged on the boring log as well.

B.4. MONITORING WELL INSTALLATION AND DEVELOPMENT

Three monitoring wells were installed during the investigation: one just north of former Building 42001, adjacent to the newer leach field (MW-1), one south of former Building 42015 (MW-2), and one on the south side of the peninsula south of former Building 42005 (MW-3). These wells provided groundwater samples near areas where potential releases may have occurred or where migration of contaminants occurred.

B.4.1 Well Installation

The monitoring wells were constructed of polyvinyl chloride (PVC) casing and screen as follows: MW-1 was installed using 5-inch internal diameter (ID) schedule 80 PVC casing and screen. MW-2 and MW-3 were installed using 4-inch ID schedule 40 PVC casing. The screen slot size is 0.010 inch, and filter pack size is No. 3 silica sand.

The top of the well screen extends above the water table to allow for seasonal groundwater level fluctuations. Actual screen intervals were determined in conference with regulatory personnel based on data collected during the field investigation. Long well screen intervals were used to account for the expected fluctuations in reservoir level, and still allow for sample collection.

The filter pack was placed to a depth approximately 3 to 5 feet above the top of the well screen. This allowed for settlement during well completion and minimized the chance of the bentonite seal permeating the well screen. A minimum of 3 feet of bentonite pellets were placed above the filter pack. Depth soundings were made to verify the placement of the filter pack and the bentonite seal. Potable water was poured down the annulus of the well to hydrate the bentonite pellets. A minimum of 30 minutes was allowed for the bentonite to hydrate prior to emplacement of a bentonite grout. The annulus above the bentonite seal was filled with a bentonite grout to within 2 feet of land surface. The grout was prepared with 3 to 5 pounds of powdered bentonite and 6.5 gallons of water per 94-pound sack of Portland cement. The bentonite was free of additives that may affect groundwater quality. Well heads were completed flush with the ground surface.

The well casing was cut 2 to 3 inches below the ground surface and a locking protective cover was placed over the PVC cap. A cast iron vault box assembly with a protective security lid was centered over the well casing. The assembly was centered within a 3-foot diameter concrete seal sloped away from the vault box to avoid surface accumulation of water. The well number was clearly marked on the vault box lid and inside the PVC cap using a permanent marker.

All wells were secured as soon as possible after drilling with corrosion-resistant locks. The locks are keyed for opening with one master key.

Well completion diagrams, showing well construction details, were completed by the geologist/ hydrogeologist who supervised the well installations. All wells were permitted with the County of Los Angeles prior to installation. All well casings were surveyed by a surveyor registered in the State of California.

B.4.2 Monitoring Well Development

Well development began by bailing accumulated sediments from the well. The well screen was slowly surged, using a surge block, to pull in the accumulated sediments around the filter pack and to create a better pathway for groundwater flowing into the well. The well was be bailed to remove most of the sediments.

After surging and bailing, the well was allowed to fully recharge. Upon full recharge, the static water level was measured, and the well was pumped with a temporary submersible pump. A grab sample of groundwater was collected immediately, and the following physical characteristics were measured: pH, electrical conductivity, temperature, and turbidity. All measurements were documented in the field logbook. As development proceeded, the quantity of water collected was monitored and removed. As each well volume of water was removed, a grab sample was collected and physical characteristics were measured. The well development was

considered complete when three to five well volumes were removed, or three consecutive water quality readings were recorded and were stable to within ±10 percent (over approximately one well volume) and water was clear through visual observation. Purged water and sediments were contained and staged temporarily at the well site until laboratory analytical results were obtained to determine their disposition. A summary of well development is presented in Table B-1.

B.5. BORING COMPLETION

Following soil sample collection, any borings not completed as groundwater monitoring wells were completed to near ground surface, using bentonite chips hydrated with fresh potable water. For deeper borings, where caving or bridging was a concern, backfilling through drill casing was performed. In general, caving or bridging was not of concern with open borings. The top 12 inches of the boring were tamped with soil, concrete, or asphalt, according to the existing ground surface. These measures reduced the potential for downhole or surface water migration.

Groundwater wells are considered permanent until regulatory and Navy personnel determine that they are no longer needed. Any monitoring wells being abandoned will be permitted for abandonment with the County of Los Angeles.

B.6. SAMPLE COLLECTION

Several different types of samples were collected during the SI field activities. These samples include: soil gas samples, surface sediment samples, subsurface soil samples, and groundwater samples.

B.6.1 Passive Soil Gas Sampling

Passive non-invasive soil gas sampling was conducted at mesh-centered grid points. The passive soil gas system was designed to collect simultaneous measurements at all stations, which takes advantage of, and corrects for, vertical velocity changes in soil gas known as "earth tides."

Optimum time (i.e., periods of maximum emission) for sample collection was determined through a predictive timing model prior to sampling. Samples were collected over a 72-hour period from May 19 to May 22, 1997.

The surface collectors were coupled with the soil by exposing the soil, or in areas of asphalt or concrete, a shallow ½-inch boring was drilled below each collector location. All vegetation was removed to expose soil. The soil gas sample cartridge and sampling assembly were secured to the ground and covered with a collection shell, and allowed to collect measurements over 72 hours, so that all monitoring stations could record similar fluctuations in vertical gas velocity. In places where the soil was covered, a copper tube was inserted into the ground through the cut hole, and the cartridge containing adsorbent was placed into the copper tube. Ambient-air control samples were collected during the emplacement process, at predetermined intervals (as designated through the predictive timing model), as a quality assurance procedure. After 72 hours, the sample collectors retrieved the sample cartridge and returned it to an air-tight vial, which was

labeled and shipped to an analytical laboratory.

The sample cartridge was then thermally desorbed and analyzed, with gas chromatography and quadruple mass spectrometry, for the analytes outlined under EPA 8260. Adsorbents used in the sample cartridge had a demonstrated affinity for the EPA 8240 target compounds, and were sufficient enough in the sample receptacle to obviate risk of saturation.

B.6.2 Surface Loess Samples

Surface loess samples were collected from the ground surface on asphalt surfaces at Area of Concern (Objective) 7. The sediment samples were collected for laboratory analytical testing with a clean stainless steel hand trowel, and placed into a stainless steel mixing bowl. Samples were composited in the stainless steel bowl and aliquoted in an 8-ounce glass jar, with a Teflon-lined screw-top lid. A sample label was affixed to each tube, identifying the sample number, project number, person who collected the sample, date and time of collection, and analyses required. Upon completion of sample collection, the glass jar was placed in a "Ziploc" plastic bag and placed in a cooler with ice for preservation and transportation to the laboratory. Table B-2 presents the specified sample parameters, sample containers, sample preservation, and holding times for all samples.

The samples were collected from a 1-foot by 1-foot square area. The loess was placed in the mixing bowl and composited as described above. Decontamination of the sampling equipment is described in Section 6.10.

B.6.3 Subsurface Soil Samples

Subsurface samples were collected from soil borings advanced with either a hand auger or Resonant Sonic drill rig. Soil borings advanced with a hand auger, and soil samples were collected with a slide hammer sampler attached to the hand auger extension rods. The sampler was lined with one, two-inch diameter, 6-inch length stainless steel (metals) or brass tube (other constituents). The sampler was driven into the soil with a slide hammer apparatus. Each sample tube was prepared for laboratory analysis by covering each end with Teflon sheets and capping the ends with plastic caps. A sample label was affixed to each tube identifying the sample number, project number, person who collected the sample, date and time of collection, and analyses required. The samples were placed in a clear "Ziploc" plastic bag and placed in a cooler with ice for preservation and transportation to the laboratory.

B.6.4 Groundwater Samples

Groundwater monitoring well sampling was performed using the following procedures:

1. After development, the well was allowed to stabilize for a minimum of 5 days.
2. Prior to purging for groundwater sampling, water level measurements were taken and recorded to the nearest 0.01 foot with respect to an established survey point on

the top of the well casing.

3. The volume of water in the well casing was determined based on the static water level.

4. The well was purged until three to five well casing volumes were removed, and the measured pH, temperature, specific conductivity, oxidation-reduction potential (ORP) stabilize to within ±0.1 pH units, ±0.5 degrees centigrade (°C), and ±10 millimhos/centimeter, respectively. Wells were purged by pumping using a stainless steel submersible pump that had been decontaminated before and after sampling. Well recharge rate was recorded during purging, when possible.

5. Samples were collected in appropriate laboratory-supplied containers as specified in Table B-1. Samples were collected using a submersible sampling pump that was designed for sampling VOCs and could be regulated to pump at no greater than 0.5 gallon/minute. Due to the depth of water in the wells, practical pumping rates were approximately 1 to 1.5 gallons per minute. The line used to lower the bailer down the well was disposed of after sampling. The pump and any line or tubing was decontaminated before and after use.

6. Purging and sampling information was recorded in a field notebook, or on a standard groundwater sampling form. Information recorded included, at a minimum: well number, date and time of purging and sampling, water level measurements, calculations, well volumes, water quality field measurements, total volume of water purged, and purging and sampling method. Purging summary information is contained in Table 4-2 of Section 4.

The following guidelines also applied to the collection of groundwater:

- While transferring water from pump output to sample bottle, mixing of air with samples containing VOCs was minimized by tilting the sample bottle to allow water to run slowly down the inside wall of the bottle.
- Sample bottles were kept out of the sun to keep them cool prior to sampling. The filled sample bottles were packaged, labeled and placed immediately into a cooler containing ice.
- When checking pH for sample preservation purposes, a small amount of sample was poured onto pH paper (i.e., pH paper was not, for any reason, placed in the sample bottle).
- Polyethylene surgical gloves were worn at all times when collecting samples.

Field Filtration of Groundwater Samples for Metals Analysis: Groundwater samples were collected for both analysis of total (unfiltered) and dissolved (filtered) metal constituents. Groundwater samples requiring filtration before analysis were filtered in the field during collection and aliquoted into a sample bottle containing preservative. Sample filtration was performed with an in-line disposable filter cartridge (with the pump). A disposable 0.45-micron filter element was used. The filter element was rinsed with several filter volumes of groundwater

prior to collection of the sample. For those samples designated as total metals, no filtering took place. The groundwater sample was aliquoted directly to the sample container containing the appropriate preservative.

B.6.5 Sediment Sampling

Prior to fieldwork, a sampling station grid was developed based on 200-foot grid spacing. Grid intersections were plotted on a scaled reservoir map, latitude and longitude determined, and corresponding Global Positioning System (GPS) coordinates calculated. However, once deployed on the reservoir, GPS navigation was not successful because of the shadowing interference of the surrounding topography. Therefore, line-of-sight navigation was necessary.

The centerline for the sediment station sampling grid was established parallel to the original outfall alignment. The origin of the centerline was established at the outfall concrete junction block existing at the top of the shoreline bluff. Patchwork (i.e., traces of pipeline burial) in the existing asphalt provided a historical orientation of the pipeline, upon which the offshore alignment was based. An orange traffic cone was place at the junction block atop the bluff, and two telescoping benchmark flagpoles were positioned in line with the pipeline orientation. Flagpoles were equipped with left, center, and right flag positions. The forward pole held right and left flags, while the endmost pole held the center flag. Thus, line-of-sight navigation offshore was accomplished by aligning the lower-profile traffic cone with the higher flagpoles behind.

Benchmark buoys were placed on the centers of the B, C, and D gridlines to assure consistent positioning relative to these demarcations. Actual sampling locations were randomly positioned within the sampling grids, and were selected based on bottom contour topography. Once at a sampling location, a marker buoy was deployed and the mooring line drawn tight to limit drift. Repeat sampling was therefore assured with a few feet relative to the marker buoys. Sampling at Station A2 was carefully determined by continuous depth soundings for accurate placement on a small, flat subsurface shelf within the cove where the outfall was centered. Once the center location of this shelf was determined, a marker buoy was used for repeat sampling. Sampling on this shelf was desired because historical photographs and topographic features suggested that the outfall terminus was directly above this shelf, thereby offering an opportunity to sample for "worst case" discharge constituents.

The background sampling location was selected as a location upon which to base data in the vicinity of the outfall. That is, a location which was distant from the outfall, upcurrent of the outfall, outside of any affects from upcurrent activities on the peninsula, and located on the opposite shore of any influential activities. Considering these parameters, a background station was selected due east of the Navy Peninsula (Figure 4.9-1). Background sampling was not possible further upstream of the peninsula due to a string of chained logs (flotsam debris trap) traversing the reservoir and prohibiting boat traffic upstream.

Samples for sediment analysis were collected on July 14 1997, using a Ponar sediment grab. Minimum acceptance standards were 6 centimeters of penetration into the sediment and no surface washing of fine material. Three replicate sediment chemistry grabs were taken at each

station. To ensure that samples were not contaminated by the sampler, they were taken from the center of the sample with methanol-rinsed, teflon-coated instruments. All samples included the upper 2 cm of the grab.

The methods of handling, processing, and analysis of chemical samples followed standard EPA-accepted protocols. Sediment chemistry results were converted to dry weight units before data analysis.

B.6.3 Rock Outcrop Samples

The strategy for the rock outcrop sampling was to target locations of outcrops of different rock types have been observed or mapped in areas on the Morris Dam site or directly outside the site boundaries. The rationale for the location of these samples was to provide representative background measurements for the rock type that may be source material for the elevated metal concentrations observed in soil at the Morris Dam site.

As discussed in the Work Plan Addendum (Brown and Caldwell, 1999), a simple random sampling design was used to define where the 22 samples (20 locations and 2 duplicates) were collected at the site. A numbered sampling grid was used to define the initial orientation of locations. A simple random number generator was used to generate 20 random numbers between 0 and 50 that were used to define where on the sampling grid samples would be collected. However, several constraints existed that limited the ability to collect samples in some of these locations once initial field reconnaissance was conducted. These constraints were primarily due to physical limitations on access. Hence, some of the sampling locations were moved, in consultation with DTSC and LACDPW personnel, to locations where the necessary conditions for collecting a sample existed.

Figure B-1 shows the different sampling locations discussed below. The figure shows the 100x100' grid locations that were presented in the Work Plan (Brown and Caldwell, 1999) for defining where the rock samples would be collected. Certain grids were designated as sampling locations based upon random numbers and the definition that 20 samples would provide enough data to meet the DQOs specified in the Work Plan Addendum.

Upon field reconnaissance and the site meeting several sample locations were relocated in agreement with all parties present during the meeting (which included SWDIV, BC, LACDPW, MWD, and DTSC). Figure B-1 also shows the final sampling locations. The following summarizes the locations based on the original grid scheme and the final disposition after the sampling.

Location 1: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** We followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface. We also removed all surface material and sampled rock below the surface.

Location 2: **Meeting Decision:** Sampling location is okay. Attempt to minimize any impact from stream flowing through channel with outcrop by sampling as high as possible on the sides of the channel. **Sampling notes:** We followed recommendations from the meeting and were successful sampling the outcrop above the channel. Sampled approximately 50 feet upstream approximately 10 feet above channel banks.

Location 3: **Meeting Decision:** Sampling in area described and viewed from road will be okay. No outcrops were visible from the road. **Sampling Notes:** We successfully collected this sample approximately 50 feet above the road surface in the general area viewed from road. Highway patrol stopped and asked "what the heck are you doing." No problems after we explained.

Location 5: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by removing and not sampling surface exposures of the outcrop. **Sampling notes:** We followed recommendations from the meeting and were successful sampling the outcrop. We removed all surface material to 1 foot and sampled rock below the surface.

Location 10: **Meeting Decision:** Sampling on outcrop viewed from road will be okay. Sampling Notes: We successfully collected this sample from the outcrop noted.

Location 11: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** We followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface on North side of Highway 39. We also removed all surface material and sampled rock below the surface.

Location 13: **Meeting Decision:** Sampling from this area is okay, but no outcrops were visible from vantage point during meeting. We decided if no outcrops were observed during closer reconnaissance, then the location would be moved to location 17. **Sampling notes:** We followed performed reconnaissance of area and found that outcrops in Location 13 were poor. Moved over to Location 17 and sampled as high as possible attempting to get above high water mark. All exposed outcrops had some evidence of "bleaching" from reservoir water. Removed approximately 0.5 foot of surface material before sampling.

Location 15: **Meeting Decision:** Sampling location is okay, but attempt to locate another outcrop on south side of bluff. If need arises to sample viewed outcrop, attempt to minimize any lead enhancement from motor vehicles by removing and not sampling surface exposures of the outcrop. **Sampling notes:** We did not find any outcrop on south side of bluff. We followed recommendations from the meeting and sampled the outcrop near the road surface, but we also removed all surface material to approximately 0.5 foot and sampled rock below the surface.

Location 18: **Meeting Decision:** Sampling location is okay, but attempt to locate another outcrop on south side of bluff. If need arises to sample viewed outcrop, attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on outcrop and removing and not sampling surface exposures of the outcrop. **Sampling notes:** We found an outcrop on south side of bluff downslope and away from the road, near northwestern boundary of the grid area.

Location 21: **Meeting Decision:** Sampling location was not specifically identified with all parties present, but we discussed how we should attempt to locate an outcrop on south side of bluff. **Sampling notes:** We found an outcrop on south side of bluff downslope, near southeastern boundary of the grid area.

Location 22: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** We followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface. We also removed all surface material and sampled rock below the surface.

Location 23: **Meeting Decision:** Sampling location was not specifically identified with all parties present, but we discussed how we should attempt to locate an outcrop above bleached high water line if at all possible. **Sampling notes:** We found an outcrop high up on slope, near northern corner of the grid area.

Location 30: **Meeting Decision:** Sampling from outcrop near VAL as viewed from road will be okay. **Sampling Notes:** We successfully collected this sample from the outcrop viewed from road. Some evidence that a grout or cement-type material was at one time sprayed near this rock was evident on portions the outcrop. We removed all surface material and collected samples from deeper within the rock to avoid any influence from this material.

Location 34: **Meeting Decision:** Sampling from outcrop near eastern bluff below VAL as viewed from first pad at site will be okay. **Sampling Notes:** We successfully collected this sample from the outcrop viewed from pad. Difficulty getting deep sample was encountered due to hardness of rock. All parties witnessed this sample being collected. We attempted to remove as much material as possible. All parties agreed the sample was sufficient.

Location 38: **Meeting Decision:** Sampling from outcrops viewed from lower portion of facility will be okay. Attempt to get above bleaching of high water mark. Additional reconnaissance with DTSC representative Andres Cano as we were sampling location 42 (for location 45 as discussed below) indicates that entry and sampling may be difficult, Andres suggests sampling of Location 41 would be okay if access proves dangerous. **Sampling Notes:** We successfully collected this sample from an outcrop above the bleaching and on the very eastern corner of Location 38.

Location 45:**Meeting Decision:** All personnel agreed that since location 45 is primarily in a paved area that sampling would occur from outcrops located towards center of Location 42. **Sampling Notes:** We successfully collected this sample from an outcrop viewed by all parties. A duplicate was collected from this location.

Location 46: **Meeting Decision:** Location on original map was area covered by vegetation with very difficult access. No clear outcrops were visible. Therefore, as agreed during meeting by all parties, we moved this location to outcrop just under bridge at midpoint of site. **Sampling Notes:** We were successful in sampling the amended outcrop location.

Location 47: **Meeting Decision:** Location agreed during meeting with stipulation that we try to sample as high as possible to avoid the "leaching" effect from water in the reservoir (as observed by visual evidence of "bleaching" as noted on the rock). **Sampling Notes:** We were successful in sampling this outcrop, although even at the highest point there was some evidence that we still were below the water line at some point in time. We removed a fair amount of material attempting to get into rock that at least did not exhibit visual evidence of the "bleaching."

Location 53: **Meeting Decision:** Location 53 is primarily covered with asphalt and concrete. One location exists with a very weathered outcrop. This weathered outcrop was sampled before as part of the SI. Hence, a new location was picked in discussions with LACDPW which was located on the eastern edge of the peninsula, on an outcrop just below former Building. **Sampling Notes:** The relocated sample was successfully collected from the mafic outcrop defined by Karen of LACDPW. Note this outcrop was below the water line for the reservoir discussed in Location 54, below. We attempted to minimize any effect from leaching by sampling from 0.5 foot below the surface exposure.

Location 54: **Meeting Decision:** Location agreed during meeting with stipulation that we try to sample as high as possible to avoid the "leaching" effect from water in the reservoir (as observed by visual evidence of "bleaching" as noted on the rock). **Sampling Notes:** We were successful in sampling this outcrop, although even at the highest point there was some evidence that we still were below the water line at some point in time. We removed a fair amount of material attempting to get into rock that at least did not exhibit visual evidence of the "bleaching."

The sample locations were sampled from approximately 12:30 p.m., Tuesday May 23 through approximately 3:00 p.m., Wednesday, May 24. Many locations were relatively easy access (i.e., walk up with minimal climbing or belay access needed). Several required rope belay or climbing. No accidents occurred, and all samples were successfully collected. All sample locations were photographed before and after sampling. I have not completely reviewed the photos yet, but the few I have, it is sometimes difficult to see clearly what area was sampled. All sample locations were marked with a small dot of spray paint.

At each location samples were collected by attempting to pry or hammer loose rock out of fractured outcrops. Rock hammers and chisels were required to complete this task.

Unfortunately stainless steel versions of these tools were impossible to find. All efforts were made in the field to avoid cross contamination of samples with the steel instruments. In all cases the sample outcrop material could be broken off with a minimum of contact with the tools. Loose weather rock was pried off until a relatively fresh rock sample could be collected from below the weather surface material. All attempts were made to get samples from approximately 6-inches to 1-foot below the original surface material. Before and after photographs of each sampling location are provided in Appendix J Samples were collected in a stainless steel bowl immediately after being loosened from the rock interface, and then divided into two sample jars (for each location – one for metals analysis and one for mineralogical analysis). Sample custody, shipment and documentation followed the procedures outlined below.

B.6.6 Field Measurements

All groundwater samples collected from wells were measured for temperature, pH, specific conductivity, turbidity, dissolved oxygen (D.O.), and ORP in the field. Measurements of temperature, specific conductivity, pH, and ORP were collected using a flow through cell mechanism. Measurements of D.O. were collected at the surface in a beaker. The D.O. probe was slowly circulated in the beaker while the measurement was monitored. Turbidity was measured in specially designed vials for use in the turbidimeter. Between field measurements, any beakers or vials used were rinsed with distilled water one to two times prior to each measurement. Instruments were rinsed with distilled water, and stored in a container with distilled water between measurements. Calibration, and operation and maintenance of each instrument was performed in accordance with the manufacture's specifications. Instruments were calibrated at the start of each day's sampling activities, at mid-day, and at the end of the day. The calibration results were recorded in a calibration logbook. All calibration standards, sources, and lot numbers were recorded in the calibration logbook.

B.6.7 QUALITY CONTROL SAMPLES

Additional samples were collected as part of the quality control program for this SI. Quality control samples were collected for each analyte and matrix. Table B-3 summarizes the QC sample types collected during the SI field effort. Table B-4 contains a summary listing of all QC field samples.

B.7. DUPLICATE SAMPLES

Duplicate samples provide a check on laboratory and field procedures. All duplicates were collected at a frequency 10 percent of all field samples for all parameters and matrices. Duplicates were collected from sampling points which were known or suspected to be contaminated. The following paragraphs discuss the procedures for collecting duplicate samples:

Soil and Rock: The number of soil duplicates was be determined prior to going into the field. One duplicate sample was required per batch of 10 samples collected per analytical method.

Where possible, duplicates were collected so that the number of analytical parameters collected with the duplicate was maximized. If a batch contained fewer than 10 samples, one duplicate was collected. Surface and subsurface duplicates collected in sleeves were chosen by selecting two adjoining sleeves from the same split-barrel sampler. If volatiles were not a concern, the sample was homogenized into a container, and then split into two separate containers.

Groundwater: Since three groundwater wells were sampled, one duplicate samples was collected. The groundwater duplicate was collected in the same manner, and immediately after the same parameter for the regular sample.

B.7.1 Equipment Blank

Equipment blanks offer quality control for avoiding cross-contamination from sampling equipment between one sample point and another. Equipment blanks were collected during soil and groundwater sampling activities. At least one equipment blank was collected on each day of field sampling. Equipment blanks were collected in the following manner:

Soil: When soil sampling with sleeves, after scrubbing, rinsing and drying the sleeves, the rinse solution was passed through the sleeve designated for the next laboratory sample collection. The rinsate was collected in a prescribed liquid sample container.

Water: After decontamination of the sampling pump, the rinse solution was pumped through the sampling device and collected in the prescribed sample containers.

Analytically-certified organic-free (high performance liquid chromatography [HPLC]-grade) water was used for organic parameters. Metal-free (deionized-distilled) water was used for inorganic parameters.

No field rinsates were collected during the rock sampling.

B.7.2 Matrix Spikes/Matrix Spike Duplicates

The contracted analytical laboratory was contacted, prior to initiating the SI field activities, regarding the volumes of soil and groundwater required for Matrix Spikes/Matrix Spike Duplicates (MS/MSD). MS/MSDs were collected at a frequency of one sample for every 20 samples (including blanks and duplicates). The MS/MSD was an additional sample; it was a special designation for an existing sample. The MS/MSD samples were selected from sampling points which were suspected to contain target analytes, when possible. The sample container was labeled MS/MSD; the laboratory must know that the sample is for their quality control analyses. For water matrices, the MS/MSD was a double volume sample (i.e., twice as many sample bottles as a normal sample). Soil or sediment samples generally contained enough material for an MS/MSD sample.

B.7.3 Trip Blanks

Trip blanks were only designated for coolers containing samples designated for VOC analysis. Trip blanks were provided by the analytical laboratory prior to initiation of the SI field activities. The trip blank was labeled in the same manner as all other samples, and was placed only in coolers with samples designated for VOC analysis.

B.7.4 SAMPLE STORAGE, PRESERVATION AND HOLDING TIMES

The laboratory provided pre-cleaned sample containers with all necessary preservatives, labels, and blank water. The schedule for sample storage and preservation is given in Table B-3. These materials and holding times conform to the requirements described in Title 40 of the Code of Federal Regulations (40 CFR), Section 136.2. All samples were preserved and maintained at temperatures described in SW-846 (EPA, 1996).

B.8. FIELD EQUIPMENT CALIBRATION

All field equipment was calibrated and checked each morning prior to initiating sampling activities, and recalibrated during the day when the equipment was suspected to be out of calibration. The field supervisor was responsible for ensuring that all field equipment was properly calibrated, and recorded in the notebook.

B.9. DECONTAMINATION PROCEDURES

All sampling and down-hole drilling equipment (drill rig, tools, augers, casing, development equipment, etc.) was decontaminated by a hot water, high-pressure washer, which had detergent adding capability. Decontamination of the drill rig took place prior to beginning work, between each boring and well location, and after the last boring had been completed. A temporary "decon" pad was constructed near former Building 42027. The drill rig and hand auger equipment was decontaminated at this location prior to start of work, between boring locations, and before leaving the site. The location of the pad minimized the distance the rig had to travel on any road.

The temporary decon pad consisted of two layers of 10-mil polyethylene sheeting. Plywood sheets were placed on top of the plastic to protect it from tearing. A berm was constructed so that fluids were held on the sheets. The decon water was pumped into 55-gallon drums from the sump and then transferred to an on-site 6,000 gal poly tank. All decontamination waste was contained and handled according to the Work Plan. All wastes were tested and disposed of at an approved waste management facility after analysis was completed.

Sampling equipment used for collecting organic constituents (hand auger, brass tubes, stainless steel bowl/trowel) was decontaminated by washing with a nonphosphate detergent, rinsing with tap water, rinsing with reagent-grade methanol, or rinsing with pesticide-grade hexane, air dried, and followed by a rinse with organic-free reagent water.

Sampling equipment used for collecting inorganic constituents was decontaminated by washing with a nonphosphate detergent, rinsing with tap water, rinsing with dilute (1-5%) hydrochloric acid (HCl), and rinsing with reagent water. Equipment used for sampling both of organic and inorganic constituents was decontaminated by washing with a non-phosphate detergent, rinsing with tap water, rinsing with dilute HCl, rinsing with reagent-grade methanol, followed by pesticide-grade hexane, then air-dried, and finally rinsed with organic-free water. Decontamination rinsate was contained in an on-site 6,000-gal poly tank, labeled, and disposed of in accordance with federal and state hazardous waste disposal regulations.

B.10. FIELD DOCUMENTATION

Field personnel were required to keep accurate written records of their daily activities in a bound logbook. All entries are legible, written in waterproof ink, and contain accurate and inclusive documentation of an individual's field activities, including field data observations, any problems encountered, and action taken to solve the problem. None of these documents were destroyed or discarded, even if they were illegible or contained inaccuracies that require a replacement document.

If an error was made on a document assigned to one individual, that individual made corrections simply by drawing a line through the error, entering the correct information, and initialing and dating the change. The erroneous information was not obliterated. Any subsequent error(s) discovered on a document were checked with the initial party entering the data, and then corrected by the person who made the change. Any changes made to a document were initialed and dated by the person making change. Any changes made to documents followed procedures that demonstrate the accuracy, traceability and integrity of the data.

In addition to the field logbooks, documentation included photographic records, chain-of-custody records, and sample labels.

B.10.1 Field Logbook

As mentioned above, a field logbook was maintained which documents all field activities. The log book included date, time of activities, weather conditions, personnel present, subcontractors present, sampling methodology, source of sample, sample container type, preservatives used, field observations, any specific considerations associated with sample acquisition (e.g., purge rate, sample rate, field parameter measurements, purge volume calculations, purge and sample times), and any drilling information (e.g., penetration rate, sample descriptions, sample depths, and well installation information).

B.10.2 Photographic Records

When photographs were taken to visually document a site or procedure, they were numbered to correspond to the field logbook entries. When possible, a reference point (building, sign, etc.) was included to assist in verifying the location of the photograph and identify an approximately scale. The name of the photographer, date, time, site location, and site description was entered

sequentially in the logbook as photos were taken. These photographic records were compiled in a bound album as an attachment to the final report.

B.10.3 Chain-of-Custody Records

After the samples were collected and documented in the logbook, a chain-of-custody form was completed and accompanied the samples to the laboratory. This form documents sample possession from the point of collection to arrival at the laboratory sample control center. A Chain-of-Custody (CoC) record was prepared for each sample cooler, which listed each sample in that cooler. The field leader was responsible for the care and custody of the samples until they were transferred or dispatched to the laboratory. When transferring the samples, the individuals relinquishing and receiving the samples signed, dated, and noted the time on the form. The original record accompanied the shipment, and a copy was retained in the project file. The CoC record contained the following information:

- Project name;
- Sampler signature;
- Site name and address;
- Sample ID number or location;
- Date of collection;
- Time of collection;
- Sample matrix;
- Number of sample containers, and number of containers for each analysis;
- Optional comments regarding sample condition; and
- Signature, date, and time of the person relinquishing the samples, and of the person receiving them.

B.10.4 Sample Labels

Sample container labels were affixed to sample containers immediately after removal of the sample from sampler to prevent misidentification of the samples. Pre-printed, waterproof labels were used on each sample container. The label was completed at the time the sample was placed in the container. Each label, at a minimum, contained the following: name (or initials) of the sampler, unique sample identification number, method of analysis required, date and time of sampling, and a project number. The labels were completed using waterproof pens. All sample information was recorded in a bound field logbook.

As mentioned above, a unique sample identification number was be assigned to each sample location. This identification number was marked on the sampling container when it was sent to the laboratory for analysis, and also was recorded on the sample CoC record. This was done carefully so that there was no uncertainty about the location and identity of each sample. The

sample identification numbering scheme was logged as an eight character alpha-numeric number. The alpha and numeric characters were assigned and appear in the following order: Objective, Objective area, specific location, sample type, and depth.

Area of Concern/Interest (Objective) Number

(1) Former Gas Station/Drum Storage Area - 01
(2) Oil-Water Separators – 02
(3) Outfall Areas – 03
(4) Propulsion Systems Testing Area – 04
(5) Sewer Septic Tank and Leach Field Lines – 05
(6) Sump and Collection Lines -06
(7) Temporary Drum Staging Area – 07
(8) Groundwater Investigation – 08
(9) Outfall Sediment Sampling – 09
(10) Electronic Test Area – 10
(11) Propellant Magazine – 11
(12) Background Soil Sampling – 12
(13) Background Rock Sampling – 13

Area of Concern/Interest (Objective)-Specific Area Location

A two digit number corresponding to the Area of Concern/Interest (Objective) specific area location:

Former Gas Station/Drum Storage Area
- Concrete Pad - 01
- Slope Soils - 02

Oil-Water Separators
- Building 42001 - 01
- Building 42010 - 02

Outfall Areas
- 0F2 -01
- BU - 02

Propulsion Systems Testing Area
- AST - 01
- Pad in front of 42015 - 02
- Slope Soils - 03
- Building 42028 Samples - 04
- Building 42039 Samples - 05

Sewer Septic Tank and Leach Field Lines
- Leach Field Lines - 01

- Sewer Septic Tank - 02

Sump and Collection Lines
- Sump and Collection Lines – 01
- Sludge Sampling - 02

Temporary Dam Staging Area
- Surface Loess Samples – 01
- Soil Borings - 02

Groundwater Investigation
- All wells - 01

Outfall Slurry Pipeline
- Sediment Samples - 01

Electronic Testing Area
- Building No. 42013 - 01

Propellant Magazine
- Building No. 42026 - 01

Background Soil Sampling
- Water Tower - 01
- Mid Peninsula - 02
- Off Site - 03

<u>Sample Type</u>

Soil - SO
Sediment - SD
Soil Gas - SG
Groundwater – GW
Rock - RK
Equipment Blank - AQ1
Trip Blank - AQ2
Duplicate - add "D" to end of sample type (e.g., soil duplicate = SOD)

<u>Boring or Location Number</u>

For soil borings a letter was typically used to designate the location unless only one boring was advanced within a particular area. It should be mentioned that some minor variations exist in this numbering scheme as instituted by field personnel. However, notes kept by field personnel were used to designate where a particular boring was advanced when it did not follow the general scheme discussed above.

Groundwater locations were designated by well number.

Sediment samples, soil gas, and rock samples were designated by grid location number.

Depth

A two-digit number was assigned in accordance with the sample collection depth.

An example of the sample identification numbering scheme consists of the following:

> A soil sample collected at the AST in the Propulsion Systems Testing Area would be logged as - 0401SO01

B.11. SAMPLE SHIPMENT

Samples shipped to the laboratory were sealed with a custody seal to detect any evidence of sample tampering. The seal was placed on the lid of individual sample containers, or on the outside of the cooler. Samples were shipped to the laboratory within 24 hours of collection. Samples requiring storage at 4 degrees Celsius were shipped in insulated containers, either with blue ice, or with ice enclosed in plastic bags. Shipments scheduled to arrive in the laboratory on weekends were coordinated with the laboratory in advance.

Table B-1. Well Development Results
Morris Dam Facility, Azusa, California

Well ID	Date	Method	Duration (min)	Dissolved Oxygen (mg/L)	pH (Std)	Conductivity (mhos/cm)	Temperature (°C)	Oxygen Reduction Potential (mV)	Turbidity (NTU)	Pump Rate (gal/min)	Cumulative Volume Removed (gal)	Comments
MW1	9/8/1997	Surge/Bail	<10	2.74	10.09	1.141	21.2	114	392	>1	<10	Cloudy gray, Initial
MW1	9/8/1997	Surge/Bail	55	4.64	9.40	0.004	21.2	93	>200	>1	40	Cloudy gray, Final
MW1	9/9/1997	Surge/Pump	<10	2.77	9.71	0.396	21.6	63	127.4	6	70	Cloudy gray, Initial
MW1	9/9/1997	Surge/Pump	140	4.70	7.71	0.280	20.2	97	*	4	650	Clear, Final
MW2	9/11/1997	Surge/Pump	<10	3.43	7.36	1.261	21.8	147	*	5	40	Cloudy gray, Initial
MW2	9/6/1997	Surge/Pump	780	5.71	7.36	0.721	24.1	96	*	1	290	Very clear, Final
MW3	9/7/1997	Surge/Pump	<10	3.62	6.69	0.757	20.9	141	161.3	2	50	Cloudy brown, Initial
MW3	9/30/1997	Surge/Pump	60	2.67	6.93	0.602	20.9	120	4.9	2	170	Very clear, Final

* = Turbidity meter not functioning.

Table B-2. Containers, Preservatives, and Holding Times

Analysis	Matrix	Method	Preservative	Container	Holding time
VOCs	Solid	8260	4°C	Brass tube	14 days
	Water	8260	4°C pH<2, HCL	2, 40 ml vials	14 days
SVOCs	Solid	8270/8310	4°C	Brass tube, or glass jar	14 days to extract, 40 days to analysis
	Water	8270/8310	4°C	1L glass amber	14 days to extract, 40 days to analysis
Metals (incl. Li)	Solid (Soil and Rock)	6010, 7000 series	N/A	Stainless steel tube, or glass jar	6 months (mercury is 28 days)
	Water	5010, 7000 series	HNO_3 to pH<2	1 L plastic	6 months (mercury is 13 days)
Cr(VI)	Solid	3060A/7199 or 7196	4°C	Brass tube or glass jar	30 days
TPH:					
Recoverable	Solid	418.1	4°C	Brass tube, or glass jar	28 days
	Water	418.1	4°C pH<2, $H2SO_4$	1 L glass amber	28 days
Volatile	Solid	5030/8015mod	4°C	Brass tube, or glass jar	14 days
	Water	5030/8015mod	4°C pH<2, HCl	2, 40 ml vials	14 days
Extract	Solid	3550/8015mod	4°C	Brass tube, or glass jar	14 days
	Water	3510/8015mod	4°C pH<2, HCl	2, 40 ml vials	14 days
Tributyltin	Solid	GC/FID	4°C	Brass tube, or glass jar	28 days
	Water	GC/FID	4°C	2, 1 L glass amber	28 days
Total Organic Carbon (TOC)	Solid	CA DHS (LUFT)	4°C	Brass tube, or glass jar	14 days
	Water	CA DHS (LUFT)	4°C	1L glass amber	14 days

Analysis	Matrix	Method	Preservative	Container	Holding time
PCBs	Solid	8080	4°C	Brass tube or glass jar	14 days to extraction, 40 days from extraction to analysis
	Water	8080	4°C	2, 1L amber glass	7 days to extraction, 40 days from extraction to analysis
Explosives	Solid	8330	4°C	Brass tube or glass jar	14 days to extract, 40 days to analysis

Table B-3. Quality Control Sample Summary

Type of Sample	Frequency
Field Duplicates	10 percent of total samples per matrix
Equipment Rinsate Blanks	1 each day or 10 percent, which ever is greater
Laboratory Matrix Spike/Matrix Spike Duplicates	1 per 20 samples collected per matrix
Trip Blanks	1 per cooler for samples destined for VOC analysis

Table B-4. Quality Control Samples Collected During the SI Morris Dam R2/12/2002 Facility, Azusa, California

Sample Type	Sample ID	Date	Associated Sample Data Group Number	Associated Sample Number (duplicates only)
Field Blank	0102AQ11	5/27/1997	G97-05-646	
Trip Blank	0102AQ27	5/27/1997	G97-05-646	
Field Blank	0404AQ1	5/28/1997	G97-05-672	
Field Blank	0403AQ1	5/29/1997	G97-05-702	
Field Blank	0403AQ2	5/29/1997	G97-05-702	
Field Blank	0601AAQ1	5/30/1997	G97-05-702	
Trip Blank	0601AAQ2	5/30/1997	G97-05-702	
Field Blank	0601AQ1	6/2/1997	G97-06-059	
Trip Blank	0601AQ2	6/2/1997	G97-06-059	
Field Blank	0405AQ1	6/3/1997	G97-06-084	
Field Blank	1206RI01	6/10/1997	G97-06-229/270	
Field Blank	R-1	7/16/1997	G97-07-331	
Trip Blank	970527	7/16/1997	G97-07-331	
Field Blank	0698AQ01	9/8/1997	G97-09-124/125	
Trip Blank	0698AQ02	9/8/1997	G97-09-124/125	
Trip Blank	0599AQ01	9/9/1997	G97-09-139	
Field Blank	0599AQ02	9/9/1997	G97-09-139	
Trip Blank	0800AQ01	9/23/1997	G97-09-460	
Field Blank	0800AQ02	9/23/1997	G97-09-460	
Duplicate	0502ASOD05	9/8/1997	G97-09-124/125	0502ASO05
Duplicate	0403BSOD01	5/29/1997	G97-05-702/06-600	0403BSO01
Duplicate	0403BSOD03	5/29/1997	G97-05-702/06-600	0403BSO03
Duplicate	0403CSOD03	6/2/1997	G97-06-059/06-600	0403CSO03
Duplicate	0601GSO05 Dup	9/9/1997	G97-09-139	0601GSO05
Duplicate	0601JSO01 Dup	9/9/1997	G97-09-139	0601JSO01
Duplicate	0601JSO03 Dup	9/9/1997	G97-09-139	0601JSO03
Duplicate	0601JSO05 Dup	9/9/1997	G97-09-139	0601JSO05
Duplicate	0202ASO05 Dup	9/9/1997	G97-09-139	0202ASO05
Duplicate	0702ESO01 Dup	9/9/1997	G97-09-139	0702ESO01 (PCB Only)
Duplicate	1001ASO01 Dup	9/9/1997	G97-09-139	1001ASO01

APPENDIX C

BORING LOGS

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: **MW1** Sheet **1** of **7**

Boring Location: **North East of Former Bldg. 42002**		Elevation and Datum: **1304.68 /**	
Drilling Contractor: **Layne**	Driller: **Gary Lyons**	Date Started: **8/26/97**	Date Finished: **9/2/97**
Drilling Equipment: **TH60 Ingersoll-Rand**	Borehole Diameter: **9.875"**	Completed Depth: (feet) **216.0**	Water Depth: (feet) **177.0**
Sampling Method: **Carbide Bit Corer**		WELL CONSTRUCTION	
Drilling Method: **Air Rotary**	Drilling Fluid: **Water**	Type and Diameter of Well Casing: **Sch. 80 PVC, 5-inch**	
Backfill Material: **Sand, Bentonite Pellets, Grout, and Concrete**		Slot Size: **0.010**	Filter Material: **No. 3 Sand**
Logged By: **David Clexton**	Checked By: **D. Van Winkle R.G.**	Development Method: **Surge and Purge**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	GP	Fill decomposed gneiss SAND WITH GRAVEL: dry to damp, moderate yellowish brown, fine to medium grained sand, fine to coarse grained gravel					0-2' Concrete (4 bags) 0-2' Tri-cone
		2'-10' HORNBLENDE-BIOTITE-QUARTZ-PLAGIOCLASE GNEISS: hard strong, moderate weathering				0	2 -143' Portland Cement (61 bags) 2'-20' Corer No recovery in corebarrel 2'-10
5							Driller indicates that material maybe very fractured because drilling is very easy but lots of vibration
10		10 -20' HORNBLENDE-BIOTITE-QUARTZ-PLAGIOCLASE GNEISS: hard, strong moderate weathering					11:15, no recovery in corebarrel 10 -20 , description from cuttings
15		16 -20 HORNBLENDE-BIOTITE-QUARTZ-PLAGIOCLASE GNEISS: hard, strong moderate weathering					11:30, grab from cuttings
							11:33, grab from cuttings
20		20'-30 HORNBLENDE-BIOTITE-QUARTZ-PLAGIOCLASE GNEISS: hard, strong, moderate weathering					20'-30', Tri-cone dual wall, grab from cuttings
25						0	

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW1 Sheet 2 of 7

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
30		30'-40' CATACLASTIC HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: intensely fractured, hard, strong, slight weathering, poor recovery					11:45, 30'-70' Carbide bit corer. Drilling started out hard at 30' then was loose between 33'-34' and then became hard again Rad meter= 0-180 cpm (background). Grab from cuttings
35						0	
40		40'-48' CATACLASTIC HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: intensely fractured, hard, strong, slight weathering, poor recovery, increasing biotite with depth, intensely to closely fractured and coated with reddish orange staining, 50% recovery					12:00, rad meter= 0-200 cpm (background) Grab from cuttings
45						0	
		48 -50' CATACLASTIC HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: fractured, hard, strong, green staining on fractured surfaces, moist					
50		50'-60' CATACLASTIC HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong, friable and moist along fractures, 70% recovery					12:40, rad meter= 80-140 cpm (background). Grab from cuttings
						0	
55							
60		60'-70' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: closely fractured, hard, moderate to strong, fresh weathering, iron oxide staining, along fractured surfaces, quartzite banding in bottom 3' of core, fractures are oriented parallel to banding, 80% recovery					14:30, drilling has become very slow. L[illegible] of vibration. Rad meter= 80-200 cpm (background) Grab from cuttings

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW1 Sheet 3 of 7

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
65						0	
						0	
70		70'-75' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	15:50, rad meter= 80-200 cpm (background) Grab from cuttings
						0	
						0	
75		75'-80' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry					16:45 Refusal with corer at 72' bg Drilled with tri-cone to 75' bg Lots of rig vibration between 72'-75'. Drilled with corer. Refusal with corer at 75', switched to tri-cone Refusal with tri-corer at 76'. Drilling with down hole hammer Drilling is continously difficult. Rad meter= 80-140 cpm (background). Grab from cuttings
80		80 -90' HORNBLEDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering dry				0	
85							09:40, rad meter= 0-200 cpm (background) Grab from cuttings
						0	
90		90'-95' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard. strong, fresh weathering, dry					09:45, rad meter= 0-200 cpm (background) Grab from cuttings
						0	
95		95'-100' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard strong, fresh weathering, dry					09:55, rad meter= 0-200 cpm (background) Grab from cuttings
						0	

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW1 Sheet 4 of 7

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
100		100'-105 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong fresh weathering, dry				0	10:10, rad meter= 0-200 cpm (background) Grab from cuttings
105		105 -110 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	10:15, rad meter= 0-200 cpm (background) Grab from cuttings
110		110'-115' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	10:20, possibly minor fracture at 118' below grade. Rad meter= 0-200 cpm (background) Grab from cuttings
115		115 -120' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	10:30, rad meter= 0-200 cpm (background) Grab from cuttings
120		120'-125' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	10:35, rad meter= 0-200 cpm (background) Grab from cuttings
125		125'-130 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard strong, fresh weathering, dry				0	10:40, started using 5.75" outer diameter hammer bit Rad meter= 0-200 cpm (background) Grab from cuttings
130		130'-135' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	13:15, rad meter= 0-200 cpm (background) Grab from cuttings
135							

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: **MW1** Sheet 5 of 7

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		135'-140' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	13:25, rad meter= 0-200 cpm (background) Grab from cuttings
140		140'-145' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	14:05, rad meter= 0-200 cpm (background) Grab from cuttings 143'-148' Bentonite pellets (4 buckets)
145		145'-150' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	14:10, fractures between 144'-148 bg Rad meter= 0-200 cpm (background) Grab from cuttings 148'-216' Sand (19 bags)
150		150'-155' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry, more felsic minerals (feldspar) highly mafic				0	14:15, rad meter= 0-180 cpm (background) Grab from cuttings
155		155'-160' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry, some mica and quartzite more felsic minerals (feldspar), highly mafic				0	14:20, grab from cuttings
160		160'-165' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry				0	14:28, grab from cuttings
165		165'-170' HORNBLEDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering dry				0	14:30, rad meter= 0-180 cpm (background) Grab from cuttings
170		170'-175' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry					14:35, rad meter= 0-200 cpm (background) Grab from cuttings

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: **MW1** Sheet **6** of **7**

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
						0	
175		175'-180' HORNBLEDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry					14:40, rad meter= 0-200 cpm (background). Grab from cuttings.
						0	Water level rose to 177' five minutes after intial water was detected in cuttings
180		180'-185' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard strong, fresh weathering, dry					14:50, rad meter= 0-180 cpm (background) Grab from cuttings.
						0	
185		185'-190 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, dry					14:53, rad meter= 0-200 cpm (background) Grab from cuttings
						0	
190		190'-195' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard. strong fresh weathering, dry					14:55, rad meter= 0-200 cpm (background) Grab from cuttings
						0	
195		195 -200' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard. strong fresh weathering, wet					14:58 Hit fracture at 195' (water at 195') Rad meter= 0-200 cpm (background). Grab from cuttings
						0	
200		200'-205 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, wet					15:00, rad meter= 0-200 cpm (background) Grab from cuttings. Reamed 200'-216'
						0	
205		205 -210' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, wet					Very little cuttings are being recovered. Rad meter=0-200 cpm (background) Grab from cuttings

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW1 Sheet 7 of 7

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
						0	
210		210 -215' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, wet					Rad meter= 0-200 cpm (background) Grab from cuttings.
						0	
215		HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong, fresh weathering, wet					Rad meter= 0-200 cpm (background) Grab from cuttings.
		Bottom of boring at 216 feet below grade. Groundwater encountered at 177 feet below grade. Boring logged from core and grab samples and cuttings. The lithologic and USCS descriptions are based entirely on visual hand specimen description procedures.					
220							
225							
230							
235							
240							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW2 Sheet 1 of 4

Boring Location: South West of Former Bldg. 42015		Elevation and Datum: 1181.96 /	
Drilling Contractor: Layne	Driller: Gary Lyons	Date Started: 9/2/97	Date Finished: 9/4/97
Drilling Equipment: TH60 Ingersoll-Rand	Borehole Diameter: 9.875"	Completed Depth: (feet) 106.0	Water Depth: (feet) 50.0
Sampling Method: Carbide Bit Corer		WELL CONSTRUCTION	
Drilling Method: Air Rotary	Drilling Fluid: Water	Type and Diameter of Well Casing: Sch. 80 PVC, 5-inch	
Backfill Material: Sand, Bentonite Pellets, Grout, and Concrete		Slot Size: 0.010	Filter Material: No. 3 Sand
Logged By: David Clexton	Checked By: D. Van Winkle R.G.	Development Method: Surge and Purge	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		CRUSHED CONCRETE: 0.5-5'				0	Concrete (4 bags)
	SM	Fill decomposed gneiss SILTY SAND: dry, medium dense, reddish brown, fine to medium grained sand, trace coarse material, trace of mica					11:45, rad meter= 0-120 cpm (background) Grab from cuttings 2'-17' Portland cement (5 bags)
5		5 -10' Same moist				0	11:50, rad meter= 0-120 cpm (background) Grab from cuttings
10		10'-15 Same, light reddish brown				0	11:55, rad meter= 0-180 cpm (background) Grab from cuttings
15	SM GP	15 -20' SILTY SAND WITH GRAVEL: moist, medium dense, moderate yellowish brown, fine to medium grained sand, fine to coarse grained gravel, trace mica				0	12:00, rad meter= 0-100 cpm (background) Grab from cuttings 18'-258' Bentonite pellets (4 buckets)
20	SM	20 -25 SILTY SAND: moist medium dense, light reddish brown, fine to medium grained, trace sand, coarse grained material, trace mica				0	12:05, rad meter= 0-160 cpm (background) Grab from cuttings
25	SM GP	25 -30' SILTY SAND WITH GRAVEL: moist, medium dense, moderate yellowish brown, fine to medium grained, sand, fine to coarse grained gravel				0	25'-106' Sand (34 bags). 12:10, rad meter= 0-140 cpm (background) Grab from cuttings

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW2 Sheet 2 of 4

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
30		30'-35' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard, moderately strong, moderately weathered dry				0	12:15, rad meter= 0-190 cpm (background) Grab from cuttings
35		35 -40' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard very strong, fresh weathering, dry				0	12:20, rad meter= 0-110 cpm (background) Grab from cuttings Drilling becomes very hard at 37 bg. Cuttings (<1/8" across)
40		40'-45' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	12:25, rad meter= 0-190 cpm (background). Grab from cuttings Cuttings (<1/8" accross)
45		45 -50' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, strong to very strong				0	12:30, rad meter= 0-120 cpm (background) Cuttings are comming up in large pieces (1/4" to 1/2 accross)
50		50 -55 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering dry				0	12:35 rad meter= 0-120 cpm (background) Cuttings are comming up in large piepes (1/4" to 1/2" across)
55		55 -60 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	12:45, Cuttings (<1/4' across) Grab form cuttings
60		60'-65' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard very strong, little to fresh weathering, dry				0	12:50, rad meter= 0-110 cpm (backgrou Grab from cuttings Cuttings (<1/4" across)

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW2 Sheet 3 of 4

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
65		65'-70 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	12:55, rad meter= 0-120 cpm (background). Grab from cuttings Cuttings (<1/4" across).
70		70'-75' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	13:00, rad meter= 0-110 cpm (background). Grab from cuttings Cuttings (<1/4" across).
75		75'-80' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	13:05, rad meter= 0-110 cpm (background) Grab from cuttings Cuttings (1/2" across).
80		80'-85 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	13:10, rad meter= 0-120 cpm (background). Grab from cuttings Cuttings (1/4" to 1/2" across).
85		85 -90' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	13:15, rad meter= 0-110 cpm (background) Grab from cuttings Cuttings (<1/4" accross)
90		90 -95' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	13:20, rad meter= 0-120 cpm (background) Grab from cuttings. Moisture in cuttings noted, open hole let stand for 15 minutes.
95		95'-100 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard very strong, little to fresh weathering, dry				0	13:45, rad meter= 0-110 cpm (background) Grab from cuttings. Water noted in bolehole

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: **MW2** Sheet **4** of **4**

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
100		100'-106 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry				0	15:30, rad meter= 0-110 cpm (background) Grab from cuttings DTW=95' bg
105		HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: very hard, very strong, little to fresh weathering, dry					
		Bottom of boring at 106 feet below grade. Groundwater encountered at 50 feet below grade. Boring logged from grab samples and cuttings. The lithologic and USCS description are based entirely on visual hand specimen description procedures.					
110							
115							
120							
125							
130							
135							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW3 Sheet 1 of 3

Boring Location: South of Former Bldg. 42035		Elevation and Datum: 1172.06 /	
Drilling Contractor:	Driller: Gary Lyons	Date Started: 9/2/97	Date Finished: 9/3/97
Drilling Equipment: TH60 Ingersoll-Rand	Borehole Diameter: 9.875"	Completed Depth: (feet) 71.0	Water Depth: (feet) 43.0
Sampling Method: Carbide Bit Corer		WELL CONSTRUCTION	
Drilling Method: Air Rotary	Drilling Fluid: Water	Type and Diameter of Well Casing: Sch. 80 PVC, 5-inch	
Backfill Material: Sand, Bentonite Pellets, Grout, and Concrete		Slot Size: 0.010	Filter Material: No. 3 Sand
Logged By: David Clexton	Checked By: D. Van Winkle R.G.	Development Method: Surge and Purge	

Depth (feet)	USCS Soil Type	Description	Graphic Log (Sample, Lithology, Boring/Well Completion)	Readings OVA PPM	Remarks
	SM	PAVEMENT ASPHALT: 4" thick Fill decomposed gneiss SILTY SAND: moist, loose, dark reddish brown, fine grained sand		0	Concrete (4 bags) 16:10, rad meter= 0-180 cpm (background) Grab from cuttings 2'-10' Portland cement (4 bags)
5		5 -10' Same, damp, medium dense, moderate reddish brown		0	16:15, rad meter= 0-180 cpm (background) Grab from cuttings
10	SM GP	10 -15' SILTY SAND WITH GRAVEL: damp, medium dense, moderate yellowish brown, fine to medium grained, sand, fine to coarse grained gravel		0	10'-15' Bentonite pellets (4 buckets). 16:20, rad meter= 0-160 cpm (background) Grab from cuttings
15	GP	15'-20' GRAVEL: dry, dense, moderate yellowish brown, medium to coarse grained (<0.5 inch diameter), subangular to angular, trace of sand		0	15 -71 Sand (25 bags). 16:25, rad meter= 0-120 cpm (background) Grab from cuttings
20		20'-25 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering		0	16:30, rad meter= 0-110 cpm (background) Grab from cuttings. Cuttings (<1/4" across)
25		25'-30' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong moderate weathering		0	16:35, rad meter= 0-180 cpm (background) Grab from cuttings. Drilling becomes harder at 27' bg.

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW3 Sheet 2 of 3

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
30		30'-35' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	16:40, rad meter= 0-180 cpm (background) Grab from cuttings Cuttings (<1/4" across).
35		35 -40 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	16:45, rad meter= 0-160 cpm (background). Grab from cuttings. Cuttings (1/4"- 1/2" across)
40		40 -45 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	16:50, rad meter= 0-180 cpm (background). Grab from cuttings.
45		45'-50' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	16:55, rad meter= 0-180 cpm (background) Grab from cuttings
50		50'-55' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	16:58, rad meter= 0-110 cpm (background) Grab from cuttings Cuttings (<1/2" across)
55		55'-60 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong. moderate weathering				0	17:00, rad meter=0-110 cpm (background) Grab from cuttings. Cuttings (<1/2" across) Water came up to 58' bg
60		60'-65 HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	17:30, rad meter=0-180 cpm (backgrou Grab from cuttings Cuttings (<1/4" across).

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring ☐ Monitoring Well ☒ Boring/Well Number: MW3

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
65		65'-70' HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering				0	17:35, rad meter=0-180 cpm (background) Grab from cuttings
70		HORNBLENDE-QUARTZ-PLAGIOCLASE-BIOTITE GNEISS: moderately hard to hard, moderately strong to strong, moderate weathering					
		Bottom of boring at 71 feet below grade. Groundwater encountered at 43 feet below grade. Boring logged from grab samples and cuttings. The lithologic and USCS description are based entirely on visual hand specimen procedures.					
75							
80							
85							
90							
95							

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 01A1-B1

Sheet 1 of 1

Boring Location: Objective 1 - Area 1	Elevation and Datum: 1177.31 /
Drilling Contractor: N/A; Driller: D. Van Winkle	Date Started: 10/8/97; Date Finished: 10/8/97
Drilling Equipment: Hand Auger; Borehole Diameter: 1.5"	Completed Depth: (feet) 3.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: D. Van Winkle; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse gravel up to boulder size, (gneiss) light brown, very poorly sorted, loose, moist (fill)				0 0	SAMPLE NUMBERS: 0101SO01 0101SO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft. bg					
5							
10							
15							
20							
25							

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BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 01A2-B1 Sheet 1 of 1

Boring Location: Objective 1 - Area 2		Elevation and Datum: 1172.51 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/29/97	Date Finished: 5/29/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: dry, dense, brown, very fine-grained to coarse-grained, 20% very fine-grained, 50% fine-grained, 10% medium-grained, 20% coarse-grained, >5% pebbly gravel, 5 mm diameter, very fine grained sand is indurated and hard, gravel is angular and metamorphic, poorly sorted				0	SAMPLE NUMBERS: 0102ASO01
		Sand as above				0	0102ASO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft. bg.					
5							
10							
15							
20							
25							

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BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 01A2-B2

Sheet 1 of 1

Boring Location: Objective 1 - Area 2		Elevation and Datum: 1173.58 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/28/97	Date Finished: 5/28/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: dry to moist, dense, dark yellowish brown, poorly sorted, fine- grained to pebbly gravel, 60% fine-grained, 20% medium-grained, 10% coarse-grained, 5% very coarse-grained, and 5% gravel gravel is subrounded to angular, 3-5 mm diameter granitic Boring completed at 1 ft bg				0	SAMPLE NUMBER: 0102BSO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **01A2-B3** Sheet **1** of **1**

Boring Location: **Objective 1 - Area 2**		Elevation and Datum: **1172.11 /**	
Drilling Contractor: **N/A**	Driller: **D. Van Winkle**	Date Started: **10/8/97**	Date Finished: **10/8/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **1.5"**	Completed Depth: (feet) **2.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **D. Van Winkle**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse, some gravel, light brown, very poorly sorted, loose, moist (fill)				0 0	SAMPLE NUMBERS: 0102SO01
		Boring completed at 3 ft bg.					0102SO02 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **01A2-B4** Sheet **1** of **1**

Boring Location: **Objective 1 - Area 2**		Elevation and Datum: **1174.19 /**	
Drilling Contractor: **N/A**	Driller: **E. Vander Velde**	Date Started: **5/27/97**	Date Finished: **5/27/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **3"**	Completed Depth: (feet) **3.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **E. Vander Velde**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse, some gravel, light brown very poorly sorted, loose moist (fill)				0	SAMPLE NUMBERS: 0102SO01a
		Sand as above				0	0102SO03a Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 02A1-B1 Sheet 1 of 1

Boring Location: Objective 2 - Area 1		Elevation and Datum: 1307.71 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	FILL SAND: damp, loose, dark grayish black, fine-to-medium-grained, moderately sorted					0-3.5' - Contained debris, wire tile fragments and wood. SAMPLE NUMBERS: N/C
			■			1	0201ASO03
		CONCRETE: 6" thick					
	SW SM	SAND WITH SILT: dry, loose, light yellowish tan, fine-to-medium-grained, trace gravel, poorly sorted	■			0	0201ASO05 Rad reading within background levels (50-200 cpm)
5		Boring completed at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 02A2-B1

Sheet 1 of 1

Boring Location: Objective 2 - Area 2		Elevation and Datum: 1192.45 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement ASPHALT: 4" thick, previously cored					SAMPLE NUMBER:
	SP SM	SAND WITH SILT: damp, loose, light yellowish brown, fine-to-medium- grained, moderately sorted					
						0	0202ASO05 Rad reading within background levels (50-200 cpm)
5		Boring completed at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 03A1-B1 Sheet 1 of 1

Boring Location: Objective 3 - Area 1		Elevation and Datum: 1165.29 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/27/97	Date Finished: 5/27/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: dry, loose, brown fine-grained to gravel, no odor very poorly sorted				0	SAMPLE NUMBERS: 0301SO01a
		Same				0	0301SO03a Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 03A1-B2

Sheet 1 of 1

Boring Location: Objective 3 - Area 1		Elevation and Datum: 1156.79 /	
Drilling Contractor: N/A	Driller: D. Van Winkle	Date Started: 9/23/97	Date Finished: 9/23/97
Drilling Equipment: Hand Auger	Borehole Diameter: 2"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: D. Van Winkle	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SILTY SAND: moist, coarse grained, brown, very poorly sorted, subangular to rounded, some humus clumps, asphalt Boring completed at 1 ft bg				0	SAMPLE NUMBERS: 0301SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **03A2-B1** Sheet **1** of **1**

Boring Location: **Objective 3 - Area 2**		Elevation and Datum: **1165.27 /**	
Drilling Contractor: **N/A**	Driller: **D. Van Winkle**	Date Started: **9/22/97**	Date Finished: **9/22/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **1.5"**	Completed Depth: (feet) **2.5**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **D. Van Winkle**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick					SAMPLE NUMBERS:
		SAND: moist, medium dense, brown, trace silt, coarse-to-medium-grained, very poorly sorted, angular medium-grained pebbles				0	0302SO01
		Same, less pebbles				0	0302SO02
		Same, moist, medium dense, medium sand, trace silt, pebbles, angular to rounded, poorly sorted					Rad reading within background levels (50-200 cpm)
		Boring completed at 2.5 ft. bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **04A1-B1** Sheet 1 of 1

Boring Location: **Objective 4 - Area 1**		Elevation and Datum: **1182.07 /**	
Drilling Contractor: **N/A**	Driller: **Chris Barr**	Date Started: **6/9/97**	Date Finished: **6/9/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **1.5"**	Completed Depth: (feet) **1.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Geoff Buckner**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick COARSE SAND: some fine grained, trace silt, trace gravel, light brown, poorly sorted, loose, moist (fill) Boring completed at 1 ft bg				0	SAMPLE NUMBER: 0401SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **04A2-B1** Sheet **1** of **1**

Boring Location: **Objective 4 - Area 2**		Elevation and Datum: **1183.20 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/8/97**	Date Finished: **9/8/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **16.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Tracy Berge**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: Reinforced, 3' thick					PID malfunction. Rad reading within backgound levels (50-200 cpm)
	ML	SANDY SILT: moist, reddish brown, medium-grained, some rock fragments, very poorly sorted, slightly plastic					
5		Same, increase in gravel and rock fragments, 6" layer of quartz rich rock with sand, beige to gray	■			0	SAMPLE NUMBERS: 0402ASO05
		Same, becomes black, contains organic material					
		Same, reddish brown					
10			■			0	0402ASO10
	SW	SAND: dry, beige to brown, poorly sorted weathered, some rock fragments and gravel					
15			■			0	0402ASO15
		Refusal at 16 ft bg					
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 04A2-B2

Sheet 1 of 1

Boring Location: Objective 4 - Area 2		Elevation and Datum: 1183.28 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 20.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Tracy Berge	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick, reinforced concrete over aggregate gravel					
	ML	SANDY SILT: moist, medium dense, reddish brown slightly plastic, medium-to-fine-grained					PID malfunction. Rad meter reading within background levels (50-200 cpm)
	GP	GRAVEL: rock fragments with greenish gray sand 6" layer					
5	ML	SANDY SILT: moist, reddish brown, dry medium dense, slightly plasticity medium-to-fine-grained	■			0	SAMPLE NUMBERS: 0402BSO05
	GP	GRAVEL: with greenish gray sand, 6" layer					
	SW	SAND: moist, reddish brown, dry, medium dense slight plasticity, medium to fine-grained					
10			■			0	0402BSO10
15		SAND: dry, beige, gravelly, appears weathered	■			0	0402BSO15
	ML	SANDY SILT: moist, red brown, medium dense, slight plasticity, medium to fine grained					
	SP GP	SAND: dry, brown gravelly, large rock fragments					
20		BED ROCK: weathered, fractured	■			0	0402BSO20
		Bottom of boring at 20 ft bg					
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 04A3-B1 Sheet 1 of 1

Boring Location: Objective 4 - Area 3		Elevation and Datum: 1172.37 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/29/97	Date Finished: 5/29/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse gravel, some silt, brown poorly sorted, loose, moist Boring completed at 1 ft bg				0	SAMPLE NUMBER: 0403ASO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 04A3-B2

Sheet 1 of 1

Boring Location: Objective 4 - Area 3		Elevation and Datum: 1166.53 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/29/97	Date Finished: 5/29/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse gravel, some silt, brown poorly sorted, loose, moist				0	SAMPLE NUMBERS: 0403BSO01
						0	0403BSO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 04A3-B3 Sheet 1 of 1

Boring Location: Objective 4 - Area 3		Elevation and Datum: 1179.82 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 6/2/97	Date Finished: 6/2/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse gravel, some silt, brown poorly sorted, loose, moist				0	SAMPLE NUMBERS: 0403CSO01
						0	0403CSO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 1 ft. bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 04A3-B4

Sheet 1 of 1

Boring Location: Objective 4 - Area 3		Elevation and Datum: 1180.37 /	
Drilling Contractor: N/A	Driller: Chris Barr	Date Started: 6/10/97	Date Finished: 6/10/97
Drilling Equipment: Hand Auger	Borehole Diameter: 1.5"	Completed Depth: (feet) 2.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Chris Barr	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick FINE SAND: some coarse gravel, some silt, brown, poorly sorted, loose, moist				0 0	SAMPLE NUMBERS: 0403DSO01
		Boring completed at 2 ft. bg					0403DSO02 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **04A4-B1** Sheet **1** of **1**

Boring Location: **Objective 4 - Area 1**		Elevation and Datum: **1182.67 /**	
Drilling Contractor: **N/A**	Driller: **Chris Barr**	Date Started: **6/10/97**	Date Finished: **6/10/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **1.5"**	Completed Depth: (feet) **3.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Chris Barr**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, hard, strong brown silt to fine-grained sand, 80% silt, 10% clay, 10% very fine-to-fine-grained sand				0	SAMPLE NUMBERS: 0404ASO01
		Silty sand as above				0	0404ASO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 04A4-B2

Sheet 1 of 1

Boring Location: Objective 4 - Area 4		Elevation and Datum: 1182.34 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/28/97	Date Finished: 5/28/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry hard, strong brown silt to fine-grained sand 80% silt, 10% clay, 10% very fine-to-fine-grained sand				0	SAMPLE NUMBERS: 0404BSO01
		Silty sand as above				0	0404BSO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 04A5-B1 Sheet 1 of 1

Boring Location: Objective 4 - Area 5		Elevation and Datum: 1183.56 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 6/3/97	Date Finished: 6/3/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick					SAMPLE NUMBERS:
		SAND: moist, dense, brownish yellow, poorly sorted, fine-grained sand to pebbly gravel, 70% fine-grained sand, 10% medium-grained sand, 15% coarse- grained sand, 5% pebbly gravel, up to 10 mm diameter	■			0	0405SO01
		Sand as above	■			0	0405SO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 04A5-B2

Sheet 1 of 1

Boring Location: Objective 4 - Area 5		Elevation and Datum: 1183.45 /	
Drilling Contractor: N/A	Driller: Chris Barr	Date Started: 6/10/97	Date Finished: 6/10/97
Drilling Equipment: Hand Auger	Borehole Diameter: 1.5"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Chris Barr	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: moist, dense, brownish yellow, poorly sorted, fine-grained sand to pebbly gravel, 70% fine-grained sand, 10% medium-grained sand, 15% coarse- grained sand 5% pebbly gravel, up to 10 mm diameter				0	SAMPLE NUMBERS: 0405ASO01
		Sand as above				0	0405ASO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 05A1-B1 Sheet 1 of 1

Boring Location: Objective 5 - Area 1		Elevation and Datum: 1326.41 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement ASPHALT: 4" thick					
	SW	SAND: damp loose, medium brown fine-to-coarse-grained (fill)				0	SAMPLE NUMBERS: 0501ASO01
	SW SM	SAND WITH SILT: damp, loose, poorly sorted, light pinkish brown fine-to- coarse-grained, (10% angular rock fragments)				0	0501ASO01 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **05A1-B2** Sheet **1** of **1**

Boring Location: **Objective 5 - Area 1**		Elevation and Datum: **1322.25 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/9/97**	Date Finished: **9/9/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **3.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Jon Dutton**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement ASPHALT: 4" thick					
	SW	SAND: damp, loose, light yellowish brown, fine-to-coarse-grained, trace gravel, trace rock fragments, poorly sorted (fill)				0	SAMPLE NUMBERS: 0501BSO01
		Sand as above				0	0501BSO03 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 3 ft. bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **05A1-B3** Sheet **1** of **1**

Boring Location: **Objective 5 - Area 1**		Elevation and Datum: **1316.76 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/9/97**	Date Finished: **9/9/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **3.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Jon Dutton**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	SILTY SAND: damp, medium dense, fine-to-coarse-grained, trace angular rock fragments, poorly sorted				0	SAMPLE NUMBERS: 0501CSO01
		Silty sand as above				0	0501CSO03 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 3 ft. bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 05A1-B4

Sheet 1 of 1

Boring Location: Objective 5 - Area 1	Elevation and Datum: 1308.59 /
Drilling Contractor: Boart Longyear / Driller: Dan Casey	Date Started: 9/9/97 / Date Finished: 9/9/97
Drilling Equipment: Sonic Rig / Borehole Diameter: 4"	Completed Depth: (feet) 3.0 / Water Depth: (feet)
Sampling Method: Grab	WELL CONSTRUCTION
Drilling Method: N/A / Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A / Filter Material: N/A
Logged By: Jon Dutton / Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 4" thick SAND WITH SILT: damp, loose, fine-to-coarse-grained with gravel sized rock fragments, (fill) CONCRETE: 1.5'-3.0 Driller reported sift material past 3 feet				0	SAMPLE NUMBER: 0501DSO01 Rad reading within background levels (50-200 cpm)
		Bottom of boring 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 05A1-B5 Sheet 1 of 1

Boring Location: Objective 5 - Area 1		Elevation and Datum: 1307.81 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SP	SAND: damp, loose, fine to medium grained with gravel sized rock fragments					
		Metamorphic rock, moderately fractured, well indurated, localized weathering	■				SAMPLE NUMBERS: 0501ESO01
	SW	SAND: damp, loose, fine-to-coarse-grained, trace of rock fragments, poorly sorted	■				0501ESO03
		Bottom of boring at 3 ft bg					Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 05A2-B1

Sheet 1 of 1

Boring Location: Objective 5 - Area 2		Elevation and Datum: 1175.46 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 10.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Tracy Berge	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SP	Pavement ASPHALT: 3" thick SAND: dry, loose, brown, fine-to-medium-grained, moderately Sand coarse grained, dry, loose, brown, moderately sorted					Rad reading within background levels (50-200 cpm) No PID readings
	ML	SANDY SILT: dry, medium dense, reddish brown, contains quartz rich rock fragments					SAMPLE NUMBERS: 0502ASO05
5							
		Sandy silt as above, increasing sand content					0502ASO10
10		Bottom of boring at 10 ft bg					
15							
20							
25							

MORRIS 4796 1.19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **06A1-B1** Sheet **1** of **1**

Boring Location: **Objective 6 - Area 1**		Elevation and Datum: **1183.24 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/8/97**	Date Finished: **9/8/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **5.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Jon Dutton**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick, previously cored					
	SW	SAND: moist, loose to medium dense, very dark brown, silt-to-very-coarse sand, 10% silt, 70% fine-grained, 10% medium dense 10% coarse-to-very -coarse sand. very poorly sorted	■			0	SAMPLE NUMBERS: 0601ASO01
			■			0	0601ASO03
	SM	SAND WITH SILT: damp, medium dense, reddish brown, fine-to-coarse- grained, trace mica, moderately sorted	■			0	0601ASO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **06A1-B10** Sheet **1** of **1**

Boring Location: **Objective 6 - Area 1**		Elevation and Datum: **1183.27 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/8/97**	Date Finished: **9/8/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **5.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Jon Dutton**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick					Well graded
	SW SM	SAND WITH SILT: damp, medium dense, light yellowish brown, fine-to- coarse-grained trace gravel, poorly sorted	■			0	SAMPLE NUMBERS: 0601ISO01
	SM	SILTY SAND: damp, medium dense, yellowish orangish brown, fine-to-medium- grained, trace coarse-grained material, micaceous, moderately sorted	■			0	0601ISO03
	ML	SANDY SILT: damp medium dense, reddish brown and yellowish orange mottled areas, fine-to-medium-grained sand, trace coarse-grained material, micaceous, poorly sorted	■			0	0601ISO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 06A1-B11 Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1192.74 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick					
	SW SM	SAND WITH SILT: dry, loose, white and tan, fine-to-coarse grained, some gravel, cobbles up to 2" x 2" x 2", angular pieces of crystalline rock, quartz or plagioclase, very poorly sorted	■			0	SAMPLE NUMERS: 0601JSO01
		Sandy with silt, as above light yellowish brown	■			0	0601JSO03
		Sandy with silt, as above, reddish brown					
5		Sandy, white and tan	■			0	0601JSO05 Rad reading within background levels (50-200 cpm)
		Bottom of borehole is 5 feet bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A1-B2

Sheet 1 of 1

Boring Location: Objective 6 - Area 1	Elevation and Datum: 1192.72 /
Drilling Contractor: Boart Longyear; Driller: Dan Casey	Date Started: 9/8/97; Date Finished: 9/8/97
Drilling Equipment: Sonic Rig; Borehole Diameter: 4"	Completed Depth: (feet) 5.0; Water Depth: (feet)
Sampling Method: Grab	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: Jon Dutton; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick, previously cored					
	CL	CLAY: moist, soft, brown, clay to-medium-grained sand, 80% clay, 10% silt, 5% fine-grained sand 5% medium-grained sand	■			0	SAMPLE NUMBERS: 0601BSO01
	SM	SILTY SAND: medium dense, reddish brown, fine-to-medium-grained, trace coarse grained material	■			0	0601BSO03
		Silty sand as above, light yellowish brown	■			0	0601BSO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 06A1-B3 Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1192.69 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick, previously cored					SAMPLE NUMBERS:
	CL	CLAY: moist, soft, brown, clay to medium-grained sand, 80% clay 10% silt 5% fine-grained sand, 5% medium-grained sand	■			0	0601CSO01
	SM	SILTY SAND: medium dense, reddish brown fine-to-medium grained, trace coarse grained material	■			0	0601CSO03
		Same, trace gravel, trace mica	■			0	0601CSO05
5		Bottom of boring at 5 ft bg					Rad reading within background levels (50-200 cpm)
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A1-B4

Sheet 1 of 1

Boring Location: Objective 6 - Area 1	Elevation and Datum: 1192.68 /
Drilling Contractor: Boart Longyear; Driller: Dan Casey	Date Started: 9/8/97; Date Finished: 9/8/97
Drilling Equipment: Sonic Rig; Borehole Diameter: 4"	Completed Depth: (feet) 5.0; Water Depth: (feet)
Sampling Method: Grab	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: Jon Dutton; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick previously cored					SAMPLE NUMBERS:
	CL	CLAY: moist, soft, brown, clay-to-medium grained sand, 80% clay, 10% silt, 5% fine-grained sand, 5% medium-grained sand				0	0601DSO01
	SM	SILTY SAND: medium dense, damp, yellowish brown, fine-to-medium grained, trace coarse-grained material, micaceous, moderately sorted				0	0601DSO03
						0	0601DSO05 Rad reading within background levels (50-200 cpm)
5		Boring Completed at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **06A1-B5** Sheet **1** of **1**

Boring Location: **Objective 6 - Area 1**		Elevation and Datum: **1192.75 /**	
Drilling Contractor: **Boart Longyear**	Driller: **Dan Casey**	Date Started: **9/8/97**	Date Finished: **9/8/97**
Drilling Equipment: **Sonic Rig**	Borehole Diameter: **4"**	Completed Depth: (feet) **5.0**	Water Depth: (feet)
Sampling Method: **Grab**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **Jon Dutton**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 6" thick, previously cored					
	CL	CLAY: moist soft, brown, clay-to-medium-grained sand, 80% clay, 10% silt, 5% fine-grained sand, 5% medium-grained sand	■			0	SAMPLE NUMBERS: 0601ESO01
			■			0	
	SM	SILTY SAND: damp, medium dense, yellowish brown to light yellowish tan mottled color, coarse, fine-to-medium-grained, trace coarse, moderately sorted					0601ESO03
5			■			0	0601ESO05 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 5 ft. bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A1-B6

Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1192.68 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	CL	Pavement Asphalt: 4" thick, previously cored CLAY: moist, soft, brown, clay to medium-grained sand, 80% clay. 10% silt 5% fine-grained sand, 5% medium-grained sand				0	SAMPLE NUMBERS: 0601FSO01
						0	
	SM	SILTY SAND: medium dense, damp, fine-to-medium-grained, trace coarse- grained material, trace gravel trace mica, moderately sorted					0601FSO03
						0	0601FSO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 06A1-B7 Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1192.83 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	CL	Pavement ASPHALT: 4" thick, previously cored CLAY: moist, soft, brown, 80% clay, 10% silt, 5% fine-grained sand, 5% medium-grained sand				0	SAMPLE NUMBERS: 0601GSO01
	SM	SILTY SAND: damp, medium dense, reddish brown, fine-to-medium-grained, trace coarse-grained material				0	0601GSO03
5		Bottom of boring at 5 ft bg				0	0601GSO05 Rad reading within background levels (50-200 cpm)
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A1-B8

Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1192.68 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	CL	Pavement ASPHALT: 4" thick, previously cored to 5' ft bg CLAY: moist, soft, brown, 80% clay, 10% silt, 5% fine-grained sand, 5% medium-grained sand				0	SAMPLE NUMBERS: 0601HSO01
						0	
	SM	SILTY SAND: damp, medium dense, dark reddish brown, fine-to-medium- grained, trace coarse material, trace mica				0	0601HSO03 0601HSO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft. bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 06A1-B9 Sheet 1 of 1

Boring Location: Objective 6 - Area 1		Elevation and Datum: 1182.44 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/8/97	Date Finished: 9/8/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Tracy Berge	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	CL	Pavement CONCRETE: 4" thick, previously cored to 3' CLAY: moist, soft, brown, 80% clay, 10% silt 5% fine-grained sand, 5% medium-grained sand				0	SAMPLE NUMBERS: 0601SO01
						0	
	SW SM	SAND WITH SILT: damp, reddish brown, fine-to-coarse grained, poorly sorted					0601SO03
5		Bottom of boring at 5 ft. bg.				0	0601SO05 Rad reading within background levels (50-200 cpm)
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A2-B1

Sheet 1 of 1

Boring Location: Objective 6 - Area 2		Elevation and Datum: 1184.97 /	
Drilling Contractor: N/A	Driller: Chris Barr	Date Started: 6/9/97	Date Finished: 6/9/97
Drilling Equipment: Hand Auger	Borehole Diameter: 1.5"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: G. Buckner	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick COARSE SAND: some fine-grained, some gravel, trace silt, poorly sorted, reddish brown, moist, dense Boring completed at 1 ft. bg				0	SAMPLE NUMBER: 0602SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A2-B2

Sheet 1 of 1

Boring Location: Objective 6 - Area 2		Elevation and Datum: 1184.99 /	
Drilling Contractor: N/A	Driller: Chris Barr	Date Started: 6/9/97	Date Finished: 6/9/97
Drilling Equipment: Hand Auger	Borehole Diameter: 1.5"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: G. Buckner	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick COARSE SAND: some fine-grained, some gravel, trace silt, poorly sorted, reddish brown, moist, dense Boring completed at 1 ft bg				0	SAMPLE NUMBER: 0602SO02 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 06A2-B3

Sheet 1 of 1

Boring Location: Objective 6 - Area 2		Elevation and Datum: 1184.91 /	
Drilling Contractor: N/A	Driller: Chris Barr	Date Started: 6/9/97	Date Finished: 6/9/97
Drilling Equipment: Hand Auger	Borehole Diameter: 1.5"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: G. Buckner	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick COARSE SAND: some fine-grained, some gravel, trace silt, poorly sorted, reddish brown, moist, dense Boring completed at 1 ft bg.				0	SAMPLE NUMBER: 0602SO03 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 07A2-B1 Sheet 1 of 1

Boring Location: Objective 7 - Area 2		Elevation and Datum: 1247.95 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 4" thick SAND: damp, loose, reddish brown, fine-to-medium-grained trace mica, moderately sorted				0	SAMPLE NUMBERS: 0702ASO01
		Same				0	0702ASO03
5	SW SM	SAND WITH SILT: damp, medium dense, fine-to-medium-grained trace gravel (rounded), trace mica poorly sorted				0	Crossbedded sand and silt lenses at 4.5 -5 0 0702ASO05 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 07A2-B2

Sheet 1 of 1

Boring Location: Objective 7 - Area 2		Elevation and Datum: 1248.36 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement ASPHALT: 4" thick					
	SW	SAND: damp, loose, reddish brown, fine-to-coarse-grained trace mica, poorly sorted				0	SAMPLE NUMBERS: 0702BSO01
		Same				0	0702BSO03
	SW SM	SAND WITH SILT: medium dense, fine-to-coarse-grained, trace gravel, trace mica, poorly sorted				0	Rounded rock, cross-bedded sand at 4 -5' 0702BSO05 Rad reading within background levels (50-200 cpm)
5		Bottom of boring at 5 ft. bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 07A2-B3 Sheet 1 of 1

Boring Location: Objective 7 - Area 2		Elevation and Datum: 1248.07 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	ML	Pavement ASPHALT: 4" thick SILT WITH SAND: damp, medium dense mottled yellowish brown and reddish brown, fine-to-medium-grained sand, trace mica	[illegible]	[illegible]	[illegible]	0	Layering cross-bedded sand in friable pieces silt stone. SAMPLE NUMBERS: 0702CSO01
	SW	SAND: damp, medium dense, reddish brown, fine-to-medium-grained, trace mica, moderately sorted	[illegible]	[illegible]	[illegible]	0	0702CSO03
5	SM	SAND WITH SILT: damp, medium dense, reddish orange brown fine-to-medium- grained, trace coarse grained fragments. trace mica	[illegible]	[illegible]	[illegible]	0	0702CSO05 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 5 ft bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 07A2-B4

Sheet 1 of 1

Boring Location: Objective 7 - Area 2	Elevation and Datum: 1250.04 /
Drilling Contractor: Boart Longyear; Driller: Dan Casey	Date Started: 9/9/97; Date Finished: 9/9/97
Drilling Equipment: Sonic Rig; Borehole Diameter: 4"	Completed Depth: (feet) 5.0; Water Depth: (feet)
Sampling Method: Grab	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: Jon Dutton; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	FILL SAND: dry loose, light yellowish brown, fine-to-coarse-grained, trace gravel				0	SAMPLE NUMBERS: 07020SO01
	SP	SAND: damp, loose, reddish brown, fine-to-medium-grained, trace coarse- grained material, moderately sorted				0	07020SO03
5	SM	SAND WITH SILT: medium dense, light yellowish brown, fine-to-medium- grained, trace coarse-grained material, some angular rock fragments, moderately sorted				0	07020SO05 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 5 ft. bg.					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 07A2-B5 Sheet 1 of 1

Boring Location: Objective 7 - Area 2		Elevation and Datum: 1249.68 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 5.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	FILL SAND: dry, loose, light yellowish brown, fine-to-coarse-grained, trace gravel, poorly sorted	■			0	SAMPLE NUMBERS: 0702ESO01
		Sand as above, reddish orange brown, trace mica	■			0	0702ESO03
5		SAND: damp, loose, fine-to-coarse-grained light green mostly, some areas black, gravel size angular rock fragments <3%, poorly sorted	■			0	0702ESO05 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 5 ft. bg					
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 10A1-B1

Sheet 1 of 1

Boring Location: Objective 10 - Area 1		Elevation and Datum: 1218.73 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 8" thick					
	SP SM	SAND WITH SILT: damp, loose, reddish brown, fine-to-medium-grained trace coarse grained fragments moderately sorted Sand with silt as above, light yellowish brown	■			0	SAMPLE NUMBER: 1001ASO01 Rad reading within background levels (50-200 cpm)
		Bottom of boring at 3 ft. bg.					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 10A1-B2 Sheet 1 of 1

Boring Location: Objective 10 - Area 1		Elevation and Datum: 1218.68 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 8" thick					
	SM	SILTY SAND: damp, medium dense, reddish orange brown, fine-to-medium- grained, trace coarse-grained material micaceous, moderately sorted				0	SAMPLE NUMBER: 1001BSO01 Rad reading within background levels (50-200 cpm)
		Silty sand as above					
		Bottom of boring at 3 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 10A1-B3

Sheet 1 of 1

Boring Location: Objective 10 - Area 1		Elevation and Datum: 1218.66 /	
Drilling Contractor: Boart Longyear	Driller: Dan Casey	Date Started: 9/9/97	Date Finished: 9/9/97
Drilling Equipment: Sonic Rig	Borehole Diameter: 4"	Completed Depth: (feet) 3.0	Water Depth: (feet)
Sampling Method: Grab		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Jon Dutton	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
		Pavement CONCRETE: 8" thick				0	Well graded, pieces of crystaline rock throughout sample interval(8'-3') SAMPLE NUMBER: 1001CSO01 Rad reading within background levels (50-200 cpm)
	SM	SAND: dry, loose, light yellowish brown, fine-to-coarse grained					
		Sand as above, reddish brown					
		Bottom of boring at 3 ft. bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 11A1-B1 Sheet 1 of 1

Boring Location: Objective 11 - Area 1		Elevation and Datum: 1181.39 /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 6/9/97	Date Finished: 6/9/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: Geoff Buckner	Checked By: D. Van Winkle R. G	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SAND: fine-to-coarse grained, trace silt, trace gravel (gneiss), light brown, loose, moist Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1101SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 11A1-B2

Sheet 1 of 1

Boring Location: Objective 11 - Area 1	Elevation and Datum: 1184.31 /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 6/9/97; Date Finished: 6/9/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: Geoff Buckner; Checked By: D. Van Winkle R. G	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SAND: fine-to-coarse grained, trace silt, trace gravel (gneiss), light brown, loose, moist Boring completed at 1 ft bg.				0	SAMPLE NUMBER: 1102SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A2-B1

Sheet 1 of 1

Boring Location: Objective 12 - Area 1		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/21/97	Date Finished: 5/21/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, very loose, yellowish brown, silt to gravel, 60% fine-grained sand 20% silt, 15% gravel, gravel up to 20 mm diameter, very angular, gravel is gneiss, very poorly sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1201SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A2-B2

Sheet 1 of 1

Boring Location: Objective 12 - Area 1	Elevation and Datum: /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 5/21/97; Date Finished: 5/21/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: E. Vander Velde; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, very loose, yellowish brown, silt to gravel, 60% fine-grained sand 20% silt, 10% gravel, gravel up to 20 mm diameter, very angular, gravel is gneiss, very poorly, sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1201SO02 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 12A1-B3 Sheet 1 of 1

Boring Location: Objective 12 - Area 1		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/21/97	Date Finished: 5/21/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings: OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, very loose, yellowish brown, silt to gravel, 60% fine-grained sand, 20% silt, 10% gravel, gravel up to 20 mm diameter, very angular, very poorly sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1201SO03 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A1-B4

Sheet 1 of 1

Boring Location: Objective 12 - Area 1	Elevation and Datum: /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 5/21/97; Date Finished: 5/21/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: E. Vandr Velde; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, loose, yellowish brown, silt to gravel, 80% fine-grained sand, 15% silt, >5% gravel, gravel up to 20 mm diameter, very angular, very poorly sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1201SO04 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A1-B5

Sheet 1 of 1

Boring Location: Objective 12 - Area 1		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: E. Vander Velde	Date Started: 5/21/97	Date Finished: 5/21/97
Drilling Equipment: Hand Auger	Borehole Diameter: 3"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: E. Vander Velde	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SM	Pavement ASPHALT: 3" thick SILTY SAND: dry, very loose, dark grayish brown, silt to gravel, 60% fine-grained sand, 20% silt, 20% gravel, gravel up to 20 mm diameter, very angular, gravel is gneiss, very poorly sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1201SO05 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A2-B1

Sheet 1 of 1

Boring Location: Objective 12 - Area 2	Elevation and Datum: 1213.00 /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 5/21/97; Date Finished: 5/21/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: E. Vander Velde; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: very dry, very loose, yellowish red, fine-grained-sand-to-very- coarse gravel, 60% fine-grained sand, 20% very-coarse sand, 20% gravel, gravel up to 20 mm diameter very angular, very poorly sorted Boring completed at 1 ft bg				0	SAMPLE NUMBER: 1202SO01 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **12A2-B2** Sheet **1** of **1**

Boring Location: **Objective 12 - Area 2**		Elevation and Datum: **1210.45 /**	
Drilling Contractor: **N/A**	Driller: **E. Vander Velde**	Date Started: **5/21/97**	Date Finished: **5/21/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **3"**	Completed Depth: (feet) **1.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **E. Vander Velde**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	Pavement ASPHALT: 3" thick SAND: dry, loose, reddish brown, fine-grained sand-to-very coarse gravel, 60% fine-grained sand, 20% medium-grained sand, 10% coarse- grained sand, 10% coarse-to-very-coarse gravel, angular, very poorly sorted Boring completed at 1 ft. bg.				0	SAMPLE NUMBER: 1202SO02 Rad reading within background levels (50-200 cpm)
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A2-B3

Sheet 1 of 1

Boring Location: Objective 12 - Area 2	Elevation and Datum: 1211.43 /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 5/21/97; Date Finished: 5/21/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: E. Vander Velde; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: dry, friable, yellowish red, fine-grained sand to very coarse gravel, 70% fine-grained sand, 10% medium-grained sand, 10% coarse- grained sand, 10% coarse gravel, semi-consolidated very poorly sorted				0	SAMPLE NUMBER: 1202SO03 Rad reading within background levels (50-200 cpm)
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **12A2-B4** Sheet **1** of **1**

Boring Location: **Objective 12 - Area 2**		Elevation and Datum: **1209.37 /**	
Drilling Contractor: **N/A**	Driller: **E. Vander Velde**	Date Started: **5/21/97**	Date Finished: **5/21/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **3"**	Completed Depth: (feet) **1.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **E. Vander Velde**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: dry, friable, yellowish red, fine-grained sand to very coarse gravel, 70% fine-grained sand, 10% medium-grained sand 10% coarse- grained sand 10% coarse-gravel, semi-consolidated, very poorly sorted				0	SAMPLE NUMBER: 1202SO04 Rad reading within background levels (50-200 cpm)
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A2-B5

Sheet 1 of 1

Boring Location: Objective 12 - Area 2	Elevation and Datum: 1208.89 /
Drilling Contractor: N/A; Driller: E. Vander Velde	Date Started: 5/21/97; Date Finished: 5/21/97
Drilling Equipment: Hand Auger; Borehole Diameter: 3"	Completed Depth: (feet) 1.0; Water Depth: (feet)
Sampling Method: Hand Auger	WELL CONSTRUCTION
Drilling Method: N/A; Drilling Fluid: None	Type and Diameter of Well Casing: N/A
Backfill Material: Grout	Slot Size: N/A; Filter Material: N/A
Logged By: E. Vander Velde; Checked By: D. Van Winkle R.G.	Development Method: N/A

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: dry, friable, yellowish red, fine-grained sand to very coarse gravel, 70% fine-grained sand, 10% medium-grained sand, 10% coarse- grained sand, 10% coarse gravel. semi-consolidated. very poorly sorted				0	SAMPLE NUMBER: 1202SO05 Rad reading within background levels (50-200 cpm)
		Boring completed at 1 ft bg.					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam | Project Number: 4796

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: 12A3-B1 Sheet 1 of 1

Boring Location: Objective 12 - Area 3		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: D. Van Winkle	Date Started: 7/15/97	Date Finished: 7/15/97
Drilling Equipment: Hand Auger	Borehole Diameter: 2.0"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: D. Van Winkle	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: moist, very poorly sorted, dark gray brown, trace pebbles, lots of organic material (humus), fragments of gneiss					SAMPLE NUMBER: 1203SO01 No PID or Rad measurements collected
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A3-B2

Sheet 1 of 1

Boring Location: Objective 12 - Area 3		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: D. Van Winkle	Date Started: 7/15/97	Date Finished: 7/15/97
Drilling Equipment: Hand Auger	Borehole Diameter: 2.0"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: D. Van Winkle	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: moist, medium grained, very poorly sorted, dark gray brown, trace pebbles, angular, trace organic material (humus) fragments of gneiss					SAMPLE NUMBER: 1203SO02 No PID or Rad measurments collected
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: **Morris Dam** Project Number: **4796**

Soil Boring [X] Monitoring Well [ ] Boring/Well Number: **12A3-B3** Sheet **1** of **1**

Boring Location: **Objective 12 - Area 3**		Elevation and Datum: /	
Drilling Contractor: **N/A**	Driller: **D. Van Winkle**	Date Started: **7/15/97**	Date Finished: **7/15/97**
Drilling Equipment: **Hand Auger**	Borehole Diameter: **2.0"**	Completed Depth: (feet) **1.0**	Water Depth: (feet)
Sampling Method: **Hand Auger**		WELL CONSTRUCTION	
Drilling Method: **N/A**	Drilling Fluid: **None**	Type and Diameter of Well Casing: **N/A**	
Backfill Material: **Grout**		Slot Size: **N/A**	Filter Material: **N/A**
Logged By: **D. Van Winkle**	Checked By: **D. Van Winkle R.G.**	Development Method: **N/A**	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: moist, very fine grained, very poorly sorted, brown, trace pebbles, trace organic material (humus), fragments of gneiss					SAMPLE NUMBER: 1203SO03 No PID or Rad measurments collected
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A3-B4

Sheet 1 of 1

Boring Location: Objective 12 - Area 4		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: D. Van Winkle	Date Started: 7/15/97	Date Finished: 7/15/97
Drilling Equipment: Hand Auger	Borehole Diameter: 2.0"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: D. Van Winkle	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: moist. very fine grained, very poorly sorted, brown, trace silt trace pebbles, angular to subangular, trace organic material (humus), fragments of gneiss					SAMPLE NUMBER: 1203SO04 No PID or Rad measurments collected
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

BROWN AND CALDWELL

BORING LOG

Project Name: Morris Dam

Project Number: 4796

Soil Boring [X] Monitoring Well [ ]

Boring/Well Number: 12A3-B5

Sheet 1 of 1

Boring Location: Objective 12 - Area 3		Elevation and Datum: /	
Drilling Contractor: N/A	Driller: D. Van Winkle	Date Started: 7/15/97	Date Finished: 7/15/97
Drilling Equipment: Hand Auger	Borehole Diameter: 2.0"	Completed Depth: (feet) 1.0	Water Depth: (feet)
Sampling Method: Hand Auger		WELL CONSTRUCTION	
Drilling Method: N/A	Drilling Fluid: None	Type and Diameter of Well Casing: N/A	
Backfill Material: Grout		Slot Size: N/A	Filter Material: N/A
Logged By: D. Van Winkle	Checked By: D. Van Winkle R.G.	Development Method: N/A	

Depth (feet)	USCS Soil Type	Description	Graphic Log: Sample	Graphic Log: Lithology	Graphic Log: Boring/Well Completion	Readings OVA PPM	Remarks
	SW	SAND: moist, very fine grained, very poorly sorted, yellowish brown, trace silt trace pebbles, angular to subangular, trace organic material (humus), fragments of gneiss					SAMPLE NUMBER: 1203SO05 No PID or Rad measurments collected
		Boring completed at 1 ft bg					
5							
10							
15							
20							
25							

MORRIS 4796 12/19/97

APPENDIX D

GEOPHYSICAL SURVEY REPORT

Maverick
Geophysical Services

2828 Cochran Street, Suite 375
Simi Valley, California 93065

Office (805) 584-6433
Fax (805) 584-2012

Project Number 970512 (1135)
May 21, 1997

Derral Van Winkle
Brown and Caldwell
9040 Friars Road
San Diego, California

Subject: **Results of Geophysical Investigation at the Morris Reservoir Dam Facility in Azusa, California**

Dear Derral:

On May 14, 1997, Maverick Geophysical Services conducted a subsurface geophysical survey at the Morris Reservoir Dam Facility in Azusa, California. The purpose of the investigation was to identify the areal extent of two (possibly three) leach fields. For the purposes of discussion, the leach field closest to Highway 39 is here referred to as the "Older Leach Field". A possible southern extension of this field is here referred to as the "Middle Leach Field". The field that terminates between Buildings 42001 and 42002 is here referred to as the "Newer Leach Field" (see Figure 1).

EQUIPMENT

The equipment used at each site included the following equipment:

Electromagnetic (EM-31)
Ground Penetrating Radar (GPR)
Magnetic Locator
M-Scope
Dynatel

An "anomaly" is defined as a deflection or change from background values. These instruments are selected so as to "overlap" each other in their "ability" to detect anomalies. This is intentional. Anomalies should be verifiable with at least one other instrument based upon different geophysical principles. For example, an anomaly that is detected by EM methods, GPR, and metal detection is considered to be a "strong" anomaly.

ELECTROMAGNETIC (EM-31)

The Geonics EM-31 Ground Conductivity Instrument (EM-31) is an earth conductivity meter used to detect changes in conductance in shallow subsurface materials (to a depth of approximately 12 feet below the ground surface). An "anomaly" is detected by the EM-31 anywhere the difference between the conductivity of two adjacent materials is great. Examples of possible EM-31 anomalies are buried pipes, drums, and USTs (contrast between metal and soil), excavations (contrast between native and fill soils), and foundations (contrast between concrete and soil). A leach field may create an EM-31 anomaly if the gravel within the field has a different conductivity than the native soil (or rock). Conversely, if the gravel within the leach field is derived from the native rock, the contrast in conductivity may not be enough to be detected as an anomaly.

GROUND PENETRATING RADAR (GPR)

The Geophysical Survey Systems, Inc. (GSSI) Subsurface Interface Radar Model SIR-3 (GPR) system graphically records (in analog form) subsurface structures, both geological and man-made, by inducing a pulse of electromagnetic energy at very high frequencies into the ground. Reflected pulses received by the antenna are then processed for measurable contrast in electrical properties. The result is a visual pseudo-cross-sectional profile. Examples of GPR anomalies are pipes, drums, utilities, and USTs (contrast between metal and soil), previously excavated areas (contrast between native and fill soils), groundwater (contrast between saturated and unsaturated soils), and subsurface voids (contrast between soil and air). A leach field may create a GPR anomaly if the gravel within the field has different electrical properties than the native soil (or rock). Conversely, if the gravel within the leach field is derived from the native rock, the contrast in electrical properties may be small. Clay-rich soil limits the depth of penetration waves of the GPR. Steel-reinforced concrete, foundry slag, or metal debris may scatter the radar energy and give no return signal.

MAGNETIC LOCATOR AND M-SCOPE

The Schonstedt Instrument Company MAC-51B Magnetic and Cable Locator (Magnetic Locator) and the Fisher M-Scope TW-6 Pipe and Cable Locator (M-Scope) are hand-held instruments based on a transmitter/receiver concept. In the "magnetic" locating mode

(they also have an "induction" mode, see below), these instruments are used to locate buried metallic objects, such as pipes, cables, manhole covers, vaults, valve boxes, drums, and other buried metallic objects. Since the central perforated pipe of each leach field and all appurtenant piping may be metal, these instruments were used to detect and map these pipes.

DYNATEL

The 3M Dynatel 2220L Cable Locator is an instrument based on a transmitter/receiver system used to detect buried utilities, including pipes. It was used in the "induction" mode to locate piping associated with each leach field. In this mode, a transmitter box was placed over each suspected pipeline location and 33 MHz and 45 MHz frequencies are transmitted into the ground (and along the pipeline). A hand-held receiver was used to trace the pipeline by detecting the two frequencies. The surface trace of each pipeline was spray-painted on the ground surface.

PROCEDURE

A visual inspection was conducted first at the site. Underground utility covers, boxes, and UST-related features, such as vent pipes, product lines, mounds, and depressions were noted. Fill ports, water and sewer lids, caps and other liftable covers were pulled up and the covered vents, ports, or pipes investigated. No UST fill ports were found.

At each suspected leach field location, three lines of traverse parallel to the long direction of the field (approximately north/south) were measured and marked on the asphalt ground cover. Five lines of traverse (east/west) were also measured and marked. EM-31, Magnetic Locator, and M-Scope data were observed at five-foot intervals along each traverse. The surface location of each anomaly for each instrument was sprayed on the asphalt with colored spray-paint. A GPR record was collected along all traverses marked. Each GPR record was annotated at five-foot spaces to correlate with the marks on the ground. The surface location of each GPR anomaly was spray-painted on the ground.

A survey was then conducted to trace appurtenant piping.

RESULTS OF THE SUBSURFACE INVESTIGATION

Geophysical investigations of the three suspected leach field sites were conducted. A summary of results for each site follows.

OLDER LEACH FIELD

The EM-31 survey showed a rectangular EM anomaly with dimensions about 12 feet wide and 74 feet long (see Figure 2). A strong north/south EM anomaly generated by a (water supply) pipe occurs west (parallel to the road cut) of this large EM anomaly. The eastern edge of the Older Leach Field coincides with a strong north/south EM anomaly generated by a (waste water supply) pipe.

The GPR data are generally poor. The survey yielded one particularly useful east/west record approximately at the middle distribution pipe. This record (Line C) shows the edge of an excavation that is sharp and vertical on the west side and gradual on the east (such as a buried ramp might appear). This suggests that the cut may have been made from the east side towards the west. This GPR anomaly coincides with the western and eastern edges of the EM anomaly discussed above.

Three vertical 24-inch-diameter pipes completely filled with cement were found in the Older Leach Field. It is assumed that these pipes were used for the distribution of waste water, however this assumption is based solely upon the location of the pipes within the limits of the leach field. Asphalt trench patches connect these distribution pipes to a north/south trench patch that connected the Older Leach Field to the Newer Leach Field. The Magnetic Locator and Dynatel were used to establish the presence of a metal pipe beneath this trench patch. The connecting trenches have no pipes in them.

Based on visual inspection and the interpretation of the geophysical data, the following is interpreted about the Older Leach Field:

- Three vertical distribution pipes occur along the center line of the Older Leach Field and are completely filled with cement.
- A rectangular EM anomaly was delineated that was corroborated by GPR records.
- Metal pipes were traced to the east and west of the leach field. One pipe (west side) is a water supply line (based on a lid in the line marked "water"). The other pipe (east) is the presumed supply line for the waste water that was put into the leach field. The trench that housed the waste water supply line was apparently the conduit for the waste water to get into the vertical distribution pipes. The evidence for this is that the connector trenches from the supply line to the distribution pipes has no metal piping in them.

MIDDLE LEACH FIELD

The evidence for the existence of a Middle Leach Field is poor. The EM-31 detected a conductivity low at the apparent east edge of the field. The west edge of the field coincides with the road cut. The EM anomaly was determined to have the dimensions 12 feet in width and 89 feet in length (Figure 3).

GPR data are very poor for this leach field and are inconclusive in corroborating the EM anomaly.

The trench patches for the waste water supply line (east) and the water supply line (west) bracket this field. The Magnetic Locator and Dynatel were used to establish the presence of metal pipes beneath these trench patches. Similarly, three cross-cutting trench patches that occur at the southern edge of the EM anomaly were found to have metallic piping beneath them.

Based on visual inspection and the interpretation of the geophysical data, the following could be interpreted about the Middle Leach Field:

- No vertical distribution pipes occur within the limits of the Middle Leach Field.
- A rectangular EM anomaly was delineated that was not corroborated by GPR records.
- Metal pipes were traced to the east and west of the leach field. One pipe (west side) is a water supply line (based on a lid in the line marked "water"). The other pipe (east) is the presumed supply line for the waste water that was put into the Older Leach Field. The trench that housed the waste water supply line was apparently NOT the conduit for the waste water to get into the Middle Leach Field.

NEWER LEACH FIELD

The north, west, and southern sides of the Newer Leach Field are detectable with the EM-31. The EM anomaly was determined to have dimensions about 20 feet wide and 120 feet long anomaly (see Figure 4). Two strong EM anomalies generated by building slabs (Buildings 42009 and 42001) form the southeastern boundary of the Field. At least two strong short-amplitude anomalies ("spikes") occur within the limits of the Field that may represent buried pipes.

The GPR data are generally good. The survey yielded several useful east/west records that verified the width of the Field. However, no GPR records corroborate the presence of buried pipes within the Field.

Based on visual inspection and the interpretation of the geophysical data, the following are interpreted about the Newer Leach Field:

- A rectangular EM anomaly was delineated that was corroborated by GPR records.
- Two strong EM anomalies generated by building slabs (Buildings 42009 and 42001) form the southeastern boundary of the Field.
- At least two strong, short-amplitude anomalies ("spikes") that may represent buried pipes occur within the limits of the Field.
- No vertical distribution pipes or waste water supply trenches were found.

DISCLAIMER

Maverick Geophysical Services uses standard engineering practices and the most modern equipment available. Maverick guarantees to client that it has completed all required and reasonable calibrations of equipment brought on-site. Maverick also guarantees to client that it has based its interpretation of suspected geophysical anomalies on over 19 years of experience doing similar geophysical surveys. Maverick used at least two geophysical methods to attempt to verify suspected subsurface anomalies.

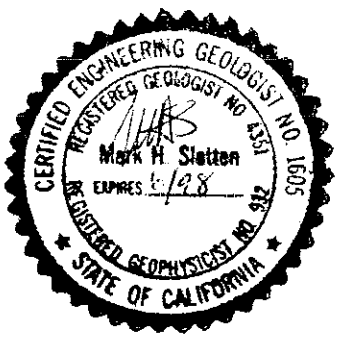
Client should understand that the subsurface geology, object size and composition, burial depth, and surface interference are all major factors as to whether the object will be detected by surface geophysical methods. These are all factors beyond Maverick's control. Client should also realize that the results of geophysical surveys may not represent unique solutions. Apparently similar anomalies may be created by different subsurface phenomena.

Thank you for your business.

Sincerely,

Norman Lee
Environmental Geophysicist

Mark Slatten, R.G./C.E.G., R.G.P.
Principal Geologist/Geophysicist



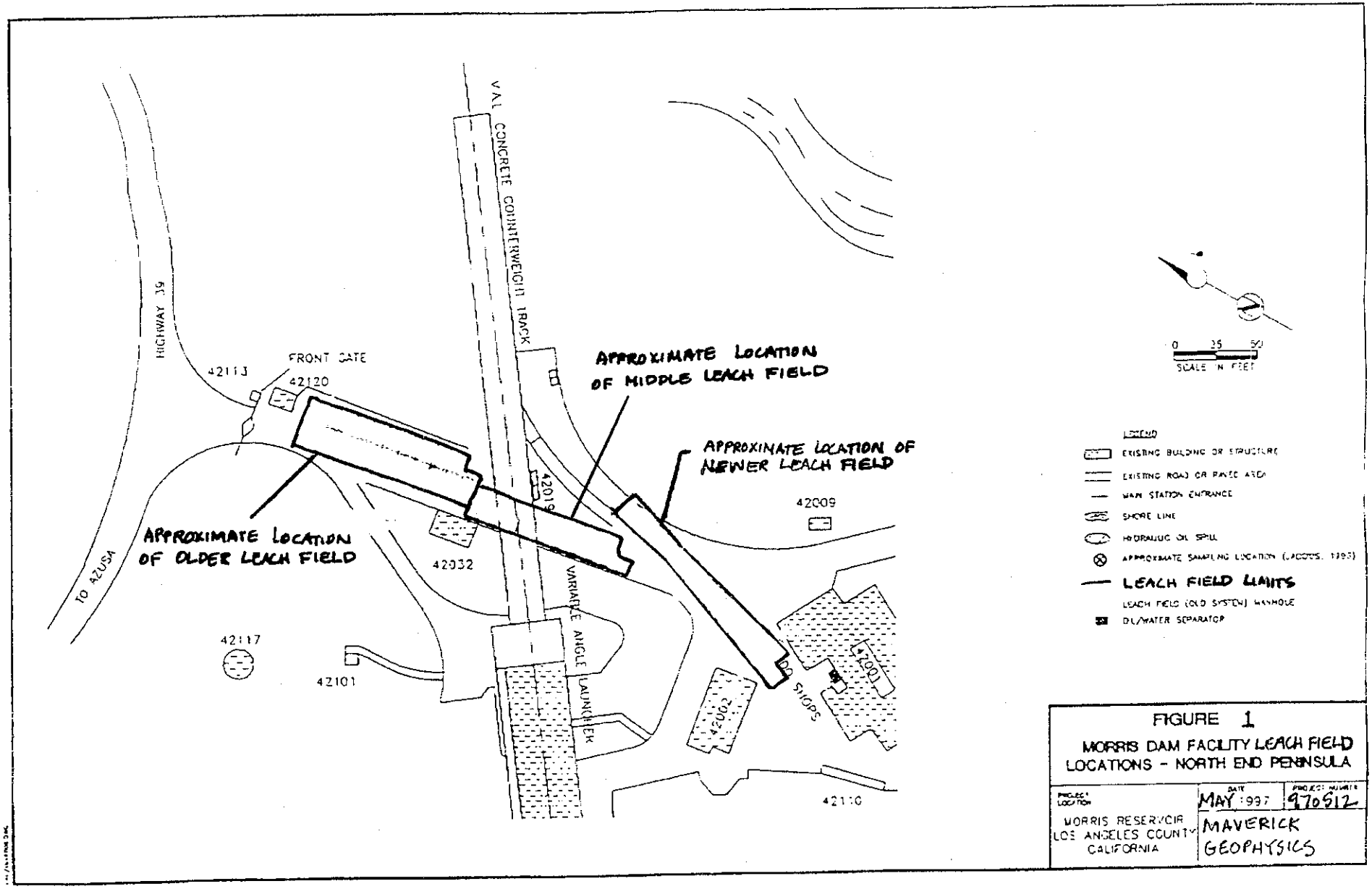


FIGURE 1

MORRIS DAM FACILITY LEACH FIELD LOCATIONS - NORTH END PENINSULA

PROJECT LOCATION	DATE	PROJECT NUMBER
MORRIS RESERVOIR LOS ANGELES COUNTY CALIFORNIA	MAY 1997	970512
	MAVERICK GEOPHYSICS	

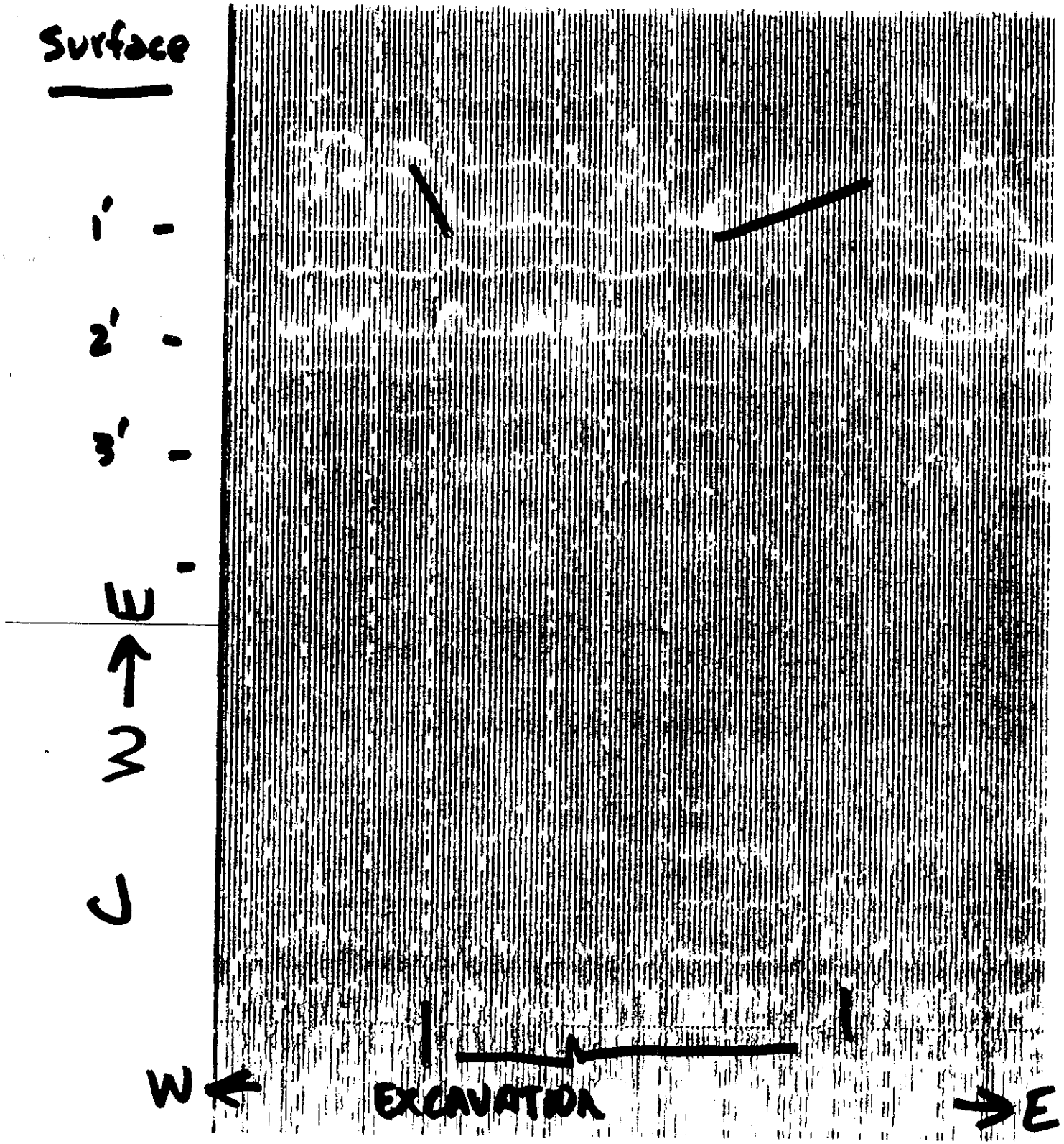
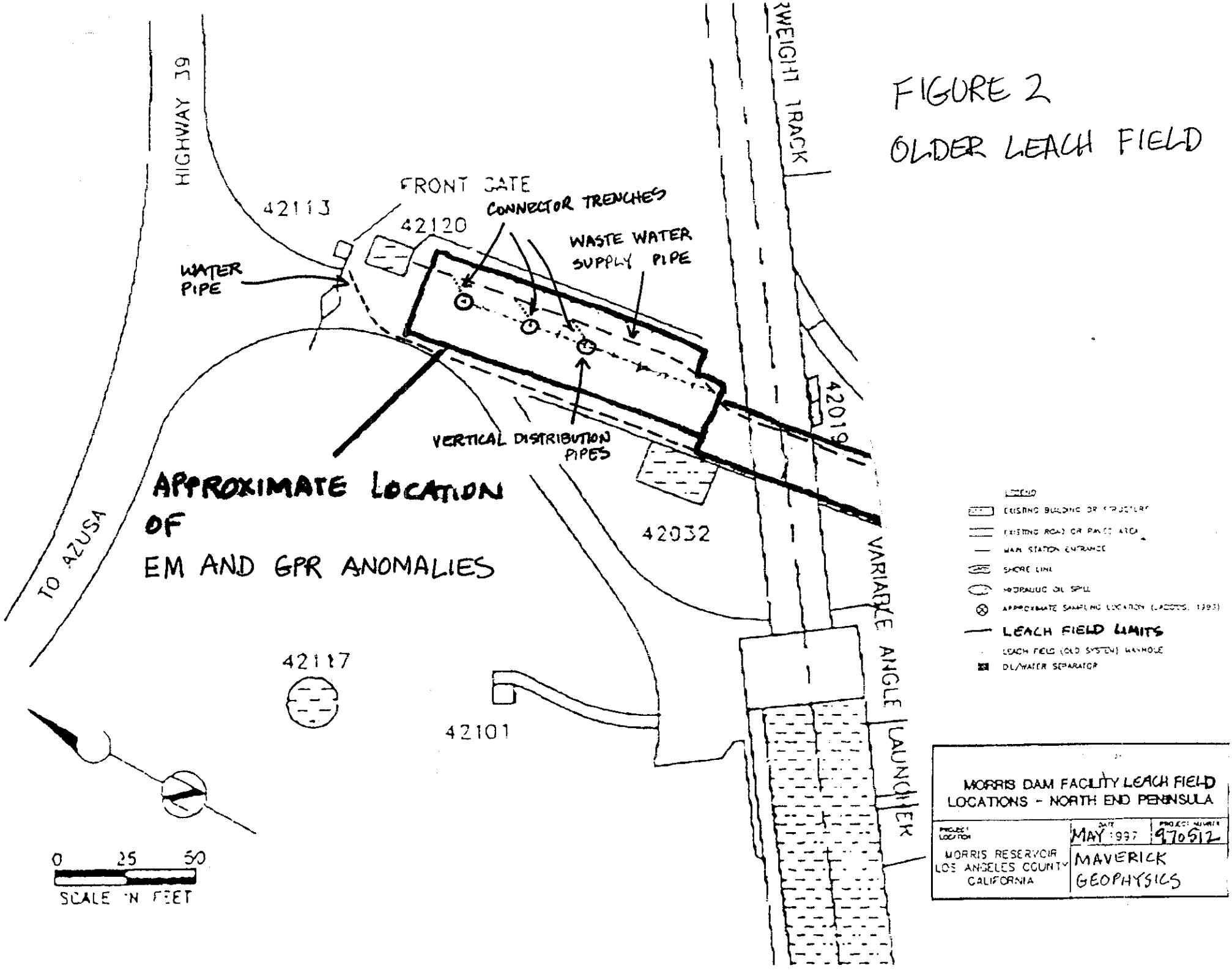
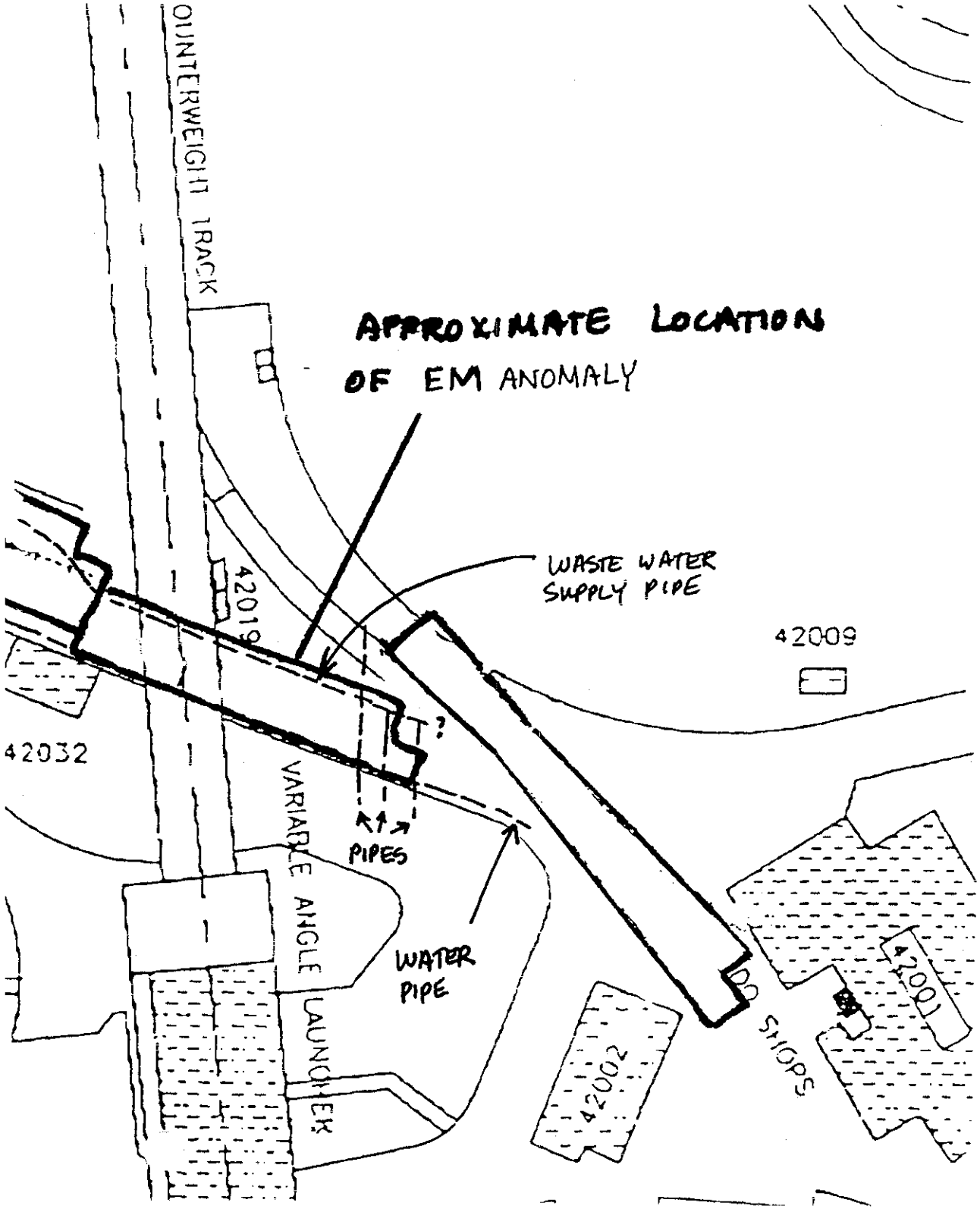

Surface
1'
2'
3'
W
E
W
EXCAVATION
E

FIGURE 2
OLDER LEACH FIELD





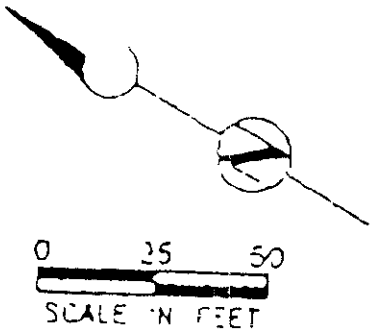


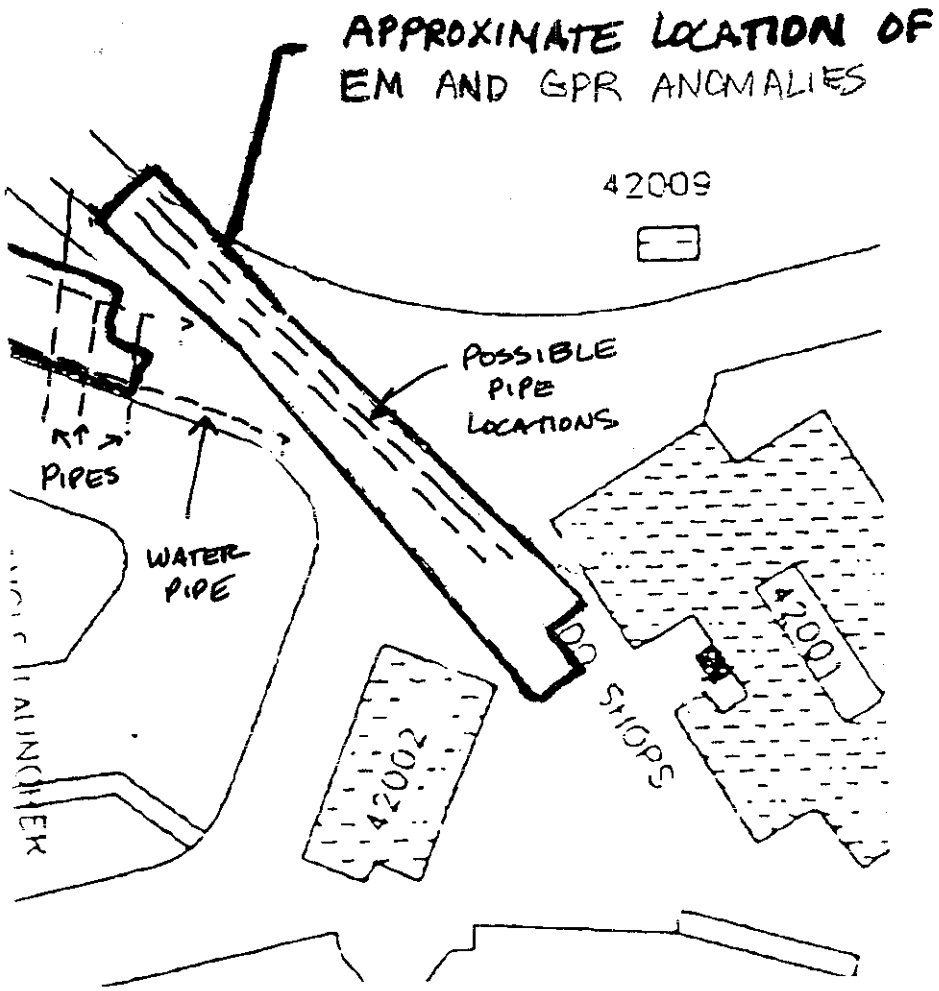
FIGURE 3
MIDDLE LEACH FIELD

LEGEND

- EXISTING BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- HYDRAULIC OIL SPILL
- APPROXIMATE SAMPLING LOCATION (JACOBS, 1993)
- LEACH FIELD LIMITS
- LEACH FIELD (OLD SYSTEM) MANHOLE
- OIL/WATER SEPARATOR

MORRIS DAM FACILITY LEACH FIELD LOCATIONS - NORTH END PENINSULA

PROJECT LOCATION	DATE	PROJECT NUMBER
MORRIS RESERVOIR LOS ANGELES COUNTY CALIFORNIA	MAY 1997	970512
	MAVERICK GEOPHYSICS	



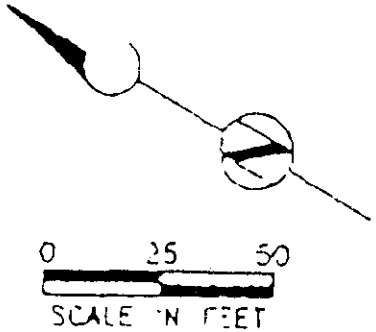


FIGURE 4
NEWER LEACH FIELD

LEGEND

- EXISTING BUILDING OR STRUCTURE
- EXISTING ROAD OR PAVED AREA
- MAIN STATION ENTRANCE
- SHORE LINE
- HYDRAULIC OIL SPILL
- APPROXIMATE SAMPLING LOCATION (LACDDS, 1993)
- LEACH FIELD LIMITS
- LEACH FIELD (OLD SYSTEM) MANHOLE
- OIL/WATER SEPARATOR

MORRIS DAM FACILITY LEACH FIELD LOCATIONS - NORTH END PENINSULA		
PROJECT LOCATION	DATE	PROJECT NUMBER
MORRIS RESERVOIR LOS ANGELES COUNTY CALIFORNIA	MAY 1997	970512
	MAVERICK GEOPHYSICS	

APPENDIX E

CONDENSED ANALYTICAL DATA

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte	Sample ID / Boring ID / Area Number / Boring Number / Depth	PRG (mg/kg) (Residential)	Units	0101SO01 01A1B1 i i i i	Lab Qual.	Valid. Qual	0101SO02 01A1B1 i 1 2	Lab Qual.	Valid. Qual	0102ASO01 01A2B1 2 i 1	Lab Qual.	Valid. Qual	0102ASO03 01A2B1 2 i 3	Lab Qual	Valid. Qual	0102BSO01 01A2B2 2 2 i	Lab Qual	Valid. Qual
Volatile Organic Compounds (EPA 8260)																		
1,1,1-Trichloroethane		1200	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,1,2,2-Tetrachloroethane		0.45	mg/kg	0.005	U	UJ	0.005	U	UJ	N/A			N/A			N/A		
1,1,2-Trichloroethane		0.65	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,1-Dichloroethane		500	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,1-Dichloroethene		0.037	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,2-Dichlorobenzene		700	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,2-Dichloroethane		0.25	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,2-Dichloropropane		0.31	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,3-Dichlorobenzene		500	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,4-Dichlorobenzene		3.6	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
1,4-Dioxane		40	mg/kg	4	U	UJ	4	U	UJ	N/A			N/A			N/A		
2-Chloroethylvinylether		—	mg/kg	0.04	U	UJ	0.04	U	UJ	N/A			N/A			N/A		
2-Hexanone		—	mg/kg	0.03	U	UJ	0.03	U	UJ	N/A			N/A			N/A		
Acetone		2100	mg/kg	0.1	U	UJ	0.1	U	UJ	N/A			N/A			N/A		
Acrolein		0.1	mg/kg	0.3	U	R	0.3	U	R	N/A			N/A			N/A		
Acrylonitrile		0.19	mg/kg	0.3	U	R	0.3	U	R	N/A			N/A			N/A		
Benzene		0.63	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Bromodichloromethane		0.63	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Bromoform		56	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Bromomethane		6.8	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Carbon Disulfide		7.5	mg/kg	0.01	U	U	0.01	U	U	N/A			N/A			N/A		
Carbon Tetrachloride		0.23	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Chlorobenzene		65	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Chloroethane		—	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Chloroform		0.25	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Chloromethane		1.2	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
cis-1,2-Dichloroethene		31	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
cis-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Dibromochloromethane		5.3	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Ethylbenzene		230	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Freon 113 (Trichlorotrifluoroethane)		5600	mg/kg	0.01	U	UJ	0.01	U	UJ	N/A			N/A			N/A		
Methyl ethyl ketone		7100	mg/kg	0.03	U	UJ	0.03	U	UJ	N/A			N/A			N/A		
Methyl isobutyl ketone		770	mg/kg	0.03	U	UJ	0.03	U	UJ	N/A			N/A			N/A		
Methylene chloride		7.8	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Styrene		680	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Tetrachloroethene		5.4	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Toluene		790	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Total Xylene Isomers		320	mg/kg	0.01	U	U	0.01	U	U	N/A			N/A			N/A		
trans-1,2-Dichloroethene		78	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
trans-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Trichloroethene		3.2	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Trichlorofluoromethane		380	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		
Vinyl acetate		780	mg/kg	0.2	U	UJ	0.2	U	UJ	N/A			N/A			N/A		
Vinyl chloride		0.016	mg/kg	0.005	U	U	0.005	U	U	N/A			N/A			N/A		

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte	Sample ID		0101SO01			0101SO02			0102ASO01			0102ASO03			0102BSO01		
	Boring ID		01A1B1			01A1B1			01A2B1			01A2B1			01A2B2		
	Area Number		i			i			2			2			2		
	Boring Number		1			1			1			i			2		
	Depth		1	Lab Qual	Valid. Qual	2	Lab Qual	Valid. Qual	i	Lab Qual	Valid. Qual	3	Lab Qual	Valid. Qual	1	Lab Qual	Valid. Qual
	PRG (mg/kg) (Residential)	Units															
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.8	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	U	0.4	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.8	U	UJ	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte		Sample ID Boring ID Area Number Boring Number Depth	PRG (mg/kg) (Residential)	Units	0101SO01 01A1B1 i i i	Lab Qual.	Valid. Qual	0101SO02 01A1B1 i i 2	Lab Qual.	Valid. Qual	0102ASO01 01A2B1 2 1 i	Lab Qual.	Valid. Qual	0102ASO03 01A2B1 2 i 3	Lab Qual.	Valid. Qual	0102BSO01 01A2B2 2 2 i	Lab Qual.	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																			
Benzo(a)pyrene			0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			0.04	U	UJ
Bis(2-chloroethyl)ether			0.043	mg/kg	0.04	U	UJ	N/A			N/A			N/A			0.04	U	UJ
Dibenzo(a,h)anthracene			0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			0.04	U	UJ
N-Nitrosodi-n-propylamine			0.063	mg/kg	0.04	U	UJ	N/A			N/A			N/A			0.04	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																			
TRPH			—	mg/kg	10	U	U	18			73			NR			34		
Petroleum Hydrocarbons (EPA 8015M)																			
TPH (Diesel Range)			—	mg/kg	10	U	U	10	U	U	N/A			N/A			10	U	U
TPH (Gasoline Range)			—	mg/kg	0.28			0.19			N/A			N/A			0.13		
OTTO Fuel			—	mg/kg	N/A			N/A			10	U	UJ	10	U	UJ	N/A		
Metals (Method Listed by Each Metal)																			
Aluminum	EPA	6010	77000	mg/kg	9500			10000			9000		J	8300		J	9800		J
Antimony	EPA	6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA	6010	0.38	mg/kg	6.4			5.4			6.7			2.2			8.5		
Barium	EPA	6010	5300	mg/kg	150			180			170			130			200		
Beryllium	EPA	6010	0.14	mg/kg	0.46			0.58			0.52			0.47			0.58		
Cadmium	EPA	7131	9	mg/kg	0.1	U	U	0.1	U	U	0.16			0.1	U	U	0.19		
Calcium	EPA	6010	—	mg/kg	2600			2800			21000		J	2700		J	3500		J
Chromium	EPA	6010	210	mg/kg	19			28			17			15			19		
Cobalt	EPA	6010	4600	mg/kg	9.1			16			8.7			8.6			11		
Copper	EPA	6010	2800	mg/kg	31			44			54			50			42		
Iron	EPA	6010	—	mg/kg	23000		J	26000		J	20000		J	20000		J	27000		J
Lead	EPA	6010	130	mg/kg	6			9.2			13		J	5.9		J	17		
Lithium	EPA	7430	1500	mg/kg	N/A			N/A			6.8			5	U	U	8.2		
Magnesium	EPA	6010	—	mg/kg	6300			6700			5900		J	5200		J	6400		J
Manganese	EPA	6010	3200	mg/kg	390			400			320		J	300		J	360		J
Mercury	EPA	7471	6.5	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA	6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA	6010	150	mg/kg	19			24			15			16			23		
Potassium	EPA	6010	—	mg/kg	2500			2600			2000		J	2200		J	2700		J
Selenium	EPA	7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U
Silver	EPA	6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U
Sodium	EPA	6010	—	mg/kg	230		J	270		J	190			160			200		
Thallium	EPA	7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA	6010	540	mg/kg	35			40			30			33			42		
Zinc	EPA	6010	23000	mg/kg	71		J	80		J	95		J	66		J	69		J
Chromium(VI)	EPA	7199	0.2	mg/kg	0.18		J	0.11		J	0.19	B	J	0.11	B	UJ	0.11	B	UJ
Organic Lead (CA DHS Method)																			
Organic Lead	CA	DHS	0.0065	mg/kg	3	U	U	3	U	U	N/A			N/A			3	U	U

NR= Not reported
N/A= Not Analyzed

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte	Sample ID / Boring ID / Area Number / Boring Number / Depth	PRG (mg/kg) (Residential)	Units	0102SO01 01A2B3 2 3 1	Lab Qual.	Valid Qual	0102SO02 01A2B3 2 3 2	Lab Qual.	Valid Qual	0102SO01A 01A2B4 2 4 1	Lab Qual.	Valid Qual	0102SO03A 01A2B4 2 4 3	Lab Qual.	Valid Qual
Volatile Organic Compounds (EPA 8260)															
1,1,1-Trichloroethane		1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane		0.45	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ
1,1,2-Trichloroethane		0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
1,1-Dichloroethane		500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene		0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene		700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane		0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene		500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane		40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether		---	mg/kg	0.04	U	UJ	0.04	U	UJ	0.04	U	UJ	0.04	U	UJ
2-Hexanone		---	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Acetone		2100	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ
Acrolein		0.1	mg/kg	0.3	U	R	0.3	U	R	0.3	U	R	0.3	U	R
Acrylonitrile		0.19	mg/kg	0.3	U	R	0.3	U	R	0.3	U	R	0.3	U	R
Benzene		0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane		0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform		56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane		6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide		7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride		0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene		65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane		---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane		1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	R
cis-1,2-Dichloroethene		31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane		5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene		230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)		5600	mg/kg	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ
Methyl ethyl ketone		7100	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Methyl Isobutyl ketone		770	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Methylene chloride		7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene		680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene		5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene		790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers		320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene		78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene		3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane		380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate		780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride		0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte	Sample ID Boring ID Area Number Boring Number Depth	PRG (mg/kg) (Residential)	Units	0102SO01 01A2B3 2 3 1	Lab Qual	Valid Qual	0102SO02 01A2B3 2 3 2	Lab Qual	Valid Qual	0102SO01A 01A2B4 2 4 1	Lab Qual	Valid Qual	0102SO03A 01A2B4 2 4 3	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)															
1,2,4-Trichlorobenzene		570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene		130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol		91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-1
Results from Area of Concern (Objective) 1 - Former Gasoline Station/Drum Storage Pad.

Analyte			Sample ID		0102SO01			0102SO02			0102SO01A			0102SO03A		
			Boring ID		01A2B3			01A2B3			01A2B4			01A2B4		
			Area Number		2			2			2			2		
			Boring Number		3			3			4			4		
			Depth		i	Lab Qual.	Valid Qual	2	Lab Qual.	Valid Qual	1	Lab Qual	Valid Qual	3	Lab Qual.	Valid Qual
			PRG (mg/kg) (Residential)	Units												
Semivolatile Organic Compounds (EPA 8270 SIM)																
Benzo(a)pyrene			0.061	mg/kg	N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether			0.043	mg/kg	N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene			0.061	mg/kg	N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine			0.063	mg/kg	N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																
TRPH			—	mg/kg	10	U	U	41			86			100		
Petroleum Hydrocarbons (EPA 8015M)																
TPH (Diesel Range)			—	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
TPH (Gasoline Range)			—	mg/kg	0.11			0.05	U	U	N/A			N/A		
OTTO Fuel			—	mg/kg	N/A			N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																
Aluminum	EPA	6010	77000	mg/kg	11000			13000			9700		J	9100		J
Antimony	EPA	6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA	6010	0.38	mg/kg	8.2			12			9.9			11		
Barium	EPA	6010	5300	mg/kg	170			200			180			210		
Beryllium	EPA	6010	0.14	mg/kg	0.59			0.63			0.63			0.5		
Cadmium	EPA	7131	9	mg/kg	0.1	U	U	0.27			0.16			0.26		
Calcium	EPA	6010	—	mg/kg	2400			3200			3700		J	4800		J
Chromium	EPA	6010	210	mg/kg	22			32			31			19		
Cobalt	EPA	6010	4600	mg/kg	11			12			12			10		
Copper	EPA	6010	2800	mg/kg	62			51			35			33		
Iron	EPA	6010	—	mg/kg	26000		J	30000		J	22000		J	23000		J
Lead	EPA	6010	130	mg/kg	9.1			16			19			16		
Lithium	EPA	7430	1500	mg/kg	N/A			N/A			5.8			5.7		
Magnesium	EPA	6010	—	mg/kg	6800			7800			6100		J	6100		J
Manganese	EPA	6010	3200	mg/kg	390			470			320		J	320		J
Mercury	EPA	7471	6.5	mg/kg	0.14		J	0.1	U	UJ	0.1			0.13		
Molybdenum	EPA	6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA	6010	150	mg/kg	20			25			25			19		
Potassium	EPA	6010	—	mg/kg	2500			3500			2700		J	3300		J
Selenium	EPA	7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U
Silver	EPA	6010	380	mg/kg	1	U	U	1	U	U	1	U	U	i	U	U
Sodium	EPA	6010	—	mg/kg	260		J	330		J	230			180		
Thallium	EPA	7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA	6010	540	mg/kg	42			47			41			41		
Zinc	EPA	6010	23000	mg/kg	71		J	100		J	84		J	70		J
Chromium(VI)	EPA	7199	0.2	mg/kg	0.1		J	0.24		J	0.18	B	J	0.09	B	UJ
Organic Lead (CA DHS Method)																
Organic Lead	CA	DHS	0.0065	mg/kg	3	U	U	3	U	U	3	U	U	3	U	U

NR= Not reported
N/A= Not Analyzed

Table E-2
Results from Area of Concern (Objective) 2 - Oil Water Separators.

Analyte	Sample ID Boring ID Area Number Boring Number Depth	PRG (mg/kg) (Residential)	Units	0201AS005 02A1B1 i i 5	Lab Qual	Valid. Qual	0202AS005 02A2B1 2 1 5	Lab Qual	Valid. Qual	0202AS005 02A2B1 2 1 5 Dup	Lab Qual	Valid. Qual
Volatile Organic Compounds (EPA 8260)												
1,1,1-Trichloroethane		1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane		0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane		0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane		500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene		0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene		700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane		0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene		500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane		40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether		---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone		---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	U
Acetone		2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	U
Acrolein		0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	U
Acrylonitrile		0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	U
Benzene		0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane		0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform		56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane		6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide		7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride		0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene		65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane		---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane		1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene		31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane		5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene		230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)		5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone		7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	U
Methyl isobutyl ketone		770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U
Methylene chloride		7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Styrene		680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene		5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Toluene		790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers		320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene		78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene		0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene		3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane		380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate		780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride		0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U

Table E-2
Results from Area of Concern (Objective) 2 - Oil Water Separators.

Analyte	Sample ID Boring ID Area Number Boring Number Depth		0201AS005 02A1B1 i i 5	Lab Qual.	Valid. Qual	0202AS005 02A2B1 2 1 5	Lab Qual.	Valid. Qual	0202AS005 02A2B1 2 i 5 Dup	Lab Qual.	Valid. Qual
	PRG (mg/kg) (Residential)	Units									
Semivolatile Organic Compounds (EPA 8270)											
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U

Table E-2
Results from Area of Concern (Objective) 2 - Oil Water Separators.

Analyte		PRG (mg/kg) (Residential)	Units	0201AS005 02A1B1 i 1 5	Lab Qual	Valid Qual	0202AS005 02A2B1 2 1 5	Lab Qual	Valid Qual	0202AS005 02A2B1 2 i 5 Dup	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270 SIM)												
Benzo(a)pyrene		0.061	mg/kg	N/A			0.008	U	UJ	N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			0.008	U	UJ	N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			0.008	U	UJ	N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			0.008	U	UJ	N/A		
Total Petroleum Hydrocarbons (EPA 418.1)												
TRPH		---	mg/kg	49		J	30		J	26		J
Petroleum Hydrocarbons (EPA 8015M)												
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	N/A			N/A			N/A		
Metals (Method Listed by Each Metal)												
Aluminum	EPA 6010	77000	mg/kg	6400			2400			2600		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	18		J	44		J	79		J
Barium	EPA 6010	5300	mg/kg	38			16			19		
Beryllium	EPA 6010	0.14	mg/kg	0.29			0.14			0.13		
Cadmium	EPA 6010	9	mg/kg	i	U	U	1	U	U	1	U	U
Cadmium	EPA 7131	9	mg/kg	N/A			N/A			N/A		
Calcium	EPA 6010	---	mg/kg	2100			550		J	570		
Chromium	EPA 6010	210	mg/kg	4.6			120			150		
Cobalt	EPA 6010	4600	mg/kg	4.7			67			100		
Copper	EPA 6010	2800	mg/kg	6.1			110			140		
Iron	EPA 6010	---	mg/kg	20000		J	10000		J	17000		J
Lead	EPA 6010	130	mg/kg	5	U	U	5	U	U	5	U	U
Lithium	EPA 7430	1500	mg/kg	6.8			5	U	U	5	U	U
Magnesium	EPA 6010	---	mg/kg	4000		J	5900		J	7000		J
Manganese	EPA 6010	3200	mg/kg	340		J	370		J	520		J
Mercury	EPA 7471	6.5	mg/kg	0.1		U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	3			2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	6.9			260			390		
Potassium	EPA 6010	---	mg/kg	630		J	50	U	R	50	U	R
Selenium	EPA 6010	380	mg/kg	10	U	UJ	10	U	UJ	10	U	UJ
Selenium	EPA 7740	380	mg/kg	N/A			N/A			N/A		
Silver	EPA 6010	380	mg/kg	i	U	UJ	1	U	UJ	1	U	UJ
Sodium	EPA 6010	---	mg/kg	290			50	U	U	50	U	U
Thallium	EPA 7841	5.4	mg/kg	0.3		U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	13			11			16		
Zinc	EPA 6010	23000	mg/kg	59			15			20		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.052		UJ	0.73			0.95		J
Tributyltin (Flame Photoionization Detector)												
Tributyltin	FPD	2	mg/kg	<1		UJ	<1		UJ	<1		UJ

NR= Not reported
N/A= Not Analyzed

Table E-3
Results from Area of Concern (Objective) 3 - Outfall Areas.

Analyte	Sample ID / Boring ID / Area Number / Boring Number / Depth	PRG (mg/kg) (Residential)	Units	0301SO01A 03A1B1 i 1 0 - 0.5	Lab Qual	Valid. Qual	0301SO03A 03A1B1 i i 3	Lab Qual	Valid. Qual	0301BS001 03A1B2 1 2 0 - 0.5	Lab Qual	Valid. Qual	0302S001 03A2B1 2 1 0 - 0.5	Lab Qual	Valid. Qual	0302S002 03A2B1 2 1 2	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270)																		
1,2,4-Trichlorobenzene		570	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	2	U	U	0.4	U	U	4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene		130	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol		91	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		---	mg/kg	2	U	U	0.4	U	U	4	U	UJ	0.4	U	U	0.4	U	U
2-Nitrophenol		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	2	U	U	0.4	U	U	6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether		---	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		---	mg/kg	2	U	U	0.4	U	U	4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	i	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	i	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		---	mg/kg	1	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	1	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	2	U	U	0.4	U	U	4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	1	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	i	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	1	U	U	0.52			2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	i	U	U	0.2	U	U	2.6			0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	i	U	U	0.2	U	U	2	U	UJ	0.2	U	UJ	0.2	U	UJ
Hydrocarbon Matrix		---	mg/kg	200			NR			200		J	400		U	30		J
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	1	U	U	0.2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	1	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	2	U	UJ	0.4	U	U	4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		---	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	i	U	U	0.2	U	U	2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	i	U	U	0.2	U	U	2.4			0.2	U	U	0.2	U	U

Table E-3
Results from Area of Concern (Objective) 3 - Outfall Areas.

Analyte		PRG (mg/kg) (Residential)	Units	0301SO01A 03A1B1 1 1 0 - 0.5	Lab Qual	Valid. Qual	0301SO03A 03A1B1 1 1 3	Lab Qual	Valid. Qual	0301BS001 03A1B2 1 2 0 - 0.5	Lab Qual	Valid. Qual	0302S001 03A2B1 2 i 0 - 0.5	Lab Qual	Valid. Qual	0302S002 03A2B1 2 1 2	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	190			46			760			49			66		
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	7200		J	10000		J	7300			10000			9800		
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	8.2			12			16			18			26		
Barium	EPA 6010	5300	mg/kg	100			200			120			120			120		
Beryllium	EPA 6010	0.14	mg/kg	0.41			0.47			0.3		U	0.56		U	0.55		U
Cadmium	EPA 6010		mg/kg	N/A			N/A			i	U	UJ	i	U	UJ	1	U	UJ
Cadmium	EPA 7131	9	mg/kg	0.92			0.1	U	U	N/A			N/A			N/A		
Calcium	EPA 6010	---	mg/kg	3600		J	4800		J	6000			3500			3100		
Chromium	EPA 6010	210	mg/kg	14			17			34			17			17		
Cobalt	EPA 6010	4600	mg/kg	8.1			12			7.9			8.9			9.1		
Copper	EPA 6010	2800	mg/kg	43			60			420			36			32		
Iron	EPA 6010	---	mg/kg	18000		J	22000		J	20000		J	22000		J	22000		J
Lead	EPA 6010	130	mg/kg	27			21			110			14			15		
Lithium	EPA 7430	1500	mg/kg	6.3			12			8.1			40			31		
Magnesium	EPA 6010	---	mg/kg	4800		J	7300		J	4600			5400			4700		
Manganese	EPA 6010	3200	mg/kg	240		J	310		J	230		J	350		J	450		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	1.4			0.2			0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	19			20			23			15			17		
Potassium	EPA 6010	—	mg/kg	2300		J	2400		J	2300			1400			2300		
Selenium	EPA 6010		mg/kg	N/A			N/A			10	U	U	10	U	U	10	U	U
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	N/A			N/A			N/A		
Silver	EPA 6010	380	mg/kg	1	U	U	i	U	U	i	U	R	1	U	R	1	U	R
Sodium	EPA 6010	---	mg/kg	160			230			120			190			120		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	29			46			25			44			44		
Zinc	EPA 6010	23000	mg/kg	140		J	68		J	270			340			200		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.18	B	J	0.09	B	UJ	0.052		UJ	0.061		UJ	0.063		UJ
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	3	U	U	3	U	U	3	U	UJ	3	U	UJ	3	U	UJ
Tributyltin (Flame Photoionization Detector)																		
Tributyltin	FPD	2	mg/kg	0.001	U	U	0.001	U	U	0.001	U	UJ	0.001	U	UJ	0.001	U	UJ

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	PRG (mg/kg) (Residential)	Units	0401SO01 04A1B1 i i 1	Lab Qual	Valid Qual	0402ASO05 04A2B1 2 i 5	Lab Qual	Valid Qual	0402ASO10 04A2B1 2 1 10	Lab Qual	Valid Qual	0402ASO15 04A2B1 2 i 15	Lab Qual	Valid Qual	0402ASO16 04A2B1 2 1 16	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	2	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	2	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	2	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	2	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	—	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	2	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	i	U	UJ	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	1	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	2	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	i	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		Sample ID Boring ID Area Number Boring Number Depth		0401SO01 04A1B1 i i i	Lab Qual	Valid Qual	0402ASO05 04A2B1 2 1 5	Lab Qual	Valid Qual	0402ASO10 04A2B1 2 1 10	Lab Qual.	Valid Qual	0402ASO15 04A2B1 2 i 15	Lab Qual.	Valid Qual	0402ASO16 04A2B1 2 i 16	Lab Qual.	Valid Qual.
		PRG (mg/kg) (Residential)	Units															
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			0.04	U	UJ	N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	0.04	U	UJ	N/A			N/A			0.04	U	UJ	N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			0.04	U	UJ	N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.04	U	UJ	N/A			N/A			0.04	U	UJ	N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	91			10		U	27		J	25		J	30		J
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	N/A			10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	9300		J	16000			12000			8800			7700		
Antimony	EPA 6010	31	mg/kg	10	U	U	30			10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	2.4		U	5	U	U	5	U	U	5	U	U	5	U	U
Barium	EPA 6010	5300	mg/kg	120			180			140			97			110		
Beryllium	EPA 6010	0.14	mg/kg	0.46			0.85			0.78			0.43			0.36		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Calcium	EPA 6010	---	mg/kg	3000		J	3500			1800			1800			3800		
Chromium	EPA 6010	210	mg/kg	16			26			24			16			14		
Cobalt	EPA 6010	4600	mg/kg	9.4			14			12			8			11		
Copper	EPA 6010	2800	mg/kg	22			45			22			18			19		
Iron	EPA 6010	---	mg/kg	20000			40000		J	30000		J	20000		J	20000		J
Lead	EPA 6010	130	mg/kg	8.8			8.9			8.3			3.2			3.6		
Lithium	EPA 7430	1500	mg/kg	5.8		J	8.6			5	U	U	5	U	U	6.1		
Magnesium	EPA 6010	---	mg/kg	4800		J	8300			5100			4300		J	4900		
Manganese	EPA 6010	3200	mg/kg	270		J	440		J	420		J	380			300		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	14			21			17			14			11		
Potassium	EPA 6010	---	mg/kg	2200		J	3300			2100			1500			2100		
Selenium	EPA 7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
Silver	EPA 6010	380	mg/kg	i	U	U	1	U	U	i	U	U	1	U	U	i	U	U
Sodium	EPA 6010	---	mg/kg	220			210			150			150			180		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	33			55			44			32			29		
Zinc	EPA 6010	23000	mg/kg	49		J	84			46			36			42		
Chromium (VI)	EPA 7199	0.2	mg/kg	N/A			0.07		J	0.035		UJ	0.13		J	0.17		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			3.2			3.6		

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	PRG (mg/kg) (Residential)	Units	0402BSO05 04A2B2 2 2 5	Lab Qual	Valid Qual	0402BSO10 04A2B2 2 2 10	Lab Qual	Valid Qual	0402BSO15 04A2B2 2 2 15	Lab Qual	Valid Qual	0402BSO20 04A2B2 2 2 20	Lab Qual	Valid Qual	0403ASO01 04A3B1 3 1 1	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		PRG (mg/kg) (Residential)	Units	0402BSO05 04A2B2 2 2 5	Lab Qual	Valid Qual.	0402BSO10 04A2B2 2 2 10	Lab Qual	Valid Qual.	0402BSO15 04A2B2 2 2 15	Lab Qual	Valid Qual.	0402BSO20 04A2B2 2 2 20	Lab Qual	Valid Qual.	0403ASO01 04A3B1 3 1 i	Lab Qual	Valid Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	37		J	39		J	10	U	U	12		J	91		
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	16000			14000			7700			6200			8700		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	5	U	U	9.6			5	U	U	12			3.2		
Barium	EPA 6010	5300	mg/kg	140			150			94			59			140		
Beryllium	EPA 6010	0.14	mg/kg	0.89			0.8			0.33			0.24			0.49		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.74		
Calcium	EPA 6010	---	mg/kg	3000			2600			2200			2600			13000		
Chromium	EPA 6010	210	mg/kg	26			37			24			59			20		
Cobalt	EPA 6010	4600	mg/kg	14			19			7			11			10		
Copper	EPA 6010	2800	mg/kg	32			28			17			20			31		
Iron	EPA 6010	---	mg/kg	34000		J	32000		J	19000		J	15000		J	24000		
Lead	EPA 6010	130	mg/kg	12			6.4			3.9			3.4			11		
Lithium	EPA 7430	1500	mg/kg	7.9			5.7			5	U	U	5	U	U	9.1		
Magnesium	EPA 6010	---	mg/kg	6600			6100			4300			6700			6000		
Manganese	EPA 6010	3200	mg/kg	390		J	450		J	270		J	210			340		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.7	U	U	1.5		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2.1			2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	21			22			33			78			18		
Potassium	EPA 6010	---	mg/kg	2600			2200			1900			1200			2300		J
Selenium	EPA 7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	U
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	270		
Sodium	EPA 6010	---	mg/kg	240			190			550			250			600		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	J	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	52			47			29			23			35		
Zinc	EPA 6010	23000	mg/kg	64			54			36			28			140		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.081		J	0.26		J	0.3			0.23		J	0.3	B	J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			6.4			3.9			3.4			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	Sample ID / Boring ID / Area Number / Boring Number / Depth	PRG (mg/kg) (Residential)	Units	0403BS001 04A3B2 3 2 1	Lab Qual.	Valid Qual.	0403BSOD01 04A3B2 3 2 1 Duplicate	Lab Qual.	Valid. Qual.	0403BSO03 04A3B2 3 2 3	Lab Qual.	Valid. Qual.	0403BSOD03 04A3B2 3 2 3 Duplicate	Lab Qual.	Valid. Qual.	0403CSO01 04A3B3 3 3 1	Lab Qual.	Valid Qual.
Semivolatile Organic Compounds (EPA 8270)																		
1,2,4-Trichlorobenzene		570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene		130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol		91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		Sample ID Boring ID Area Number Boring Number Depth		0403BS001 04A3B2 3 2 i	Lab Qual	Valid Qual	0403BSOD01 04A3B2 3 2 i Duplicate	Lab Qual	Valid Qual	0403BSO03 04A3B2 3 2 3	Lab Qual	Valid Qual	0403BSOD03 04A3B2 3 2 3 Duplicate	Lab Qual	Valid Qual	0403CSO01 04A3B3 3 3 i	Lab Qual	Valid Qual
		PRG (mg/kg) (Residential)	Units															
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.04	U	UJ	N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	43			28			44			30			30		
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	7700		J	6900		J	8800		J	7700		J	12000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	5.4			6.4			6.5			10			15		
Barium	EPA 6010	5300	mg/kg	120			110			130			120			180		
Beryllium	EPA 6010	0.14	mg/kg	0.41			0.38			0.5			0.44			0.76		
Cadmium	EPA 7131	9	mg/kg	0.14			0.1	U	U	0.31			0.15			0.1	U	U
Calcium	EPA 6010	---	mg/kg	2600		J	2500		J	3100		J	2600		J	4200		J
Chromium	EPA 6010	210	mg/kg	24			16			18			19			23		
Cobalt	EPA 6010	4600	mg/kg	8.5			7.4			9.1			8.2			13		
Copper	EPA 6010	2800	mg/kg	30			26			34			32			64		
Iron	EPA 6010	---	mg/kg	20000		J	19000		J	23000		J	21000		J	40000		J
Lead	EPA 6010	130	mg/kg	9.6		J	13		J	18		J	18		J	14		
Lithium	EPA 7430	1500	mg/kg	7.3			7.3			8.5			9.9			15		
Magnesium	EPA 6010	---	mg/kg	5200		J	4400		J	5500		J	4800		J	7400		
Manganese	EPA 6010	3200	mg/kg	260		J	210		J	260		J	220		J	460		J
Mercury	EPA 7471	6.5	mg/kg	2.2			7.6			2.6			3			0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	17			14			17			16			21		
Potassium	EPA 6010	---	mg/kg	2100		J	2100		J	3200		J	2400		J	3000		J
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Silver	EPA 6010	380	mg/kg	i	U	U	i	U	U	i	U	U	35			1	U	U
Sodium	EPA 6010	---	mg/kg	180			170			190			180			640		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	31			28			36			32			56		
Zinc	EPA 6010	23000	mg/kg	69		J	70		J	90		J	91		J	93		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.1	B	UJ	0.13	B	UJ	0.09	B	UJ	0.15	B	UJ	0.13	B	UJ
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	PRG (mg/kg) (Residential)	Units	0403CSO03 04A3B3 3 3 3	Lab Qual	Valid Qual	0403CSOD03 04A3B3 3 3 3 Duplicate	Lab Qual	Valid Qual	0403DSO01 04A3B4 3 4 1	Lab Qual	Valid Qual	0403DSO02 04A3B4 3 4 2	Lab Qual	Valid Qual	0404ASO01 04A4B1 4 1 1	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.8	U	UJ	0.4	U	UJ	0.4	U	UJ
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.4	U	UJ	0.2	U	UJ	0.2	U	UJ
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.8	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.4	U	U	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		PRG (mg/kg) (Residential)	Units	0403CSO03 04A3B3 3 3 3	Lab Qual.	Valid. Qual	0403CSOD03 04A3B3 3 3 3 Duplicate	Lab Qual.	Valid. Qual.	0403DSO01 04A3B4 3 4 1	Lab Qual.	Valid. Qual.	0403DSO02 04A3B4 3 4 2	Lab Qual.	Valid. Qual.	0404ASO01 04A4B1 4 i i	Lab Qual.	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	49			50			220			47			25		U
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	10	U	UJ	10	U	U	20	U	U	20	U	U	20	U	U
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	13000		J	14000		J	14000		J	13000		J	9800		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	19			15			10			11			8.7		
Barium	EPA 6010	5300	mg/kg	160			190			160			190			87		
Beryllium	EPA 6010	0.14	mg/kg	0.94			0.8			0.72			0.72			0.72		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.14			0.1	U	U	0.1	U	U
Calcium	EPA 6010	---	mg/kg	4700		J	6000		J	2800		J	3100		J	1400		J
Chromium	EPA 6010	210	mg/kg	37			37			23			29			19		
Cobalt	EPA 6010	4600	mg/kg	14			13			12			10			14		
Copper	EPA 6010	2800	mg/kg	46			52			36			36			20		
Iron	EPA 6010	---	mg/kg	43000		J	46000		J	31000			32000			24000		
Lead	EPA 6010	130	mg/kg	15			13			15			10			7.8		
Lithium	EPA 7430	1500	mg/kg	26			16			10		J	12		J	5.7		J
Magnesium	EPA 6010	---	mg/kg	6900			8300			5900		J	7500		J	5700		J
Manganese	EPA 6010	3200	mg/kg	420		J	470		J	390		J	390		J	360		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.13		U	0.38			0.25			0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	26			29			20			30			14		
Potassium	EPA 6010	—	mg/kg	2600		J	3300		J	2500		J	3000		J	1800		J
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	19			0.4	U	UJ
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	390			500			260			550			330		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	64			62			46			53			44		
Zinc	EPA 6010	23000	mg/kg	77		J	100		J	73		J	82		J	49		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.18	B	J	0.16	B	J	0.1	B	UJ	0.1	B	UJ	0.13		UJ
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	PRG (mg/kg) (Residential)	Units	0404ASO03 04A4B1 4 i 3	Lab Qual	Valid Qual	0404BSO01 04A4B2 4 2 i	Lab Qual	Valid Qual	0404BSO03 04A4B2 4 2 3	Lab Qual	Valid Qual	0405SO01 04A5B1 5 1 i	Lab Qual	Valid Qual	0405SO03 04A5B1 5 i 3	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	UJ	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		PRG (mg/kg) (Residential)	Units	0404ASO03 04A4B1 4 i 3	Lab Qual	Valid. Qual.	0404BSO01 04A4B2 4 2 i	Lab Qual	Valid. Qual.	0404BSO03 04A4B2 4 2 3	Lab Qual	Valid. Qual.	0405SO01 04A5B1 5 i i	Lab Qual.	Valid. Qual.	0405SO03 04A5B1 5 1 3	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	10	U	U	22			33			18			19		
Petroleum Hydrocarbons (EPA 8015M)																		
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	20	U	U	10	U	U	10	U	U	N/A			N/A		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	11000		J	9600		J	8700		J	15000		J	15000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	10			11			9.9			9.9			17		
Barium	EPA 6010	5300	mg/kg	120			110			110			200			450		
Beryllium	EPA 6010	0.14	mg/kg	0.84			0.74			0.72			0.92			1.1		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Calcium	EPA 6010	---	mg/kg	1200		J	1300		J	1400		J	3000		J	4000		J
Chromium	EPA 6010	210	mg/kg	24			18			20			60			150		
Cobalt	EPA 6010	4600	mg/kg	14			11			11			11			21		
Copper	EPA 6010	2800	mg/kg	23			25			24			24			57		
Iron	EPA 6010	---	mg/kg	29000			24000		J	23000		J	38000		J	60000		J
Lead	EPA 6010	130	mg/kg	9.4		U	6.6			6.3			9.2			13		
Lithium	EPA 7430	1500	mg/kg	6.3		J	5	U	U	5	U	U	25			120		
Magnesium	EPA 6010	---	mg/kg	5800		J	5600		J	5800		J	9400			18000		
Manganese	EPA 6010	3200	mg/kg	440		J	320		J	250		J	570		J	570		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	6.9			20		
Nickel	EPA 6010	150	mg/kg	17			14			15			73			110		
Potassium	EPA 6010	---	mg/kg	2500		J	1700		J	1600		J	3400		J	6900		J
Selenium	EPA 7740	380	mg/kg	13			0.4	U	U	0.4	U	U	22			42		
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	240			230			230			750			350		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.38			0.3	U	U
Vanadium	EPA 6010	540	mg/kg	48			41			40			52			96		
Zinc	EPA 6010	23000	mg/kg	52		J	52		J	52		J	89		J	130		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.15	B	UJ	0.14	B	UJ	0.12	B	UJ	1.19	B	J	0.6	B	J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte	Sample ID Boring ID Area Number Boring Number Depth		0405ASO01 04A5B2 5 2 i	Lab Qual	Valid. Qual	0405ASO03 04A5B2 5 2 3	Lab Qual	Valid. Qual
	PRG (mg/kg) (Residential)	Units						
Semivolatile Organic Compounds (EPA 8270)								
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	UJ	0.4	U	UJ
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U

Table E-4
Results from Area of Concern (Objective) 4 - Propulsion System Testing Area.

Analyte		PRG (mg/kg) (Residential)	Units	0405ASO01 04A5B2 5 2 i	Lab Qual.	Valid. Qual.	0405ASO03 04A5B2 5 2 3	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)									
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)									
TRPH		---	mg/kg	25		U	32		
Petroleum Hydrocarbons (EPA 8015M)									
TPH (Diesel Range)		---	mg/kg	N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A		
OTTO Fuel		---	mg/kg	20	U	U	20	U	U
Metals (Method Listed by Each Metal)									
Aluminum	EPA 6010	77000	mg/kg	14000		J.	3800		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	84			24		
Barium	EPA 6010	5300	mg/kg	110			62		
Beryllium	EPA 6010	0.14	mg/kg	0.75			0.1	U	U
Cadmium	EPA 7131	9	mg/kg	0.37			0.1	U	U
Calcium	EPA 6010	---	mg/kg	1900		J	690		J
Chromium	EPA 6010	210	mg/kg	440			260		
Cobalt	EPA 6010	4600	mg/kg	47			100		
Copper	EPA 6010	2800	mg/kg	54			37		
Iron	EPA 6010	---	mg/kg	37000			46000		
Lead	EPA 6010	130	mg/kg	30			1.3		
Lithium	EPA 7430	1500	mg/kg	170		J	250		J
Magnesium	EPA 6010	---	mg/kg	28000		J	46000		J
Manganese	EPA 6010	3200	mg/kg	730		J	760		J
Mercury	EPA 7471	6.5	mg/kg	0.18			0.13		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	400			930		
Potassium	EPA 6010	---	mg/kg	1100		J	120		J
Selenium	EPA 7740	380	mg/kg	10			32		
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	640			930		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.33		
Vanadium	EPA 6010	540	mg/kg	32			25		
Zinc	EPA 6010	23000	mg/kg	71		J	36		J
Chromium (VI)	EPA 7199	0.2	mg/kg	1.1	B	J	0.72	B	J
Organic Lead (CA DHS Method)									
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501AS001 05A1B1 1 1 1	Lab Qual	Valid. Qual.	0501AS003 05A1B1 1 1 3	Lab Qual.	Valid Qual.	0501BS001 05A1B2 1 2 1	Lab Qual	Valid. Qual	0501BS003 05A1B2 1 2 3	Lab Qual.	Valid. Qual.
Volatile Organic Compounds (EPA 8260)														
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	UJ	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	U	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501AS001 05A1B1 i i i	Lab Qual.	Valid Qual.	0501AS003 05A1B1 1 i 3	Lab Qual	Valid. Qual	0501BS001 05A1B2 i 2 i	Lab Qual	Valid Qual	0501BS003 05A1B2 i 2 3	Lab Qual	Valid Qual.
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	2	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	2	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	3	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	2	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	2	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	1	U	UJ	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	2	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	1	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	i	U	U	0.2	U	U

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0501AS001 05A1B1 i i i	Lab Qual	Valid. Qual	0501AS003 05A1B1 i i 3	Lab Qual.	Valid. Qual.	0501BS001 05A1B2 1 2 i	Lab Qual.	Valid. Qual.	0501BS003 05A1B2 i 2 3	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)															
Benzo(a)pyrene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH		---	mg/kg	12		J	17		J	140		J	18		J
Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	77000	mg/kg	11000		J	9400		J	7300		J	9000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	22		J	18		J	18		J	19		J
Barium	EPA 6010	5300	mg/kg	120			100			160			120		
Beryllium	EPA 6010	0.14	mg/kg	0.74			0.58			0.54			0.59		
Cadmium	EPA 6010	9	mg/kg	1	U	U	1	U	U	i	U	U	1	U	U
Calcium	EPA 6010	---	mg/kg	7100			5100			21000			4200		
Chromium	EPA 6010	210	mg/kg	14			16			10			15		
Cobalt	EPA 6010	4600	mg/kg	16			15			8.3			13		
Copper	EPA 6010	2800	mg/kg	10			5.2			16			16		
Iron	EPA 6010	---	mg/kg	19000			16000			17000			20000		
Lead	EPA 6010	130	mg/kg	5.7			6			10			5.8		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	---	mg/kg	9400		J	9100		J	6100		J	7600		J
Manganese	EPA 6010	3200	mg/kg	440		J	420		J	350		J	490		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	16			15			11			14		
Potassium	EPA 6010	---	mg/kg	340			260		J	1300		J	880		J
Selenium	EPA 6010	380	mg/kg	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
Silver	EPA 6010	380	mg/kg	i	U	UJ	i	U	UJ	1	U	UJ	i	U	UJ
Sodium	EPA 6010	---	mg/kg	180			140			100			150		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	39			33			23			31		
Zinc	EPA 6010	23000	mg/kg	57		J	58		J	44		J	57		J
Cadmium	EPA 7131	9	mg/kg	N/A			N/A			N/A			N/A		
Selenium	EPA 7740	380	mg/kg	N/A			N/A			N/A			N/A		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.063		UJ	0.05		UJ	0.16		J	0.027		UJ

NR= Not reported
N/A= Not Analyzed

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501CS001 05A1B3 i 3 i	Lab Qual	Valid Qual	0501CS003 05A1B3 i 3 3	Lab Qual	Valid Qual	0501DS001 05A1B4 i 4 1	Lab Qual	Valid Qual	0501ES001 05A1B5 i 5 i	Lab Qual	Valid Qual
Volatile Organic Compounds (EPA 8260)														
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	—	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	UJ
2-Hexanone	—	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	UJ
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	UJ
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Chloroethane	—	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	UJ
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	UJ
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	UJ
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	UJ
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501CS001 05A1B3	Lab Qual.	Valid Qual	0501CS003 05A1B3	Lab Qual.	Valid Qual.	0501DS001 05A1B4	Lab Qual	Valid Qual	0501ES001 05A1B5	Lab Qual.	Valid Qual.
Sample ID			0501CS001			0501CS003			0501DS001			0501ES001		
Boring ID			05A1B3			05A1B3			05A1B4			05A1B5		
Area Number			1			1			1			1		
Boring Number			3			3			4			5		
Depth			1			3			1			1		
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	2	U	UJ	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	2	U	U	0.2	U	U

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0501CS001 05A1B3	Lab Qual.	Valid Qual.	0501CS003 05A1B3	Lab Qual.	Valid Qual	0501DS001 05A1B4	Lab Qual.	Valid Qual	0501ES001 05A1B5	Lab Qual.	Valid Qual
Sample ID				0501CS001			0501CS003			0501DS001			0501ES001		
Boring ID				05A1B3			05A1B3			05A1B4			05A1B5		
Area Number				i			1			i			i		
Boring Number				3			3			4			5		
Depth				1			3			i			i		
Semivolatile Organic Compounds (EPA 8270 SIM)															
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH		—	mg/kg	31		J	13		J	420		J	69		J
Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	77000	mg/kg	3600		J	8300		J	9700		J	16000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	8.1		J	19		J	23		J	130		J
Barium	EPA 6010	5300	mg/kg	240			210			140			59		
Beryllium	EPA 6010	0.14	mg/kg	0.48			0.76			0.56			0.93		
Cadmium	EPA 6010	9	mg/kg	1	U	U	1	U	U	i	U	U	1	U	U
Calcium	EPA 6010	—	mg/kg	21000			17000			20000			7100		
Chromium	EPA 6010	210	mg/kg	4.2			11			39			6.2		
Cobalt	EPA 6010	4600	mg/kg	6.5			10			8.7			8.9		
Copper	EPA 6010	2800	mg/kg	15			30			45			52		
Iron	EPA 6010	—	mg/kg	9700			20000			25000			34000		
Lead	EPA 6010	130	mg/kg	5	U	U	6.3			11			13		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	—	mg/kg	2300		J	5700		J	8300		J	13000		J
Manganese	EPA 6010	3200	mg/kg	380		J	440		J	380		J	590		J
Mercury	EPA 7471	6.5	mg/kg	0.2			0.15			0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	7.1			13			25			25		
Potassium	EPA 6010	—	mg/kg	920		J	1400		J	1800			1300		J
Selenium	EPA 6010	380	mg/kg	10	U	U	10	U	UJ	10	U	UJ	22		J
Silver	EPA 6010	380	mg/kg	i	U	UJ	i	U	UJ	i	U	UJ	i	U	UJ
Sodium	EPA 6010	—	mg/kg	59			96			150			290		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	12			27			32			77		
Zinc	EPA 6010	23000	mg/kg	24		J	48		J	56		J	97		J
Cadmium	EPA 7131	9	mg/kg	N/A			N/A			N/A			0.3		
Selenium	EPA 7740	380	mg/kg	N/A			N/A			N/A			N/A		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.04		UJ	0.055			0.12			0.034		UJ

NR= Not reported
N/A= Not Analyzed

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501ES003 05A1B5 i 5 3	Lab Qual.	Valid Qual	0502ASO05 05A2B1 2 i 5	Lab Qual	Valid. Qual.	0502ASOD05 05A2B1 2 i 5 Duplicate	Lab Qual	Valid. Qual.	0502ASO10 05A2B1 2 i 10	Lab Qual	Valid. Qual
Volatile Organic Compounds (EPA 8260)														
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	UJ	0.01	U	U	0.01	U	UJ
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	R	0.03	U	R	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0501ES003 05A1B5 i 5 3	Lab Qual	Valid Qual.	0502ASO05 05A2B1 2 1 5	Lab Qual	Valid Qual	0502ASOD05 05A2B1 2 1 5 Duplicate	Lab Qual.	Valid Qual.	0502ASO10 05A2B1 2 1 10	Lab Qual.	Valid Qual
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	UJ	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U

Table E-5
Results from Area of Concern (Objective) 5 - Sewer Septic Tank and Leach Field Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0501ES003 05A1B5 i 5 3	Lab Qual	Valid. Qual.	0502ASO05 05A2B1 2 1 5	Lab Qual.	Valid. Qual.	0502ASOD05 05A2B1 2 i 5 Duplicate	Lab Qual	Valid. Qual.	0502ASO10 05A2B1 2 i 10	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)															
Benzo(a)pyrene		0.061	mg/kg	N/A			0.04	U	UJ	N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			0.04	U	UJ	N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			0.04	U	UJ	N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			0.04	U	UJ	N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH		—	mg/kg	11		J	24		J	16		J	24		J
Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	77000	mg/kg	21000		J	19000			7600		J	21000		
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	30			10	U	U
Arsenic	EPA 6010	0.38	mg/kg	76		J	5	U	U	47			5	U	U
Barium	EPA 6010	5300	mg/kg	39			150			140			140		
Beryllium	EPA 6010	0.14	mg/kg	1.2			0.96			0.7			1.1		
Cadmium	EPA 6010	9	mg/kg	i	U	U	0.1	U	U	0.1	U	UJ	0.1	U	U
Calcium	EPA 6010	—	mg/kg	12000			1500			1600		J	1700		
Chromium	EPA 6010	210	mg/kg	6.7			24			18			24		
Cobalt	EPA 6010	4600	mg/kg	11			16			11			12		
Copper	EPA 6010	2800	mg/kg	37			24			15			27		
Iron	EPA 6010	—	mg/kg	32000			33000		J	25000			37000		J
Lead	EPA 6010	130	mg/kg	15			8.6			6			9.3		
Lithium	EPA 7430	1500	mg/kg	N/A			5.8			5	U	U	8		
Magnesium	EPA 6010	—	mg/kg	9700		J	5700			4400		J	7000		
Manganese	EPA 6010	3200	mg/kg	500		J	640		J	450		J	480		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	14			21			11			30		
Potassium	EPA 6010	—	mg/kg	640		J	2100			790		J	1400		
Selenium	EPA 6010	380	mg/kg	12		J	18		J	20		J	35		J
Silver	EPA 6010	380	mg/kg	1	U	UJ	1	U	U	1	U	R	i	U	U
Sodium	EPA 6010	—	mg/kg	340			120			80			160		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	J	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	40			58			45			74		
Zinc	EPA 6010	23000	mg/kg	74		J	45			30		J	53		
Cadmium	EPA 7131	9	mg/kg	N/A			0.1	U	U	0.1	U	U	0.1	U	U
Selenium	EPA 7740	380	mg/kg	N/A			18			N/A			N/A		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.022		UJ	0.14		J	0.19		J	0.21		J

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601ASO01 06A1B1 i i 1	Lab Qual	Valid Qual	0601ASO03 06A1B1 i 1 3	Lab Qual	Valid Qual	0601ASO05 06A1B1 1 i 5	Lab Qual	Valid Qual	0601BSO01 06A1B2 i 2 i	Lab Qual	Valid Qual	0601BSO03 06A1B2 i 2 3	Lab Qual	Valid Qual
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	R
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	UJ	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	R	0.1	U	UJ	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	R	0.03	U	UJ	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	R	0.03	U	U	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	Sample ID / Boring ID / Area Number / Boring Number / Depth	PRG (mg/kg) (Residential)	Units	0601ASO01 06A1B1 i 1 1	Lab Qual.	Valid Qual	0601ASO03 06A1B1 i i 3	Lab Qual.	Valid Qual.	0601ASO05 06A1B1 i i 5	Lab Qual	Valid Qual.	0601BSO01 06A1B2 i 2 1	Lab Qual	Valid Qual.	0601BSO03 06A1B2 i 2 3	Lab Qual.	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																		
1,2,4-Trichlorobenzene		570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene		130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol		91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	0.4	U	U	0.4	U	U	0.6	U	U	0.4	U	U	0.6	U	U
4-Bromophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		---	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601ASO01 06A1B1 i 1 i	Lab Qual.	Valid Qual.	0601ASO03 06A1B1 i 1 3	Lab Qual.	Valid Qual.	0601ASO05 06A1B1 1 i 5	Lab Qual.	Valid Qual.	0601BSO01 06A1B2 1 2 1	Lab Qual.	Valid Qual.	0601BSO03 06A1B2 1 2 3	Lab Qual.	Valid Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	UJ
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		—	mg/kg	26			21			15		J	35			10		J
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	11000		J	9500		J	11000		J	18000		J	8800		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	UJ	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	12			11			64			21			56		
Barium	EPA 6010	5300	mg/kg	160			120			170			140			110		
Beryllium	EPA 6010	0.14	mg/kg	0.62			0.73			0.55			1.1			0.73		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.1	U	UJ	0.1	U	U	0.1	U	UJ
Calcium	EPA 6010	—	mg/kg	2900		J	1500		J	2900		J	1800		J	1300		J
Chromium	EPA 6010	210	mg/kg	15			20			14			58			29		
Cobalt	EPA 6010	4600	mg/kg	7.8			13			6.3			15			14		
Copper	EPA 6010	2800	mg/kg	37			23			36			51			22		
Iron	EPA 6010	—	mg/kg	29000		J	26000		J	35000			48000		J	27000		
Lead	EPA 6010	130	mg/kg	8		J	8.2		J	6.3			14			9.8		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			17			N/A			5		
Magnesium	EPA 6010	—	mg/kg	6100		J	5300		J	6700		J	6100			4100		J
Manganese	EPA 6010	3200	mg/kg	350		J	350		J	380		J	590		J	460		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	19			22			21			50			18		
Potassium	EPA 6010	—	mg/kg	2500		J	2200		J	2100		J	4300		J	2300		J
Selenium	EPA 6010		mg/kg	0.8	U	U	0.4	U	U	20		J	48			0.4	U	R
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	R	1	U	U	1	U	R
Sodium	EPA 6010	—	mg/kg	520			210			620			580			580		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.35			0.3	U	U
Vanadium	EPA 6010	540	mg/kg	43			41			42			83			44		
Zinc	EPA 6010	23000	mg/kg	79		J	54		J	84			66		J	34		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.07	B	UJ	0.1	B	UJ	0.049		UJ	0.23	B	J	0.31		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			3	U	U	N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601BSO05 06A1B2 1 2 5	Lab Qual	Valid. Qual.	0601CSO01 06A1B3 1 3 i	Lab Qual	Valid. Qual.	0601CSO03 06A1B3 1 3 3	Lab Qual.	Valid. Qual.	0601CSO05 06A1B3 i 3 5	Lab Qual.	Valid. Qual.	0601DSO01 06A1B4 i 4 1	Lab Qual.	Valid. Qual.
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	R	0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	—	mg/kg	0.04	U	U	0.04	U	U	0.04	U	UJ	0.04	U	U	0.04	U	UJ
2-Hexanone	—	mg/kg	0.05	U	UJ	0.05	U	UJ	0.03	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	UJ	0.1	U	UJ	0.1	U	R	0.1	U	UJ
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.3	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.3	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	—	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	UJ	0.01	U	UJ	0.01	U	U	0.01	U	UJ
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	UJ	0.03	U	UJ	0.03	U	R	0.03	U	UJ
Methyl isobutyl ketone	770	mg/kg	0.03	U	R	0.03	U	U	0.03	U	UJ	0.03	U	R	0.03	U	UJ
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601BSO05 06A1B2 i 2 5	Lab Qual.	Valid. Qual.	0601CSO01 06A1B3 i 3 i	Lab Qual.	Valid. Qual.	0601CSO03 06A1B3 i 3 3	Lab Qual.	Valid. Qual.	0601CSO05 06A1B3 i 3 5	Lab Qual.	Valid. Qual.	0601DSO01 06A1B4 i 4 i	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.4	U	U	0.4	U	U	0.6	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		Sample ID		0601BSO05			0601CSO01			0601CSO03			0601CSO05			0601DSO01		
		Boring ID		06A1B2			06A1B3			06A1B3			06A1B3			06A1B4		
		Area Number		1			i			1			i			i		
		Boring Number		2			3			3			3			4		
		Depth		5			1			3			5			i		
		PRG (mg/kg) (Residential)	Units		Lab Qual	Valid. Qual.		Lab Qual	Valid. Qual.		Lab Qual	Valid. Qual.		Lab Qual	Valid. Qual.		Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			0.04	U	UJ
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			0.04	U	UJ
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			0.04	U	UJ
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			0.04	U	UJ
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	10	U	U	34			11			10	U	U	27		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	6200		J	17000		J	19000		J	10000		J	16000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	38			24			27			64			150		
Barium	EPA 6010	5300	mg/kg	65			160			160			110			180		
Beryllium	EPA 6010	0.14	mg/kg	0.37			1.1			1.1			0.74			0.85		
Cadmium	EPA 7131	9	mg/kg	0.1	U	UJ	0.1	U	U	0.1	U	U	0.1	U	UJ	0.1	U	U
Calcium	EPA 6010	---	mg/kg	980		J	1600		J	2000		J	1200		J	1300		J
Chromium	EPA 6010	210	mg/kg	16			58			63			30			60		
Cobalt	EPA 6010	4600	mg/kg	6.8			14			17			13			22		
Copper	EPA 6010	2800	mg/kg	11			49			55			24			170		
Iron	EPA 6010	---	mg/kg	16000			53000		J	54000		J	33000			43000		J
Lead	EPA 6010	130	mg/kg	8.5			17			15			6.1			29		
Lithium	EPA 7430	1500	mg/kg	5.9			N/A			N/A			5	U	U	N/A		
Magnesium	EPA 6010	---	mg/kg	4200		J	6200			6800			5200		J	6200		
Manganese	EPA 6010	3200	mg/kg	210		J	550		J	600		J	450		J	370		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.21		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2.1		
Nickel	EPA 6010	150	mg/kg	11			48			50			19			41		
Potassium	EPA 6010	---	mg/kg	1600		J	4800		J	4700		J	2500			4100		J
Selenium	EPA 6010		mg/kg	0.4	U	R	49			46			0.4	U	R	18		
Silver	EPA 6010	380	mg/kg	i	U	R	i	U	U	1	U	U	1	U	R	1	U	U
Sodium	EPA 6010	---	mg/kg	79			450			350			140			400		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	25			88			85			45			45		
Zinc	EPA 6010	23000	mg/kg	33		J	70		J	81		J	44		J	120		U
Chromium(VI)	EPA 7199	0.2	mg/kg	0.2		J	0.33	B	J	0.5	B	J	0.16		J	0.56	B	J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			3	U	U	3	U	U	N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601DSO03 06A1B4 1 4 3	Lab Qual	Valid. Qual.	0601DSO05 06A1B4 i 4 5	Lab Qual	Valid Qual	0601ESO01 06A1B5 1 5 i	Lab Qual	Valid Qual.	0601ESO03 06A1B5 i 5 3	Lab Qual	Valid Qual.	0601ESO05 06A1B5 i 5 5	Lab Qual	Valid Qual
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	R	0.005	U	UJ	0.005	U	U	0.005	U	R
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	UJ	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	UJ	0.1	U	R	0.1	U	UJ	0.1	U	UJ	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	UJ	0.01	U	U	0.01	U	UJ	0.01	U	UJ	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	U	0.03	U	R	0.03	U	UJ	0.03	U	U	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	UJ	0.03	U	R	0.03	U	UJ	0.03	U	U	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601DSO03 06A1B4 i 4 3	Lab Qual	Valid. Qual.	0601DSO05 06A1B4 i 4 5	Lab Qual	Valid. Qual.	0601ESO01 06A1B5 i 5 i	Lab Qual	Valid. Qual.	0601ESO03 06A1B5 1 5 3	Lab Qual	Valid. Qual.	0601ESO05 06A1B5 i 5 5	Lab Qual	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.6	U	U	0.4	U	U	0.4	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	UJ	0.2	U	U	0.2	U	UJ	0.2	U	UJ	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601DSO03 06A1B4 1 4 3	Lab Qual	Valid. Qual	0601DSO05 06A1B4 1 4 5	Lab Qual	Valid. Qual.	0601ESO01 06A1B5 1 5 1	Lab Qual	Valid. Qual.	0601ESO03 06A1B5 1 5 3	Lab Qual	Valid. Qual	0601ESO05 06A1B5 1 5 5	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		—	mg/kg	21			22			24			22			16		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	43000		J	16000		J	19000		J	17000		J	4900		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	29			97			25			23			31		
Barium	EPA 6010	5300	mg/kg	280			220			160			150			75		
Beryllium	EPA 6010	0.14	mg/kg	1.1			0.77			i			0.99			0.33		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	UJ	0.1	U	U	0.1	U	U	0.1	U	UJ
Calcium	EPA 6010	—	mg/kg	1400		J	1600		J	1500		J	1300		J	520		J
Chromium	EPA 6010	210	mg/kg	97			54			100			130			28		
Cobalt	EPA 6010	4600	mg/kg	17			13			21			18			6.5		
Copper	EPA 6010	2800	mg/kg	31			18			92			48			17		
Iron	EPA 6010	—	mg/kg	62000		J	36000			43000		J	47000		J	12000		
Lead	EPA 6010	130	mg/kg	16			9.5			14			15			8.7		
Lithium	EPA 7430	1500	mg/kg	N/A			12			N/A			N/A			5	U	U
Magnesium	EPA 6010	—	mg/kg	15000			13000		J	7700			7800			3100		J
Manganese	EPA 6010	3200	mg/kg	370		J	320		J	670		J	600		J	240		J
Mercury	EPA 7471	6.5	mg/kg	0.57			0.31			0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	65			43			57			69			15		
Potassium	EPA 6010	—	mg/kg	8700		J	2100		J	3400		J	3300		J	1200		J
Selenium	EPA 6010		mg/kg	57			31		J	22			18			0.4	U	R
Silver	EPA 6010	380	mg/kg	i	U	U	i	U	R	1	U	U	i	U	U	1	U	R
Sodium	EPA 6010	—	mg/kg	920			910			400			360			110		
Thallium	EPA 7841	5.4	mg/kg	0.44			0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	110			72			59			60			19		
Zinc	EPA 6010	23000	mg/kg	110		J	62		J	96		J	78		J	23		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.41	B	J	0.18		J	0.29	B	J	0.38	B	J	0.22		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601FSO01 06A1B6 i 6 1	Lab Qual	Valid. Qual.	0601FSO03 06A1B6 i 6 3	Lab Qual	Valid. Qual.	0601FSO05 06A1B6 i 6 5	Lab Qual	Valid. Qual.	0601GSO01 06A1B7 1 7 1	Lab Qual	Valid. Qual.	0601GSO03 06A1B7 i 7 3	Lab Qual.	Valid. Qual.
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	—	mg/kg	0.04	U	UJ	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	U	0.05	U	U
Acetone	2100	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	R	0.1	U	UJ	0.1	U	UJ
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	—	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	UJ
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	UJ	0.01	U	UJ	0.01	U	U	0.01	U	UJ	0.01	U	UJ
Methyl ethyl ketone	7100	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	R	0.03	U	U	0.03	U	U
Methyl isobutyl ketone	770	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	R	0.03	U	U	0.03	U	U
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Sample ID			0601FSO01			0601FSO03			0601FSO05			0601GSO01			0601GSO03		
Boring ID			06A1B6			06A1B6			06A1B6			06A1B7			06A1B7		
Area Number			i			i			i			i			1		
Boring Number			6			6			6			7			7		
Depth			1			3			5			i			3		
Analyte	PRG (mg/kg) (Residential)	Units		Lab Qual.	Valid. Qual.		Lab Qual.	Valid. Qual.		Lab Qual.	Valid. Qual.		Lab Qual.	Valid. Qual.		Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	—	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.6	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.92		
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	U	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601FSO01 06A1B6 i 6 i	Lab Qual	Valid. Qual.	0601FSO03 06A1B6 1 6 3	Lab Qual	Valid. Qual	0601FSO05 06A1B6 i 6 5	Lab Qual.	Valid Qual	0601GSO01 06A1B7 i 7 i	Lab Qual.	Valid Qual	0601GSO03 06A1B7 1 7 3	Lab Qual.	Valid Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	25			10	U	U	14		J	19			22		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	12000		J	13000		J	8800		J	18000		J	14000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	21			17			54			25			24		
Barium	EPA 6010	5300	mg/kg	130			96			100			150			160		
Beryllium	EPA 6010	0.14	mg/kg	1.1			0.94			0.73			1.3			1.2		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	U	0.1	U	UJ	0.1	U	U	0.1	U	U
Calcium	EPA 6010	—	mg/kg	3600		J	1900		J	1300		J	3500		J	1800		J
Chromium	EPA 6010	210	mg/kg	30			27			18			30			29		
Cobalt	EPA 6010	4600	mg/kg	13			15			15			18			10		
Copper	EPA 6010	2800	mg/kg	46			44			18			56			57		
Iron	EPA 6010	—	mg/kg	44000		J	38000		J	28000			50000		J	48000		J
Lead	EPA 6010	130	mg/kg	17			12			8.1			15			15		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			5.6			N/A			N/A		
Magnesium	EPA 6010	—	mg/kg	5500			5900			5900		J	6100			5900		
Manganese	EPA 6010	3200	mg/kg	340		J	320		J	410		J	520		J	430		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	29			20			15			34			32		
Potassium	EPA 6010	—	mg/kg	2800		J	1700		J	1500		J	2000		J	3100		J
Selenium	EPA 6010		mg/kg	21			12			0.4	U	R	46			42		
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	R	1	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	700			240			130			270			560		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	75			66			40			86			76		
Zinc	EPA 6010	23000	mg/kg	83			65		J	46		J	92		J	70		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.22	B	J	0.16	B	J	0.093		J	0.12	B	UJ	0.07	B	UJ
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601GS005 06A1B7 i 7 5	Lab Qual.	Valid. Qual.	0601GS005 06A1B7 i 7 5 Dup	Lab Qual.	Valid. Qual.	0601HSO01 06A1B8 i 8 1	Lab Qual	Valid. Qual	0601HSO02 06A1B8 i 8 2	Lab Qual	Valid. Qual	0601HSO05 06A1B8 i 8 5	Lab Qual.	Valid. Qual
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	R
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	U	0.05	U	U	0.05	U	U	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	U	0.1	U	UJ	0.1	U	UJ	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	UJ	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601GS005 06A1B7 i 7 5	Lab Qual.	Valid Qual	0601GS005 06A1B7 1 7 5 Dup	Lab Qual.	Valid Qual	0601HSO01 06A1B8 1 8 1	Lab Qual.	Valid Qual.	0601HSO02 06A1B8 1 8 2	Lab Qual	Valid Qual.	0601HSO05 06A1B8 i 8 5	Lab Qual.	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.4	U	U	0.4	U	U	0.6	U	UJ
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601GS005 06A1B7 i 7 5	Lab Qual	Valid Qual	0601GS005 06A1B7 i 7 5 Dup	Lab Qual	Valid Qual	0601HSO01 06A1B8 1 8 1	Lab Qual	Valid Qual	0601HSO02 06A1B8 i 8 2	Lab Qual	Valid Qual	0601HSO05 06A1B8 1 8 5	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		—	mg/kg	20		J	36		J	32			24		U	10		J
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	8000			11000		J	12000		J	12000		J	13000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	22		J	28		J	22			23			140		
Barium	EPA 6010	5300	mg/kg	130			130			130			120			89		
Beryllium	EPA 6010	0.14	mg/kg	0.68			0.89			0.61			0.57			0.99		
Cadmium	EPA 7131	9	mg/kg	i	U	U	i	U	U	0.47			0.51			0.1	U	UJ
Calcium	EPA 6010	---	mg/kg	1600		J	1700			4500		J	4200		J	2400		J
Chromium	EPA 6010	210	mg/kg	15			20			140			130			300		
Cobalt	EPA 6010	4600	mg/kg	13			14			27			28			32		
Copper	EPA 6010	2800	mg/kg	16			22			65			54			60		
Iron	EPA 6010	—	mg/kg	21000		J	27000			34000			29000			45000		
Lead	EPA 6010	130	mg/kg	6.5			8.1			30			26			50		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A			22		
Magnesium	EPA 6010	---	mg/kg	5600		J	5500			8300		J	8800		J	14000		J
Manganese	EPA 6010	3200	mg/kg	380		J	390		J	500		J	520		J	1300		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.16			i			0.18		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	12			16			150			140			330		
Potassium	EPA 6010	---	mg/kg	1400		J	1900		J	2400		J	2400		J	1200		J
Selenium	EPA 6010		mg/kg	10	U	UJ	10	U	UJ	0.4	U	UJ	0.4	U	UJ	16		J
Silver	EPA 6010	380	mg/kg	i	U	UJ	1	U	UJ	1	U	U	i	U	U	i	U	R
Sodium	EPA 6010	---	mg/kg	230			570			410			490			1300		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	32			41			37			34			41		
Zinc	EPA 6010	23000	mg/kg	47			54		J	280		J	220		J	63		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.085		J	0.086			0.45		J	0.9		J	1.4		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601SO01 06A1B9 1 9 i	Lab Qual	Valid. Qual.	0601SO03 06A1B9 1 9 3	Lab Qual	Valid. Qual.	0601SO05 06A1B9 i 9 5	Lab Qual	Valid. Qual.	0601ISO01 06A1B10 i 10 i	Lab Qual	Valid. Qual.	0601ISO03 06A1B10 i 10 3	Lab Qual	Valid. Qual.
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	R	0.005	U	R
1,1-Dichloroethane	500	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	N/A			4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	N/A			0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	N/A			0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	N/A			0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	N/A			0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	N/A			0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	N/A			0.01	U	UJ	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ
Carbon Tetrachloride	0.23	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	N/A			0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	N/A			0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	N/A			0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methylene chloride	7.8	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	N/A			0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	N/A			0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ
Vinyl acetate	780	mg/kg	N/A			0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	N/A			0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601SO01 06A1B9 1 9 1	Lab Qual	Valid Qual	0601SO03 06A1B9 1 9 3	Lab Qual	Valid Qual	0601SO05 06A1B9 1 9 5	Lab Qual	Valid Qual	0601ISO01 06A1B10 1 10 1	Lab Qual	Valid Qual	0601ISO03 06A1B10 1 10 3	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	1.3			0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601SO01 06A1B9	Lab Qual.	Valid. Qual.	0601SO03 06A1B9	Lab Qual.	Valid. Qual.	0601SO05 06A1B9	Lab Qual.	Valid. Qual.	0601ISO01 06A1B10	Lab Qual.	Valid. Qual.	0601ISO03 06A1B10	Lab Qual.	Valid. Qual.
Sample ID				0601SO01			0601SO03			0601SO05			0601ISO01			0601ISO03		
Boring ID				06A1B9			06A1B9			06A1B9			06A1B10			06A1B10		
Area Number				i			i			i			i			i		
Boring Number				9			9			9			10			10		
Depth				i			3			5			1			3		
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	N/A			0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	N/A			0.03	U	UJ	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		—	mg/kg	18			12		J	19		J	10	U	U	10	U	U
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	9000		J	9600		J	7000		J	15000		J	37000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	20			10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	13			60			42			97			170		
Barium	EPA 6010	5300	mg/kg	97			130			140			130			130		
Beryllium	EPA 6010	0.14	mg/kg	0.71			0.75			0.53			0.92			1.4		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ
Calcium	EPA 6010	—	mg/kg	1200		J	1400		J	1400		J	2300		J	3100		J
Chromium	EPA 6010	210	mg/kg	16			18			14			21			750		
Cobalt	EPA 6010	4600	mg/kg	11			15			12			8.5			30		
Copper	EPA 6010	2800	mg/kg	19			20			15			18			11		
Iron	EPA 6010	—	mg/kg	22000		J	32000			21000			40000			54000		
Lead	EPA 6010	130	mg/kg	3.9		J	7.9			6.3			7.6			22		
Lithium	EPA 7430	1500	mg/kg	0.5	U	U	6.5			5.8			24			110		
Magnesium	EPA 6010	—	mg/kg	5400		J	5800		J	5100		J	9800		J	50000		J
Manganese	EPA 6010	3200	mg/kg	250		J	490		J	350		J	330		J	650		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	2			1.4		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	13			14			13			37			250		
Potassium	EPA 6010	—	mg/kg	1300		J	1600		J	1200		J	2200		J	640		J
Selenium	EPA 6010		mg/kg	0.4	U	U	0.4	U	R	0.4	U	R	0.4	U	R	34		J
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	R	1	U	R	2.7		J	47		
Sodium	EPA 6010	—	mg/kg	350			380			200			150			310		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	39			41			28			41			75		
Zinc	EPA 6010	23000	mg/kg	48		J	49		J	44		J	58		J	160		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.06	B	UJ	0.048		UJ	0.05		UJ	0.092		J	0.17		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601ISO05	Lab Qual	Valid Qual	0601JS001	Lab Qual	Valid Qual	0601JS001	Lab Qual	Valid Qual	0601JS003	Lab Qual	Valid Qual	0601JS003	Lab Qual	Valid Qual
Sample ID			0601ISO05			0601JS001			0601JS001			0601JS003			0601JS003		
Boring ID			06A1B10			06A1B11			06A1B11			06A1B11			06A1B11		
Area Number			i			1			1			i			1		
Boring Number			10			11			11			11			11		
Depth			5			i			i			3			3		
									Dup						Dup		
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	R	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	U
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	U	0.1	U	R	0.1	U	U
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	U
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	U
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	UJ	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Methyl isobutyl ketone	770	mg/kg	0.03	U	R	0.03	U	R	0.03	U	U	0.03	U	R	0.03	U	U
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601ISO05 06A1B10 i 10 5	Lab Qual	Valid. Qual.	0601JS001 06A1B11 i 11 1	Lab Qual.	Valid. Qual	0601JS001 06A1B11 1 11 i Dup	Lab Qual	Valid. Qual.	0601JS003 06A1B11 1 11 3	Lab Qual.	Valid. Qual.	0601JS003 06A1B11 i 11 3 Dup	Lab Qual	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601ISO05 06A1B10 1 10 5	Lab Qual	Valid. Qual	0601JS001 06A1B11 i 11 1	Lab Qual	Valid. Qual.	0601JS001 06A1B11 1 11 i Dup	Lab Qual	Valid. Qual.	0601JS003 06A1B11 1 11 3	Lab Qual	Valid. Qual	0601JS003 06A1B11 1 11 3 Dup	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		—	mg/kg	31		J	26		J	32		J	54		J	26		J
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	38000		J	950			1000		J	3700			4000		J
Antimony	EPA 6010	31	mg/kg	20			10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	270			15		J	10		J	29		J	29		J
Barium	EPA 6010	5300	mg/kg	110			12			10			41			41		
Beryllium	EPA 6010	0.14	mg/kg	1.5			0.17			0.11			0.26			0.23		
Cadmium	EPA 7131	9	mg/kg	0.1	U	UJ	1	U	U	i	U	U	i	U	U	i	U	U
Calcium	EPA 6010	—	mg/kg	3100		J	180			200			230		J	240		
Chromium	EPA 6010	210	mg/kg	290			2.7			3.2			8.8			10		
Cobalt	EPA 6010	4600	mg/kg	60			4	U	U	4	U	U	4	U	U	4	U	U
Copper	EPA 6010	2800	mg/kg	52			14			12			45			52		
Iron	EPA 6010	—	mg/kg	63000			3300		J	2700			9100		J	9400		
Lead	EPA 6010	130	mg/kg	45			28			22			22			25		
Lithium	EPA 7430	1500	mg/kg	130			N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	—	mg/kg	52000		J	280		J	310			1600		J	1600		J
Manganese	EPA 6010	3200	mg/kg	1100		J	130		J	93		J	110		J	120		J
Mercury	EPA 7471	6.5	mg/kg	0.43			0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	370			4	U	U	4	U	U	6.1			6.9		
Potassium	EPA 6010	—	mg/kg	410		J	440			400		J	610			750		J
Selenium	EPA 6010		mg/kg	25		J	10	U	UJ	10	U	UJ	10	U	UJ	30		J
Silver	EPA 6010	380	mg/kg	i	U	R	1	U	UJ	i	U	UJ	i	U	UJ	1	U	UJ
Sodium	EPA 6010	—	mg/kg	380			50	U	U	76			110			170		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	64			4	U	U	4	U	U	7.3			7.7		
Zinc	EPA 6010	23000	mg/kg	160			5.5			11		J	18			18		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.47		J	0.098		J	0.082		U	0.23		J	0.092		
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601JS005 06A1B11 i 11 5	Lab Qual	Valid. Qual	0601JS005 06A1B11 i 11 5 Dup	Lab Qual	Valid. Qual	0602SO01 06A2B1 2 1 1	Lab Qual	Valid. Qual	0602SO02 06A2B2 2 2 i	Lab Qual	Valid. Qual	0602SO03 06A2B3 2 3 i	Lab Qual	Valid. Qual
Volatile Organic Compounds (EPA 8260)																	
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	U	0.04	U	U	0.04	U	UJ	0.04	U	U	0.04	U	U
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	U	0.05	U	U
Acetone	2100	mg/kg	0.1	U	R	0.1	U	U	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	U	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	UJ	0.01	U	UJ	0.01	U	UJ
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	U	0.03	U	UJ	0.03	U	UJ	0.03	U	UJ
Methyl isobutyl ketone	770	mg/kg	0.03	U	U	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte	PRG (mg/kg) (Residential)	Units	0601JS005 06A1B11 i 11 5	Lab Qual	Valid. Qual.	0601JS005 06A1B11 i 11 5 Dup	Lab Qual.	Valid. Qual	0602SO01 06A2B1 2 1 i	Lab Qual	Valid. Qual	0602SO02 06A2B2 2 2 1	Lab Qual	Valid. Qual.	0602SO03 06A2B3 2 3 i	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	—	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.4	U	UJ	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	—	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	UJ
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.22			0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2		U	0.2	U	U

Table E-6
Results from Area of Concern (Objective) 6 - Sump and Collection Lines.

Analyte		PRG (mg/kg) (Residential)	Units	0601JS005 06A1B11 i 11 5	Lab Qual	Valid. Qual.	0601JS005 06A1B11 1 11 5 Dup	Lab Qual	Valid. Qual.	0602SO01 06A2B1 2 i i	Lab Qual.	Valid. Qual.	0602SO02 06A2B2 2 2 1	Lab Qual	Valid. Qual.	0602SO03 06A2B3 2 3 i	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			0.04	U	UJ	N/A		
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.21		J	0.03	U	UJ	0.03	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	10	U	U	41		J	N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	1400			2400		J	15000			15000		J	20000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	21			10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	19		J	29		J	9			10			11		
Barium	EPA 6010	5300	mg/kg	24			27			290			270			370		
Beryllium	EPA 6010	0.14	mg/kg	0.13			0.14			0.68			0.55			0.57		
Cadmium	EPA 7131	9	mg/kg	i	U	U	1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Calcium	EPA 6010	---	mg/kg	190		J	210			3600			2600		J	4200		J
Chromium	EPA 6010	210	mg/kg	3.8			5.9			52			64			90		
Cobalt	EPA 6010	4600	mg/kg	6.2			7.3			14			14			14		
Copper	EPA 6010	2800	mg/kg	29			59			40			63			67		
Iron	EPA 6010	---	mg/kg	3100		J	5900			38000		J	37000			50000		
Lead	EPA 6010	130	mg/kg	46			52			15			15			12		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	---	mg/kg	690		J	990		J	8900			8600		J	13000		J
Manganese	EPA 6010	3200	mg/kg	110		J	150		J	290			350		J	400		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.11			0.1	U	UJ	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	4	U	U	5.3			37			38			58		
Potassium	EPA 6010	---	mg/kg	340		J	570		J	4500			4700		J	9400		J
Selenium	EPA 6010		mg/kg	20		J	10	U	UJ	0.4	U	UJ	12			35		
Silver	EPA 6010	380	mg/kg	1	U	UJ	i	U	UJ	1	U	U	i	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	71			130			370		J	300			980		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	4	U	U	4.2			51			45			81		U
Zinc	EPA 6010	23000	mg/kg	9.5			16		J	76		J	79		J	110		J
Chromium(VI)	EPA 7199	0.2	mg/kg	2.2			0.12			0.18		J	0.13		UJ	0.28		J
Organic Lead (CA DHS Method)																		
Organic Lead	CA DHS	0.0065	mg/kg	N/A			N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte	PRG (mg/kg) (Residential)	Units	0701SD01 07A1B1 i 1 Surface	Lab Qual	Valid. Qual	0701SD02 07A1B2 1 2 Surface	Lab Qual	Valid. Qual	0701SD03 07A1B3 i 3 Surface	Lab Qual	Valid. Qual	0702AS001 07A2B1 2 i 1	Lab Qual	Valid. Qual	0702AS003 07A2B1 2 1 3	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	4	U	U	4	U	U	4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	4	U	U	4	U	U	4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	4	U	U	4	U	U	4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	2	U	UJ	2	U	U	2	U	J	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	2	U	UJ	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	2	U	UJ	2	U	UJ	2	U	UJ	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	2	U	UJ	2	U	UJ	2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	2	U	U	2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	2	U	UJ	2	U	UJ	2	U	UJ	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	4	U	U	4	U	U	4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	2	U	UJ	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	2	U	UJ	2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	2	U	UJ	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	2	U	UJ	2	U	UJ	2	U	UJ	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	2	U	U	2	U	U	2	U	UJ	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	4	U	U	4	U	U	4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	2	U	U	2	U	U	2	U	U	0	U	U	0.2	U	U
Pyrene	100	mg/kg	2	U	U	2	U	U	2	U	U	0.2	U	U	0.2	U	U

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte		PRG (mg/kg) (Residential)	Units	0701SD01 07A1B1 i i Surface	Lab Qual	Valid. Qual.	0701SD02 07A1B2 i 2 Surface	Lab Qual	Valid. Qual.	0701SD03 07A1B3 1 3 Surface	Lab Qual	Valid. Qual.	0702AS001 07A2B1 2 i i	Lab Qual	Valid. Qual.	0702AS003 07A2B1 2 i 3	Lab Qual	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			0.046		J	N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			0.04	U	UJ	N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			0.04	U	UJ	N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			0.04	U	UJ	N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	270			260			910			25		J	29		J
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.06	U	U	0.39			0.78			0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.06	U	U	0.03	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	4000			4200			3600			5500			8600		
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	6.1			8.2			5.8			15		J	20		J
Barium	EPA 6010	5300	mg/kg	140			88			75			65			110		
Beryllium	EPA 6010	0.14	mg/kg	0.2			0.19			0.17			0.48			0.42		
Cadmium	EPA	9	mg/kg	2.1			2.9			0.85			1	U	U	1	U	U
Calcium	EPA 6010	—	mg/kg	1400			1700			1500			1100		J	2100		J
Chromium	EPA 6010	210	mg/kg	28			32			38			9.8			5.5		
Cobalt	EPA 6010	4600	mg/kg	5.4			5.5			4.8			6.3			7.6		
Copper	EPA 6010	2800	mg/kg	57			60			57			19			25		
Iron	EPA 6010	---	mg/kg	19000		J	21000		J	15000		J	16000		J	26000		J
Lead	EPA 6010	130	mg/kg	200			200			200			6.7			6.5		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	—	mg/kg	2600			2600			2200			3500		J	6300		J
Manganese	EPA 6010	3200	mg/kg	330			190			160			230		J	400		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2.4			2.8			2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	20			24			14			8.2			7.2		
Potassium	EPA 6010	---	mg/kg	1400			1400			1100			640		J	3200		J
Selenium	EPA	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	10	U	UJ	10	U	UJ
Silver	EPA 6010	380	mg/kg	i	U	U	i	U	U	i	U	U	1	U	UJ	1	U	UJ
Sodium	EPA 6010	---	mg/kg	200		J	210		J	180		J	61			71		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	20			21			16			27			33		
Zinc	EPA 6010	23000	mg/kg	1100		J	360		J	260		J	30			47		
Chromium (VI)	EPA 7199	0.2	mg/kg	8.11		J	3.08		J	4.61		J	0.069		UJ	0.033		UJ

NR= Not reported
N/A= Not Analyzed

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte	PRG (mg/kg) (Residential)	Units	0702AS005 07A2B1 2 i 5	Lab Qual	Valid Qual	0702BS001 07A2B2 2 2 i	Lab Qual	Valid Qual	0702BS003 07A2B2 2 2 3	Lab Qual	Valid Qual	0702BS005 07A2B2 2 2 5	Lab Qual	Valid Qual	0702CS001 07A2B3 2 3 1	Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte		PRG (mg/kg) (Residential)	Units	0702AS005 07A2B1 2 i 5	Lab Qual	Valid. Qual.	0702BS001 07A2B2 2 2 i	Lab Qual.	Valid. Qual.	0702BS003 07A2B2 2 2 3	Lab Qual	Valid. Qual.	0702BS005 07A2B2 2 2 5	Lab Qual	Valid. Qual.	0702CS001 07A2B3 2 3 i	Lab Qual.	Valid. Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			0.008	U	UJ
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			0.008	U	UJ
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			0.008	U	UJ
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			0.008	U	UJ
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	12		J	65		J	54		J	19		J	43		J
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	6500			4500			5200			7600			9300		
Antimony	EPA 6010	31	mg/kg	10	U	U	36			10	U	U	20			10	U	U
Arsenic	EPA 6010	0.38	mg/kg	17		J	12		J	10		J	17		J	25		J
Barium	EPA 6010	5300	mg/kg	72			130			42			68			110		
Beryllium	EPA 6010	0.14	mg/kg	0.47			0.34			0.37			0.52			0.7		
Cadmium	EPA	9	mg/kg	1	U	U	i	U	U	1	U	U	1	U	U	1	U	U
Calcium	EPA 6010	---	mg/kg	1900		J	1000		J	670		J	860		J	1500		J
Chromium	EPA 6010	210	mg/kg	10			4.1			2			6.3			15		
Cobalt	EPA 6010	4600	mg/kg	8.8			4	U	U	4	U	U	4.3			6.6		
Copper	EPA 6010	2800	mg/kg	15			840			6.5			29			20		
Iron	EPA 6010	---	mg/kg	18000		J	14000		J	12000		J	18000		J	29000		J
Lead	EPA 6010	130	mg/kg	5.4			2800			7.1			110			10		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	---	mg/kg	4800		J	2500		J	2500		J	3400		J	4300		J
Manganese	EPA 6010	3200	mg/kg	270		J	320		J	320		J	330		J	230		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.17			0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	9.1			4	U	U	4	U	U	5			9.2		
Potassium	EPA 6010	---	mg/kg	980		J	2200		J	2200		J	2100		J	1400		J
Selenium	EPA	380	mg/kg	10	U	UJ	10	U	UJ	10	U	UJ	40		J	10	U	UJ
Silver	EPA 6010	380	mg/kg	1	U	UJ	14		UJ	i	U	UJ	i	U	UJ	1	U	UJ
Sodium	EPA 6010	---	mg/kg	130			50	U	U	50	U	U	50	U	U	60		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.38			0.3	U	U
Vanadium	EPA 6010	540	mg/kg	34			15			14			25			49		
Zinc	EPA 6010	23000	mg/kg	34			270			33			53			32		
Chromium (VI)	EPA 7199	0.2	mg/kg	0.037		UJ	0.1		U	0.18		J	0.13		J	0.086		J

NR= Not reported
N/A= Not Analyzed

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Sample ID			0702CS003			0702CS005			0702DS001			0702DS003			0702DS005		
Boring ID			07A2B3			07A2B3			07A2B4			07A2B4			07A2B4		
Area Number			2			2			2			2			2		
Boring Number			3			3			4			4			4		
Depth			3			5			1			3			5		
Analyte	PRG (mg/kg) (Residential)	Units		Lab Qual	Valid Qual		Lab Qual	Valid Qual		Lab Qual	Valid Qual		Lab Qual	Valid Qual		Lab Qual	Valid Qual
Semivolatile Organic Compounds (EPA 8270)																	
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte		PRG (mg/kg) (Residential)	Units	0702CS003 07A2B3 2 3 3	Lab Qual.	Valid Qual.	0702CS005 07A2B3 2 3 5	Lab Qual.	Valid Qual.	0702DS001 07A2B4 2 4 i	Lab Qual.	Valid Qual.	0702DS003 07A2B4 2 4 3	Lab Qual.	Valid Qual.	0702DS005 07A2B4 2 4 5	Lab Qual.	Valid Qual.
Semivolatile Organic Compounds (EPA 8270 SIM)																		
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)																		
TRPH		---	mg/kg	64		J	72		J	42		J	10	U	U	31		J
Polychlorinated Biphenyl - PCB (EPA 8080)																		
Aroclor 1016		0.066	mg/kg	0.03	U	UJ	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	UJ	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	14000			12000			4900			6000			5400		J
Antimony	EPA 6010	31	mg/kg	10	U	U	20			10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	110		J	26		J	13		J	16		J	11		J
Barium	EPA 6010	5300	mg/kg	160			120			80			77			95		
Beryllium	EPA 6010	0.14	mg/kg	0.79			0.68			0.36			0.43			0.37		
Cadmium	EPA	9	mg/kg	i	U	U	1	U	U	1	U	U	1	U	U	i	U	U
Calcium	EPA 6010	—	mg/kg	1200		J	1600		J	1700		J	2400		J	1500		
Chromium	EPA 6010	210	mg/kg	28			8.1			6.6			5.9			9.4		
Cobalt	EPA 6010	4600	mg/kg	8.3			8.4			6.3			7.8			6.8		
Copper	EPA 6010	2800	mg/kg	8.5			15			14			36			22		
Iron	EPA 6010	---	mg/kg	39000		J	26000		J	15000		J	19000		J	13000		
Lead	EPA 6010	130	mg/kg	8.6			7.5			5.1			5	U	U	8.6		
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	—	mg/kg	7600		J	5400		J	3700		J	4000		J	4200		J
Manganese	EPA 6010	3200	mg/kg	680		J	280		J	190		J	310		J	680		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	22			7.5			5.7			7.3			11		
Potassium	EPA 6010	—	mg/kg	5900		J	2700		J	1100		J	1500		J	1000		J
Selenium	EPA	380	mg/kg	31		J	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
Silver	EPA 6010	380	mg/kg	i	U	UJ	1	U	UJ	i	U	UJ	1	U	UJ	1	U	UJ
Sodium	EPA 6010	—	mg/kg	65			120			67			83			74		
Thallium	EPA 7841	5.4	mg/kg	0.42			0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	66			44			19			26			26		
Zinc	EPA 6010	23000	mg/kg	65			37			32			35			31		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.035		UJ	0.21		UJ	0.084		J	0.088		J	0.11		J

NR= Not reported
N/A= Not Analyzed

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte	PRG (mg/kg) (Residential)	Units	0702ES001	Lab Qual.	Valid. Qual.	0702ES001	Lab Qual.	Valid. Qual.	0702ES003	Lab Qual.	Valid. Qual.	0702ES005	Lab Qual.	Valid. Qual.
Sample ID			0702ES001			0702ES001			0702ES003			0702ES005		
Boring ID			07A2B5			07A2B5			07A2B5			07A2B5		
Area Number			2			2			2			2		
Boring Number			5			5			5			5		
Depth			i			i Dup			3			5		
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	N/A			0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	N/A			0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.6	U	U	N/A			0.6	U	U	0.6	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	N/A			0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	N/A			0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	N/A			0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	N/A			0.2	U	U	0.2	U	U

Table E-7
Results from Area of Concern (Objective) 7 - Temporary Drum Staging Area.

Analyte		PRG (mg/kg) (Residential)	Units	0702ES001 07A2B5 2 5 i	Lab Qual.	Valid. Qual	0702ES001 07A2B5 2 5 i Dup	Lab Qual	Valid. Qual	0702ES003 07A2B5 2 5 3	Lab Qual.	Valid. Qual	0702ES005 07A2B5 2 5 5	Lab Qual	Valid. Qual
Semivolatile Organic Compounds (EPA 8270 SIM)															
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH		---	mg/kg	11		J	N/A			27		J	17		J
Polychlorinated Biphenyl - PCB (EPA 8080)															
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	UJ	0.03	U	U	0.03	U	U
Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	77000	mg/kg	7600		J	N/A			9000		J	5400		J
Antimony	EPA 6010	31	mg/kg	10	U	U	N/A			10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	15		J	N/A			17		J	11		J
Barium	EPA 6010	5300	mg/kg	89			N/A			140			70		
Beryllium	EPA 6010	0.14	mg/kg	0.47			N/A			0.51			0.37		
Cadmium	EPA	9	mg/kg	1	U	U	N/A			1	U	U	i	U	U
Calcium	EPA 6010	—	mg/kg	1500			N/A			2900			1500		
Chromium	EPA 6010	210	mg/kg	12			N/A			8.8			9.9		
Cobalt	EPA 6010	4600	mg/kg	8.9			N/A			12			5.1		
Copper	EPA 6010	2800	mg/kg	19			N/A			21			14		
Iron	EPA 6010	---	mg/kg	16000			N/A			19000			12000		
Lead	EPA 6010	130	mg/kg	5.1			N/A			6.6			5	U	U
Lithium	EPA 7430	1500	mg/kg	N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	---	mg/kg	5400		J	N/A			5900		J	4200		J
Manganese	EPA 6010	3200	mg/kg	250		J	N/A			270		J	200		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	N/A			0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	N/A			2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	11			N/A			13			9.1		
Potassium	EPA 6010	—	mg/kg	1200		J	N/A			1300		J	1100		J
Selenium	EPA	380	mg/kg	10	U	UJ	N/A			10	U	UJ	10	U	UJ
Silver	EPA 6010	380	mg/kg	1	U	UJ	N/A			1	U	UJ	1	U	UJ
Sodium	EPA 6010	---	mg/kg	200			N/A			430			300		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	N/A			0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	31			N/A			32			20		
Zinc	EPA 6010	23000	mg/kg	38		J	N/A			40		J	31		J
Chromium (VI)	EPA 7199	0.2	mg/kg	0.045		UJ	N/A			0.049		UJ	0.085		J

NR= Not reported
N/A= Not Analyzed

Table E-8
Results from Area of Concern (Objective) 8 - Groundwater Investigation.

Analyte	Sample ID Location Number		0801AQ01 MW-1	Lab Q	Valid Q	0802AQ01 MW-2	Lab Q	Valid Q	0803AQ01 MW-3	Lab Q	Valid Q	0803AQ02 MW-3 Duplicate	Lab Q	Valid Q
	PRG (mg/L) (Residential)	Units												
Volatile Organic Compounds (EPA 8260)														
1,1,1-Trichloroethane	790	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,1,2,2-Tetrachloroethane	0.55	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,1,2-Trichloroethane	0.2	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,1-Dichloroethane	810	mg/L	0.5	U	UJ	0.5	U	U	0.5	U	U	0.5	U	U
1,1-Dichloroethene	0.046	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,2-Dichlorobenzene	370	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,2-Dichloroethane	0.12	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,2-Dichloropropane	0.16	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,3-Dichlorobenzene	180	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,4-Dichlorobenzene	0.14	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
1,4-Dioxane	1.0	mg/L	50	U	R	50	U	R	50	U	R	50	U	R
2-Chloroethylvinylether	-	mg/L	4	U	R	4	U	R	4	U	R	4	U	R
2-Hexanone		mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Acetone	610	mg/L	10	U	R	10	U	R	12		J	10	U	R
Acrolein	0.042	mg/L	100	U	R	100	U	R	100	U	R	100	U	R
Acrylonitrile	3.7	mg/L	50	U	R	50	U	R	50	U	R	50	U	R
Benzene	0.39	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Bromodichloromethane	0.18	mg/L	0.5	U	UJ	0.5	U	U	0.5	U	U	0.5	U	U
Bromoform	8.5	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Bromomethane	8.7	mg/L	0.5	U	U	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
Carbon Disulfide	21	mg/L	2	U	U	2	U	U	2	U	U	2	U	U
Carbon Tetrachloride	0.1	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Chlorobenzene	39	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Chloroethane		mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Chloroform	0.1	mg/L	0.5	U	U	2.1		U	0.5	U	U	0.5	U	U
Chloromethane	1.5	mg/L	1	U	UJ	1	U	U	1	U	U	1	U	U
cis-1,2-Dichloroethene	61	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
cis-1,3-Dichloropropene	0.5	mg/L	0.5	U	UJ	0.5	U	U	0.5	U	U	0.5	U	U
Dibromochloromethane	1	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Ethylbenzene	1300	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Freon 113 (Trichlorotrifluoroethane)	59000	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Methyl ethyl ketone	19000	mg/L	10	U	R	10	U	R	10	U	R	10	U	R
Methyl isobutyl ketone	160	mg/L	4	U	U	4	U	U	4	U	U	4	U	U
Methylene chloride	1.3	mg/L	2	U	UJ	2	U	U	2	U	U	2	U	U
Styrene	1600	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Tetrachloroethene	1.1	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Toluene	720	mg/L	0.5	U	U	0.58			0.5	U	U	0.5	U	U
Total Xylene Isomers	400	mg/L	2	U	U	2	U	U	2	U	U	2	U	U
trans-1,2-Dichloroethene	120	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
trans-1,3-Dichloropropene	0.081	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Trichloroethene	1.6	mg/L	2.4			2			2.6			2		
Trichlorofluoromethane	1300	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U
Vinyl acetate	410	mg/L	5	U	R	5	U	R	5	U	R	5	U	R
Vinyl chloride	0.02	mg/L	0.5	U	U	0.5	U	U	0.5	U	U	0.5	U	U

Table E-8
Results from Area of Concern (Objective) 8 - Groundwater Investigation.

Analyte	Sample ID Location Number		0801AQ01 MW-1	Lab Q	Q Valid	0802AQ01 MW-2	Lab Q	Q Valid	0803AQ01 MW-3	Lab Q	Q Valid	0803AQ02 MW-3 Duplicate	Lab Q	Q Valid
	PRG (mg/L) (Residential)	Units												
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	190	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
1,2-Dichlorobenzene	370	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
1,3-Dichlorobenzene	180	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
1,4-Dichlorobenzene	0.47	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2,4,6-Trichlorophenol	6.1	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2,4-Dichlorophenol	110	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2,4-Dimethylphenol	730	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2,4-Dinitrophenol	73	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
2,4-Dinitrotoluene	73	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2,6-Dinitrotoluene	37	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2-Chloronaphthalene	490	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2-Chlorophenol	38	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
2-Methyl-4,6-dinitrophenol		mg/L	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
2-Nitrophenol		mg/L	5	U	U	5	U	U	5	U	U	5	U	U
3,3'-Dichlorobenzidine	0.15	mg/L	10	U	UJ	10	U	UJ	10	U	UJ	10	U	UJ
4-Bromophenylphenylether	-	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
4-Chloro-3-methylphenol	-	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
4-Chlorophenylphenylether	-	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
4-Nitrophenol	-	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
Acenaphthene	370	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Acenaphthylene		mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Anthracene	1800	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Benzo(a)anthracene	0.092	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Benzo(a)pyrene	0.0015	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Benzo(b)fluoranthene	0.092	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Benzo(g,h,i)perylene	-	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Benzo(k)fluoranthene	0.092	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Bis(2-chloroethoxy)methane		mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Bis(2-chloroethyl)ether	0.0098	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Bis(2-chloroisopropyl)ether	0.27	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Bis(2-ethylhexyl)phthalate	4.8	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
Butylbenzylphthalate	7300	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Chrysene	9.2	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Di-n-octylphthalate	730	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Dibenzo(a,h)anthracene	0.0092	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Dibutylphthalate	3700	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
Diethylphthalate	29000	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
Dimethylphthalate	370000	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Fluoranthene	1500	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Fluorene	240	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Hexachlorobenzene	0.042	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Hexachlorobutadiene	0.86	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Hexachloroethane	4.8	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Indeno(1,2,3-c,d)pyrene	0.092	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Isophorone	71	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
N-Nitrosodi-n-propylamine	0.0096	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Naphthalene	240	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Nitrobenzene	3.4	mg/L	5		U	5		U	5		U	5		U
Pentachlorophenol	0.56	mg/L	10	U	U	10	U	U	10	U	U	10	U	U
Phenanthrene	-	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Phenol	22000	mg/L	5	U	U	5	U	U	5	U	U	5	U	U
Pyrene	180	mg/L	5	U	U	5	U	U	5	U	U	5	U	U

Table E-8
Results from Area of Concern (Oblective) 8 - Groundwater Investigation.

Analyte		Sample ID Location Number		0801AQ01 MW-1	Lab Q	Valid. Q	0802AQ01 MW-2	Lab Q	Valid. Q	0803AQ01 MW-3	Lab Q	Valid. Q	0803AQ02 MW-3 Duplicate	Lab Q	Valid Q
		PRG (mg/L) (Residential)	Units												
Polynuclear Aromatic Hydrocarbons (EPA 8310)															
Acenaphthene		370	mg/L	2	U	U	2	U	U	2	U	U	2	U	U
Acenaphthylene			mg/L	3	U	U	3	U	U	3	U	U	3	U	U
Anthracene		1800	mg/L	0.7	U	U	0.7	U	U	0.7	U	U	0.7	U	U
Benzo(a)anthracene		0.092	mg/L	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Benzo(b)fluoranthene		0.092	mg/L	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
Benzo(k)fluoranthene		0.092	mg/L	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Benzo(g,h,i)perylene		-	mg/L	0.76	U	U	0.76	U	U	0.76	U	U	0.76	U	U
Benzo(a)pyrene		0.0015	mg/L	0.23	U	U	0.23	U	U	0.23	U	U	0.23	U	U
Chrysene		9.2	mg/L	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Dibenzo(a,h)anthracene		0.0092	mg/L	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
Fluoranthene		1500	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Fluorene		240	mg/L	0.6	U	U	0.6	U	U	0.6	U	U	0.6	U	U
Indeno(1,2,3-cd)pyrene		0.092	mg/L	0.43	U	U	0.43	U	U	0.43	U	U	0.43	U	U
Naphthalene		240	mg/L	2	U	U	2	U	U	2	U	U	2	U	U
Phenanthrene			mg/L	0.64	U	U	0.64	U	U	0.64	U	U	0.64	U	U
Pyrene		180	mg/L	0.27	U	U	0.27	U	U	0.27	U	U	0.27	U	U
Polychlorinated Biphenyl - PCB (EPA 8080)															
Aroclor 1016		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1221		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1232		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1242		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1248		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1254		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Aroclor 1260		0.0087	mg/L	1	U	U	1	U	U	1	U	U	1	U	U
Total Metals (Method Listed by Each Metal)		PRG													
Aluminum	EPA 6010	37	mg/L	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Antimony	EPA 7041	0.015	mg/L	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Arsenic	EPA 7060	0.00045	mg/L	0.0054		U	0.0052		U	0.002	U	U	0.0025		U
Barium	EPA 6010	2.6	mg/L	0.039			0.035			0.11			0.1		
Beryllium	EPA 6010	0.00016	mg/L	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U
Cadmium	EPA 7131	0.018	mg/L	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U
Calcium	EPA 6010	-	mg/L	51			46			75			72		
Chromium	EPA 7191		mg/L	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Cobalt	EPA 6010		mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Copper	EPA 6010	1.4	mg/L	0.02	U	U	0.02	U	U	0.02	U	U	0.02	U	U
Iron	EPA 6010		mg/L	0.1			0.12			0.14			0.11		
Lead	EPA 7421	0.004	mg/L	0.002	U	U	0.002	U	U	0.002	U	U	0.002	U	U
Magnesium	EPA 6010		mg/L	13			71			58			55		
Manganese	EPA 6010	0.18	mg/L	0.016			0.01	U	U	0.015			0.015		
Mercury	EPA 7470	0.011	mg/L	0.0002	U	U	0.0002	U	U	0.0002	U	U	0.0002	U	U
Molybdenum	EPA 6010	0.18	mg/L	0.097			0.02	U	U	0.02	U	U	0.02	U	U
Nickel	EPA 6010	0.73	mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Potassium	EPA 6010	-	mg/L	5.8			18			5			4.7		
Selenium	EPA 7740	0.18	mg/L	0.004	U	U	0.004	U	U	0.004	U	U	0.004	U	U
Silver	EPA 6010	0.18	mg/L	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Sodium	EPA 6010	-	mg/L	23			140			68			65		
Thallium	EPA 7841	0.0029	mg/L	0.003	U	U	0.003	U	U	0.003	U	U	0.003	U	U
Vanadium	EPA 6010	0.0026	mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Zinc	EPA 6010	11	mg/L	0.01	U	U	0.01	U	U	0.013			0.011		
Chromium(VI)	EPA 7196	0.00016	mg/L	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U

Table E-8
Results from Area of Concern (Objective) 8 - Groundwater Investigation.

Analyte		Sample ID Location Number		0801AQ01 MW-1	Lab Q.	Valid Q	0802AQ01 MW-2	Lab Q.	Valid Q	0803AQ01 MW-3	Lab Q.	Valid Q	0803AQ02 MW-3 Duplicate	Lab Q.	Valid Q
		PRG (mg/L) (Residential)	Units												
Dissolved Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	37	mg/L	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Antimony	EPA 7041	0.015	mg/L	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Arsenic	EPA 7060	0.00045	mg/L	0.002	U	U	0.0064		U	0.002	U	U	0.002	U	U
Barium	EPA 6010	2.6	mg/L	0.042			0.034			0.1			0.11		
Beryllium	EPA 6010	0.00016	mg/L	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U
Cadmium	EPA 7131	0.018	mg/L	0.001	U	U	0.001	U	U	0.001	U	U	0.001	U	U
Calcium	EPA 6010		mg/L	53			44			73			75		
Chromium	EPA 7191	-	mg/L	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Cobalt	EPA 6010	-	mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Copper	EPA 6010	1.4	mg/L	0.02	U	U	0.02	U	U	0.02	U	U	0.02	U	U
Iron	EPA 6010		mg/L	0.069			0.1			0.11			0.11		
Lead	EPA 7421	0.004	mg/L	0.002	U	U	0.002	U	U	0.002	U	U	0.002	U	U
Magnesium	EPA 6010		mg/L	14			68			56			58		
Manganese	EPA 6010	0.18	mg/L	0.017			0.01	U	U	0.014			0.015		
Mercury	EPA 7470	0.011	mg/L	0.0002	U	U	0.0002	U	U	0.0002	U	U	0.0002	U	U
Molybdenum	EPA 6010	0.18	mg/L	0.1			0.02	U	U	0.02	U	U	0.02	U	U
Nickel	EPA 6010	0.73	mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Potassium	EPA 6010		mg/L	6.2			17			4.6			5		
Selenium	EPA 7740	0.18	mg/L	0.004	U	U	0.004	U	U	0.004	U	U	0.004	U	U
Silver	EPA 6010	0.18	mg/L	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Sodium	EPA 6010	-	mg/L	25			130			65			69		
Thallium	EPA 7841	0.0029	mg/L	0.003	U	U	0.003	U	U	0.003	U	U	0.003	U	U
Vanadium	EPA 6010	0.0026	mg/L	0.04	U	U	0.04	U	U	0.04	U	U	0.04	U	U
Zinc	EPA 6010	11	mg/L	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Chromium(VI)	EPA 7196	0.00016	mg/L	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U

NR= Not reported
N/A= Not Analyzed

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID		A2-1			A2-2			A2-3			B1-1			B1-2			B1-3			B2-1		
	Location Number		A2			A2			A2			B1			B1			B1			B2		
	Replicate Number		1			2			3			1			2			3			1		
	Depth		0 - 0.5	Lab Q	Valid Q	0 - 0.5	Lab Q	Valid Q	0 - 0.5	Lab Q	Valid Q	0 - 0.5	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q
	PRG (mg/kg) (Residential)	Units																					
Volatile Organic Compounds (EPA 8260)																							
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	R	0.04	U	R	0.04	U	R	0.04	U	R	0.04	U	R	0.04	U	R	0.04	U	R
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	R	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	U	0.03	U	R	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID Location Number Replicate Number Depth		A2-1 A2 i 0 - 0.5	Lab Q	Valid Q	A2-2 A2 2 0 - 0.5	Lab Q	Valid Q	A2-3 A2 3 0 - 0.5	Lab Q	Valid Q	B1-1 B1 i 0 - 0.5	Lab Q	Valid Q	B1-2 B1 2 0 - 0.25	Lab Q	Valid Q	B1-3 B1 3 0 - 0.25	Lab Q	Valid Q	B2-1 B2 i 0 - 0.25	Lab Q	Valid Q
	PRG (mg/kg) (Residential)	Units																				
Semivolatile Organic Compounds (EPA 8270)																						
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	UJ
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte		Sample ID Location Number Replicate Number Depth		A2-1 A2 1 0 - 0.5	Lab Q	Valid Q	A2-2 A2 2 0 - 0.5	Lab Q	Valid Q	A2-3 A2 3 0 - 0.5	Lab Q	Valid Q	B1-1 B1 1 0 - 0.5	Lab Q	Valid Q	B1-2 B1 2 0 - 0.25	Lab Q	Valid Q	B1-3 B1 3 0 - 0.25	Lab Q	Valid Q	B2-1 B2 1 0 - 0.25	Lab Q	Valid Q
		PRG (mg/kg) (Residential)	Units																					
Polychlorinated Biphenyl - PCB (EPA 8080)																								
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.03	U	U	3	U	U	0.2	U	U	0.03	U	U	0.03	U	U
Semivolatile Organic Compounds (EPA 8270 SIM)																								
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																								
Aluminum	EPA 6010	77000	mg/kg	17000		J	12000		J	12000		J	10000		J	10000		J	15000		J	16000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	11			13			10			8.6			7.8			11			9.5		
Barium	EPA 6010	5300	mg/kg	150			140			120			120			120			180			140		
Beryllium	EPA 6010	0.14	mg/kg	0.58			0.53			0.47			0.38			0.36			0.55			0.52		
Cadmium	EPA 7131	9	mg/kg	0.13		U	0.13		U	0.16		U	0.19		U	0.1	U	U	0.11		U	0.1	U	U
Calcium	EPA 6010	---	mg/kg	11000		J	12000		J	11000		J	14000		J	10000		J	9800		J	10000		J
Chromium	EPA 6010	210	mg/kg	27			23			24			15			15			24			23		
Cobalt	EPA 6010	4600	mg/kg	12			9.5			9.2			7.3			7.4			12			11		
Copper	EPA 6010	2800	mg/kg	38			33			33			27			25			36			32		
Iron	EPA 6010	---	mg/kg	26000		J	20000		J	20000		J	18000		J	17000		J	25000		J	24000		J
Lead	EPA 6010	130	mg/kg	19			21			21			18			15			19			15		
Lithium	EPA 7430	1500	mg/kg	11		J	5.4		J	8.1		J	7.4		J	7.1		J	12		J	11		J
Magnesium	EPA 6010	—	mg/kg	6800			5000			5000			4300			4400			7600			7100		
Manganese	EPA 6010	3200	mg/kg	570		J	560		J	410		J	610		J	520		J	540		J	510		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	24			20			21			14			14			23			21		
Potassium	EPA 6010	---	mg/kg	2600		J	2200		J	2300		J	1600		J	1600		J	2600		J	2500		J
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U
Sodium	EPA 6010	---	mg/kg	250			180			140			120			130			230			240		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ
Vanadium	EPA 6010	540	mg/kg	43			35			33			29			27			45			41		
Zinc	EPA 6010	23000	mg/kg	66		J	66			87		J	42		J	39		J	54		J	51		J
Chromium(VI)	EPA 7199	0.2	mg/kg	NR			NR			NR			NR			NR			NR			NR		
Total Organic Carbon (EPA 410.1M)																								
TOC				13000		J	14000		J	19000		J	12000		J	7500		J	94000		J	6400		J
Sulfides (EPA 376.2)																								
Sulfide				0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Moisture Content (ASTM D2216)																								
Moisture (percent)				45			47			47			57			51			43			41		

NR= Not reported
N/A= Not Analyzed

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID Location Number Replicate Number Depth		B2-2 B2 2 0 - 0.25	Lab Q	Valid Q	B2-3 B2 3 0 - 0.25	Lab Q	Valid Q	B3-1 B3 1 0 - 0.25	Lab Q	Valid Q	B3-2 B3 2 0 - 0.25	Lab Q	Valid Q	B3-3 B3 3 0 - 0.25	Lab Q	Valid Q	C2-1 C2 1 0 - 0.25	Lab Q	Valid Q	C2-2 C2 2 0 - 0.25	Lab Q	Valid Q
	PRG (mg/kg) (Residential)	Units																					
Volatile Organic Compounds (EPA 8260)																							
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	---	mg/kg	0.04	U	R	0.04	U	R	0.04	U	U	0.04	U	UJ	0.04	U	R	0.04	U	R	0.04	U	R
2-Hexanone	---	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Bromomethane	6.8	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	---	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	U	0.03	U	R	0.03	U	R	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	U	0.03	U	R	0.03	U	R	0.03	U	R
Methylene chloride	7.8	mg/kg	0.005	U	U	0.005	U	U	0.0079		J	0.005	U	U	0.005	U	U	0.005	U	UJ	0.0073		J
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID / Location Number / Replicate Number / Depth	PRG (mg/kg) (Residential)	Units	B2-2 B2 2 0 - 0.25	Lab Q	Valid Q	B2-3 B2 3 0 - 0.25	Lab Q	Valid Q	B3-1 B3 1 0 - 0.25	Lab Q	Valid Q	B3-2 B3 2 0 - 0.25	Lab Q	Valid Q	B3-3 B3 3 0 - 0.25	Lab Q	Valid Q	C2-1 C2 i 0 - 0.25	Lab Q	Valid Q	C2-2 C2 2 0 - 0.25	Lab Q	Valid Q
Semivolatile Organic Compounds (EPA 8270)																								
1,2,4-Trichlorobenzene		570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene		130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
2-Chlorophenol		91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		—	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		—	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		—	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte		Sample ID		B2-2			B2-3			B3-1			B3-2			B3-3			C2-1			C2-2		
		Location Number		B2			B2			B3			B3			B3			C2			C2		
		Replicate Number		2			3			i			2			3			i			2		
		Depth		0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q	0 - 0.25	Lab Q	Valid Q
		PRG (mg/kg) (Residential)	Units																					
Polychlorinated Biphenyl - PCB (EPA 8080)																								
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U
Semivolatile Organic Compounds (EPA 8270 SIM)																								
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																								
Aluminum	EPA 6010	77000	mg/kg	17000		J	16000		J	12000		J	10000		J	8700		J	13000		J	16000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	7.9			10			12			9.2			9.2			7.8			8.5		
Barium	EPA 6010	5300	mg/kg	140			140			190			150			130			140			150		
Beryllium	EPA 6010	0.14	mg/kg	0.53			0.51			0.48			0.43			0.34			0.55			0.55		
Cadmium	EPA 7131	9	mg/kg	0.12		U	0.12		U	0.11		U	0.1	U	U	0.14		U	0.1	U	U	0.1	U	U
Calcium	EPA 6010	—	mg/kg	10000		J	9900		J	11000		J	15000		J	12000		J	9600		J	11000		J
Chromium	EPA 6010	210	mg/kg	24			23			19			16			13			22			25		
Cobalt	EPA 6010	4600	mg/kg	11			11			9.8			7.9			6.5			11			12		
Copper	EPA 6010	2800	mg/kg	33			34			33			29			25			35			36		
Iron	EPA 6010	---	mg/kg	25000		J	24000		J	22000		J	18000		J	15000		J	23000		J	26000		J
Lead	EPA 6010	130	mg/kg	14			16			20			19			18			17			16		
Lithium	EPA 7430	1500	mg/kg	13		J	12		J	8.9		J	8		J	6.7		J	10		J	12		J
Magnesium	EPA 6010	—	mg/kg	7500			6900			5500			4600			3700			6600			7400		
Manganese	EPA 6010	3200	mg/kg	510		J	530		J	710		J	630		J	540		J	550		J	620		J
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	23			21			18			15			13			21			22		
Potassium	EPA 6010	---	mg/kg	2700		J	2400		J	2200		J	1700		J	1400		J	2300		J	2400		J
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	i	U	U	i	U	U	i	U	U	10	U	U	i	U	U
Sodium	EPA 6010	—	mg/kg	220			220			140			130			97			190			220		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ
Vanadium	EPA 6010	540	mg/kg	42			40			38			31			26			37			41		
Zinc	EPA 6010	23000	mg/kg	54		J	51		J	51		J	42		J	36		J	50		J	54		J
Chromium(VI)	EPA 7199	0.2	mg/kg	NR			NR			NR			NR			NR			NR			NR		
Total Organic Carbon (EPA 410.1M)																								
TOC				7900		J	9900		J	15000		J	31000		J	14000		J	8000		J	9600		J
Sulfides (EPA 376.2)																								
Sulfide				0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Moisture Content (ASTM D2216)																								
Moisture (percent)				40			40			51			61			61			43			43		

NR= Not reported
N/A= Not Analyzed

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID Location Number Replicate Number Depth		C2-3 C2 3 0 - 0.25			C3-1 C3 i 0 - 0.25			C3-2 C3 2 0 - 0.25			C3-3 C3 3 0 - 0.25			BKG-1 Background 1 0 - 0.25			BKG-2 Background 2 0 - 0.25			BKG-3 Background 3 0 - 0.25		
	PRG (mg/kg) (Residential)	Units		Lab Q.	Valid. Q		Lab Q	Valid Q		Lab Q	Valid. Q		Lab Q	Valid. Q		Lab Q	Valid. Q		Lab Q	Valid. Q		Lab Q	Valid. Q
Volatile Organic Compounds (EPA 8260)																							
1,1,1-Trichloroethane	1200	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2,2-Tetrachloroethane	0.45	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
1,1,2-Trichloroethane	0.65	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethane	500	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,1-Dichloroethene	0.037	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichlorobenzene	700	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloroethane	0.25	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
1,2-Dichloropropane	0.31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,3-Dichlorobenzene	500	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
1,4-Dioxane	40	mg/kg	4	U	UJ	4	U	UJ	4	U	UJ	4	U	R	4	U	UJ	4	U	UJ	4	U	UJ
2-Chloroethylvinylether	—	mg/kg	0.04	U	R	0.04	U	U	0.04	U	R	0.04	U	U	0.04	U	R	0.04	U	R	0.04	U	R
2-Hexanone	—	mg/kg	0.05	U	UJ	0.05	U	UJ	0.05	U	U	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
Acetone	2100	mg/kg	0.2		J	0.14		J	0.1	U	R	0.1	U	R	0.1	U	U	0.1	U	U	0.1	U	R
Acrolein	0.1	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Acrylonitrile	0.19	mg/kg	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R	0.5	U	R
Benzene	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromodichloromethane	0.63	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Bromoform	56	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
Bromomethane	6.8	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	UJ	0.005	U	UJ	0.005	U	UJ
Carbon Disulfide	7.5	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Carbon Tetrachloride	0.23	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chlorobenzene	65	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroethane	—	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloroform	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Chloromethane	1.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,2-Dichloroethene	31	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
cis-1,3-Dichloropropene	0.25	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Dibromochloromethane	5.3	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Ethylbenzene	230	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Freon 113 (Trichlorotrifluoroethane)	5600	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
Methyl ethyl ketone	7100	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methyl isobutyl ketone	770	mg/kg	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R	0.03	U	R
Methylene chloride	7.8	mg/kg	0.0071		J	0.0058		J	0.0057			0.0065		J	0.005	U	U	0.005	U	U	0.005	U	U
Styrene	680	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Tetrachloroethene	5.4	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Toluene	790	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Total Xylene Isomers	320	mg/kg	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U	0.01	U	U
trans-1,2-Dichloroethene	78	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
trans-1,3-Dichloropropene	0.25	mg/kg	0.005	U	UJ	0.005	U	UJ	0.005	U	U	0.005	U	UJ	0.005	U	U	0.005	U	U	0.005	U	U
Trichloroethene	3.2	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Trichlorofluoromethane	380	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U
Vinyl acetate	780	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	R	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Vinyl chloride	0.016	mg/kg	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U	0.005	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte	Sample ID / Location Number / Replicate Number / Depth	PRG (mg/kg) (Residential)	Units	C2-3 C2 3 0 - 0.25	Lab Q	Valid Q	C3-1 C3 1 0 - 0.25	Lab Q	Valid Q	C3-2 C3 2 0 - 0.25	Lab Q	Valid Q	C3-3 C3 3 0 - 0.25	Lab Q	Valid Q	BKG-1 Background 1 0 - 0.25	Lab Q	Valid Q	BKG-2 Background 2 0 - 0.25	Lab Q	Valid Q	BKG-3 Background 3 0 - 0.25	Lab Q	Valid Q
Semivolatile Organic Compounds (EPA 8270)																									
1,2,4-Trichlorobenzene		570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene		700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene		500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene		3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol		40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol		200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol		130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
2,4-Dinitrotoluene		130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene		65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene		110	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	U	0.2	U	UJ	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol		91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	UJ	0.4	U	U	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
2-Nitrophenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine		0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol		---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Acenaphthene		110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene		6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether		0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether		2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate		32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate		930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene		7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate		1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene		0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate		6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate		52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate		100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene		2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene		90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene		0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene		5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane		32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene		0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Isophorone		470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene		240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene		18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol		2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene		---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol		39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene		100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-9
Results from Area of Concern (Objective) 9 - Slurry Outfall Pipe Sediment Sampling.

Analyte		Sample ID Location Number Replicate Number Depth		C2-3 C2 3 0 - 0.25	Lab Q	Valid. Q	C3-1 C3 i 0 - 0.25	Lab Q	Valid. Q	C3-2 C3 2 0 - 0.25	Lab Q	Valid Q	C3-3 C3 3 0 - 0.25	Lab Q	Valid Q	BKG-1 Background i 0 - 0.25	Lab Q	Valid Q	BKG-2 Background 2 0 - 0.25	Lab Q	Valid Q	BKG-3 Background 3 0 - 0.25	Lab Q	Valid Q
		PRG (mg/kg) (Residential)	Units																					
Polychlorinated Biphenyl - PCB (EPA 8080)																								
Aroclor 1016		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1221		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1232		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1242		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1248		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1254		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Aroclor 1260		0.066	mg/kg	0.03	U	U	0.03	U	U	0.06	U	U	0.06	U	U	0.03	U	U	0.03	U	U	0.03	U	U
Semivolatile Organic Compounds (EPA 8270 SIM)																								
Benzo(a)pyrene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	N/A			N/A			N/A			N/A			N/A			N/A			N/A		
Metals (Method Listed by Each Metal)																								
Aluminum	EPA 6010	77000	mg/kg	15000		J	16000		J	13000		J	13000		J	14000		J	13000		J	14000		J
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	10			7.9			11			11			8.4			11			9.6		
Barium	EPA 6010	5300	mg/kg	160			180			200			130			160			150			130		
Beryllium	EPA 6010	0.14	mg/kg	0.58			0.53			0.51			0.46			0.44			0.41			0.39		
Cadmium	EPA 7131	9	mg/kg	0.1	U	U	0.12		U	0.1	U	U	0.13		U	0.14		U	0.12		U	0.11		U
Calcium	EPA 6010	—	mg/kg	11000		J	12000		J	14000		J	8300		J	12000		J	10000		J	8700		
Chromium	EPA 6010	210	mg/kg	24			22			20			19			17			16			18		
Cobalt	EPA 6010	4600	mg/kg	11			11			9.7			8.8			12			11			12		
Copper	EPA 6010	2800	mg/kg	33			36			37			30			40			35			36		
Iron	EPA 6010	—	mg/kg	25000		J	24000		J	21000		J	19000		J	24000		J	23000		J	24000		J
Lead	EPA 6010	130	mg/kg	18			21			25			14			14			13			14		
Lithium	EPA 7430	1500	mg/kg	12		J	12		J	11		J	8.7		J	10		J	9.9		J	9.3		J
Magnesium	EPA 6010	—	mg/kg	6900			6900			5800			5500			7600			6900			7600		
Manganese	EPA 6010	3200	mg/kg	610		J	650		J	700		J	530		J	330		J	320		J	350		
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	22			21			18			18			19			17			28		
Potassium	EPA 6010	—	mg/kg	2500		J	2400		J	2300		J	2100		J	3500		J	3200		J	3400		
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Silver	EPA 6010	380	mg/kg	i	U	U	1	U	J	i	U	U	i	U	U	i	U	U	1	U	U	i	U	U
Sodium	EPA 6010	—	mg/kg	240			190			180			210			210			190			210		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	UJ	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	41			42			40			34			50			48			47		
Zinc	EPA 6010	23000	mg/kg	53		J	55		J	54		J	43		J	57		J	51		J	55		
Chromium(VI)	EPA 7199	0.2	mg/kg	NR			NR			NR			NR			NR			NR			NR		
Total Organic Carbon (EPA 410.1M)																								
TOC				7800		J	13000		J	12000		J	7800		J	15000		J	12000		J	11000		J
Sulfides (EPA 376.2)																								
Sulfide				0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U
Moisture Content (ASTM D2216)																								
Moisture (percent)				41			47			54			45			37			42			39		

NR= Not reported
N/A= Not Analyzed

Table E-10
Results from Area of Concern (Objective) 10 - Electronic Test Area Sampling.

Analyte			Sample ID Boring ID Location Number Area Number Depth		1001AS001 10A10B1 10 1 1	Lab Qual	Valid Qual	1001AS001 10A10B1 10 i 1 Dup	Lab Qual	Valid Qual	1001BS001 10A10B2 10 2 i	Lab Qual	Valid Qual	1001CS001 10A10B3 10 3 1	Lab Qual	Valid Qual
			PRG (mg/kg) (Residential)	Units												
Petroleum Hydrocarbons (EPA 8015M)																
TPH (Diesel Range)			—	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
TPH (Gasoline Range)			—	mg/kg	N/R			N/R			N/R			N/R		
OTTO Fuel			—	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U
Metals (Method Listed by Each Metal)																
Aluminum	EPA	6010	77000	mg/kg	N/A			N/A			N/A			N/A		
Antimony	EPA	6010	31	mg/kg	N/A			N/A			N/A			N/A		
Arsenic	EPA	6010	0.38	mg/kg	N/A			N/A			N/A			N/A		
Barium	EPA	6010	5300	mg/kg	N/A			N/A			N/A			N/A		
Beryllium	EPA	6010	0.14	mg/kg	N/A			N/A			N/A			N/A		
Calcium	EPA	6010	—	mg/kg	N/A			N/A			N/A			N/A		
Chromium	EPA	6010	210	mg/kg	N/A			N/A			N/A			N/A		
Cobalt	EPA	6010	4600	mg/kg	N/A			N/A			N/A			N/A		
Copper	EPA	6010	2800	mg/kg	N/A			N/A			N/A			N/A		
Iron	EPA	6010	—	mg/kg	N/A			N/A			N/A			N/A		
Lead	EPA	6010	130	mg/kg	N/A			N/A			N/A			N/A		
Magnesium	EPA	6010	—	mg/kg	N/A			N/A			N/A			N/A		
Manganese	EPA	6010	3200	mg/kg	N/A			N/A			N/A			N/A		
Molybdenum	EPA	6010	380	mg/kg	N/A			N/A			N/A			N/A		
Nickel	EPA	6010	150	mg/kg	N/A			N/A			N/A			N/A		
Potassium	EPA	6010	—	mg/kg	N/A			N/A			N/A			N/A		
Silver	EPA	6010	380	mg/kg	N/A			N/A			N/A			N/A		
Sodium	EPA	6010	—	mg/kg	N/A			N/A			N/A			N/A		
Vanadium	EPA	6010	540	mg/kg	N/A			N/A			N/A			N/A		
Zinc	EPA	6010	23000	mg/kg	N/A			N/A			N/A			N/A		
Cadmium	EPA	7131	9	mg/kg	N/A			N/A			N/A			N/A		
Mercury	EPA	7471	6.5	mg/kg	N/A			N/A			N/A			N/A		
Selenium	EPA	7740	380	mg/kg	N/A			N/A			N/A			N/A		
Thallium	EPA	7841	5.4	mg/kg	N/A			N/A			N/A			N/A		
Lithium	EPA	7430	1500	mg/kg	5	U	U	5	U	U	17			5	U	U
Chromium(VI)	EPA	7199	0.2	mg/kg	0.083		J	0.11		J	0.33		J	0.67		J
Explosives (EPA 8330)																
1,3-DNB			—	mg/kg	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
2,4-DNT			—	mg/kg	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
2,6-DNT			—	mg/kg	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
HMX			—	mg/kg	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ
NB			—	mg/kg	0.6	U	UJ	0.6	U	UJ	0.6	U	UJ	0.6	U	UJ
2-NT			—	mg/kg	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ
3-NT			—	mg/kg	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ
4-NT			—	mg/kg	1.1	U	UJ	1.1	U	UJ	1.1	U	UJ	1.1	U	UJ
RDX			—	mg/kg	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
Tetryl			—	mg/kg	1.9	U	UJ	1.9	U	UJ	1.9	U	UJ	1.9	U	UJ
1,3,5-TNB			—	mg/kg	0.7	U	UJ	0.7	U	UJ	0.7	U	UJ	0.7	U	UJ
2,4,6-TNT			—	mg/kg	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
2-Am-DNT			—	mg/kg	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ	0.9	U	UJ
4-Am-DNT			—	mg/kg	1.1	U	UJ	1.1	U	UJ	1.1	U	UJ	1.1	U	UJ

NR= Not reported
N/A= Not Analyzed

Table E-11
Results from Area of Concern (Objective) 11 - Propellant Magazine, Building 42026.

Analyte	PRG (mg/kg) (Residential)	Units	1101SO01 11A1B1 i i 0 - 0.5'	Lab Qual	Valid Qual.	1101SO03 11A1B1 1 1 0 - 0.5' Duplicate	Lab Qual	Valid Qual	1101SO02 11A1B2 i 2 0 - 0.5'	Lab Qual	Valid Qual	1102SO01 11A1B3 1 3 0 - 0.5'	Lab Qual	Valid Qual.
Semivolatile Organic Compounds (EPA 8270)														
1,2,4-Trichlorobenzene	570	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,2-Dichlorobenzene	700	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,3-Dichlorobenzene	500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
1,4-Dichlorobenzene	3.6	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4,6-Trichlorophenol	40	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dichlorophenol	200	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dimethylphenol	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,4-Dinitrophenol	130	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2,4-Dinitrotoluene	130	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2,6-Dinitrotoluene	65	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chloronaphthalene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Chlorophenol	91	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
2-Methyl-4,6-dinitrophenol	---	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
2-Nitrophenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
3,3'-Dichlorobenzidine	0.99	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
4-Bromophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chloro-3-methylphenol	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Chlorophenylphenylether	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
4-Nitrophenol	---	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
Acenaphthene	110	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Acenaphthylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Anthracene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)anthracene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(a)pyrene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(b)fluoranthene	0.61	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(g,h,i)perylene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Benzo(k)fluoranthene	6.1	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethoxy)methane	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroethyl)ether	0.043	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-chloroisopropyl)ether	2.5	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Bis(2-ethylhexyl)phthalate	32	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Butylbenzylphthalate	930	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Chrysene	7.2	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Di-n-octylphthalate	1300	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibenzo(a,h)anthracene	0.061	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dibutylphthalate	6500	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Diethylphthalate	52000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Dimethylphthalate	100000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluoranthene	2600	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Fluorene	90	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobenzene	0.28	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachlorobutadiene	5.7	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Hexachloroethane	32	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Indeno(1,2,3-c,d)pyrene	0.61	mg/kg	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ	0.2	U	UJ
Isophorone	470	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
N-Nitrosodi-n-propylamine	0.063	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Naphthalene	240	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Nitrobenzene	18	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pentachlorophenol	2.5	mg/kg	0.4	U	U	0.4	U	U	0.4	U	U	0.4	U	U
Phenanthrene	---	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Phenol	39000	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U
Pyrene	100	mg/kg	0.2	U	U	0.2	U	U	0.2	U	U	0.2	U	U

Table E-11
Results from Area of Concern (Objective) 11 - Propellant Magazine, Building 42026.

Analyte		Sample ID Boring ID Area Number Boring Number Depth		1101SO01 11A1B1 1 1 0 - 0.5'	Lab Qual.	Valid. Qual.	1101SO03 11A1B1 1 i 0 - 0.5' Duplicate	Lab Qual.	Valid. Qual.	1101SO02 11A1B2 i 2 0 - 0.5'	Lab Qual.	Valid. Qual.	1102SO01 11A1B3 i 3 0 - 0.5'	Lab Qual.	Valid. Qual.
		PRG (mg/kg) (Residential)	Units												
Semivolatile Organic Compounds (EPA 8270 SIM)															
Benzo(a)pyrene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Bis(2-chloroethyl)ether		0.043	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Dibenzo(a,h)anthracene		0.061	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
N-Nitrosodi-n-propylamine		0.063	mg/kg	0.04	U	UJ	N/A			N/A			N/A		
Total Petroleum Hydrocarbons (EPA 418.1)															
TRPH		---	mg/kg	N/A			N/A			N/A			N/A		
Petroleum Hydrocarbons (EPA 8015M)															
TPH (Diesel Range)		---	mg/kg	N/A			N/A			N/A			N/A		
TPH (Gasoline Range)		---	mg/kg	N/A			N/A			N/A			N/A		
OTTO Fuel		---	mg/kg	20	U	U	20	U	U	20	U	U	20	U	U
Metals (Method Listed by Each Metal)															
Aluminum	EPA 6010	77000	mg/kg	N/A			N/A			N/A			N/A		
Antimony	EPA 6010	31	mg/kg	N/A			N/A			N/A			N/A		
Arsenic	EPA 6010	0.38	mg/kg	N/A			N/A			N/A			N/A		
Barium	EPA 6010	5300	mg/kg	N/A			N/A			N/A			N/A		
Beryllium	EPA 6010	0.14	mg/kg	N/A			N/A			N/A			N/A		
Calcium	EPA 6010	---	mg/kg	N/A			N/A			N/A			N/A		
Chromium	EPA 6010	210	mg/kg	N/A			N/A			N/A			N/A		
Cobalt	EPA 6010	4600	mg/kg	N/A			N/A			N/A			N/A		
Copper	EPA 6010	2800	mg/kg	N/A			N/A			N/A			N/A		
Iron	EPA 6010	---	mg/kg	N/A			N/A			N/A			N/A		
Lead	EPA 6010	130	mg/kg	N/A			N/A			N/A			N/A		
Magnesium	EPA 6010	---	mg/kg	N/A			N/A			N/A			N/A		
Manganese	EPA 6010	3200	mg/kg	N/A			N/A			N/A			N/A		
Molybdenum	EPA 6010	380	mg/kg	N/A			N/A			N/A			N/A		
Nickel	EPA 6010	150	mg/kg	N/A			N/A			N/A			N/A		
Potassium	EPA 6010	---	mg/kg	N/A			N/A			N/A			N/A		
Silver	EPA 6010	380	mg/kg	N/A			N/A			N/A			N/A		
Sodium	EPA 6010	---	mg/kg	N/A			N/A			N/A			N/A		
Vanadium	EPA 6010	540	mg/kg	N/A			N/A			N/A			N/A		
Zinc	EPA 6010	23000	mg/kg	N/A			N/A			N/A			N/A		
Cadmium	EPA 7131	9	mg/kg	N/A			N/A			N/A			N/A		
Mercury	EPA 7471	6.5	mg/kg	N/A			N/A			N/A			N/A		
Selenium	EPA 7740	380	mg/kg	N/A			N/A			N/A			N/A		
Thallium	EPA 7841	5.4	mg/kg	N/A			N/A			N/A			N/A		
Lithium	EPA 7430	1500	mg/kg	17		J	15		J	16		J	12		J
Chromium(VI)	EPA 7199	0.2	mg/kg	N/A			N/A			N/A			N/A		

NR= Not reported
N/A= Not Analyzed

Table E-12
Results from Area of Interest (Objective) 12 - Background Samples.

Analyte		Sample ID / Boring ID / Area Number / Boring Number / Depth		1201SO01 12A1B1 1 1 0 - 0.5	Lab Qual.	Valid. Qual.	1201SO02 12A1B2 i 2 0 - 0.5	Lab Qual.	Valid. Qual.	1201SO03 12A1B3 1 3 0 - 0.5	Lab Qual.	Valid. Qual.	1201SO04 12A1B4 1 4 0 - 0.5	Lab Qual.	Valid. Qual.	1201SO05 12A1B5 i 5 0 - 0.5	Lab Qual.	Valid. Qual.
		PRG (mg/kg) (Residential)	Units															
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	12000			13000			12000			9300			10000		
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	7.4			9			11			12			25		
Barium	EPA 6010	5300	mg/kg	140			150			140			150			140		
Beryllium	EPA 6010	0.14	mg/kg	0.85			0.87			0.82			0.82			0.81		
Cadmium	EPA 7131	9	mg/kg	0.19			0.1	U	U	0.15		U	0.1	U	U	0.16		
Calcium	EPA 6010	—	mg/kg	3500			3500			2600			2300			6000		
Chromium	EPA 6010	210	mg/kg	18			19			18			13			16		
Cobalt	EPA 6010	4600	mg/kg	13			13			12			11			11		
Copper	EPA 6010	2800	mg/kg	26			27			27			19			31		
Iron	EPA 6010	—	mg/kg	25000		J	63000		J	42000		J	37000		J	35000		J
Lead	EPA 6010	130	mg/kg	8.4			13			14			14			32		
Lithium	EPA 7430	1500	mg/kg	8.6			11			9.9			5	U	U	9.3		
Magnesium	EPA 6010	—	mg/kg	6300			7200			6100			4800			6400		
Manganese	EPA 6010	3200	mg/kg	590			540			540			490			500		
Mercury	EPA 7471	6.5	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	18			18			20			13			15		
Potassium	EPA 6010	—	mg/kg	2800			2500			2900			2300			1900		
Selenium	EPA 7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ
Silver	EPA 6010	380	mg/kg	1	U	U	1	U	U	1	U	U	1	U	U	1	U	U
Sodium	EPA 6010	—	mg/kg	290		J	290		J	260		J	220		J	220		J
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	42			46			44			38			36		
Zinc	EPA 6010	23000	mg/kg	63		J	66		J	73		J	58		J	76		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.15		J	0.12		J	0.21		J	0.14		J	0.21		J

NR= Not reported
N/A= Not Analyzed

Table E-12
Results from Area of Interest (Objective) 12 - Background Samples.

Analyte		Sample ID		1202SO01			1202SO02			1202SO03			1202SO04			1202SO05		
		Boring ID		12A2B1			12A2B2			12A2B3			12A2B4			12A2B5		
		Area Number		2			2			2			2			2		
		Boring Number		i			2			3			4			5		
		Depth		0 - 0.5	Lab Qual	Valid Qual	0 - 0.5	Lab Qual	Valid Qual	0 - 0.5	Lab Qual	Valid Qual	0 - 0.5	Lab Qual	Valid Qual	0 - 0.5	Lab Qual	Valid Qual
		PRG (mg/kg) (Residential)	Units															
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	4900			8000			5400			16000			13000		
Antimony	EPA 6010	31	mg/kg	10	U	U	10	U	U	10	U	U	10	U	U	10	U	U
Arsenic	EPA 6010	0.38	mg/kg	5.9			11			1.4			9.2			7.2		
Barium	EPA 6010	5300	mg/kg	79			130			84			160			190		
Beryllium	EPA 6010	0.14	mg/kg	0.48			0.59			0.39			1.1			0.95		
Cadmium	EPA 7131	9	mg/kg	0.41			0.24			0.1	U	U	0.1	U	U	0.1	U	U
Calcium	EPA 6010	—	mg/kg	1000			1200			470			1000			1100		
Chromium	EPA 6010	210	mg/kg	8.9			26			13			42			32		
Cobalt	EPA 6010	4600	mg/kg	21			8.7			8.5			10			13		
Copper	EPA 6010	2800	mg/kg	16			29			11			31			27		
Iron	EPA 6010	—	mg/kg	14000		J	23000		J	13000		J	40000		J	32000		J
Lead	EPA 6010	130	mg/kg	4.1			21			5.6			11			12		
Lithium	EPA 7430	1500	mg/kg	5	U	U	5	U	U	5	U	U	6.6			6.9		
Magnesium	EPA 6010	—	mg/kg	1500			2900			2100			5800			4900		
Manganese	EPA 6010	3200	mg/kg	120			200			220			310			400		
Mercury	EPA 7471	6.5	mg/kg	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	2	U	U	2	U	U
Nickel	EPA 6010	150	mg/kg	11			21			9.8			35			29		
Potassium	EPA 6010	—	mg/kg	900			1700			1800			5000			4300		
Selenium	EPA 7740	380	mg/kg	0.4	U	UJ	0.4	U	UJ	0.4	U	UJ	33		J	29		J
Silver	EPA 6010	380	mg/kg	1	U	U	i	U	U	i	U	U	1	U	U	i	U	U
Sodium	EPA 6010	—	mg/kg	190		J	230		J	160		J	730		J	640		J
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	19			29			23			81			67		
Zinc	EPA 6010	23000	mg/kg	24		J	44		J	23		J	52		J	46		J
Chromium(VI)	EPA 7199	0.2	mg/kg	0.26		J	0.94		J	0.52		J	0.46		J	0.63		J

NR= Not reported
N/A= Not Analyzed

Table E-12
Results from Area of Interest (Objective) 12 - Background Samples.

Analyte		Sample ID Boring ID Area Number Boring Number Depth		1203SO01 12A3B1 3 i 0 - 0.5	Lab Qual.	Valid Qual.	1203SO02 12A3B2 3 2 0 - 0.5	Lab Qual.	Valid Qual.	1203SO03 12A3B3 3 3 0 - 0.5	Lab Qual	Valid Qual	1203SO04 12A3B4 3 4 0 - 0.5	Lab Qual	Valid Qual	1203SO05 12A3B5 3 5 0 - 0.5	Lab Qual.	Valid Qual.
		PRG (mg/kg) (Residential)	Units															
Metals (Method Listed by Each Metal)																		
Aluminum	EPA 6010	77000	mg/kg	17000		J	18000		J	23000		J	18000		J	19000		J
Antimony	EPA 6010	31	mg/kg	10	U	UJ	10	U	UJ	10	U	U	10	U	U	10	U	UJ
Arsenic	EPA 6010	0.38	mg/kg	16			18			7.8			7.9			6.8		
Barium	EPA 6010	5300	mg/kg	180			200			230			250			290		
Beryllium	EPA 6010	0.14	mg/kg	0.59			0.68			0.89			0.81			0.68		
Cadmium	EPA 7131	9	mg/kg	0.14		J	0.1	U	UJ	0.1	U	UJ	0.1	U	UJ	0.22		J
Calcium	EPA 6010	---	mg/kg	3900			5300			4500			5500			4000		
Chromium	EPA 6010	210	mg/kg	17			23			14			18			23		
Cobalt	EPA 6010	4600	mg/kg	13			17			18			12			17		
Copper	EPA 6010	2800	mg/kg	36			43			43			44			51		
Iron	EPA 6010	---	mg/kg	30000		J	39000		J	48000		J	36000		J	34000		J
Lead	EPA 6010	130	mg/kg	44			28			21			40			65		
Lithium	EPA 7430	1500	mg/kg	8.9			17			22			17			12		
Magnesium	EPA 6010	---	mg/kg	7700			10000			12000			9600			7300		
Manganese	EPA 6010	3200	mg/kg	530			590			870			670			590		
Mercury	EPA 7471	6.5	mg/kg	0.1	U	U	0.1	U	U	0.1	U	U	0.1	U	U	0.1		
Molybdenum	EPA 6010	380	mg/kg	2	U	U	2	U	U	2	U	U	3.2			2	U	U
Nickel	EPA 6010	150	mg/kg	22			30			44			43			25		
Potassium	EPA 6010	---	mg/kg	4600			5500			8000			7300			4300		
Selenium	EPA 7740	380	mg/kg	0.4	U	U	0.4	U	U	28			25			0.4	U	U
Silver	EPA 6010	380	mg/kg	10	U	U	1	U	U	i	U	U	1	U	U	i	U	U
Sodium	EPA 6010	---	mg/kg	120			110			91			110			140		
Thallium	EPA 7841	5.4	mg/kg	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U	0.3	U	U
Vanadium	EPA 6010	540	mg/kg	59			76			95			72			73		
Zinc	EPA 6010	23000	mg/kg	80			79			91			110			91		
Chromium(VI)	EPA 7199	0.2	mg/kg	0.034		UJ	0.02		UJ	0.043		UJ	0.071		J	0.115		J

NR= Not reported
N/A= Not Analyzed

Table E-13. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-01-RK-01	Valid Qual	13-02-RK-01	Valid Qual	13-03-RK-01	Valid Qual	13-05-RK-01	Valid Qual	13-10-RK-01	Valid Qual
Sample ID					13-01-RK-01		13-02-RK-01		13-03-RK-01		13-05-RK-01		13-10-RK-01	
Boring ID					13L01		13L02		13L03		13L05		13L10	
Boring Number					1		2		3		5		10	
Depth					1		1		1		1		1	
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	16700	J	17500		8480		12900		13900	
Antimony	EPA 6010	31	10	mg/kg	6.46	J	3.76	J	4.86	J	10	U	6.21	J
Arsenic	EPA 6010	0.39	32	mg/kg	6.06	J	12.3	J	2.63	J	3.73	J	4.52	J
Barium	EPA 6010	5400	263	mg/kg	134	J	112	J	83.2	J	72.1	J	33.4	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.774	J	0.755	J	0.708	J	0.561	J	0.838	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.502	U	0.501	U
Calcium	EPA 6010	---	N/C	mg/kg	19600	J	27100	J	12100	J	19100	J	17100	J
Chromium	EPA 6010	210	46	mg/kg	449	J	377	J	442	J	186	J	244	J
Cobalt	EPA 6010	4700	23	mg/kg	16.9	J	20.3	J	7.61	J	15.6	J	16.2	J
Copper	EPA 6010	2900	55	mg/kg	7.13		249		150		8.61		7.39	
Iron	EPA 6010	---	N/C	mg/kg	32200	J	28400	J	16000	J	24700	J	24300	J
Lead	EPA 6010	400	64	mg/kg	9.47	J	5.86	J	5.17	J	5.17	J	7.53	J
Lithium	EPA 7430	1600	22	mg/kg	28.3		52.1		11.9		26		22.4	
Magnesium	EPA 6010	---	N/C	mg/kg	16700	J	18700	J	7010	J	13600	J	15800	J
Manganese	EPA 6010	1800	1172	mg/kg	527	J	794	J	283	J	465	J	529	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.166	
Molybdenum	EPA 6010	390	3.2	mg/kg	4.46	J	3.98	J	5.45	J	0.96	J	2.42	J
Nickel	EPA 6010	150	63	mg/kg	27.3	J	26.7	J	16.3	J	21.4	J	23.4	J
Potassium	EPA 6010	---	N/C	mg/kg	1440		1240		961		1230		953	
Selenium	EPA 7740	390	33	mg/kg	55.3	U	55.9		31.9		49.6		45.1	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2	U	2.01	U	2	U
Sodium	EPA 6010	---	N/C	mg/kg	184	J	199		77.5	J	92.6	J	184	
Thallium	EPA 7841	5.5	0.3	mg/kg	1.09	U	0.965	U	0.6	U	0.691	U	1.45	U
Vanadium	EPA 6010	550	122	mg/kg	55.2	J	42	J	18.8	J	44.8	J	43.4	J
Zinc	EPA 6010	23000	125	mg/kg	87.9	J	89.3	J	35.3	J	73.2	J	79.5	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.2	U	0.2	U	0.721		0.675		0.451	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table E-13. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-11D-RK-01	Valid Qual	13-11-RK-01	Valid Qual	13-15-RK-01	Valid Qual	13-17-RK-01	Valid Qual	13-18-RK-01	Valid Qual
Sample ID					13-11D-RK-01		13-11-RK-01		13-15-RK-01		13-17-RK-01		13-18-RK-01	
Boring ID					13L11D		13L11		13L15		13L17		13L18	
Boring Number					11		11		15		17		18	
Depth					1		1		i		2		i	
					Duplicate									
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	10800		7030		16200		27000		15800	
Antimony	EPA 6010	31	10	mg/kg	4.32	J	10	U	10	U	10	U	10	U
Arsenic	EPA 6010	0.39	32	mg/kg	5.7	J	14.7	J	3.17	J	1.18	J	3.36	J
Barium	EPA 6010	5400	263	mg/kg	639	J	1770	J	99.4	J	245	J	54.8	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.744	J	0.536	J	0.624	J	0.365	J	0.697	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	85200	J	146000	J	21400	J	806	J	16800	J
Chromium	EPA 6010	210	46	mg/kg	167	J	203	J	90.9	J	259	J	137	J
Cobalt	EPA 6010	4700	23	mg/kg	11.5	J	11.5	J	11.5	J	15.2	J	21.3	J
Copper	EPA 6010	2900	55	mg/kg	24.5		50.6		3.95		192		4.6	
Iron	EPA 6010	—	N/C	mg/kg	24800	J	25000	J	28500	J	51800	J	28200	J
Lead	EPA 6010	400	64	mg/kg	8.54	J	11.2		4.05	J	9.12	J	11.8	
Lithium	EPA 7430	1600	22	mg/kg	20.9		12.1		22.7		21.1		22.4	
Magnesium	EPA 6010	---	N/C	mg/kg	8130	J	12400	J	13500	J	17700	J	14900	J
Manganese	EPA 6010	1800	1172	mg/kg	1160	J	1760	J	545	J	754	J	525	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.137		0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	1.52	J	1.44	J	1.13	J	10	U	0.968	J
Nickel	EPA 6010	150	63	mg/kg	15.8	J	14	J	20.2	J	52.5	J	20.2	J
Potassium	EPA 6010	—	N/C	mg/kg	1810		1440		1260		16000		1010	
Selenium	EPA 7740	390	33	mg/kg	40		46.3		48.6		105		49.2	
Silver	EPA 6010	390	i	mg/kg	2	U	2	U	2	U	2	U	2	U
Sodium	EPA 6010	—	N/C	mg/kg	139		92.5	J	151		213		139	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	0.915	U	0.76	U	2	U
Vanadium	EPA 6010	550	122	mg/kg	31.1	J	24.1	J	43.1	J	85.9	J	47	J
Zinc	EPA 6010	23000	125	mg/kg	67.9	J	64.1	J	84.3	J	252	J	92.6	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.406		0.2	U	0.2	U	0.2	U	0.36	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table E-13. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-21-RK-01 13L21 21 1	Valid Qual	13-22-RK-01 13L22 22 1	Valid Qual	13-23-RK-01 13L23 23 i	Valid Qual	13-30-RK-01 13L30 30 1	Valid Qual	13-34-RK-01 13L34 34 i	Valid Qual
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	13700		14600		17800		11400		41400	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	3.91	J	9.31	J	9.53	J
Arsenic	EPA 6010	0.39	32	mg/kg	9.44	J	2.8	J	4.72	J	2.28	J	2	J
Barium	EPA 6010	5400	263	mg/kg	52.7	J	110	J	98.3	J	90.5	J	107	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.641	J	0.971	J	1.04	J	0.387	J	1.43	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.502	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	6430	J	25800	J	13900	J	4990	J	58500	J
Chromium	EPA 6010	210	46	mg/kg	177	J	144	J	174	J	967	J	525	J
Cobalt	EPA 6010	4700	23	mg/kg	15.4	J	17.5	J	17.5	J	17.1	J	5.86	J
Copper	EPA 6010	2900	55	mg/kg	7.57		4.89		8.09		21.1		10	
Iron	EPA 6010	—	N/C	mg/kg	24100	J	29100	J	30800	J	20800	J	56600	J
Lead	EPA 6010	400	64	mg/kg	4.82	J	9.72	J	4.6	J	7.15	J	9.01	J
Lithium	EPA 7430	1600	22	mg/kg	30.1		27.4		28.6		26		84.5	J
Magnesium	EPA 6010	—	N/C	mg/kg	15600	J	8370	J	15900	J	14900	J	53900	J
Manganese	EPA 6010	1800	1172	mg/kg	490	J	375	J	465	J	316	J	1420	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	1.22	J	10	U	1.22	J	11.4		10	U
Nickel	EPA 6010	150	63	mg/kg	22.6	J	22.5	J	20.9	J	18.2	J	237	J
Potassium	EPA 6010	—	N/C	mg/kg	617		1820		958		4930		3900	
Selenium	EPA 7740	390	33	mg/kg	45.6		51.7		55.8		35.6		95.3	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2.01	U	2	U	2	U
Sodium	EPA 6010	---	N/C	mg/kg	183		92.4	J	139		139		118	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	2.01	U	2	U	0.814	U
Vanadium	EPA 6010	550	122	mg/kg	52.5	J	32	J	44.6	J	18.9	J	94	J
Zinc	EPA 6010	23000	125	mg/kg	81.3	J	87.9	J	92.3	J	49.3	J	145	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.36		0.36		0.452		0.629		0.36	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table E-13. Summary of Results from Background Area 2 (Objective 13)

Analyte		Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-38-RK-01	Valid Qual	13-42D-RK-01	Valid Qual	13-42-RK-01	Valid Qual	13-46-RK-01	Valid Qual	13-47-RK-01	Valid Qual
Sample ID					13-38-RK-01		13-42D-RK-01		13-42-RK-01		13-46-RK-01		13-47-RK-01	
Boring ID					13L38		13L42D		13L42		13L46		13L47	
Boring Number					38		42		42		46		47	
Depth					i		i		i		1		1	
							Duplicate							
Metals (Method Listed by Each Metal)														
Aluminum	EPA 6010	76000	22729	mg/kg	14100		9730		17100		9740		23400	
Antimony	EPA 6010	31	10	mg/kg	10	U	10	U	5.88	J	10	U	6.47	J
Arsenic	EPA 6010	0.39	32	mg/kg	1.2	J	2.74	J	1.5	J	3.26	J	0.909	J
Barium	EPA 6010	5400	263	mg/kg	42.4	J	66.5	J	51.6	J	52.1	J	293	J
Beryllium	EPA 6010	150	1.3	mg/kg	0.0964	U	0.445	J	0.345	J	0.267	J	0.507	J
Cadmium	EPA 7131	9.0	0.41	mg/kg	0.501	U	0.501	U	0.501	U	0.501	U	0.501	U
Calcium	EPA 6010	—	N/C	mg/kg	6280	J	13100	J	1360	J	1230	J	1440	J
Chromium	EPA 6010	210	46	mg/kg	139	J	136	J	664	J	351	J	178	J
Cobalt	EPA 6010	4700	23	mg/kg	40.1	J	16.8	J	19.5	J	12.3	J	6.17	J
Copper	EPA 6010	2900	55	mg/kg	2.54		263		10.1		6.1		38.6	
Iron	EPA 6010	—	N/C	mg/kg	18400	J	27700	J	34900	J	22200	J	37900	J
Lead	EPA 6010	400	64	mg/kg	6.77	J	10	U	4.07	J	24.8		6.41	J
Lithium	EPA 7430	1600	22	mg/kg	9.36		8.72		12.3		13.1		14.8	
Magnesium	EPA 6010	—	N/C	mg/kg	12600	J	6320	J	12900	J	7200	J	11100	J
Manganese	EPA 6010	1800	1172	mg/kg	108	J	224	J	222	J	275	J	267	J
Mercury	EPA 7471	6.1	0.1	mg/kg	0.1	U	0.1	U	0.1	U	0.1	U	0.1	U
Molybdenum	EPA 6010	390	3.2	mg/kg	10	U	2.38	J	7.83	J	5.25	J	1.43	J
Nickel	EPA 6010	150	63	mg/kg	72.5	J	21.7	J	34.6	J	15.1	J	36.3	J
Potassium	EPA 6010	—	N/C	mg/kg	2640		422	J	3130		3640		7370	
Selenium	EPA 7740	390	33	mg/kg	41.1		53.6		60.7		47.1		64	
Silver	EPA 6010	390	1	mg/kg	2	U	2	U	2	U	2	U	2	U
Sodium	EPA 6010	—	N/C	mg/kg	508		602		149		138		209	
Thallium	EPA 7841	5.5	0.3	mg/kg	2	U	2	U	1.24	U	0.822	U	1.13	U
Vanadium	EPA 6010	550	122	mg/kg	16.3	J	68	J	35	J	21.6	J	57.2	J
Zinc	EPA 6010	23000	125	mg/kg	29.6	J	35	J	52.6	J	97.9	J	80.9	J
Chromium(VI)	EPA 7199	0.2	0.74	mg/kg	0.2	U	0.2	U	0.539		0.494		0.587	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

Table E-13. Summary of Results from Background Area 2 (Objective 13)

Analyte		Sample ID / Boring ID / Boring Number / Depth	Residential PRG (mg/kg)	Ambient Threshold (mg/kg)	Units	13-53-RK-01 13L53 53 1	Valid Qual	13-57-RK-01 13L57 57 1	Valid Qual
Metals (Method Listed by Each Metal)									
Aluminum	EPA	6010	76000	22729	mg/kg	2700		18700	
Antimony	EPA	6010	31	10	mg/kg	7.61	J	7.53	J
Arsenic	EPA	6010	0.39	32	mg/kg	7.7	J	1.6	J
Barium	EPA	6010	5400	263	mg/kg	56.1	J	139	J
Beryllium	EPA	6010	150	1.3	mg/kg	0.051	U	0.681	J
Cadmium	EPA	7131	9.0	0.41	mg/kg	0.501	U	0.501	U
Calcium	EPA	6010	—	N/C	mg/kg	1190	J	1410	J
Chromium	EPA	6010	210	46	mg/kg	230	J	292	J
Cobalt	EPA	6010	4700	23	mg/kg	15	J	94.6	J
Copper	EPA	6010	2900	55	mg/kg	22.9		21.4	
Iron	EPA	6010	—	N/C	mg/kg	44400	J	36300	J
Lead	EPA	6010	400	64	mg/kg	6.41	J	20	
Lithium	EPA	7430	1600	22	mg/kg	6.94		19	
Magnesium	EPA	6010	—	N/C	mg/kg	133000	J	8510	J
Manganese	EPA	6010	1800	1172	mg/kg	946	J	328	J
Mercury	EPA	7471	6.1	0.1	mg/kg	0.1	U	0.1	U
Molybdenum	EPA	6010	390	3.2	mg/kg	1.36	J	3.71	J
Nickel	EPA	6010	150	63	mg/kg	820	J	29	J
Potassium	EPA	6010	—	N/C	mg/kg	501	U	5340	
Selenium	EPA	7740	390	33	mg/kg	76.3		73.8	
Silver	EPA	6010	390	1	mg/kg	2	U	2	U
Sodium	EPA	6010	—	N/C	mg/kg	46	J	138	
Thallium	EPA	7841	5.5	0.3	mg/kg	1.43	U	2	U
Vanadium	EPA	6010	550	122	mg/kg	9.85	J	34.7	J
Zinc	EPA	6010	23000	125	mg/kg	53	J	83.5	J
Chromium(VI)	EPA	7199	0.2	0.74	mg/kg	0.361		0.68	

N/A = Not Analyzed.
NR = Not Reported.
ND = Not Detected.
N/C = Not Calculated.

APPENDIX F

DATA QUALITY ASSESSMENT

APPENDIX F

DATA QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) ASSESSMENT

The purpose of this data QA/QC evaluation is to assess the adequacy of the procedures used in the field to ensure the quality, integrity, and representativeness of the samples; accuracy and precision of the laboratory analyses; and completeness of the information. Ultimately, this process is intended to identify the level of uncertainty associated with the analytical results presented in this report.

The evaluation was based on measured quality control parameters relative to the required project-specific criteria outlined in the Quality Assurance Project Plan (QAPP). The following sections provide a review of the data evaluation process with respect to field and laboratory QC measurements.

F.1 FIELD QA/QC

A number of QA/QC measures were employed in the field to ensure that the collected soil, groundwater, sediment, and rock samples were representative of the actual environmental conditions at each Area of Concern/Interest (Objective). Prior to the collection of any sample, all sampling equipment was decontaminated to minimize the chance of cross contamination. Field QA/QC samples were collected and analyzed to provide QC checks on the representativeness of the environmental samples collected the precision of sample collection and handling procedures. Field equipment was calibrated daily to minimize the collection of erroneous field data. Decontamination procedures, calibration of field equipment, sample documentation and chain-of-custody procedures are discussed in Appendix B. The following section provides a summary of field QA/QC sample results collected during this investigation.

F.2 FIELD QA/QC SAMPLES

The following QA/QC samples were collected for this investigation.

F.2.1 Field Blanks

Field blanks were collected at a frequency of one per 10 samples or one per day and analyzed for the same parameters as the associated environmental samples. Organic free water was poured over the sampling equipment and collected in sample bottles. Because field blanks and environmental samples are collected under the same conditions, the results of the field blank analysis were used to indicate the presence of external contaminants that may have been introduced into samples during collection and to make an overall judgment as to whether the contaminants detected in the environmental samples were contributed by conditions independent of the formation sampled or are representative of conditions at the site. Field contamination was assessed by the simultaneous evaluation of field blanks, method blanks (laboratory blanks) and trip blanks (VOC and volatile TPH analyses). Overall, field blanks were analyte-free with the exception of the following:

- TRPH was detected in one field blank (1206RI01) at a concentration of 0.60mg/L. This result was qualified with an "U" during independent data validation since associated laboratory method blank reported a TRPH concentration of 0.3 mg/L.
- Total Organic Carbon (TOC) was detected in one field blank (R-1) at a concentration of 180 mg/L.
- Toluene was detected in two field blanks (R-1 and 0601AAQ1) at concentrations of 1.9 µg/L and 0.57 µg/L, respectively.
- Trace concentrations of various metals were detected in three field blanks (R-1, 0599AQ02, 0698AQ1); zinc was detected in two blanks at concentrations near the reporting limit; calcium and sodium were detected in one field blank also at trace concentrations.

Environmental sample results associated with the above field blanks were evaluated against each respective blank concentration to determine whether or not systematic contamination from decontamination or sample handling procedures had occurred. Based on this evaluation, no environmental sample results were qualified due to field contamination.

F.2.2 Trip Blanks

Trip blanks provided by the laboratory were transported with each cooler containing volatile organic samples. The trip blanks remained unopened throughout the sampling event. Trip blanks were used to determine if sample containers were contaminated during transport to the site, storage, or transfer from the site. All trip blanks were analyte-free.

F.2.3 Field Duplicates

Field duplicates were collected at a frequency of one per ten (10) environmental samples. These samples were collected at the same time as the environmental samples using the same techniques and submitted "blind" to the laboratory and analyzed for the full list of target metals. The results of the field duplicates analyses for soil, groundwater, and sediment samples were used to make an overall judgement as to whether the contaminants detected in the environmental samples are representative of conditions at Morris Dam. In general, the results from duplicate samples yielded relative percent difference (RPD) between samples of 100 percent or less.

A total of two field duplicate samples were collected during the rock background sampling. These samples were submitted "blind" to the laboratory and analyzed for the full list of target metals. RPD results for the rock samples ranged from 1 to 200 percent with values of less than 75 percent for most metals. The higher RPDs (i.e., 200 percent) are associated with metals in which sample concentrations were less than five times the reporting detection limit (RDL).

There are no review criteria for field duplicate analyses comparability. It is expected that the results may have more variability than lab duplicates which serve to measure only lab performance. It is likely that the variance in the RPD observed in these samples is due to the heterogeneity of the sample matrices.

F.3 DATA VALIDATION CRITERIA

The laboratory data were independently validated by Laboratory Data Consultants, Inc. (LDC). Validation was performed in accordance with Naval Facility Engineering Command (NAVFACENGCOM) Guidance "Environmental Quality Assurance Requirements (SWDIV, 1997). For this study SWDIV and BC personnel determined that NFESC Level D criteria for 10 percent of the data were adequate to yield the quality appropriate for this project. Level D criteria were performed for additional defensibility of the data. Both levels of validation include the review of laboratory summary forms (blanks, calibrations, spike recoveries, duplicates, etc.). Level D validation process incorporates a review of analytical raw data such as chromatograms and quantitation reports. This additional information is utilized in the Level D data validation process for checking calculations of quantified analytical data. The purpose of the data validation was to define the level of uncertainty associated with the concentration values generated by the laboratory. In general, field and laboratory data were assessed for compliance with the requirements specified in the project Quality Assurance Project Plan (QAPP) and data were validated following the SW Division Policy B (SWDIV, 1996). The parameters used to assess the quality and ultimately validate the data presented in this report are listed below.

- Volatile organic compounds (VOCs) by gas chromatography/mass spectrometry (GC/MS): validation process was patterned after the CLP functional guidelines (US EPA 1988a, 1988c, 1994a, 1994b, 1994d). The parameters considered included holding times (exceedance), GC/MS tune (meet CLP criteria), initial and continuing calibrations (CLP criteria), method blanks (use of "5 times/10 times rule" for assessment of contamination), blank spikes/laboratory control samples (LCS, laboratory set limits), surrogates (laboratory specific criteria or US EPA/CLP limits), matrix spike/matrix spike duplicates (MS/MSD, meet laboratory specific or US EPA/CLP criteria), and internal standards (IS, area performance).
- VOCs by GC: parameters considered included holding times, calibration (external), method blanks ("5 times/10 times rule"), surrogates, MS/MSD, LCS, and target compound retention times.
- Petroleum hydrocarbons by US EPA Method 418.1: parameters included holding times, calibrations, method blanks, LCS, and duplicates.
- Semi-volatile organic compounds (SVOCs) by GC/MS: validation process was patterned after the CLP functional guidelines and those parameters listed above for VOCs by GC/MS were considered.
- Polychlorinated biphenyls (PCBs): validation process was patterned after the CLP functional guidelines. Parameter included holding times, instrument performance (compound resolution, standard compound breakdown), calibrations, blanks, target compound retention times, and interference with compound quantitation.
- Metals: validation process was patterned after the CLP functional guidelines. Parameters included holding times, initial and continuing calibration verifications (ICV and CCV, respectively; meet laboratory specific criteria or CLP criteria),

method blanks, LCS (laboratory set limits), and spike/duplicate (laboratory specific criteria or US EPA/CLP limits).

F.4 LABORATORY QA/QC

The following sections provide a summary of the QA/QC review and validation process for analytical data generated by the laboratory during this investigation. The objective of this QA/QC review was to assess the results of the data validation process to determine whether or not the data obtained during this investigation are adequate to support their intended use.

Data for soil, groundwater, sediment, soil gas, and rock samples collected during the field investigation were reviewed with respect to the following criteria:

- ☐ Data package completeness;
- ☐ Use of specified analytical methods;
- ☐ Technical holding times
- ☐ GC/MS instrument performance check (if applicable)
- ☐ Initial calibration
- ☐ Continuing calibration
- ☐ Blanks
- ☐ Surrogate recovery
- ☐ Matrix spike/Matrix spike duplicates (MS/MSD)
- ☐ Laboratory control samples (LCS)
- ☐ Internal standards
- ☐ Target compound identification (only for NFESC "Full" Level D review)
- ☐ Compound quantitation and CRQLs (only for NFESC "Full" Level D review)
- ☐ Tentatively identified compounds (only for NFESC "Full" Level D review)
- ☐ System performance (only for NFESC "Full" Level D review)
- ☐ Overall assessment of data
- ☐ Field duplicates
- ☐ Field blanks

F.5 DATA QUALITY OBJECTIVES

Environmental samples and QA/QC samples were collected using the field methods and procedures outlined in Section 6 of the Work Plan. Prior to determining the presence or absence of environmental contamination, laboratory reports were assessed and the data validated for overall accuracy, precision, representativeness and completeness to establish data quality and usability. Additionally, reporting detection limits (RDLs) were checked against EPA method criteria as outlined in the QAPP. In general, the approach used in the validation process involved the review of chain-of-custody forms, preparation and use of checklists which detail the required QC for each respective analytical method, and verification and documentation of compliance with the applicable criteria. The final step was the assignment of qualifiers to sample results associated with QA/QC samples that did not meet the applicable criteria.

F.6 DATA QUALIFIERS

Data that did not meet the applicable validation criteria were flagged with data qualifiers. These qualifiers are intended to provide data users with an estimate of the level of certainty associated with the result.

The following code letters were used as qualifiers for data collected during this investigation.

U - Indicates the compound or analyte was analyzed for but not detected at or above the associated detection limit. Also, samples associated with contaminated blanks were qualified with an "U" if sample results were positive but less than five times (ten times if it was a common laboratory contaminant) blank result.

J - Indicates the associated value is an estimated quantity. Data accuracy, precision, or surrogate spike recovery did not meet the laboratory criteria.

UJ - Indicates the compound or analyte was analyzed for but was not detected. The associated detected limit is an estimate value.

R - Indicates the result is not usable.

During the validation process, field and laboratory QA data were assessed for compliance with established QA standards. In general, laboratory QC criteria were met. However, QA/QC sample results that were outside the specified QC limits established in the QAPP for data accuracy and precision were flagged by the laboratory and further evaluated during the validation process as to whether qualification of the data was deemed necessary. Additionally, method blank results were evaluated to assess the possibility of external contamination of environmental or QA samples in the laboratory (including field blanks). Table F-1 lists the specific criteria applied to each qualifier assigned during the data validation process.

F.7 DATA VALIDATION RESULTS

The following paragraphs summarize and discuss the validation results presented in Table F-1.

F.7.1 TPH-d (EPA Method 8015M)

The data validation review of the TPH-d sample results indicates that there were minor discrepancies noted in laboratory QC samples. Based on the overall assessment conducted by LDC, these discrepancies do not adversely affect the quality, validity, or usability of the environmental and QA samples presented in this report for TPH-d. All samples results associated with this analyte group were below the reporting detection limit (RDL) and therefore were qualified with an "U". No additional qualifiers were deemed necessary.

F.7.2 TPH-g (EPA Method 8015M)

The data validation review of the TPH-g sample results indicates that there were no discrepancies associated with this analyte group. All environmental sample results are considered usable and quantitatively acceptable.

F.7.3 Otto Fuel (EPA Method 8015M)

The data validation review of the Otto fuel sample results indicates that there were minor discrepancies associated with this analyte group. As indicated in Table F-1, several sample results were qualified with an "UJ". In addition, due to the surrogate recoveries and continuing calibration verification problems, UJs were added to some sample concentrations due to the absence of Otto fuel standard during the analytical run. At the time these analyses were performed, the Otto fuel standard supplied to the laboratory by the Navy had significantly degraded and a new standard could not be obtained. Consequently, chromatograms associated with the samples in which Otto fuel determination was required were carefully reviewed and compared to previous chromatograms from fresh Otto fuel standard. Therefore, although the laboratory reported these results as TPH-d, in this report they are presented as Otto fuel. No Otto fuel pattern was observed in these sample chromatograms (1001AS001, 1001BS001, 1001CS001, 0402AS015, 0402AS016 0402BS010, 0402BS015 0402BS020, 0402AS005, 0402AS010, and 0402BS005).

F.7.4 TRPH (EPA Method 418.1)

The data validation review of the TRPH sample results indicates that there were minor discrepancies associated with this analyte group. Several sample results were qualified with an "UJ" or "J" due to laboratory QC sample results. In addition, three sample results were qualified with an "U" due to associated method blank contamination. Please refer to Table F-1 for further specific information.

F.7.5 VOCs (EPA Method 8260A)

The data validation review of the VOCs sample results indicates that there were discrepancies associated with various analytes. A number of sample results were qualified with an "UJ" or "J" due to poor laboratory QC sample results, and/or discrepancies associated with calibration curves, internal standards and retention times. In addition, several results for various analytes were qualified with a "R" due to laboratory QC sample results or calibration relative response factors (RRFs) below the validation criteria.

Although sample results for 1,4-dioxane and vinyl acetate were among the rejected data points (low RRFs), a detailed review of MS/MSD spike concentrations and their associated spike recoveries, indicates that this problem has no impact on the overall interpretation of these results. The PRGs for 1,4-dioxane (40 mg/kg) and vinyl acetate (780 mg/kg) are at concentration levels at least twenty times above the spike concentrations added to the MS/MSD samples for these compounds. MS/MSD spike concentration levels for 1,4 dioxane at 2 mg/kg and vinyl acetate at 0.1 mg/kg were recovered in most analytical batches at a level at least 50 % of the original spike concentration (i.e., if the compound was present at these concentrations it would have been detected). In light of these results, it is reasonable to convey that a higher detection limit would pose no validity threat once compared to such high PRGs.

Neither of these analytes were detected in any samples collected at the Morris Dam site. Therefore, the detection limits for 1,4-dioxane and vinyl acetate were raised to a value 2 times the respective spike concentration. To reflect the uncertainty associated with these results all concentrations for 1,4-dioxane and vinyl acetate are qualified with an "UJ".

The RDLs for several analytes were greater than the limit specified in the QAPP. The actual RDLs reported by the laboratory and the specified RDLs are summarized in Table F-2. Except for Acrolein and Acrylonitrile, the reported RDLs are either lower than the PRG concentrations or no PRG value exist. Acrolein and Acrylonitrile have not been detected above the reported RDLs in any samples and are not believed to be present at the site

F.7.6 SVOCs (EPA Method 8270)

The data validation review of the SVOCs sample results indicates that there were minor discrepancies associated with various analytes. A number of sample results were qualified with an "UJ" or "J" due to poor laboratory QC sample results, calibration, internal standard areas and retention times. Please refer to Table 5-1 for further information.

The RDLs for several analytes were greater than the limit specified in the QAPP. The actual detection limits reported by the laboratory and the specified RDLs are summarized in Table F-3. In an attempt to obtain lower detection limits for the analytes associated with low PRG concentrations, EPA Method 8270 SIM was performed in 10 percent of the samples for these analytes (Table F-3). All samples were originally analyzed by standard EPA Method 8270. With respect to groundwater samples, the remaining 12 analytes listed in Table F-3, were analyzed using EPA Method 8310 in an attempt to meet the low MCL concentrations associated with these analytes. Although these reported RDLs are still higher than the PRG and MCL concentrations, the analytes listed in Table F-3 have not been detected in any samples and are not believed to be present at the site.

F.7.7 SVOCs (EPA Method 8270 SIM)

The data validation review of the SVOC-SIM analysis sample results indicated that calibrations were not performed at the required frequency. Only a DFTTP tune and a method blank were analyzed for the SIM analysis. Therefore, all SIM results were qualified with a "J". Please refer to Table F-1 for further specific information.

F.7.8 Polynuclear Aromatic Hydrocarbons (EPA Method 8310)

The data validation review of the PAH sample results indicates that there were no discrepancies associated with this analysis and data was not qualified. All environmental sample results are considered usable and quantitatively acceptable.

F.7.9 Metals (EPA Method 6010/7000 Series)

The data validation review of the metal sample results indicates that there were minor discrepancies associated with various analytes. A number of sample results were qualified with an "UJ" or "J" due to laboratory QC sample and ICP serial dilution results. In addition, results for various analytes were qualified with a "R" in various batches due to MS/MSD percent recoveries below the QC limits. Several arsenic, beryllium, cadmium, zinc and lead

sample results were qualified with an "UJ" due to associated method blank contamination. Please refer to Table F-1 for further specific information.

The RDLs for several analytes were greater than the limit specified in the QAPP. The actual detection limits reported by the laboratory and the specified RDLs are summarized in Table F-4. Except for Arsenic, the reported RDLs are either lower than the PRG concentrations or no PRG value exist. Arsenic has not been detected above background concentrations in any samples and is not believed to be a metal of concern at this site.

Twenty-two rock samples including two sets of field duplicates were analyzed and validated for twenty-five target metals. With the exception of mercury (Hg) by EPA Method 7471A (Cold Vapor), Arsenic (As) and Lithium (Li) by EPA Method 3050B/7000A (Graphite Furnace), and hexavalent chromium by EPA Method 7196A (Colorimetric), all other metals were analyzed by EPA Method 6010B (ICP). Samples were organized into one sample delivery group (SDG) as defined in the U.S. Environmental Protection Agency (EPA) Contract Laboratory Program (CLP) Scope of Work (SOW): SDG# 00E160.

F.7.9.1 Mercury (EPA Method 7471A)

The data validation review of the mercury sample results indicates that there were no discrepancies associated with this analyte group. All environmental sample results are considered usable and quantitatively acceptable.

F.7.9.2 Hexavalent Chromium (EPA Method 7196A)

The data validation review of the hexavalent chromium sample results indicates that there were no discrepancies associated with this analyte group. All environmental sample results are considered usable and quantitatively acceptable.

F.7.9.3 Arsenic and Lithium (EPA Methods 7060A & 7430)

The data validation review of the arsenic and lithium sample results obtained using the graphite furnace technique indicates that there were minor discrepancies associated with this analyte group. As indicated in Table F-1, arsenic sample results were qualified as estimated "J" due to matrix spike/matrix spike duplicate percent recoveries slightly below (73 and 76 percent) the lower control limit of 80 percent. Additionally, one sample result for lithium (13-34-RK-01A) was qualified as estimated "J" because the percent recovery for the analytical spike, as required by the graphite furnace technique, was above (123 percent) the upper control limit of 115 percent. The qualification of both arsenic and lithium results are believed to be the result of matrix interference most likely caused by the presence of other metals in the sample. All environmental sample results are considered usable and quantitatively acceptable as demonstrated by their unique qualifier.

F.7.9.4 ICP Metals (EPA Method 6010B)

The data validation review of the ICP metals sample results indicates that there were minor discrepancies associated with this analyte group. Several sample results for Thallium and, to a lesser extent, Beryllium were qualified with an "U" due to associated initial and continuing calibration blank contamination. Although other metals were also detected in these blanks and the method blank, sample concentrations were greater than 5 times their associated blank

concentration and, therefore did not require qualification. Serial dilution results for several metals were outside the validation criteria. As indicated in Table F-1, associated sample results were qualified as estimated "J". All environmental sample results are considered usable and quantitatively acceptable as demonstrated by their unique qualifier.

Reporting detection limits (RDLs) for some metals (Aluminum, Lead, Potassium, Selenium, and Sodium) were greater than the limits specified in the QAPP. In all cases, the actual reported RDL was either significantly lower (less than 40 times) than the site evaluation criteria (soil PRGs) or was not applicable, therefore not impacting data usability.

F.7.10 Organic Pb (CA DHS Method)

The data validation review of the organic lead sample results indicates that there were minor discrepancies associated with this analyte group. Most samples results associated with this analyte group were below the RDL and therefore were qualified with an "U". However, three samples were qualified with an "UJ" due to high cooler temperature. Please refer to Table F-1 for further information.

The RDL was greater than the limit specified in the QAPP. The QAPP specified reporting limits for water and soil were 0.0001 mg/L and 0.0005 mg/kg, respectively due to the extremely low PRGs associated with this analyte. The water and soil RDLs were 3 mg/L and 3 mg/kg, respectively and attempts to achieve lower RDLs failed. In accordance with the method, all samples for organic lead were analysed by flame atomic absorption (FAA) which yield interference at lower detection limits.

F.7.11 Tributyltin (Flame Photoionization Detector)

The data validation review of the tributyltin sample results indicates that there were minor discrepancies associated with this analyte group. Several sample results were qualified with an "UJ" due to high cooler temperature, exceedance of technical holding time and poor calibration verification results. Please refer to Table F-1 for further information.

F.7.12 Hexavalent Chromium (EPA Method 7199)

The data validation review of the hexavalent chromium sample results indicates that there were minor discrepancies associated with this analyte group. Several sample results were qualified with an "UJ" or "J" due to laboratory QC sample results, calibration procedures, and/or lack of laboratory preparation information. In addition, several sample results were qualified with an "U" due to associated method blank contamination. Please refer to Table F-1 for further specific information.

The RDL for water samples was greater than the limit specified in the QAPP. The QAPP specified a reporting limit of 0.001 mg/L and the actual RDL was 0.01 mg/L.

F.7.13 PCB (EPA Method 8080)

The data validation review of the PCB sample results indicates that there were minor discrepancies associated with this analyte group. Several sample results were qualified with an

"UJ" or "J" due to laboratory QC sample results and calibration. Please refer to Table F-1 for further specific information.

The RDL for soil samples was greater than the limit specified in the QAPP. The QAPP specified a reporting limit of 0.001 mg/kg (0.002 mg/kg for Aroclor 1016 and 1260). The actual detection limit for undiluted samples was 0.03 mg/kg. Due to matrix interference, some samples required dilution. RDLs for the diluted samples were raised by the same factor as the dilution.

The RDL water samples was greater than the limit specified in the QAPP. The QAPP specified a reporting limit of 0.5 µg/L for Aroclor 1221, 1232, 1242, 1248, and 1254. The actual detection limit for undiluted samples for these analytes were 1.0 µg/L. Due to matrix interference, some samples required dilution. RDLs for the diluted samples were raised by the same factor as the dilution.

F.7.14 Explosives (EPA Method 8330)

The data validation review of the explosive sample results indicates that there were minor discrepancies associated with this analysis. All results were qualified with an "UJ" based on high cooler temperature. Please refer to Table F-1 for further specific information.

F.7.15 Sulfides (EPA Method 376.2)

The data validation review of the sulfides sample results indicates that there were no discrepancies associated with this analyte group. All samples results associated with this analyte group were below the RDL and therefore were qualified with an "U".

F.7.16 TOC (EPA Method 415.1)

The data validation review of the TOC sample results indicates that initial calibration was not performed for this analyte. Therefore, all sample results were qualified with a "J". Due to instrument limitations, a single point calibration was performed prior to sample analyses.

Table F-1 Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-05-572	2396G1	Volatiles	Soil	0101SO01 0101SO02 0102SO01 0102SO02	Acrolein Acrylonitrile Vinyl Acetate 1,4-Dioxane	R	All continuing calibration relative response factor (RRF) were below validation criteria
					1,1,2 2-Tetrachloroethane 2-Chloroethylvinyl ether 2-Hexanone Methyl ethyl ketone Methyl isobutyl ketone	UJ	MS/MSD percent recoveries (%R) and/or relative percent differences (RPD) were outside QC limits
					Acetone	UJ	Above and the initial calibration %RSD was >30.0% (QC limit)
					Freon 113	UJ	Continuing calibration RRF was >25.0%
G97-05-572	2396G2a	Semivolatiles	Soil	0101SO01 0101SO02 0102SO01 0102SO02	Benzo(k)fluoranthene	UJ	Laboratory Control Samples (LCS) %R and RPD were outside the QC limits
G97-05-572	2396G2b	Semivolatiles	Soil	0101SO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	One point calibration was performed versus a 5-point calibration specified by the method
G97-05-572	2396G4	Metals	Soil	0101SO01 0101SO02 0102SO01 0102SO02	Iron Selenium	J UJ	LCS %R or RSD were outside the QC limits.
					Mercury Sodium	UJ/J J	MS/MSD %R or RPD were ouside the QC limits
					Zinc	J	ICP serial dilution %D above limit.
G97-05-646	2396H1	Volatiles	Soil	0102SO01a 0102SO03a	Vinyl Acetate Chloromethane	R	Continuing calibration RRF were outside the validation criteria.
					Acrolein Acrylonitrile 1,4-Dioxane	R	All initial and continuing calibration RRF were below the validation criteria.
					Acetone	UJ	Initial calibration %RSD was >30.0%.
					Freon 113 Acetone	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%.
					1,1,2,2-Tetrachloroethane 1,1,2-Trichloroethane 2-Chloroethylvinyl ether 2-Hexanone Acetone Methyl ethyl ketone Methyl isobutyl ketone	UJ	MS/MSD %R and RPD were outside the QC limits
G97-05-646	2396H2b	Semivolatiles	Soil	0301SO01a	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-05-646	2396H4	Metals	Soil	0102SO01a 0102SO03a 0301SO01a 0301SO03a	Aluminum Calcium Iron Potassium Magnesium Manganese Zinc	J	Although ICP serial dilution analysis was not required by the method %D was >10
G97-05-646	2396H2a	Semivolatiles	Soil	0301SO01a	Pentachlorphenol	J	Continuing calibration %D between initial and continuing RRF was >25.0%.
G97-05-672	2396C2b	Semivolatiles	Soil	0102BSO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	One point calibration was performed versus a 5-point calibration specified by the method
G97-05-569	2396B2b	Semivolatiles	Soil	0701SD03	Benzo(a)pyrene	J	Calibrations were not performed at required frequency Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
					Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-06-489	2396I28	Hexavalent Cr	Soil	0701SD01 0701SD02 0701SD03 0602SO01 0101SO01 0101SO02 0102SO01 0102SO02	Hexavalent Chromium	J	MSD %R and RPD were above the QC limits.
G97-05-569	2396B4	Metals	Soil	0701SD01 0701SD02 0701SD03 0602SO01	Sodium	J	MS/MSD %R were outside the QC limits.
					Mercury	UJ	
					Iron	J	LCS/LCSD %R were outside the QC limits.
					Selenium	UJ	
					Zinc	J	ICP serial dilution %D above limit.
G97-05-569	2396B3	PCBs	Soil	0602SO01	Aroclor-1260	J	%R in continuing standard mixture was below the 85-115% QC limit.
G97-05-569	2396B2a	Semivolatiles	Soil	0701SD01 0701SD02 0701SD03 0602SO01	Bis(2-chloroisopropyl)ether Isophorone 3,3'-Dichlorobenzidine Benzo(g,h,i)perylene	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%.
					Benzo(k)fluoranthene	UJ	LCS RPD was above the QC limits.
				0701SD01	Di-n-octylphthalate Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	UJ	Internal standard areas and retention times were outside the QC limits.
G97-05-702	2396D4	Metals	Soil	0403ASO01 0102ASO03	Lead	J	LCS %R (82%) was below the QC limit (83%).
				0102ASO01 0403BSO01 0403BSO03 0403BSOD01 0403BSOD03 0601SO01 0601ASO01 0601ASO03	Aluminum Calcium Potassium Magnesium Manganese Zinc Iron	J	Although ICP serial dilution analysis was not required by the method %D was >10
G97-05-702	2396D2a	Semivolatiles Level D	Soil	0403ASO01 0102ASO01 0601ASO01 0601ASO03	4-Nitrophenol	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%
				0102ASO03	Pentachlorphenol	UJ	
G97-05-672	2396C4	Metals	Soil	0404BSO01 0404BSO03 0102BSO01	Aluminum Calcium Iron Potassium Magnesium Manganese Zinc	J	Although ICP serial dilution analysis was not required by the method %D was >10
G97-05-702	2396D2b	Semivolatiles	Soil	0403BSO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency. Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-06-059	2396E30	Otto Fuel	Soil	0403CSO01 0403CSO03	Otto Fuel 400 ppm	UJ	%R for continuing standard mixture was above the QC limits.
G97-05-702	2396D30	Otto Fuel Level D	Soil	0403ASO03 0403BSO01 0403BSO03 0403BSOD01 0403BSOD03 0102ASO03 0102ASO01	Otto Fuel	UJ	Although otto fuel was recognized as mixture of constituent, no specific standard was analyzed for active ingredient, propylene glycol dinitrate and therefore detection limit was estimated.
				0403ASO01	Otto fuel	UJ	Above and surrogate %R was above the QC limits.

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-06-059	2396E4	Metals	Soil	0403CSO01 0403CSO03 0403CSOD03 0601BSO01 0601CSO01 0601CSO03	Aluminum Calcium Iron Manganese Potassium Zinc	J	Although ICP serial dilution analysis was not required by the method %D was >10.
G97-06-084	2396F4	Metals	Soil	0601DSO01 0601DSO03 0601ESO01 0601ESO03 0601FSO01 0601FSO03 0601GSO01 0601GSO03 0405SO01 0405SO03	Aluminum Calcium Iron Manganese Potassium Zinc	J	Although ICP serial dilution analysis was not required by the method %D was >10.
G97-05-568	2396A4	Metals	Soil	1201SO01	Sodium	J	MS/MSD %R were outside the QC limits.
				1201SO02	Mercury	UJ	
				1201SO03	Iron	J	LCS/LCSD %R were outside the QC limits.
				1201SO04	Selenium	J/UJ	
				1201SO05	Zinc	J	ICP serial dilution %D above limit.
	2396A28	Hexavalent Cr		1202SO01 1202SO02 1202SO03 1202SO04 1202SO05	Hexavalent Chromium	J	MS/MSD %R were outside the QC limits.
G97-05-569	2396B1	Volatiles	Soil	0602SO01	Acetone	UJ	Initial calibration %RSD was >30.0%.
					Vinyl Acetate	R	Continuing RRF below validation criteria.
					Acrolein Acrylonitrile 1,4-Dioxane	R	Above reason and average RRF outside validation criteria
					Freon 113	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%
					1 1 2 2-Tetrachloroethane 1,1 2-Trichloroethane 2-Chloroethylvinyl ether 2-Hexanone Acetone Methyl ethyl ketone Methyl isobutyl ketone	UJ	MS/MSD %R and RPD were outside the QC limits

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-06-084	2396F1	Volatiles	Soil	0601DSO01 0601DSO03 0601ESO01	Acrolein Acrylonitrile 1,4-Dioxane	R	Continuing and average RRF outside validation criteria.
				0601ESO03 0601FSO01 0601FSO03 0601GSO01 0601GSO03	Acetone	UJ	Initial calibration %RSD was >30 0%
				0601DSO03	Freon 113 Acetone 2-Hexanone Methyl isobutyl ketone	UJ	Continuing calibration %D between the initial and continuing RRF were >25 0%
				0601ESO03 0601FSO03 0601GSO01 0601GSO03	Chloromethane Bromomethane Chloroethane Freon 113 Acetone	UJ	Continuing calibration %D between the initial and continuing RRF were >25 0%
				0601DSO01 0601ESO01 0601FSO01	Freon 113 Acetone 2-Chloroethylvinyl ether 2-Hexanone Methyl ethyl ketone Methyl isobutyl ketone	UJ	Continuing calibration %D between the initial and continuing RRF were >25 0%
					Bromodichloromethane 2-Chloroethylvinyl ether	UJ	LCS/LCSD %R were outside the QC limits.
				0601DSO03 0601ESO03	Vinyl Acetate	R	Continuing RRF below validation criteria.
				0601FSO03 0601GSO01 0601GSO03	Freon 113	UJ	LCS/LCSD %R were outside the QC limits
				0601ESO01	Chloroform Chloromethane Carbon disulfide Dibromochloromethane Ethylbenzene Methyl ethyl ketone Methylene chloride Styrene Trichlorofluoromethane Tetrachloroethene Vinyl Acetate Vinyl Chloride Xylenes (total) cis-1,2-Dichloroethene trans-1,2-Dichloroethene 1 1 1-Trichloroethane 1 1 2 2-Tetrachloroethane 1 1-Dichloroethane 1,1-Dichloroethene 1 2-Dichlorobenzene 1,3-Dichlorobenzene 1 4-Dichlorobenzene Acetone Bromomethane Bromoform Chlorobenzene Chloroethane	UJ	Internal standard areas and retention times were outside the QC limits.
G97-06-059	2396E3	PCBs	Soil	0601BSO01 0601CSO01 0601CSO03	Aroclor-1016	UJ	%R of continuing standard mixtures were above the 85-115% QC limit

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-06-084	2396F3	PCBs	Soil	0601DSO03 0601FSO03	Aroclor-1016 Aroclor-1221 Aroclor-1232 Aroclor-1242 Aroclor-1248 Aroclor-1254 Aroclor-1260	UJ	Surrogate %R were outside the QC limits
G97-06-084	2396F2b	Semivolatiles	Soil	0601DSO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency. Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-06-084	2396F2a	Semivolatiles	Soil	0601DSO01 0601DSO03 0601ESO01 0601ESO03 0601FSO01 0601FSO03 0601GSO01 0601GSO03 0405SO01 0405SO03	Indeno(1 2 3-cd)pyrene	UJ	MS/MSD %R were below the QC limits
G97-06-059	2396E1	Volatiles	Soil	0601BSO01 0601CSO01 0601CSO03	Acetone	UJ	Initial calibration %RSD was >30.0%.
					Acrolein Acrylonitrile 1,4-Dioxane	R	Average RRF were below the validation criteria.
				0601CSO03	Freon 113 Acetone	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%.
					Chloromethane Vinyl acetate	R	Continuing calibration RRF values were outside the validation criteria.
					1,1,2 2-Tetrachloroethane 2-Chloroethylvinyl ether 2-Hexanone Acetone Methyl ethyl ketone Methyl isobutyl ketone	UJ	MS/MSD %R and RPD were outside the QC limit.
				0601BSO01 0601CSO01	Bromomethane Freon 113 Acetone	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0%.
					2-Hexanone Acetone Freon 113 Methyl ethyl ketone	UJ	MSD %R and RPD were outside the QC limit
					Vinyl Acetate	R	MSD %R was below and RPD was above the QC limits.

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-05-702	2396D1	Volatiles Level D	Soil	0601ASO01	Acetone	UJ	Initial calibration %RSD was >30.0%.
				0601ASO03	Acrolein Acrylonitrile 1,4-Dioxane	R	Average RRF were below the validation criteria
					Vinyl Acetate	R	Continuing calibration RRF values below the validation criteria.
				0601ASO01	Freon 113	UJ	Continuing calibration %D between the initial and continuing RRF were >25.0% and LCSD outside QC limit.
					2-Hexanone Acetone Methyl ethyl ketone Freon 113	UJ	MSD %R and RPD were outside QC limits
				0601ASO03	Acetone Freon 113 Methyl ethyl ketone 2-Hexanone	J	Continuing calibration %D between the initial and continuing RRF were >25 0%.
G97-09-124	2443A2b	Semivolatile	Soil	0502ASO05 0402ASO015	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency. Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-09-124	2443B11	TRPH	Soil	0601DO05 0601HS05 0601ISO05 0601ASO05 0502ASOD05 0601SO05 0601ESO05 0601FSO05 0601SO03 0601BSO03	TRPH	J	%R were outside the QC limits for LCS/LCSD
G97-09-125	2443B28	Hexavalent Cr	Soil	0601ASO05 0601SO03 0601SO05	Hexavalent Cr	U	Modifed final concentration due to analyte detected in method blanks
				0601DSO05 0601HS005 0601ISO05 0502ASOD05 0601ESO05 0601CSO05 0601FSO05 0601BSO03 0601BSO05	Hexavalent Cr	J	Initial calibration was performed after the sample analysis MS/MSD RPD was outside the QC limits and calibration verification %R was above the QC limits.
				0601ISO01 0601ISO03		J	Above reason and %R continuing calibration (CCV1) was outside the QC limits.
G97-09-125	2443B2a	Semivolatiles	Soil	0601HS05 0601CSO05 0502ASOD05	All	UJ	All MS/MSD RPD was above the QC limits for all compounds In addition, MS for nine analytes were below the QC limits.
G97-09-124	2443A1	Volatiles	Soil	0502ASO05 0502ASO10	Acrolein Acetone Vinyl acetate 1,4-Dioxane	R	Average RRF were below the validation criteria
					Acrylonitrile Methyl ethyl ketone Methyl isobutyl ketone	R	Continuing RRF values were below the validation criteria
					Trichlorofluoromethane Carbon disulfide 2-Hexanone	UJ	Continuing calibration %D between initial RRF and continuing RRF were >25.0%.

Table F-1 Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-09-125	2443B1	Volatiles	Soil	0601ISO01 0601DSO05 0601HSO05 0601ISO03 0601ISO05 0601ASO05 0502ASOD05 0601SO05 0601ESO05 0601CSO05 0601FSO05 0601SO03 0601BSO05 0601BSO03	Acrolein Acetone Acrylonitrile Vinyl acetate Methyl ethyl ketone 1 4-Dioxane Methyl isobutyl ketone	R	Initial and continuing calibration RRF were below the validation criteria
				0601DSO05 0601HSO05 0502ASOD05 0601ESO05 0601CSO05 0601FSO05 0601BSO05 0601BSO03	1 1 2-Trichloroethane	R	MS %R was below QC limits and RPD was greater than QC limits
				0601ISO01 0601ISO03 0601ISO05 0601ASO05 0601SO03 0601SO05 0601BSO03 0601BSO05 0601DSO05 0601ESO05 0601HSO05 0601CSO05 0601FSO05 0502ASOD05	Trichlorofluoromethane Carbon disulfide 2-Hexanone	UJ	Continuing calibration %D between initial RRF and continuing RRF were >25.0%
				0601ASO05	All TCL compounds (except those noted above)	UJ	Surrogate recoveries (%R) were below the QC limits.
G97-06-229	2428A2b	Semivolatiles	Soil	1101SO01 0602SO02 0401SO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency Only a DFTPP tune and Method blank were analyzed for the SIM analysis.

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-06-229	2428A4	Metals	Soil	0403DSO01 0404ASO01 0601HSO01 0601HSO02 0602SO03 0401SO01 0405ASO03 0404ASO03 0405ASO01 0403DSO02 0602SO02	Aluminum Potassium	J	MS analysis RPD was greater than 30 0% and MS %R was outside the QC limits
				0403DSO01 0404ASO01 0601HSO01 0601HSO02 0401SO01	Selenium	UJ	MS %R was reported outside the QC limits
				0403DSO01 0404ASO01 1102SO01 1101SO01 1101SO02 1101SO03 0401SO01 0405ASO03 0404ASO03 0405ASO01 0403DSO02	Lithium	J	LCS and LCSD %R were reported outside the QC limits.
				0403DSO01 0404ASO01 0601HSO01 0601HSO02 0602SO03 0401SO01 0405ASO03 0404ASO03 0405ASO01 0403DSO02 0602SO02	Calcium Magnesium Manganese Zinc	J	ICP serial dilution %D was above the QC limits.
				0401SO01 0404ASO03	Arsenic Lead	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-06-229	2428A11	TRPH	Soil	0404ASO01 0601HSO02 0405ASO01	TRPH	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-07-330	2428E4	Metals	Soil	1203SO03 1203SO04 1203SO01 1203SO02 1203SO05	Iron Aluminum Cadmium	J	MS %R and RPD was outside the QC limits. LCS/LCSD and RPD was outside the QC limits

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-07-331	2428F4	Metals	Soil	C2-1 C2-2 C2-3 C3-1 C3-2 C3-3 B3-1 B3-2 B3-3 B1-1 B1-2 B1-3 B2-1 B2-2 B2-3 A2-1 A2-2 A2-3 BKG-1 BKG-2	Potassium Manganese Aluminum Iron	J	MS/MSD and/or LCS/LCSD %R outside the QC limits
					Thallium	UJ	MS/MSD and/or LCS/LCSD %R outside the QC limits.
					Calcium Zinc	J	ICP serial dilution %D was above the QC limit.
					Lithium	J	LCS/LCSD and RPD was outside the QC limits.
				BKG-3	Aluminum Iron	J	LCS/LCSD and RPD was outside the QC limits.
				C3-1 C3-3 B3-1 B3-3 B1-1 B1-3 B2-2 B2-3 A2-1 A2-2 A2-3 BKG-1 BKG-2 BKG-3	Cadmium	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks
			Water	R-1	Iron Zinc	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-09-139	2470A2a	Semivolatiles	Soil	0501BSO01	Di-n-octylphthalate	UJ	Continuing calibration %D between initial RRF and continuing RRF were >25.0%.
G97-09-459	2470B2a	Semivolatiles	Soil	0301BSO01	2,4-Dinitrophenol 4,6-Dinitro-2-methylphenol	UJ	Continuing calibration %D between initial RRF and continuing RRF were >25.0%.
				0302SO01 0302SO02 0301BSO01	Hecachloroethane	UJ	LCS %R were below the QC limits
				0301BSO01	Di-n-octylphthalate Benzo(b)fluoranthene Benzo(k)fluoranthene Benzo(a)pyrene Indeno(1,2,3-cd)pyrene Dibenzo(a,h)anthracene Benzo(g,h,i)perylene	UJ	Interal standard areas were reported outside the QC limits

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-09-139	2470A2b	Semivolatiles	Soil	0202ASO05 0702CSO01 0501ASO01	Benzo(a)pyrene Dibenzo(a h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-09-139	2470A3	PCBs	Soil	0601GSO05 0601JSO01 0601JSO03 0601JSO05 0702CSO01 0702CSO03 0702CSO05	Aroclor-1016	UJ	%R of amounts in continuing standard mixtures were above the 85-115% QC limits
				0601JSO01Dup 0601JSO03Dup 0601JSO05Dup 0702ESO01Dup	Aroclor-1016 Aroclor-1260	UJ	%R of amounts in continuing standard mixtures were above the 85-115% QC limits.
				0702CSO01 0702CSO03	All TCL compounds	UJ	Surrogate recoveries were below the QC limits.
G97-09-459	2470B4	Metals	Soil	0302SO01 0302SO02 0301BSO01	Silver	R	MS/MSD %R were below the QC limits.
					Cadmium Manganese	UJ J	MS/MSD %R were outside the QC limits.
					Iron	J	ICP serial dilution %D was above QC limits.
					Beryllium	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-09-139	2470A4	Metals	Soil	All Samples	Silver Arsenic Manganese Selenium Potassium	J	MS/MSD %R were below the QC limits
					Aluminum Zinc Magnesium Manganese	J (detects)	ICP serial dilution %D was above QC limits
				0202ASO05 0202ASO05Dup	Potassium	R	MS/MSD %R were below the QC limits.
G97-09-459	2470B28	Hexavalent Cr	Soil	0302SO01 0302SO02 0301BSO01	Hexavalent Cr	J	MS/MSD %R were reported below the QC limits.
						U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-09-139	2470A28	Hexavalent Cr	Soil	All Samples	Hexavalent Cr	J (detects)	LCS %R were above the QC limits.
				0201ASO05 0702CSO03 0702ASO01 0702ASO03 0702ASO05 0702ESO01 0702ESO03 0501ASO01 0501ASO03 0501BSO03 0501CSO01 0501CSO03 0501ESO01 0601JSO01Dup	Hexavalent Cr	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks

Table F-1 Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-09-125	2443B4	Metals	Soil	0601ISO01 0601ISO03 0601ISO05 0601ASO05	Aluminum Potassium Selenium Silver	J	MS/MSD %R was outside the QC limits.
				0601SO03 0601SO05	Cadmium	UJ	MS/MSD %R was outside the QC limits.
				0601BSO03 0601BSO05 0601DSO05 0601ESO05 0601HSO05 0601CSO05 0601FSO05 0502ASOD05	Calcium Magnesium Manganese Zinc	J	ICP serial dilution %D was above the QC limits
				0601ISO01 0601ESO05 0601CSO05 0601FSO05 0601FSO05 0601BSO03 0601BSO03	Selenium	R	MS/MSD %R was below the QC limit
				0601DSO05 0601HSO05 0601ISO05 0601ASO05 0502ASOD05 0601SO05 0601ESO05 0601CSO05 0601FSO05 0601BSO03 0601BSO03 0601BSO05	Silver	R	MS/MSD %R was below the QC limit
G97-09-125	2443B3	PCBs	Soil	0601HSO05 0601CSO05 0601FSO05 0601ISO01 0601ISO03 0601ISO05 0601ASO05 0601SO03 0601SO05 0601BSO03	Aroclor-1260	UJ	%R of amounts in continuing standard mixtures were below the 85-115% QC limits
				0601DSO05	All TCL compounds	UJ	Surrogate recoveries were below the the QC limits.
G97-09-124	2443A4	Metals	Soil	0502ASO05 0502ASO10 0402ASO05	Cadmium Selenium Manganese	J (detects) J	MS/MSD %R were reported outside the QC limits.
				0402ASO10 0402ASO15 0402ASO16 0402BSO10 0402BSO15 0402BSO20	Iron	J	LCS/LCSD %R were reported outside the QC limits.
G97-09-125	2443B2b	Semivolatiles	Soil	0601ISO01	Benzo(a)pyrene Dibenzo(a,h)anthracene N-Nitrosodi-n-propylamine Bis(2-chloroethyl)ether	UJ	Calibrations were not performed at required frequency. Only a DFTPP tune and Method blank were analyzed for the SIM analysis.
G97-09-124	2443A11	TRPH	Soil	0402ASO15 0502ASO05 0402ASO10 0402BSO05 0402BSO20 0402ASO16 0402BSO10 0502ASO10	TRPH	J	LCSD %R was above the QC limit.

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-09-139	2470A11	TRPH	Soil	All Samples except for 0601JSO05 0702DSO03	TRPH	J	LCS %R was above the QC limit
G97-09-124	2443A28	Hexavalent Cr	Soil	All Samples	Hexavalent Cr	J	MS/MSD RPD was outside the QC limit and initial calibrations was performed after sample analysis.
				0402ASO10	Hexavalent Cr	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-09-460	2483A14	Metals	Water	0802AQ01	Arsenic	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.
G97-09-460	2483A14	Metals	Water	0801AQ01 0802AQ01 0803AQ02	Arsenic	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks
G97-06-600	2428C28	Hexavalent Cr	Soil	All Samples	Hexavalent Cr	J	MS/MSD %R were reported outside the QC limits and most samples were analyzed outside the technical holding times.
				0102SO03a 0301SO03a 0404BSO01 0404BSO03 0102BSO01 0102ASO03 0403BSO01 0403BSO03 0403BSOD01 0403BSOD03 0601SO01 0601ASO01 0601ASO03 0403CSO01 0601GSO01 0601GSO03 0403DSO01 0404ASO01 0404ASO03 0403DSO02 0602SO02 0401SO01	Hexavalent Cr	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks
G97-07-330	2428E28	Hexavalent Cr	Soil	1203SO01 1203SO02 1203SO03 1203SO04 1203SO05	Hexavalent Cr	J	Laboratory preparation date was not provided and MS/MSD %R were below the QC limits Due to lack of data, all sample results are estimated.
				1203SO01 1203SO02 1203SO03	Hexavalent Cr	U	Final sample result modified due to sample concentration was not significantly > concentrations found in associated method blanks.

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-09-459	2470B12	Organic Lead	Soil	0302SO01 0302SO02 0301BSO01	Organic Lead	UJ	Cooler temperature higher than 10 degrees Celsius.
G97-09-459	2470B19	Tributyl-tin	Soil	0302SO01 0302SO02 0301BSO01	Tributyl-tin	UJ	%R of amounts in continuing standard mixtures were outside the 85-115% QC limits.
G97-09-139	2470A19	Tributyl-tin	Soil	0202ASO05 0201ASO05 0202ASO0D5	Tributyl-tin	UJ	Sample extraction was performed outside the required holding time and cooler temperature higher than 10 degrees Celsius.
G97-09-139	2470A30	Explosives	Soil	1001ASO01 1001BSO01 1001CS01 1001ASD01	All TCL compounds	J	Cooler temperature higher than 10 degrees Celsius
G97-09-139	2470A1	Volatiles	Soil	0501BSO01 0501ESO01	Acrolein Acetone Vinyl acetate 1,4-Dioxane	R	Initial and continuing calibration RRF were below the validation criteria
				0601GSO01 0601JSO01 0601JSO03 0601JSO05 0202ASO05 0201ASO05 0501ASO01 0501ASO03 0501BSO03 0501CSO01 0501CSO03 0501DSO01 0501ESO03	Acrolein Acetone Acrylonitrile Methyl ethyl ketone 1 4-Dioxane	R	Initial and/or continuing calibration RRF were below the validation criteria
				0501ESO01	All TCL compounds	UJ	Surrogate %R was below the QC limits.
			Water	0599AQ01 0599AQ02	Acrolein Acetone Acrylonitrile Vinyl acetate Methyl ethyl ketone 1,4-Dioxane	R	Initial and continuing calibration RRF were below the validation criteria

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
G97-07-331	2428F1	Volatiles	Soil	C2-1 C2-2 C2-3 C3-3 B3-1	Acrolein Acetone Acrylonitrile Vinyl Acetate Methyl ethyl ketone Methyl isobutyl ketone 1,4-Dioxane	R	Initial and continuing calibration RRF were below the validation criteria.
				C3-2 B3-3 B1-1 B1-3 B2-1 B2-2 B2-3 A2-1 A2-4 BKG-2 BKG-3 B1-2 A2-2 BKG-1	Acetone Acrolein 2-Butanone 1,4-Dioxane 2-Chloroethylvinly ether 4-Methyl-2-pentanone Vinyl Acetate	R	Initial average RRF were below the validation criteria
				C3-1	Acetone	UJ	Initial average RRF were below the validation criteria and %RSD was above 30.0%.
					Acrolein Acrylonitrile Vinyl Acetate Methyl ethyl ketone Methyl isobutyl ketone 1,4-Dioxane	R	Initial and continuing calibration RRF were below the validation criteria.
				B1-2 A2-2 BKG-1	Acetone Acrolein 2-Butanone 1,4-Dioxane Vinyl Acetate 2-Chloroethylvinly ether 4-Methyl-2-pentanone	R	Initial and/or continuing calibration RRF were below the validation criteria
				C2-1 C2-2 C2-3 C3-1 C3-3 B3-1	Methylene chloride 1,2-Dichloroethane trans-1,3-Dichloropropene 1,1,2-Trichloroethane 2-Hexanone Bromoform 1,1,2,2-Tetrachloroethane	J	Continuing calibration %D was outside the QC limits
				B1-1 B1-3 B2-1 B2-2 B2-3 A2-1 A2-3 BKG-2 BKG-3 B3-2	Bromomethane 2-Hexanone	J	Continuing calibration %D was outside the QC limits
				C3-1 B3-1 B3-3	1,1,2,2-Tetrachloroethane 1,3-Dichlorobenzene 1,4-Dichlorobenzene 1,2-Dichlorobenzene	J	Internal standard areas were outside the QC limits

Table F-1. Data Validation Summary

SDG Number	LDC Report #	Parameters	Matrix	Samples	Analyte	Qualifier Added	Reason for Adding Qualifier
00E160		Metals	Rock	All Samples	Arsenic	J	Matrix spike/matrix spike duplicate percent recover above the validation criteria
00E160		Metals	Rock	All Samples	Barium Beryllium Calcium Chromium Cobalt Iron Magnesium Nickel Vanadium Zinc	J	ICP serial dilution results outside the validation criteria (detects only)
00E160		Metals	Rock	13-38-RK-01 13-53-RK-01	Beryllium	U	Analyte detected in associated initial and/or continuing calibration blank (ICB/CCB). Sample concentration less than 5 times the associated blank concentration.
00E160		Metals	Rock	13-34-RK-01 13-17-RK-01 13-05-RK-01 13-42-RK-01 13-47-RK-01 13-53-RK-01 13-15-RK-01 13-46-RK-01 13-01-RK-01 13-02-RK-01 13-03-RK-01 13-10-RK-01	Thallium	U	Analyte detected in associated initial and/or continuing calibration blank (ICB/CCB). Sample concentration less than 5 times the associated blank concentration

Table F-2. VOCs with RDLs Above Levels Specified in QAPP

Analyte	Actual RDL	Specified RDL
2-Hexanone	0.05 mg/kg	0.03 mg/kg
Acrolein	0.50 mg/kg 100 µg/L	0.30 mg/kg 50 µg/L
Acrylonitrile	0.50 mg/kg 50 µg/L	0.10 mg/kg 1 µg/L
2-Chloroethylvinyl ether	4 µg/L	1 µg/L
Carbon tetrachloride	0.5 µg/L	0.1 µg/L
Vinyl acetate	0.5 µg/L	0.1 µg/L
Methyl ethyl ketone	10 µg/L	5 µg/L
Methylene chloride	2 ug/L	1 ug/L

Table F-3. SVOCs with RDLs Above Levels Specified in QAPP

Analyte	Actual RDL	Specified RDL
Benzo(a)pyrene	5.0 µg/L	0.1 µg/L
Dibenzo(a,h)anthracene	5.0 µg/L	0.1 µg/L
N-Nitroso-di-n-propylamine	5.0 µg/L	0.1 µg/L
Bis(2-chloroethyl)ether	0.20 mg/kg 5.0 µg/L	0.04 mg/kg 0.1 µg/L
Bis(2-ethylhexyl)phthalate	0.40 mg/kg 10 µg/L	0.330 mg/kg 1.0 µg/L
Pentachlorophenol	0.40 mg/kg	0.330 mg/kg
Benzo(a)anthracene	5.0 µg/L	0.1 µg/L
Benzo(b)fluoranthene	5.0 µg/L	0.1 µg/L
Benzo(k)fluoranthene	5.0 µg/L	0.1 µg/L
Bis(2-chloroethyl)ether	5.0 µg/L	0.1 µg/L
Bis(2-chloroisopropyl)ether	5.0 µg/L	0.1 µg/L
Chrysene	5.0 µg/L	0.1 µg/L
Indeno(1,2,3-cd)pyrene	5.0 µg/L	0.1 µg/L
Hexachlorobenzene	5.0 ug/L	0.5 ug/L
Hexachlorobutadiene	5.0 ug/L	0.5 ug/L
2,4,6-Trichlorophenol	5.0 ug/L	0.5 ug/L
3,3'-Dichlorobenzidine	10 µg/L	0.1 µg/L
Pentachlorophenol	10 µg/L	0.5 µg/L

Table F-4. Metals with RDLs Above Levels Specified in QAPP

Analyte	Actual RDL	Specified RDL
Aluminum	10 mg/kg	0.2 mg/kg
Arsenic	5.0 mg/kg	0.2 mg/kg
Lead	5.0 mg/kg	0.2 mg/kg
Calcium	50 mg/kg	5 mg/kg
Sodium	50 mg/kg	5 mg/kg
Magnesium	10 mg/kg	5 mg/kg
Molybdenum	2 mg/kg 0.02 mg/L	1 mg/kg 0.01 mg/L
Selenium	10 mg/kg	0.4 mg/kg
Cadmium	1 mg/kg	0.5 mg/kg

APPENDIX G

SURVEY DATA

Bush & Associates Inc.

Land Surveyors

MORRIS DAM FACILITY

Land Survey Services
Monitoring Well Measurements
USC&GS Sea Level Datum of 1929

September 24, 1997 & November 5, 1997

Name	North	East	Elevation	Description
LPAD	1889048.923	6599939.656	1304.985	LS tag 2522 on conc deck
NAVA	1889049.287	6600124.310	1306.135	LS tag in curb
B	1888588.4	6600507.9	1247.52	LS tag in pipe
D	1888495.4	6600661.9	1180.81	Chis X cut in conc
MW1	1889038.2	6600079.0	1304.68 1305.12 1304.98	Top PVC casing Rim Finish surface
MW2	1888430.1	6600626.9	1179.14 1179.75 1179.60	Top PVC casing Rim Finish surface
MW3	1888323.1	6600432.2	1172.06 1172.69 1172.48	Top PVC casing Rim Finish surface
J170			1320.027	USC&GS benchmark at entrance to Navy Testing Center
H170			1234.269	USC&GS benchmark at entrance to Morris Dam
MWD11			1186.48	MWD benchmark, record elev. 1180.96 per MWD FB 5968/1
FLOOR			1178.94	Conc floor, at edge of stilling well
PLATE			1182.22	Top of metal plate mounted to table, above stilling well elev marked "1179.03"
BOARD			1164.92	Gauging board elev. painted "1165.00"

LICENSED LAND SURVEYOR
KEITH F. BUSH
Exp. 9-30-01
No. 4406
STATE OF CALIFORNIA

Keith F. Bush

18019 Sky Park Circle • Suite H • Irvine, California 92614-6520 • (714) 752-1888

Bush & Associates Inc.

Land Surveyors

MORRIS DAM FACILITY

Land Survey Services
Monitoring Well Measurements
Navy Datum

September 24, 1997 & November 5, 1997

Name	North	East	Elevation	Description
LPAD	1889048.923	6599939.656	1307.635	LS tag 2522 on conc deck
NAVA	1889049.287	6600124.310	1308.785	LS tag in curb
B	1888588.4	6600507.9	1250.17	LS tag in pipe
D	1888495.4	6600661.9	1183.46	Chis X cut in conc
MW1	1889038.2	6600079.0	1307.33	Top PVC casing
			1307.77	Rim
			1307.63	Finish surface
MW2	1888430.1	6600626.9	1181.79	Top PVC casing
			1182.40	Rim
			1182.25	Finish surface
MW3	1888323.1	6600432.2	1174.71	Top PVC casing
			1175.34	Rim
			1175.13	Finish surface
J170			1322.68	USC&GS benchmark at entrance to Navy Testing Center. Record USC&GS elev 1320.027 Record Navy elev 1322.6478

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U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY
WASHINGTON D.C.

VERTICAL CONTROL DATA

by the
Coast and Geodetic Survey
SEA-LEVEL DATUM OF 1929

LINE 102 - - (CONTINUED) ADJUSTED ELEVATIONS

Bench Mark	1935-39 Second-order (Feet)	1960 First-order (Feet)	1964 First-order (Feet)
106-50 (LAC)		3401.164	3401.141
106-51 (LAC)		3395.436	3395.413
M 306	3396.388	3396.545	3396.515
L 1046		3401.555	3401.522
M 1046		3386.230	3386.207
N 1046		3391.017	3390.994
Z 1047		3388.855	3388.835

THE LINE LEAVES AND RE-ENTERS THE QUADRANGLE

R 1046		3451.394	3451.341
S 1046		3559.947	3559.888
H 35 (USGS)		3612.850	3612.791
T 1046		3570.452	3570.409
U 1046		3551.039	3550.997
V 1046		3533.644	3533.612

LINE 103 - - ADJUSTED ELEVATIONS

Bench Mark	1934 First-order (Feet)	1961-62 First-order (Feet)	1964 First-order (Feet)	1965 First-order (Feet)
EFS 1		617.9		
B 170	665.993	665.760		
C 170	703.342			
P 1151		700.825		
D 170	741.472	741.265		
EFS 7		744.5		
E 170	781.826			
F 170	839.542	839.319		
EFS 8		837.2		
G 170	943.466	943.243		
L 170	1086.947	1086.707		
M 170	1234.509	1234.269		
J 170	1320.293	1320.027		
EFS 6		1322.0		
K 170	1269.912	1269.646		
M 170	1194.309	1194.036		
18 (USBPR)	1207.665			
N 170	1374.679	1374.423		
A (LACFCD)	1443.445			
P 170	1548.048	1547.648		
OMAR (CSHD)		1572.494		
Q 1151		1645.420		
B (LACFCD)	1611.877			
R 170	1670.518	1670.266		
S 170	1618.491	1618.235		

LINE 103 - - (CONTINUED) ADJUSTED ELEVATIONS

Bench Mark	1934 First-order (Feet)	1961-62 First-order (Feet)	1964 First-order (Feet)	1965 First-order (Feet)
31 (USBPR)	1553.855			
R 1151		1543.504		
1548.52 (USBPR)	1548.504			
S 1151		1547.097		
1513.93 (USBPR)	1514.098			
T 1151		1483.658		
EFS 5		1482.802		
T 170	1477.763	1477.359		
1476.79 (USBPR)	1476.929			
1490.79 (USBPR)	1490.971			
W 1151		1541.762		
U 1151		1555.742		
U 1151 RESET 1962 RESET 1968		1575.361 No Good ~~1570.78~~ 1577.08		
U 170	1554.961			
EFS 4		1574.725		
R 114 (USGS)	1574.413			
V 170	1656.716	1656.447		
X 1151		1860.196		
W 170	1870.072			
V 1151		2044.556		
X 170	2084.064			
Y 1151		2247.318		
R 115 (USGS)	2275.140	2274.812		
EFS 3		2288.7		
Y 170	2439.808			
Z 1151		2430.264		
A 1152		2616.107		
Z 170	2754.922			
B 1152		2910.946		
C 1152		3124.406		
A 171	3131.601	3131.234		
EFS 2		3282.0		
3289.6 (USGS)-BM 15 (LAC)	3289.842			
B 171	3282.257	3281.844		
D 1152		3421.683		
R 116 (USGS)	3483.267	3482.893		
H 1166		3688.313		
J 1166		3868.850		
44-B-60 (CDH)		3994.897		
47-B-60 (CDH)		4139.588		
K 1166		4307.554		
L 1166		4726.890		
EFS 1		4861.7		
B-325480 (CDH)		5068.185		
R 1167		5098.438		

DESCRIPTION OF SUPPLEMENTARY ELEVATION POINT

SP

Extra Foresight No. 8 State California County Los Angeles
Distance and direction from bench mark Near F 170 Chief of Party C. Symns
Detailed description Date October 1961

Surface of the roadway at the center of the west-northwest end of a bridge over San Gabriel River.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

69-G170

RECOVERY NOTE, BENCH MARK

R

Designation G 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 3.2 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping G 170 1934
Established by C&GS
Present condition Good
Detailed report 3.2 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, in the top of the north end of the concrete curb of a concrete guardrail, 17 feet east of the center line of the highway, 7 feet south of the north end of the concrete curb, directly across the highway from catch-basin 2/42, and about 1 foot higher than the highway.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

69-L170

RECOVERY NOTE, BENCH MARK

R

Designation L 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 3.7 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping L 170 1934
Established by C&GS
Present condition Good
Detailed report 3.7 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, on the outside of a curve, in the top of the east end of the concrete curb of a concrete guardrail, 20 feet south of the center line of the highway, 6.5 feet west of the east end of the curb, 20 feet west of the center line of a track road leading south, and about 1½ feet lower than the highway.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

70-H170

RECOVERY NOTE, BENCH MARK

R

Designation H 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 4.2 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping H 170 1934
Established by C&GS
Present condition Good
Detailed report 4.2 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, near the entrance to the northwest end of the Morris Dam, in the top of the east end of the long curved concrete curb of a concrete guardrail, 15 feet south of the center line of the highway, 8 feet west of the east end of the curb, and about 1 foot higher than the highway.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

70-J170

RECOVERY NOTE, BENCH MARK

R

Designation J 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 5.15 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping J 170 1934
Established by C&GS
Present condition Good
Detailed report 5.15 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, 0.1 mile south of the entrance to the U.S. Navy Ordance Testing Center, in the top of the northwest end of a concrete curb of a concrete guardrail, 18 feet southwest of the center line of the highway, 6.0 feet south-east of the northwest end of the curb, and 1½ feet higher than the highway.

DESCRIPTION OF SUPPLEMENTARY ELEVATION POINT

SP

Extra Foresight No. 6 State California County Los Angeles
Distance and direction from bench mark 0.1 mile east of J 170 Chief of Party C. Symns
Detailed description Date October 1961

Surface of the roadway at the "T" junction of the center lines of State Highway 39 and a paved road southeast to U.S. Naval Test Station.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

70-K170

RECOVERY NOTE, BENCH MARK

R

Designation K 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 5.7 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping K 170 1934
Established by C&GS
Present condition Good
Detailed report 5.7 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, in the top of the west-southwest end of the south-southeast concrete curb of bridge 53.115 over Van Ornum Canyon, 17 feet south-southeast of the center line of the highway, 6.0 feet east-northeast of the west-southwest end of the curb, and about 1 foot higher than the highway.

U.S. DEPARTMENT OF COMMERCE
COAST AND GEODETIC SURVEY

70-M170

RECOVERY NOTE, BENCH MARK

R

Designation M 170 State California County Los Angeles
Nearest town Azusa County Los Angeles Chief of Party C.Symns
Distance and direction from nearest town 6.1 miles north Recovery Date Sept. 1961
Character of mark C&GS bench mark disk Stamping M 170 1934
Established by C&GS
Present condition Good
Detailed report 6.1 miles north along State Highway 39 from the Atchison, Topeka and Santa Fe Railway station at Azusa, at the northeast end of a curve, in the top of the west-southwest end of the north-north-west end of concrete box culvert 5.40, 47 feet north-northwest of the center line of the highway, 90 feet east-northeast of the east-northeast end of a parking area, and about 35 feet lower than the highway.

	+	STAD.	−	STAD.	DIST.	BAL	ELEV.	ADJ. EL.	REMARKS
					609'	+75✓	1211.094		
	3.724	37	0.297	22					
	3.5[illegible]	38	0.275	22					
	3.[illegible]9	75✓	0.253	[illegible]	119	+31✓			
T.P.	11.060✓		0.825✓		728	+106✓	+10.235 / 1221.329✓		P.K. NAIL
	3.[illegible]	35	0.2[illegible]	60					
	[illegible]	36	0.184	60					
	3.[illegible]12	71✓	0.124	120✓	191	−49			
	10.343✓		0.552✓		919	+57✓	+9.791 / 1231.120✓		P.K. NAIL
	2.[illegible]	14	0.[illegible]	46					
	2.[illegible]	15	0.170	46					
	2.[illegible]	29✓	0.12[illegible]	92✓	121	−63✓			
[illegible]	10.790✓		0.510✓		1040	−6✓	+10.280 / 1241.400✓		P.K. NAIL
	0.0[illegible]	17	2.4[illegible]	14					
	0.0[illegible]	17	2.401	14					
	0.[illegible]	34✓	2.387	28✓	72	+6			
B.M.	0.[illegible] / 63.957		7.203✓		111[illegible]	.0✓	−7.086 / 1234.314✓	1234.314✓	U.S.C.&G.S. BM. #H-170, BRASS CAP ON NO. END OF CONC. RETAINING WALL HWY. 39, AT ENTRANCE TO MORRIS DAM
	[illegible]	53	[illegible]	42					
	[illegible]	53	3.[illegible]	[illegible]					
	[illegible]	10[illegible]✓	3.[illegible]	8[illegible]	189	+[illegible]✓			
	0.609✓		11.524✓		1301	[illegible]	−10.915 / 1223.3[illegible]		

MORRIS DAM

LEVEL CIRCUIT FROM B.M. ON DAM TO U.S.C.&G.S. B.M. # H-170 (1938)

ZEISS LEVEL # 33352
YARD ROD # 535
" " # 540

7-30-05
MARTEIS
BROOKS ROD
PHELPS - π
RUPERT - ROD
WARM - CLEAR

THREE-WIRE, YARD ROD

	+	STAD	—	STAD.	DIST	BAL.	ELEV.	ADJ. EL.	REMARK.
B.M.						0	1180.962		BRASS CAP MONU. #11, ON WEST ABUT. OF DAM SEE F.B. # 5344 PG. 12
	[illegible]	58	0.169	55					
	[illegible]	56	0.114	54					
	3.057	114	0.060	109	223	+5			
	9.381		0.343			+5	+8.998 / 1189.960		PK NAIL
T.P.									
	[illegible]	[illegible]	0.267	48					
	[illegible]	54	[illegible]	[illegible]					
	[illegible]	[illegible]	0.170	9	205	+11			
	10.968		0.436		428	+16	+10.252 / 1200.212		PK. NAIL
	[illegible]	60	[illegible]	35					
	[illegible]	60	[illegible]	[illegible]					
	3.700	120	0.106	[illegible]	181	+59			
	11.298		0.416		609	+75	+10.882 / 1211.094		PK. NAIL

Table G-2. Surveyed Locations for SI Soil Borings.

Station ID	BC Location		QC Check - CA Surveyor Value/or Prev. Measured			
	Northing	Easting	Northing	Easting	+/- Northing	+/- Easting
01A1B1	1888261.36	6600499.54				
01A2B1	1888244.34	6600479.94				
01A2B2	1888257.73	6600525.87				
01A2B3	1888240.57	6600459.78				
01A2B4	1888305.99	6600554.90				
02A1B1	1888982.36	6600080.92				
02A1B1	1888982.39	6600080.97	1888982.36	6600080.92	-0.03	-0.05
02A2B1	1888504.88	6600561.91				
03A1B1	1888228.94	6600446.13				
03A1B2	1888232.85	6600513.28				
03A2B1	1888451.19	6600722.61				
04A1B1	1888416.78	6600628.22				
04A2B1	1888442.48	6600683.20				
04A2B1	1888442.44	6600683.44	1888442.48	6600683.20	0.04	-0.24
04A2B2	1888462.47	6600627.94				
04A3B1	1888425.73	6600720.02				
04A3B2	1888391.45	6600705.42				
04A3B3	1888411.89	6600686.74				
04A3B4	1888397.41	6600656.84				
04A4B1	1888414.12	6600573.64				
04A4B2	1888421.70	6600526.39				
04A5B1	1888548.97	6600625.39				
04A5B2	1888540.31	6600625.05				
05A1B1	1889292.44	6600060.22				
05A1B2	1889245.60	6600070.90				
05A1B3	1889189.66	6600075.06				
05A1B4	1889076.10	6600089.05				
05A1B5	1889022.81	6600073.20				
05A2B1	1888346.50	6600397.24				

Table G-2. Surveyed Locations for SI Soil Borings.

Station ID	BC Location		QC Check - CA Surveyor Value/or Prev. Measured			
	Northing	Easting	Northing	Easting	+/- Northing	+/- Easting
05A2B1	1888346.29	6600397.51				
06A1B1	1888435.08	6600669.98				
06A1B10	1888520.19	6600625.52				
06A1B11	1888475.43	6600516.87				
06A1B2	1888449.32	6600482.32				
06A1B3	1888442.20	6600493.53				
06A1B4	1888461.64	6600499.98				
06A1B5	1888467.46	6600519.58				
06A1B6	1888450.57	6600536.43				
06A1B7	1888465.27	6600577.34				
06A1B8	1888484.29	6600571.21				
06A1B9	1888419.49	6600562.77				
06A2B1	1888587.69	6600196.83				
06A2B2	1888588.38	6600194.18				
06A2B3	1888585.68	6600198.04				
07 Pad NE	1888644.09	6600505.69				
07 Pad NW	1888632.35	6600483.71				
07 Pad SE	1888622.26	6600517.53				
07 Pad SW	1888610.24	6600495.61				
07A1SD1	1888785.71	6600422.16				
07A1SD2	1888748.91	6600442.48				
07A1SD3	1888703.41	6600476.81				
07A2B1	1888631.13	6600408.96				
07A2B2	1888614.46	6600416.75				
07A2B3	1888619.79	6600401.60				
07A2B4	1888642.70	6600494.62				
07A2B5	1888635.94	6600487.41				
10A1B1	1888535.87	6600473.34				
10A1B2	1888538.57	6600489.80				

Table G-2. Surveyed Locations for SI Soil Borings.

Station ID	BC Location		QC Check - CA Surveyor Value/or Prev. Measured			
	Northing	Easting	Northing	Easting	+/- Northing	+/- Easting
10A1B3	1888540.00	6600502.58				
11A1B1	1888677.97	6600110.07				
11A1B2	1888679.89	6600119.48				
11A2B2	1888679.84	6600119.48				
12A2B1	1888524.13	6600376.91				
12A2B2	1888520.07	6600378.15				
12A2B3	1888517.01	6600383.21				
12A2B4	1888572.73	6600385.80				
12A2B5	1888507.77	6600390.46				
MW-1	1889038.20	6600079.00				
MW-2	1888430.30	6600626.85	1888430.10	6600626.90	-0.20	0.05
MW-3	1888323.10	6600432.20				
Ref BA1	1888270.52	6600531.87	1888270.60	6600532.00	0.08	0.13
Ref BA1	1888270.30	6600531.95	1888270.60	6600532.00	0.30	0.05
Ref I	1888250.39	6600433.97	1888250.40	6600434.06	0.01	0.09
SG-1	1888631.15	6600407.97				
SG-13	1888600.87	6600431.54				
SG-18	1888651.04	6600512.07				
SG-22	1888584.29	6600481.95				
SG-25	1888624.26	6600546.89				
SG-6	1888686.77	6600490.90				

The surveyed measurements listed above were collected by Brown and Caldwell personnel performing field operations. As such they were not collected under the oversight of a registered engineer, and their accuracy is not guaranteed by such. The original intent of the measurements was to provide the Navy with approximate locations that could help guide remediation should soil boring markings . on the ground disappear with time. The survey was based on benchmarks established by registered surveyors with the State of California, and station backsighting measurements suggest that survey precision is good to within ± 0.5 feet.

APPENDIX H

GRAIN SIZE ANALYSIS RESULTS

PTS Laboratories, Inc.

Geotechnical Services

8100 Secura Way • Santa Fe Springs • CA 90670
Phone (562) 907-3607 • Fax (562) 907-3610

July 23, 1997

Patty Mata
VOC Analytical
1212 E Katella NE
Anaheim, CA 92805

Re: G9707331
PTS File: 27221

Dear Ms Mata:

Enclosed are final data for samples submitted from your Geotechnical Analyses Project # G9707331. All analyses were performed by applicable ASTM, EPA or API methodology Samples will be retained for 30 days before disposal unless prior arrangements are made.

We appreciate the opportunity to be of service and trust these data will prove beneficial in the development of this project Please feel free to call myself or Larry Kunkel, District Manager, should you have any questions or require additional information

Sincerely,

PTS Laboratories, Inc

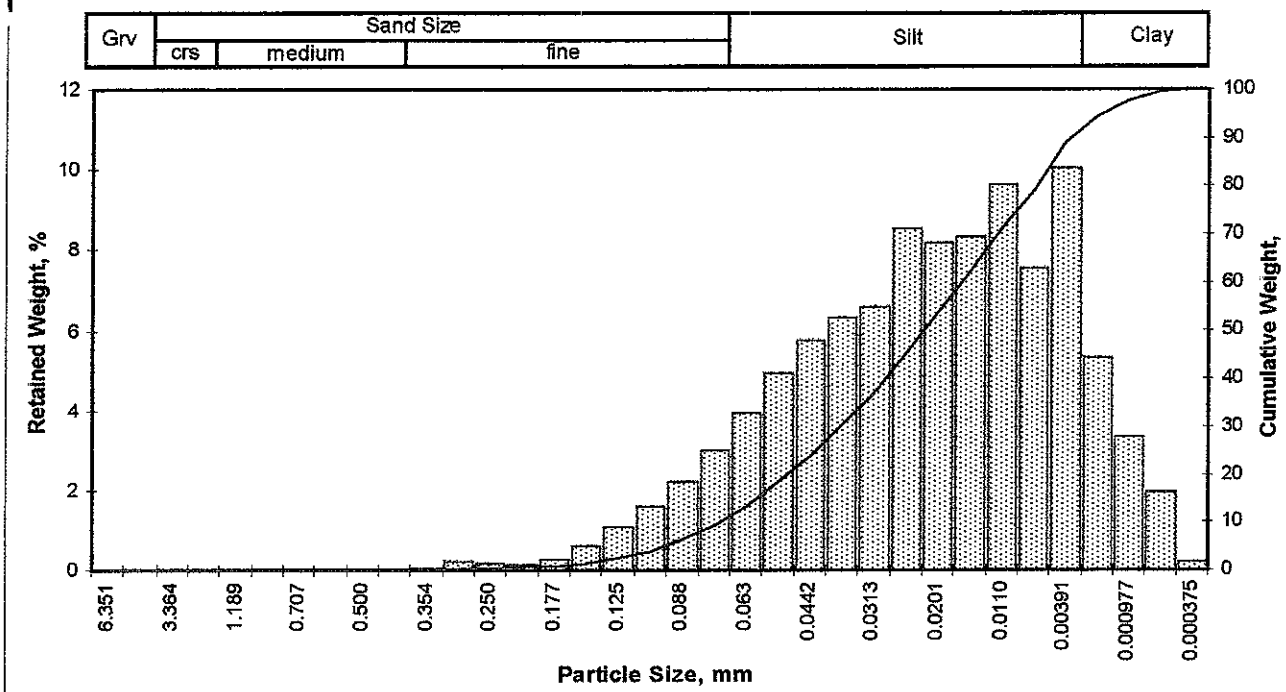
Rick Young
Project Manager

RY:vk
encl

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C2-1
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00
0.0139	0.354	1.50	45	0.05	0.05
0.0117	0.297	1.75	50	0.20	0.25
0.0098	0.250	2.00	60	0.19	0.44
0.0083	0.210	2.25	70	0.15	0.59
0.0070	0.177	2.50	80	0.24	0.83
0.0059	0.149	2.75	100	0.61	1.44
0.0049	0.125	3.00	120	1.10	2.54
0.0041	0.105	3.25	140	1.61	4.15
0.0035	0.088	3.50	170	2.21	6.36
0.0029	0.074	3.75	200	3.01	9.37
0.0025	0.063	4.00	230	3.96	13.33
0.0021	0.053	4.25	270	4.92	18.25
0.00174	0.0442	4.50	325	5.74	23.99
0.00146	0.0372	4.75	400	6.31	30.30
0.00123	0.0313	5.00	450	6.60	36.90
0.000986	0.0250	5.32	500	8.54	45.44
0.000790	0.0201	5.64	635	8.18	53.62
0.000615	0.0156	6.00		8.33	61.95
0.000435	0.0110	6.50		9.62	71.57
0.000308	0.00781	7.00		7.54	79.11
0.000154	0.00391	8.00		10.03	89.14
0.000077	0.00195	9.00		5.35	94.49
0.000038	0.000977	10.00		3.33	97.82
0.000019	0.000488	11.00		1.97	99.79
0.000015	0.000375	11.38		0.21	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.35	0.0039	0.098
10	3.79	0.0028	0.072
16	4.14	0.0022	0.057
25	4.54	0.0017	0.043
40	5.12	0.0011	0.029
50	5.50	0.0009	0.022
60	5.92	0.0007	0.017
75	6.73	0.0004	0.009
84	7.49	0.0002	0.006
90	8.16	0.0001	0.003
95	9.15	0.0001	0.002

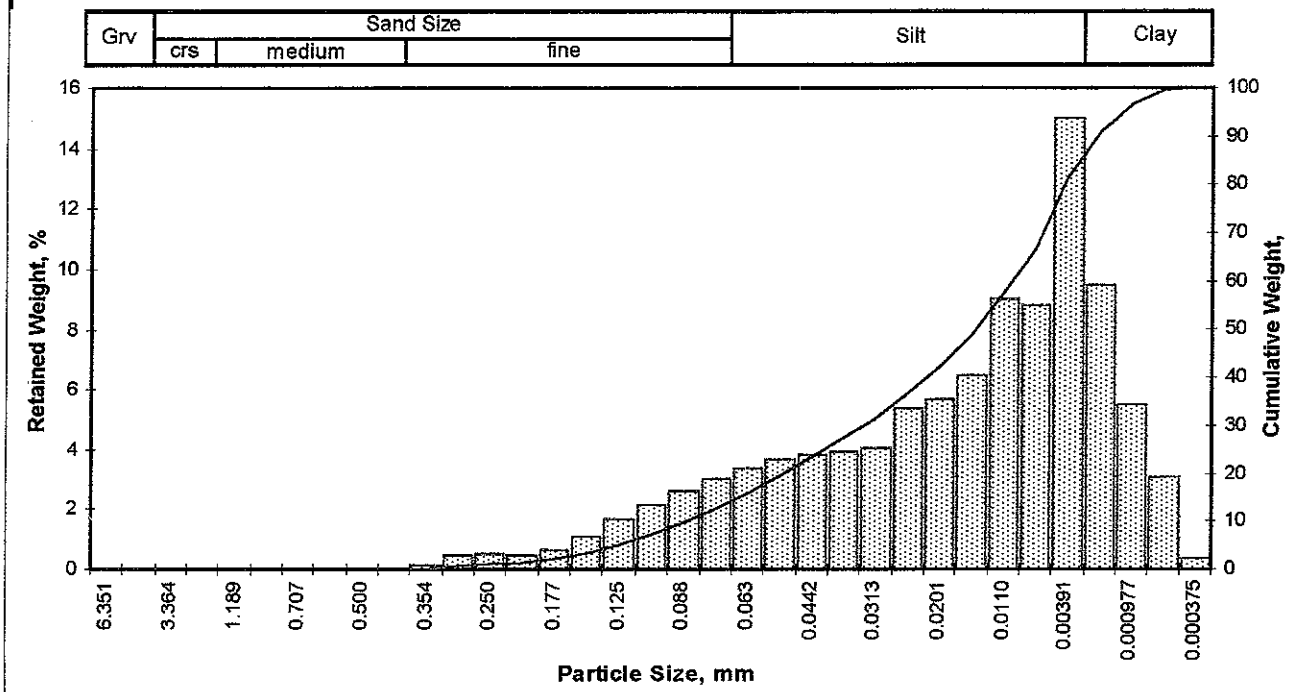
Measure	Trask	Inman	Folk-Ward
Median phi	5.50	5.50	5.50
Median in	0.0009	0.0009	0.0009
Median mm	0.022	0.022	0.022
Mean, phi	5.25	5.81	5.71
Mean in	0.0010	0.0007	0.0008
Mean, mm	0.026	0.018	0.019
Sorting	0.469	1.676	1.718
Skewness	0.910	0.187	0.223
Kurtosis	0.244	0.733	1.088
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	9.36
Silt	.00391 mm	79.77
Clay	<.00391 mm	10.86
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C2-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.02	0.02
0.0139	0.354	1.50	45	0.12	0.14
0.0117	0.297	1.75	50	0.44	0.58
0.0098	0.250	2.00	60	0.49	1.07
0.0083	0.210	2.25	70	0.48	1.55
0.0070	0.177	2.50	80	0.61	2.16
0.0059	0.149	2.75	100	1.07	3.23
0.0049	0.125	3.00	120	1.65	4.88
0.0041	0.105	3.25	140	2.16	7.04
0.0035	0.088	3.50	170	2.58	9.63
0.0029	0.074	3.75	200	2.98	12.61
0.0025	0.063	4.00	230	3.34	15.95
0.0021	0.053	4.25	270	3.62	19.57
0.00174	0.0442	4.50	325	3.79	23.36
0.00146	0.0372	4.75	400	3.91	27.27
0.00123	0.0313	5.00	450	4.02	31.29
0.000986	0.0250	5.32	500	5.40	36.69
0.000790	0.0201	5.64	635	5.67	42.36
0.000615	0.0156	6.00		6.47	48.83
0.000435	0.0110	6.50		8.99	57.82
0.000308	0.00781	7.00		8.80	66.62
0.000154	0.00391	8.00		15.00	81.62
0.000077	0.00195	9.00		9.50	91.12
0.000038	0.000977	10.00		5.51	96.63
0.000019	0.000488	11.00		3.04	99.67
0.000015	0.000375	11.38		0.33	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.01	0.0049	0.124
10	3.53	0.0034	0.086
16	4.00	0.0025	0.062
25	4.61	0.0016	0.041
40	5.51	0.0009	0.022
50	6.07	0.0006	0.015
60	6.62	0.0004	0.010
75	7.56	0.0002	0.005
84	8.25	0.0001	0.003
90	8.88	0.0001	0.002
95	9.70	0.0000	0.001

Measure	Trask	Inman	Folk-Ward
Median, phi	6.07	6.07	6.07
Median, in.	0.0006	0.0006	0.0006
Median, mm	0.015	0.015	0.015
Mean, phi	5.43	6.13	6.11
Mean, in.	0.0009	0.0006	0.0006
Mean, mm	0.023	0.014	0.015
Sorting	0.359	2.123	2.075
Skewness	0.988	0.029	0.058
Kurtosis	0.212	0.575	0.928
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

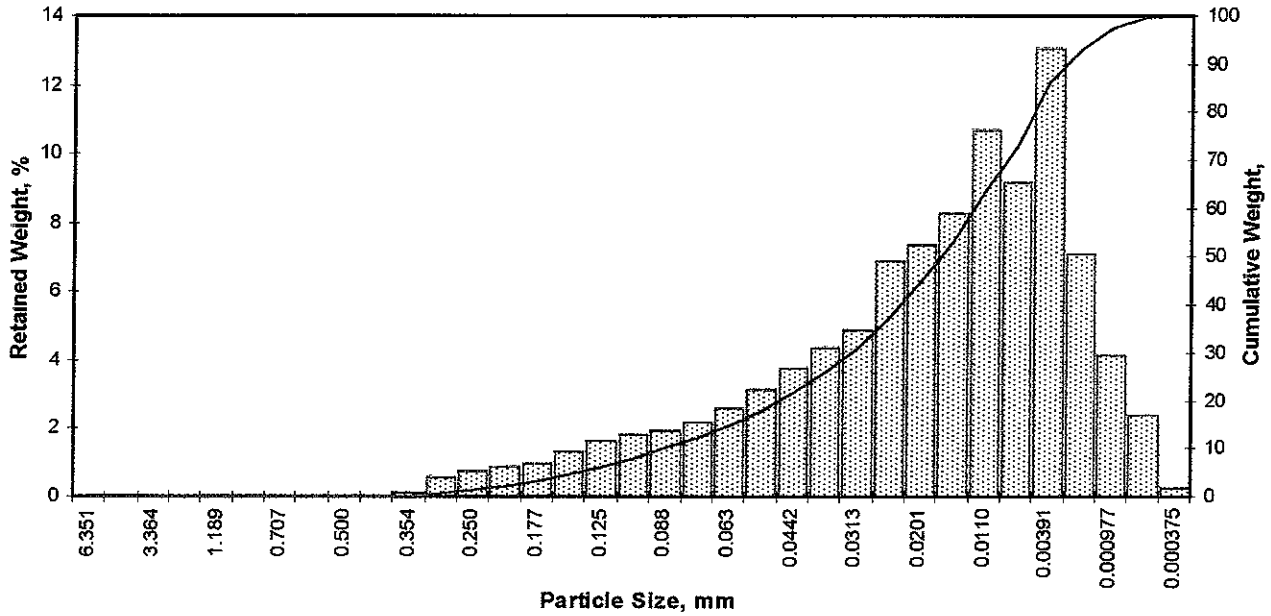
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.02
Fine Sand	200	12.59
Silt	.00391 mm	69.02
Clay	<.00391 mm	18.38
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C2-3
Project No:	G9707331	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.01	0.01
0.0139	0.354	1.50	45	0.12	0.13
0.0117	0.297	1.75	50	0.57	0.70
0.0098	0.250	2.00	60	0.77	1.47
0.0083	0.210	2.25	70	0.85	2.33
0.0070	0.177	2.50	80	0.98	3.30
0.0059	0.149	2.75	100	1.30	4.60
0.0049	0.125	3.00	120	1.62	6.22
0.0041	0.105	3.25	140	1.81	8.03
0.0035	0.088	3.50	170	1.93	9.96
0.0029	0.074	3.75	200	2.16	12.12
0.0025	0.063	4.00	230	2.57	14.69
0.0021	0.053	4.25	270	3.12	17.81
0.00174	0.0442	4.50	325	3.75	21.56
0.00146	0.0372	4.75	400	4.35	25.91
0.00123	0.0313	5.00	450	4.87	30.78
0.000986	0.0250	5.32	500	6.88	37.66
0.000790	0.0201	5.64	635	7.33	44.99
0.000615	0.0156	6.00		8.24	53.23
0.000435	0.0110	6.50		10.66	63.89
0.000308	0.00781	7.00		9.17	73.06
0.000154	0.00391	8.00		13.06	86.12
0.000077	0.00195	9.00		7.09	93.21
0.000038	0.000977	10.00		4.17	97.38
0.000019	0.000488	11.00		2.37	99.75
0.000015	0.000375	11.38		0.25	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	2.81	0.0056	0.142
10	3.50	0.0035	0.088
16	4.10	0.0023	0.058
25	4.70	0.0015	0.039
40	5.42	0.0009	0.023
50	5.86	0.0007	0.017
60	6.32	0.0005	0.013
75	7.15	0.0003	0.007
84	7.84	0.0002	0.004
90	8.55	0.0001	0.003
95	9.43	0.0001	0.001

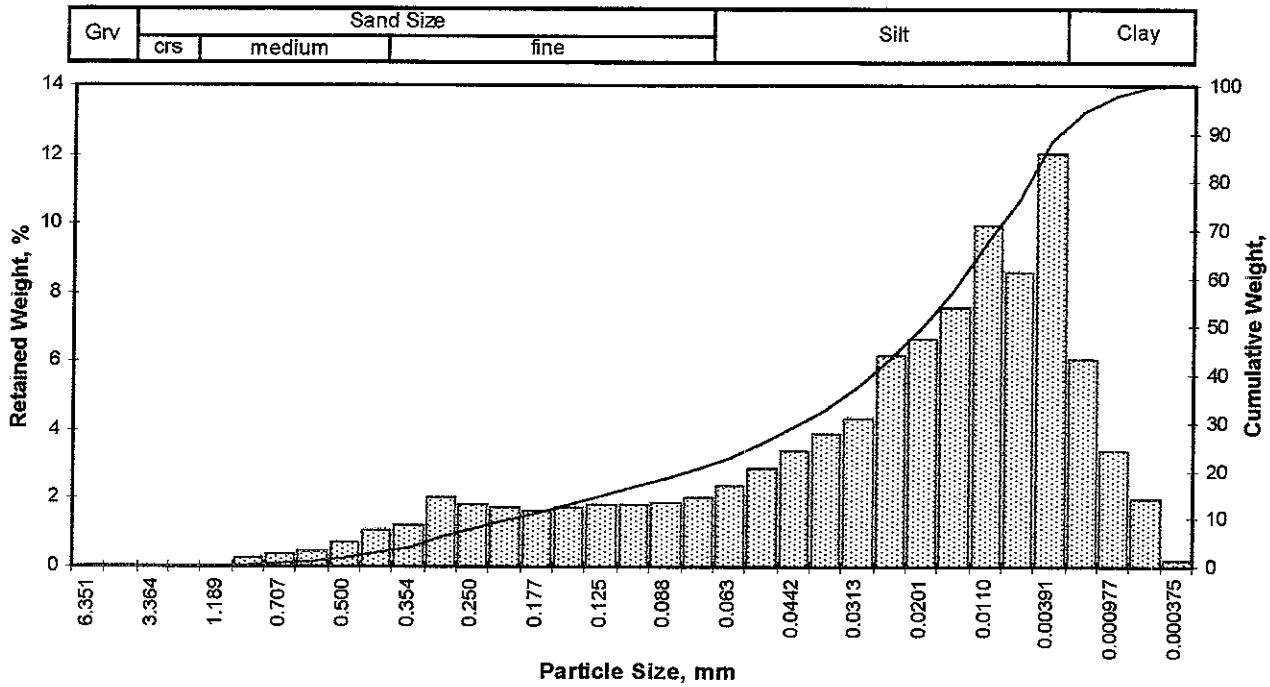
Measure	Trask	Inman	Folk-Ward
Median, phi	5.86	5.86	5.86
Median in.	0.0007	0.0007	0.0007
Median, mm	0.017	0.017	0.017
Mean, phi	5.46	5.97	5.93
Mean, in	0.0009	0.0006	0.0006
Mean mm	0.023	0.016	0.016
Sorting	0.428	1.867	1.936
Skewness	0.956	0.060	0.070
Kurtosis	0.184	0.773	1.107
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.01
Fine Sand	200	12.11
Silt	.00391 mm	73.99
Clay	<.00391 mm	13.88
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C3-1
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.27	0.27
0.0278	0.707	0.50	25	0.34	0.62
0.0234	0.595	0.75	30	0.47	1.09
0.0197	0.500	1.00	35	0.70	1.78
0.0166	0.420	1.25	40	1.06	2.84
0.0139	0.354	1.50	45	1.21	4.05
0.0117	0.297	1.75	50	2.03	6.08
0.0098	0.250	2.00	60	1.80	7.89
0.0083	0.210	2.25	70	1.70	9.59
0.0070	0.177	2.50	80	1.63	11.22
0.0059	0.149	2.75	100	1.71	12.93
0.0049	0.125	3.00	120	1.80	14.73
0.0041	0.105	3.25	140	1.84	16.57
0.0035	0.088	3.50	170	1.87	18.44
0.0029	0.074	3.75	200	2.03	20.47
0.0025	0.063	4.00	230	2.38	22.85
0.0021	0.053	4.25	270	2.87	25.72
0.00174	0.0442	4.50	325	3.40	29.12
0.00146	0.0372	4.75	400	3.90	33.02
0.00123	0.0313	5.00	450	4.36	37.38
0.000986	0.0250	5.32	500	6.19	43.57
0.000790	0.0201	5.64	635	6.66	50.23
0.000615	0.0156	6.00		7.58	57.81
0.000435	0.0110	6.50		9.95	67.76
0.000308	0.00781	7.00		8.61	76.38
0.000154	0.00391	8.00		12.01	88.39
0.000077	0.00195	9.00		6.08	94.47
0.000038	0.000977	10.00		3.37	97.84
0.000019	0.000488	11.00		1.95	99.79
0.000015	0.000375	11.38		0.21	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.62	0.0128	0.326
10	2.31	0.0079	0.201
16	3.17	0.0044	0.111
25	4.19	0.0022	0.055
40	5.14	0.0011	0.028
50	5.63	0.0008	0.020
60	6.11	0.0006	0.014
75	6.92	0.0003	0.008
84	7.63	0.0002	0.005
90	8.27	0.0001	0.003
95	9.16	0.0001	0.002

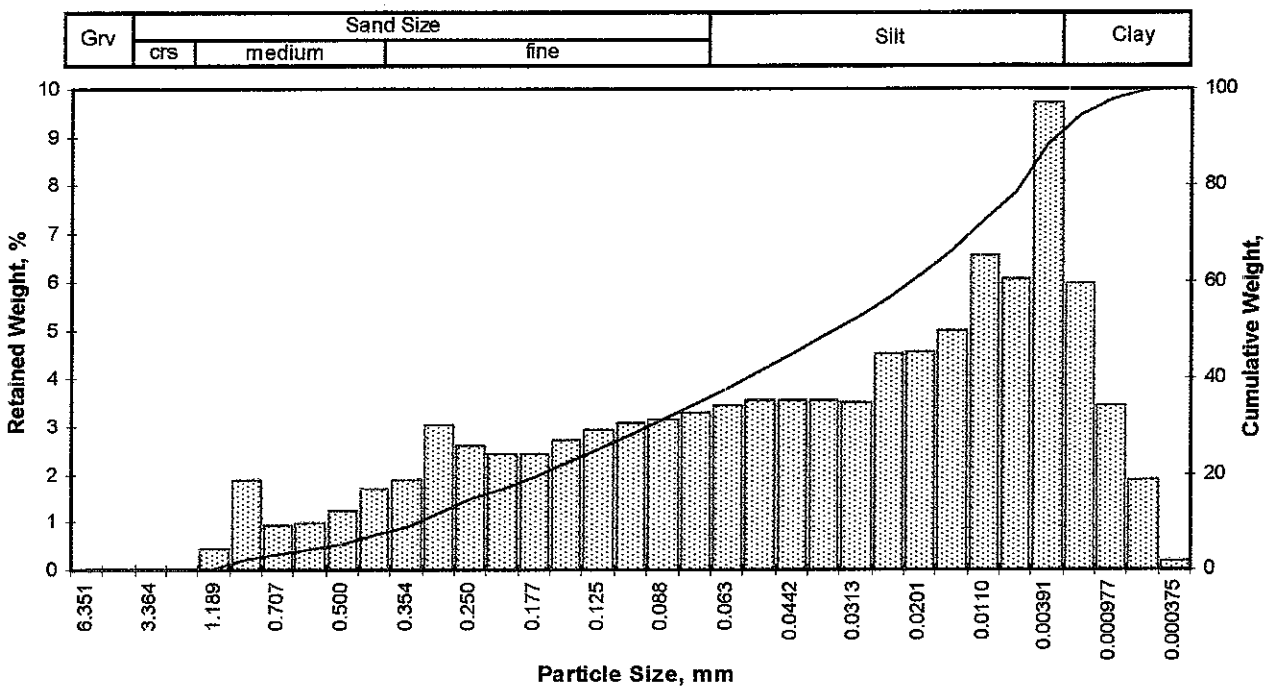
Measure	Trask	Inman	Folk-Ward
Median, phi	5.63	5.63	5.63
Median, in.	0.0008	0.0008	0.0008
Median, mm	0.020	0.020	0.020
Mean, phi	4.99	5.40	5.48
Mean, in.	0.0012	0.0009	0.0009
Mean, mm	0.032	0.024	0.022
Sorting	0.388	2.231	2.258
Skewness	1.053	-0.101	-0.082
Kurtosis	0.118	0.690	1.131
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	2.84
Fine Sand	200	17.62
Silt	.00391 mm	67.92
Clay	<.00391 mm	11.61
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C3-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.45	0.45
0.0331	0.841	0.25	20	1.86	2.31
0.0278	0.707	0.50	25	0.96	3.26
0.0234	0.595	0.75	30	0.98	4.24
0.0197	0.500	1.00	35	1.21	5.45
0.0166	0.420	1.25	40	1.70	7.15
0.0139	0.354	1.50	45	1.88	9.03
0.0117	0.297	1.75	50	3.05	12.08
0.0098	0.250	2.00	60	2.59	14.67
0.0083	0.210	2.25	70	2.43	17.10
0.0070	0.177	2.50	80	2.43	19.53
0.0059	0.149	2.75	100	2.70	22.23
0.0049	0.125	3.00	120	2.93	25.16
0.0041	0.105	3.25	140	3.07	28.23
0.0035	0.088	3.50	170	3.15	31.38
0.0029	0.074	3.75	200	3.28	34.66
0.0025	0.063	4.00	230	3.42	38.09
0.0021	0.053	4.25	270	3.53	41.62
0.00174	0.0442	4.50	325	3.55	45.17
0.00146	0.0372	4.75	400	3.53	48.70
0.00123	0.0313	5.00	450	3.51	52.21
0.000986	0.0250	5.32	500	4.52	56.73
0.000790	0.0201	5.64	635	4.54	61.27
0.000615	0.0156	6.00		4.98	66.25
0.000435	0.0110	6.50		6.55	72.80
0.000308	0.00781	7.00		6.05	78.85
0.000154	0.00391	8.00		9.71	88.56
0.000077	0.00195	9.00		5.94	94.50
0.000038	0.000977	10.00		3.44	97.94
0.000019	0.000488	11.00		1.86	99.80
0.000015	0.000375	11.38		0.20	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	0.91	0.0210	0.533
10	1.58	0.0132	0.335
16	2.14	0.0090	0.227
25	2.99	0.0050	0.126
40	4.14	0.0022	0.057
50	4.84	0.0014	0.035
60	5.55	0.0008	0.021
75	6.68	0.0004	0.010
84	7.53	0.0002	0.005
90	8.24	0.0001	0.003
95	9.14	0.0001	0.002

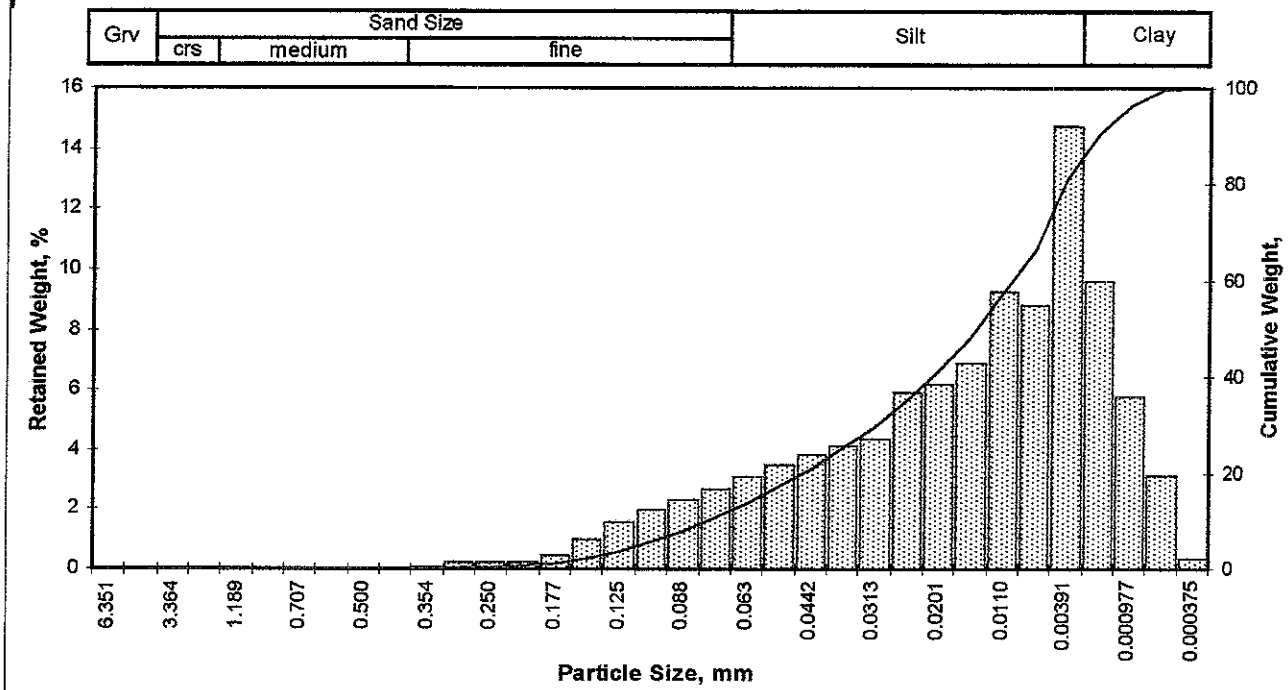
Measure	Trask	Inman	Folk-Ward
Median phi	4.84	4.84	4.84
Median, in	0.0014	0.0014	0.0014
Median, mm	0.035	0.035	0.035
Mean phi	3.88	4.83	4.84
Mean, in	0.0027	0.0014	0.0014
Mean mm	0.068	0.035	0.035
Sorting	0.278	2.697	2.597
Skewness	1.006	-0.003	0.020
Kurtosis	0.176	0.527	0.913
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	7.15
Fine Sand	200	27.51
Silt	.00391 mm	53.90
Clay	<.00391 mm	11.44
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	C3-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00
0.0139	0.354	1.50	45	0.05	0.06
0.0117	0.297	1.75	50	0.22	0.28
0.0098	0.250	2.00	60	0.23	0.51
0.0083	0.210	2.25	70	0.25	0.76
0.0070	0.177	2.50	80	0.47	1.23
0.0059	0.149	2.75	100	0.99	2.22
0.0049	0.125	3.00	120	1.54	3.76
0.0041	0.105	3.25	140	1.96	5.72
0.0035	0.088	3.50	170	2.30	8.02
0.0029	0.074	3.75	200	2.66	10.68
0.0025	0.063	4.00	230	3.06	13.74
0.0021	0.053	4.25	270	3.45	17.19
0.00174	0.0442	4.50	325	3.81	21.00
0.00146	0.0372	4.75	400	4.11	25.11
0.00123	0.0313	5.00	450	4.36	29.47
0.000986	0.0250	5.32	500	5.92	35.39
0.000790	0.0201	5.64	635	6.17	41.55
0.000615	0.0156	6.00		6.90	48.45
0.000435	0.0110	6.50		9.27	57.72
0.000308	0.00781	7.00		8.78	66.50
0.000154	0.00391	8.00		14.71	81.20
0.000077	0.00195	9.00		9.57	90.77
0.000038	0.000977	10.00		5.77	96.54
0.000019	0.000488	11.00		3.13	99.67
0.000015	0.000375	11.38		0.33	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.16	0.0044	0.112
10	3.69	0.0031	0.078
16	4.16	0.0022	0.056
25	4.74	0.0015	0.037
40	5.56	0.0008	0.021
50	6.08	0.0006	0.015
60	6.63	0.0004	0.010
75	7.58	0.0002	0.005
84	8.29	0.0001	0.003
90	8.92	0.0001	0.002
95	9.73	0.0000	0.001

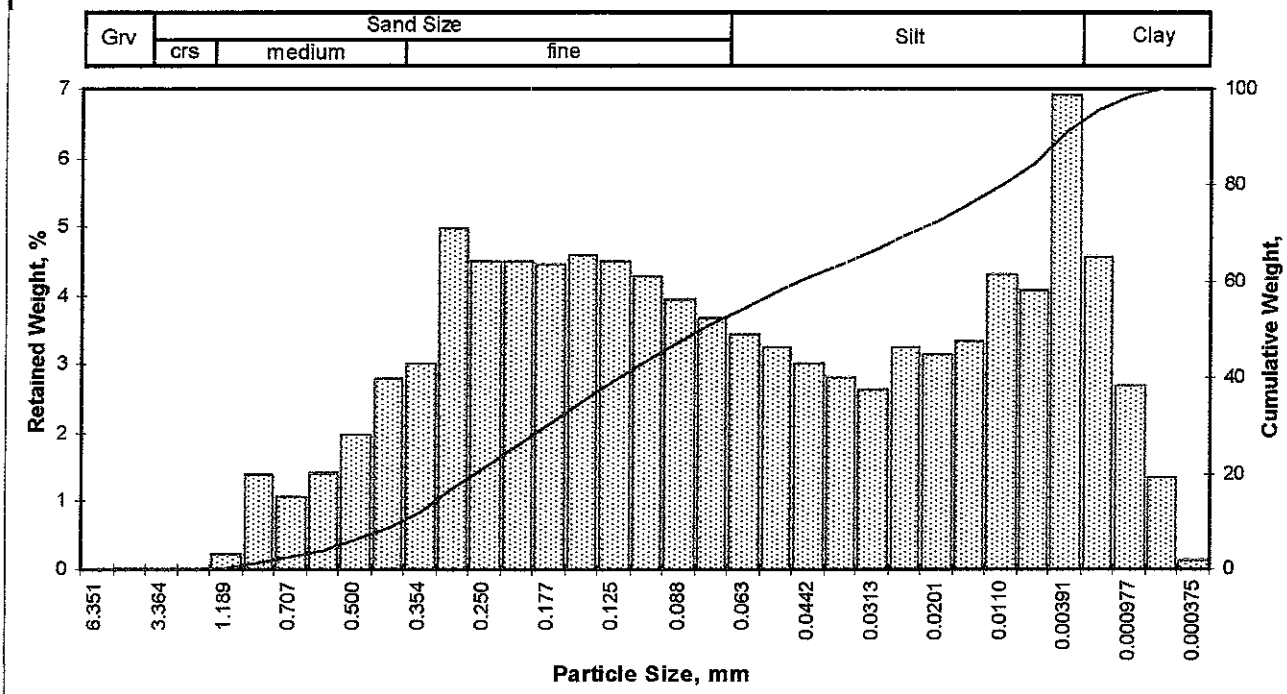
Measure	Trask	Inman	Folk-Ward
Median phi	6.08	6.08	6.08
Median, in	0.0006	0.0006	0.0006
Median, mm	0.015	0.015	0.015
Mean, phi	5.55	6.23	6.18
Mean, in.	0.0008	0.0005	0.0005
Mean, mm	0.021	0.013	0.014
Sorting	0.374	2.064	2.028
Skewness	0.948	0.070	0.090
Kurtosis	0.212	0.593	0.951
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	10.68
Silt	.00391 mm	70.52
Clay	<.00391 mm	18.80
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B3-1
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.22	0.22
0.0331	0.841	0.25	20	1.38	1.60
0.0278	0.707	0.50	25	1.07	2.67
0.0234	0.595	0.75	30	1.41	4.08
0.0197	0.500	1.00	35	1.97	6.05
0.0166	0.420	1.25	40	2.78	8.83
0.0139	0.354	1.50	45	3.01	11.84
0.0117	0.297	1.75	50	4.98	16.82
0.0098	0.250	2.00	60	4.51	21.33
0.0083	0.210	2.25	70	4.49	25.82
0.0070	0.177	2.50	80	4.46	30.28
0.0059	0.149	2.75	100	4.58	34.86
0.0049	0.125	3.00	120	4.51	39.37
0.0041	0.105	3.25	140	4.26	43.63
0.0035	0.088	3.50	170	3.93	47.56
0.0029	0.074	3.75	200	3.66	51.22
0.0025	0.063	4.00	230	3.43	54.65
0.0021	0.053	4.25	270	3.23	57.88
0.00174	0.0442	4.50	325	3.00	60.88
0.00146	0.0372	4.75	400	2.80	63.68
0.00123	0.0313	5.00	450	2.63	66.31
0.000986	0.0250	5.32	500	3.24	69.55
0.000790	0.0201	5.64	635	3.13	72.68
0.000615	0.0156	6.00		3.33	76.01
0.000435	0.0110	6.50		4.30	80.31
0.000308	0.00781	7.00		4.06	84.37
0.000154	0.00391	8.00		6.92	91.29
0.000077	0.00195	9.00		4.55	95.84
0.000038	0.000977	10.00		2.68	98.52
0.000019	0.000488	11.00		1.35	99.87
0.000015	0.000375	11.38		0.13	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	0.87	0.0216	0.548
10	1.35	0.0155	0.393
16	1.71	0.0120	0.306
25	2.20	0.0085	0.217
40	3.04	0.0048	0.122
50	3.67	0.0031	0.079
60	4.43	0.0018	0.046
75	5.89	0.0007	0.017
84	6.95	0.0003	0.008
90	7.81	0.0002	0.004
95	8.82	0.0001	0.002

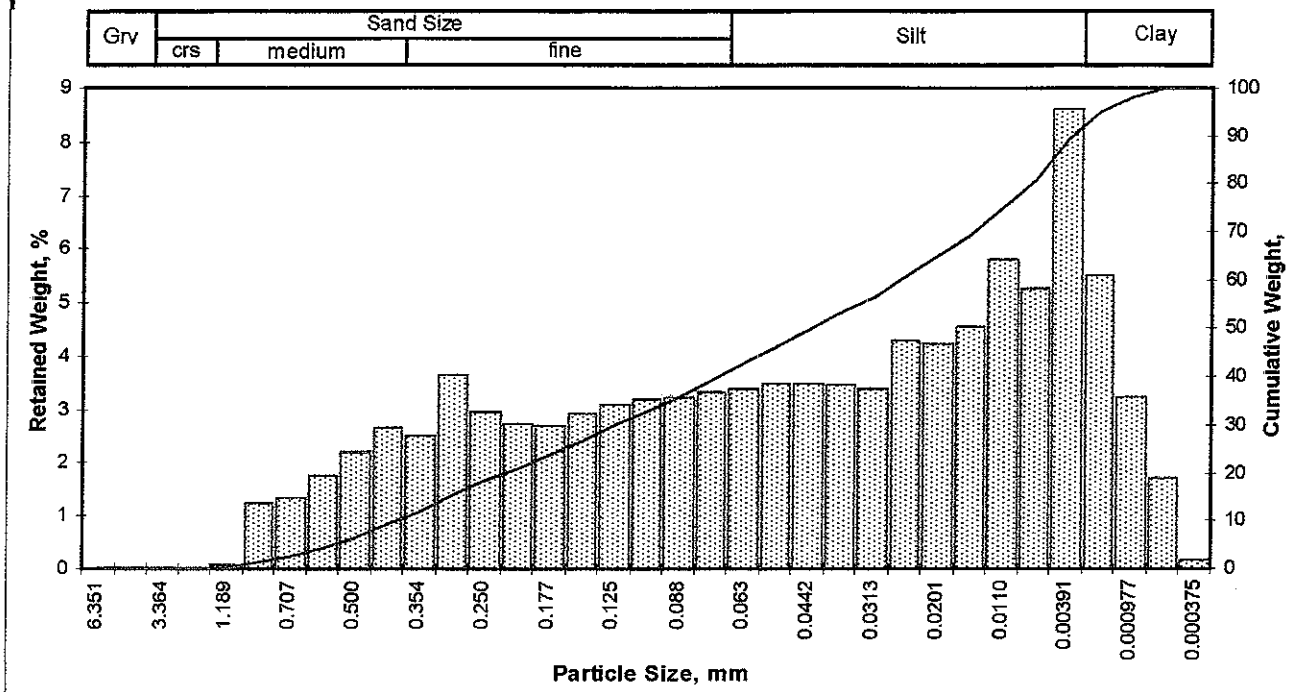
Measure	Trask	Inman	Folk-Ward
Median phi	3.67	3.67	3.67
Median, in.	0.0031	0.0031	0.0031
Median mm	0.079	0.079	0.079
Mean, phi	3.10	4.33	4.11
Mean in.	0.0046	0.0020	0.0023
Mean mm	0.117	0.050	0.058
Sorting	0.279	2.623	2.516
Skewness	0.768	0.254	0.275
Kurtosis	0.257	0.515	0.884
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	8.83
Fine Sand	200	42.39
Silt	.00391 mm	40.07
Clay	<.00391 mm	8.71
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B3-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.06	0.06
0.0331	0.841	0.25	20	1.23	1.29
0.0278	0.707	0.50	25	1.33	2.62
0.0234	0.595	0.75	30	1.77	4.39
0.0197	0.500	1.00	35	2.21	6.60
0.0166	0.420	1.25	40	2.66	9.26
0.0139	0.354	1.50	45	2.51	11.77
0.0117	0.297	1.75	50	3.64	15.41
0.0098	0.250	2.00	60	2.95	18.36
0.0083	0.210	2.25	70	2.74	21.11
0.0070	0.177	2.50	80	2.70	23.81
0.0059	0.149	2.75	100	2.91	26.72
0.0049	0.125	3.00	120	3.09	29.81
0.0041	0.105	3.25	140	3.18	32.99
0.0035	0.088	3.50	170	3.22	36.21
0.0029	0.074	3.75	200	3.30	39.51
0.0025	0.063	4.00	230	3.39	42.90
0.0021	0.053	4.25	270	3.47	46.38
0.00174	0.0442	4.50	325	3.48	49.86
0.00146	0.0372	4.75	400	3.44	53.30
0.00123	0.0313	5.00	450	3.38	56.68
0.000986	0.0250	5.32	500	4.28	60.96
0.000790	0.0201	5.64	635	4.23	65.19
0.000615	0.0156	6.00		4.55	69.74
0.000435	0.0110	6.50		5.80	75.55
0.000308	0.00781	7.00		5.27	80.82
0.000154	0.00391	8.00		8.60	89.42
0.000077	0.00195	9.00		5.49	94.91
0.000038	0.000977	10.00		3.23	98.15
0.000019	0.000488	11.00		1.68	99.83
0.000015	0.000375	11.38		0.17	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	0.82	0.0223	0.567
10	1.32	0.0157	0.400
16	1.80	0.0113	0.287
25	2.60	0.0065	0.165
40	3.79	0.0029	0.072
50	4.51	0.0017	0.044
60	5.25	0.0010	0.026
75	6.45	0.0004	0.011
84	7.37	0.0002	0.006
90	8.11	0.0001	0.004
95	9.03	0.0001	0.002

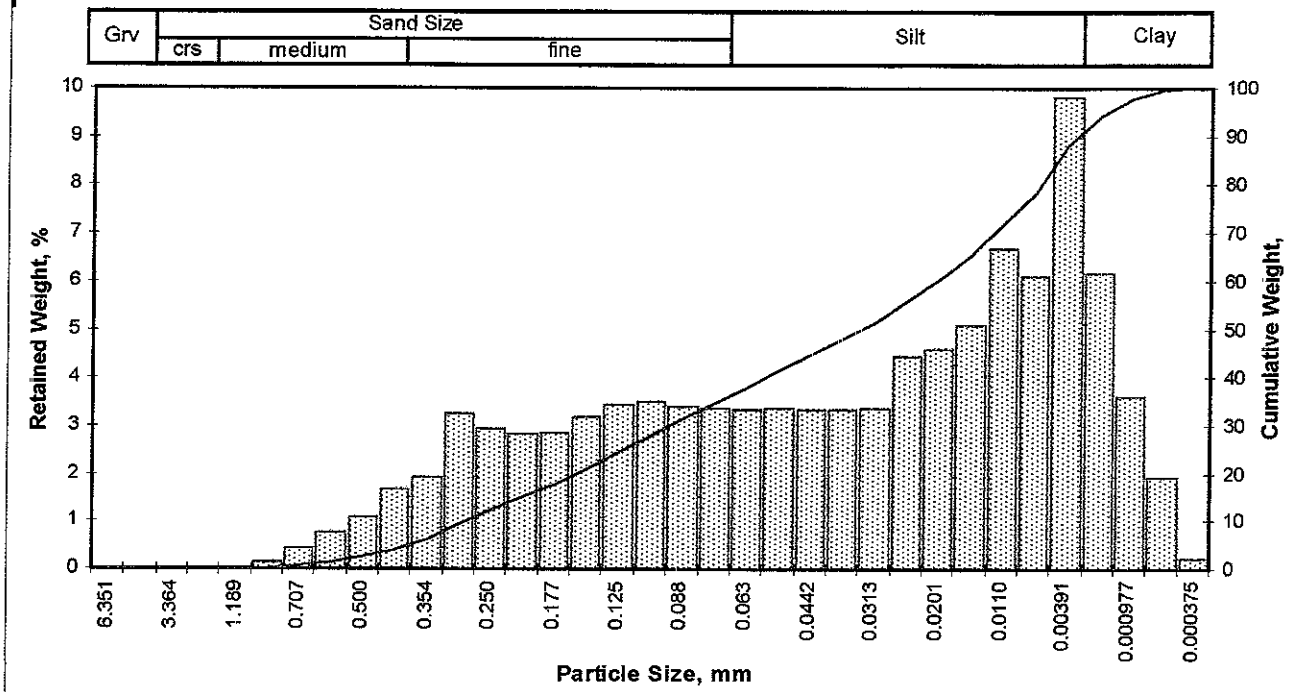
Measure	Trask	Inman	Folk-Ward
Median phi	4.51	4.51	4.51
Median, in	0.0017	0.0017	0.0017
Median mm	0.044	0.044	0.044
Mean, phi	3.51	4.58	4.56
Mean in	0.0035	0.0016	0.0017
Mean mm	0.088	0.042	0.042
Sorting	0.263	2.785	2.636
Skewness	0.988	0.027	0.064
Kurtosis	0.194	0.473	0.874
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	9.26
Fine Sand	200	30.25
Silt	.00391 mm	49.91
Clay	<.00391 mm	10.58
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B3-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.14	0.14
0.0278	0.707	0.50	25	0.45	0.59
0.0234	0.595	0.75	30	0.76	1.35
0.0197	0.500	1.00	35	1.10	2.45
0.0166	0.420	1.25	40	1.65	4.10
0.0139	0.354	1.50	45	1.92	6.02
0.0117	0.297	1.75	50	3.26	9.28
0.0098	0.250	2.00	60	2.91	12.19
0.0083	0.210	2.25	70	2.82	15.01
0.0070	0.177	2.50	80	2.86	17.87
0.0059	0.149	2.75	100	3.18	21.05
0.0049	0.125	3.00	120	3.43	24.48
0.0041	0.105	3.25	140	3.49	27.97
0.0035	0.088	3.50	170	3.41	31.38
0.0029	0.074	3.75	200	3.34	34.72
0.0025	0.063	4.00	230	3.32	38.04
0.0021	0.053	4.25	270	3.34	41.38
0.00174	0.0442	4.50	325	3.33	44.71
0.00146	0.0372	4.75	400	3.32	48.03
0.00123	0.0313	5.00	450	3.34	51.37
0.000986	0.0250	5.32	500	4.43	55.80
0.000790	0.0201	5.64	635	4.58	60.38
0.000615	0.0156	6.00		5.10	65.48
0.000435	0.0110	6.50		6.68	72.16
0.000308	0.00781	7.00		6.10	78.26
0.000154	0.00391	8.00		9.82	88.08
0.000077	0.00195	9.00		6.18	94.26
0.000038	0.000977	10.00		3.62	97.88
0.000019	0.000488	11.00		1.92	99.80
0.000015	0.000375	11.38		0.20	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.37	0.0153	0.388
10	1.81	0.0112	0.285
16	2.34	0.0078	0.198
25	3.04	0.0048	0.122
40	4.15	0.0022	0.056
50	4.90	0.0013	0.034
60	5.61	0.0008	0.020
75	6.73	0.0004	0.009
84	7.58	0.0002	0.005
90	8.31	0.0001	0.003
95	9.20	0.0001	0.002

Measure	Trask	Inman	Folk-Ward
Median phi	4.90	4.90	4.90
Median in.	0.0013	0.0013	0.0013
Median mm	0.034	0.034	0.034
Mean phi	3.93	4.96	4.94
Mean, in.	0.0026	0.0013	0.0013
Mean mm	0.066	0.032	0.033
Sorting	0.278	2.624	2.500
Skewness	1.009	0.024	0.062
Kurtosis	0.200	0.493	0.869
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

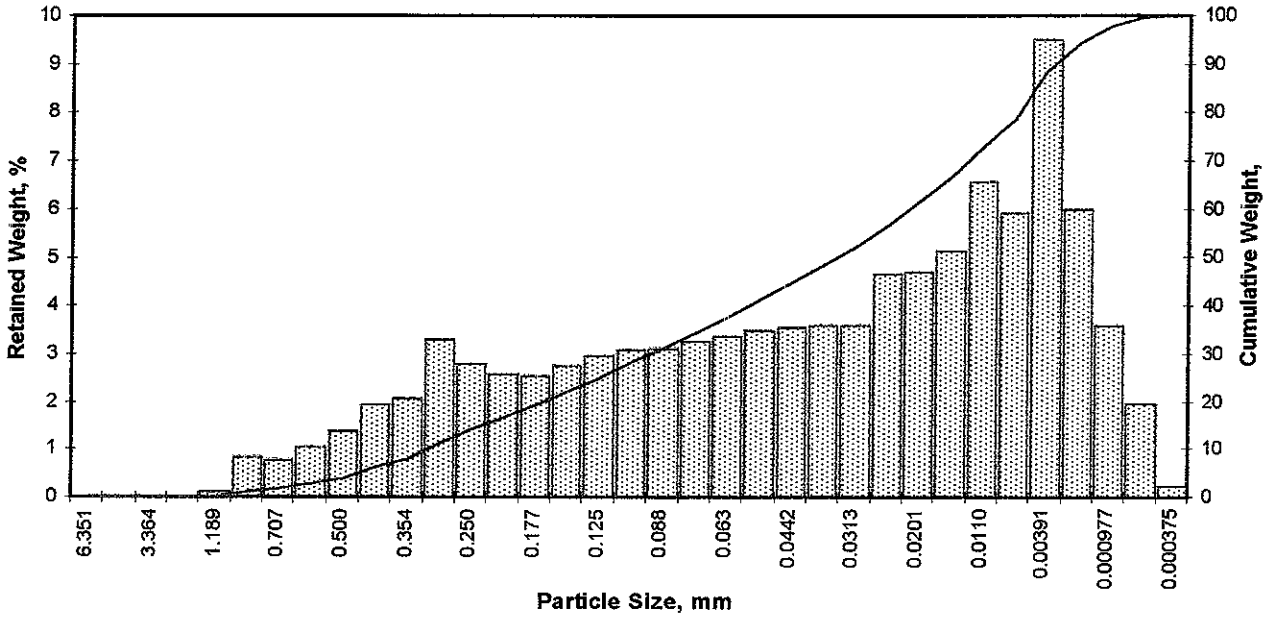
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	4.10
Fine Sand	200	30.62
Silt	.00391 mm	53.36
Clay	<.00391 mm	11.92
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B1-1
Project No:	G9707331	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.11	0.11
0.0331	0.841	0.25	20	0.82	0.92
0.0278	0.707	0.50	25	0.77	1.69
0.0234	0.595	0.75	30	1.03	2.72
0.0197	0.500	1.00	35	1.38	4.10
0.0166	0.420	1.25	40	1.92	6.02
0.0139	0.354	1.50	45	2.06	8.08
0.0117	0.297	1.75	50	3.28	11.36
0.0098	0.250	2.00	60	2.77	14.13
0.0083	0.210	2.25	70	2.57	16.70
0.0070	0.177	2.50	80	2.52	19.22
0.0059	0.149	2.75	100	2.76	21.98
0.0049	0.125	3.00	120	2.95	24.93
0.0041	0.105	3.25	140	3.06	27.99
0.0035	0.088	3.50	170	3.12	31.11
0.0029	0.074	3.75	200	3.24	34.35
0.0025	0.063	4.00	230	3.37	37.72
0.0021	0.053	4.25	270	3.48	41.20
0.00174	0.0442	4.50	325	3.53	44.73
0.00146	0.0372	4.75	400	3.56	48.29
0.00123	0.0313	5.00	450	3.59	51.88
0.000986	0.0250	5.32	500	4.67	56.55
0.000790	0.0201	5.64	635	4.70	61.25
0.000615	0.0156	6.00		5.11	66.36
0.000435	0.0110	6.50		6.56	72.92
0.000308	0.00781	7.00		5.91	78.83
0.000154	0.00391	8.00		9.48	88.31
0.000077	0.00195	9.00		5.98	94.29
0.000038	0.000977	10.00		3.57	97.86
0.000019	0.000488	11.00		1.94	99.80
0.000015	0.000375	11.38		0.20	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.12	0.0182	0.461
10	1.65	0.0126	0.319
16	2.18	0.0087	0.220
25	3.01	0.0049	0.125
40	4.16	0.0022	0.056
50	4.87	0.0013	0.034
60	5.56	0.0008	0.021
75	6.68	0.0004	0.010
84	7.55	0.0002	0.005
90	8.28	0.0001	0.003
95	9.20	0.0001	0.002

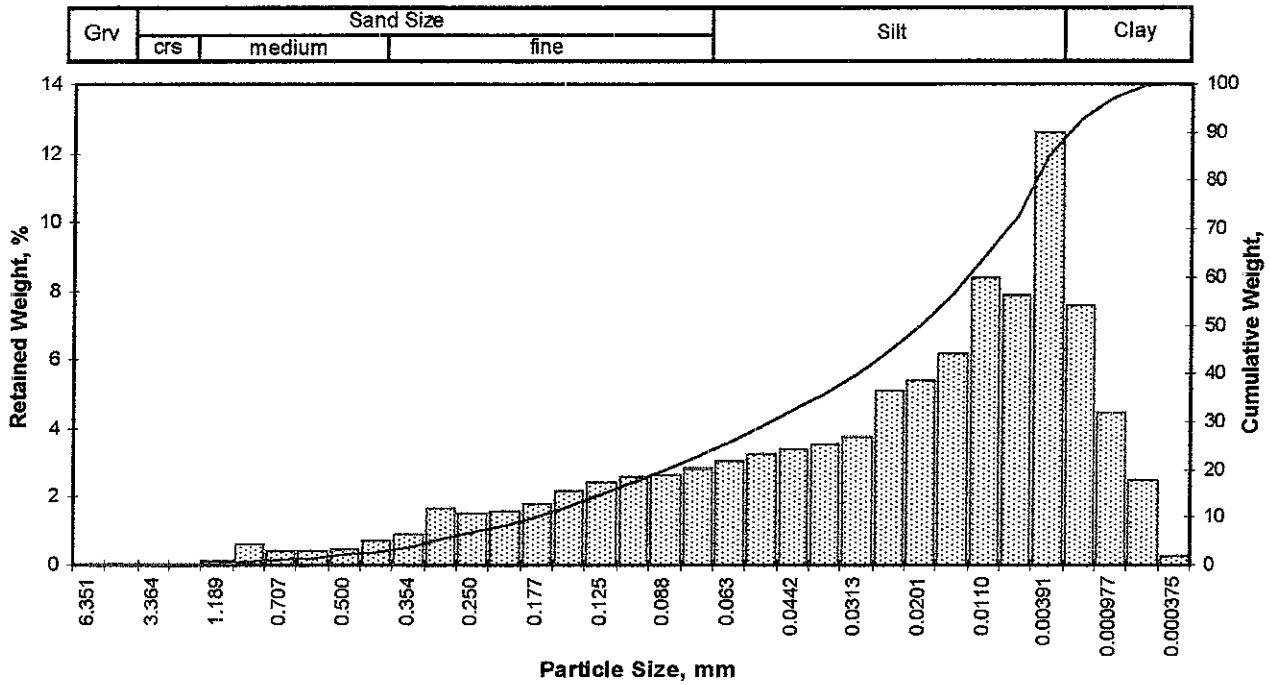
Measure	Trask	Inman	Folk-Ward
Median phi	4.87	4.87	4.87
Median in	0.0013	0.0013	0.0013
Median mm	0.034	0.034	0.034
Mean phi	3.90	4.86	4.87
Mean, in	0.0026	0.0014	0.0014
Mean, mm	0.067	0.034	0.034
Sorting	0.280	2.682	2.566
Skewness	1.020	-0.002	0.035
Kurtosis	0.181	0.507	0.903
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	6.02
Fine Sand	200	28.33
Silt	.00391 mm	53.96
Clay	<.00391 mm	11.69
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B1-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.10	0.10
0.0331	0.841	0.25	20	0.61	0.71
0.0278	0.707	0.50	25	0.41	1.12
0.0234	0.595	0.75	30	0.41	1.53
0.0197	0.500	1.00	35	0.46	1.99
0.0166	0.420	1.25	40	0.71	2.70
0.0139	0.354	1.50	45	0.92	3.62
0.0117	0.297	1.75	50	1.67	5.29
0.0098	0.250	2.00	60	1.53	6.82
0.0083	0.210	2.25	70	1.57	8.39
0.0070	0.177	2.50	80	1.76	10.15
0.0059	0.149	2.75	100	2.15	12.30
0.0049	0.125	3.00	120	2.42	14.72
0.0041	0.105	3.25	140	2.56	17.27
0.0035	0.088	3.50	170	2.65	19.92
0.0029	0.074	3.75	200	2.81	22.73
0.0025	0.063	4.00	230	3.01	25.74
0.0021	0.053	4.25	270	3.21	28.95
0.00174	0.0442	4.50	325	3.39	32.34
0.00146	0.0372	4.75	400	3.56	35.90
0.00123	0.0313	5.00	450	3.75	39.65
0.000986	0.0250	5.32	500	5.12	44.77
0.000790	0.0201	5.64	635	5.43	50.20
0.000615	0.0156	6.00		6.19	56.39
0.000435	0.0110	6.50		8.40	64.79
0.000308	0.00781	7.00		7.86	72.65
0.000154	0.00391	8.00		12.58	85.23
0.000077	0.00195	9.00		7.57	92.80
0.000038	0.000977	10.00		4.43	97.23
0.000019	0.000488	11.00		2.50	99.73
0.000015	0.000375	11.38		0.27	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.71	0.0121	0.306
10	2.48	0.0071	0.179
16	3.13	0.0045	0.115
25	3.94	0.0026	0.065
40	5.02	0.0012	0.031
50	5.63	0.0008	0.020
60	6.21	0.0005	0.013
75	7.19	0.0003	0.007
84	7.90	0.0002	0.004
90	8.63	0.0001	0.003
95	9.50	0.0001	0.001

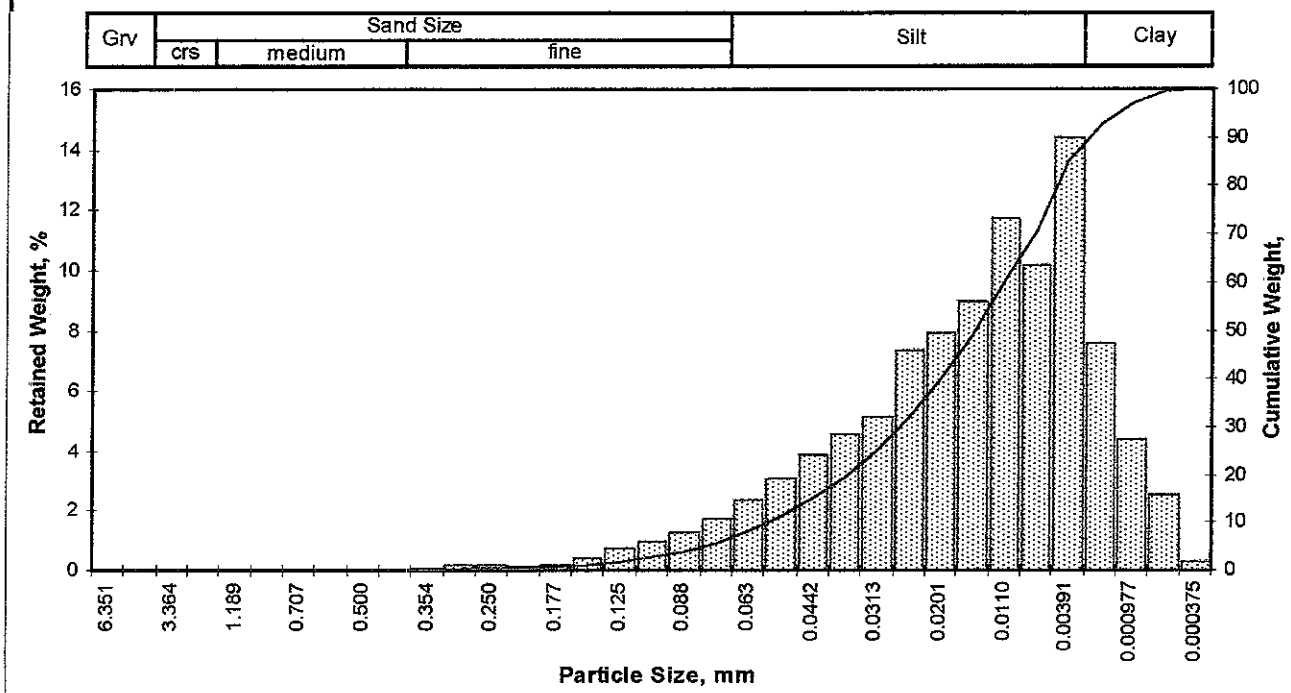
Measure	Trask	Inman	Folk-Ward
Median phi	5.63	5.63	5.63
Median, in.	0.0008	0.0008	0.0008
Median, mm	0.020	0.020	0.020
Mean phi	4.79	5.51	5.55
Mean, in.	0.0014	0.0009	0.0008
Mean, mm	0.036	0.022	0.021
Sorting	0.324	2.388	2.374
Skewness	1.047	-0.048	-0.027
Kurtosis	0.165	0.631	0.983
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	2.70
Fine Sand	200	20.03
Silt	.00391 mm	62.50
Clay	<.00391 mm	14.77
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B1-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00
0.0139	0.354	1.50	45	0.05	0.05
0.0117	0.297	1.75	50	0.18	0.23
0.0098	0.250	2.00	60	0.16	0.39
0.0083	0.210	2.25	70	0.11	0.50
0.0070	0.177	2.50	80	0.17	0.67
0.0059	0.149	2.75	100	0.43	1.10
0.0049	0.125	3.00	120	0.73	1.83
0.0041	0.105	3.25	140	0.99	2.82
0.0035	0.088	3.50	170	1.28	4.10
0.0029	0.074	3.75	200	1.72	5.82
0.0025	0.063	4.00	230	2.34	8.16
0.0021	0.053	4.25	270	3.08	11.24
0.00174	0.0442	4.50	325	3.85	15.09
0.00146	0.0372	4.75	400	4.56	19.65
0.00123	0.0313	5.00	450	5.16	24.81
0.000986	0.0250	5.32	500	7.34	32.15
0.000790	0.0201	5.64	635	7.89	40.04
0.000615	0.0156	6.00		8.95	48.99
0.000435	0.0110	6.50		11.71	60.70
0.000308	0.00781	7.00		10.14	70.84
0.000154	0.00391	8.00		14.36	85.20
0.000077	0.00195	9.00		7.57	92.77
0.000038	0.000977	10.00		4.39	97.16
0.000019	0.000488	11.00		2.56	99.72
0.000015	0.000375	11.38		0.28	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.63	0.0032	0.081
10	4.15	0.0022	0.056
16	4.55	0.0017	0.043
25	5.01	0.0012	0.031
40	5.64	0.0008	0.020
50	6.04	0.0006	0.015
60	6.47	0.0004	0.011
75	7.29	0.0003	0.006
84	7.92	0.0002	0.004
90	8.63	0.0001	0.003
95	9.51	0.0001	0.001

Measure	Trask	Inman	Folk-Ward
Median phi	6.04	6.04	6.04
Median, in.	0.0006	0.0006	0.0006
Median mm	0.015	0.015	0.015
Mean phi	5.74	6.23	6.17
Mean in	0.0007	0.0005	0.0005
Mean mm	0.019	0.013	0.014
Sorting	0.454	1.683	1.732
Skewness	0.929	0.113	0.146
Kurtosis	0.229	0.746	1.056
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

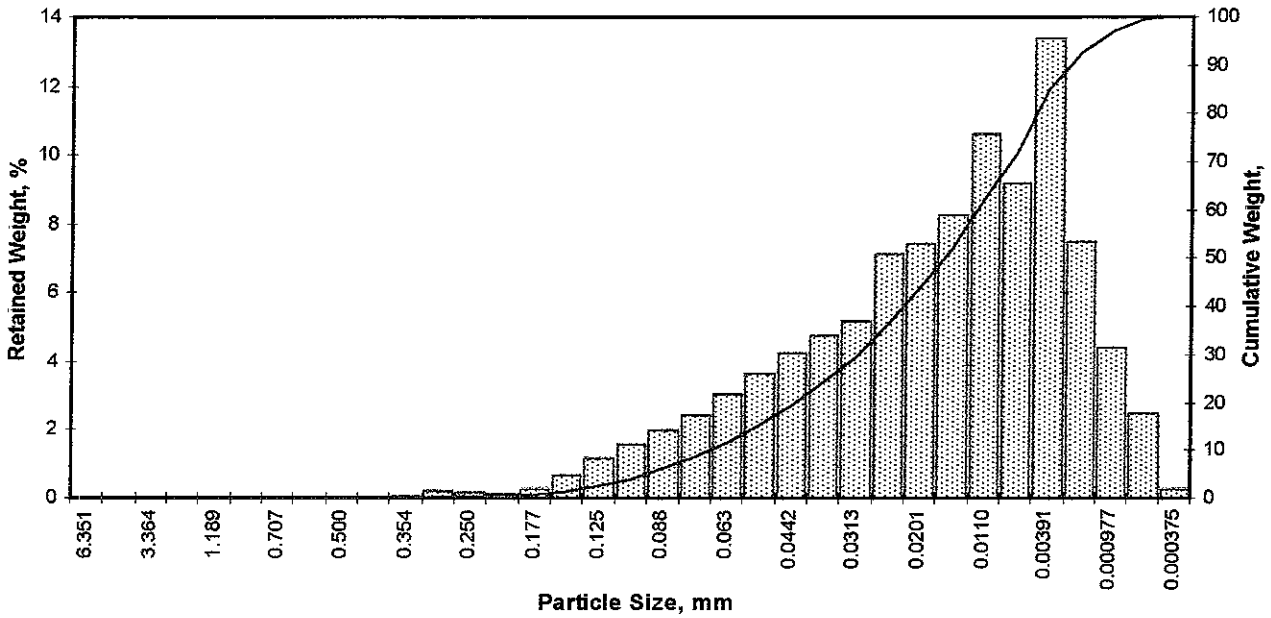
Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	5.81
Silt	.00391 mm	79.39
Clay	<.00391 mm	14.80
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B2-1
Project No:	G9707331	**Depth, ft:**	N/A

Grv	Sand Size			Silt	Clay
	crs	medium	fine		



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.01	0.01
0.0139	0.354	1.50	45	0.05	0.06
0.0117	0.297	1.75	50	0.18	0.24
0.0098	0.250	2.00	60	0.14	0.38
0.0083	0.210	2.25	70	0.10	0.48
0.0070	0.177	2.50	80	0.24	0.72
0.0059	0.149	2.75	100	0.67	1.38
0.0049	0.125	3.00	120	1.16	2.54
0.0041	0.105	3.25	140	1.57	4.11
0.0035	0.088	3.50	170	1.96	6.07
0.0029	0.074	3.75	200	2.44	8.51
0.0025	0.063	4.00	230	3.02	11.54
0.0021	0.053	4.25	270	3.65	15.19
0.00174	0.0442	4.50	325	4.25	19.44
0.00146	0.0372	4.75	400	4.76	24.20
0.00123	0.0313	5.00	450	5.17	29.37
0.000986	0.0250	5.32	500	7.11	36.48
0.000790	0.0201	5.64	635	7.42	43.90
0.000615	0.0156	6.00		8.23	52.13
0.000435	0.0110	6.50		10.60	62.73
0.000308	0.00781	7.00		9.20	71.93
0.000154	0.00391	8.00		13.40	85.33
0.000077	0.00195	9.00		7.48	92.81
0.000038	0.000977	10.00		4.42	97.23
0.000019	0.000488	11.00		2.50	99.73
0.000015	0.000375	11.38		0.27	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.36	0.0038	0.097
10	3.87	0.0027	0.068
16	4.30	0.0020	0.051
25	4.79	0.0014	0.036
40	5.47	0.0009	0.023
50	5.91	0.0007	0.017
60	6.37	0.0005	0.012
75	7.23	0.0003	0.007
84	7.90	0.0002	0.004
90	8.62	0.0001	0.003
95	9.49	0.0001	0.001

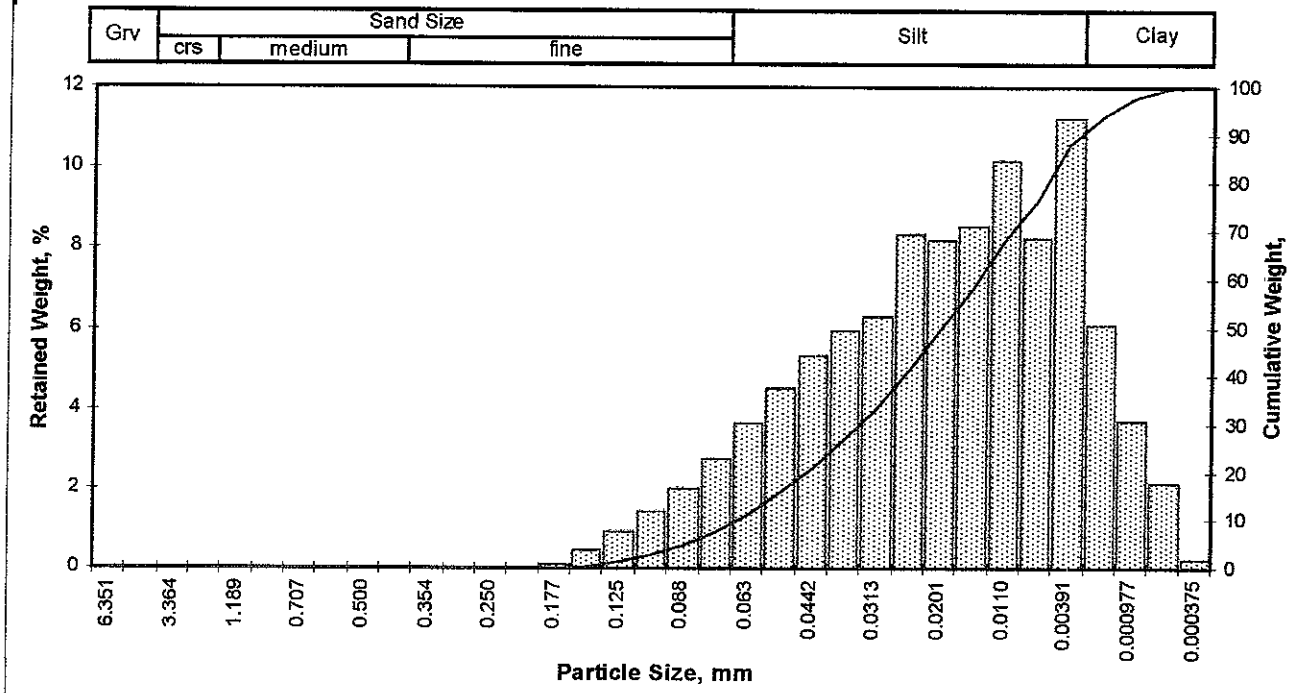
Measure	Trask	Inman	Folk-Ward
Median phi	5.91	5.91	5.91
Median, in.	0.0007	0.0007	0.0007
Median, mm	0.017	0.017	0.017
Mean, phi	5.54	6.10	6.04
Mean in	0.0008	0.0006	0.0006
Mean mm	0.021	0.015	0.015
Sorting	0.429	1.801	1.830
Skewness	0.932	0.107	0.139
Kurtosis	0.225	0.702	1.030
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.01
Fine Sand	200	8.51
Silt	.00391 mm	76.82
Clay	<.00391 mm	14.67
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B2-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00
0.0070	0.177	2.50	80	0.08	0.08
0.0059	0.149	2.75	100	0.45	0.53
0.0049	0.125	3.00	120	0.92	1.45
0.0041	0.105	3.25	140	1.41	2.86
0.0035	0.088	3.50	170	1.98	4.84
0.0029	0.074	3.75	200	2.73	7.57
0.0025	0.063	4.00	230	3.62	11.19
0.0021	0.053	4.25	270	4.52	15.71
0.00174	0.0442	4.50	325	5.33	21.04
0.00146	0.0372	4.75	400	5.92	26.96
0.00123	0.0313	5.00	450	6.29	33.25
0.000986	0.0250	5.32	500	8.31	41.56
0.000790	0.0201	5.64	635	8.17	49.73
0.000615	0.0156	6.00		8.54	58.27
0.000435	0.0110	6.50		10.19	68.46
0.000308	0.00781	7.00		8.23	76.69
0.000154	0.00391	8.00		11.24	87.92
0.000077	0.00195	9.00		6.07	93.99
0.000038	0.000977	10.00		3.67	97.66
0.000019	0.000488	11.00		2.11	99.77
0.000015	0.000375	11.38		0.23	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.51	0.0034	0.087
10	3.92	0.0026	0.066
16	4.26	0.0020	0.052
25	4.67	0.0015	0.039
40	5.26	0.0010	0.026
50	5.65	0.0008	0.020
60	6.09	0.0006	0.015
75	6.90	0.0003	0.008
84	7.65	0.0002	0.005
90	8.34	0.0001	0.003
95	9.27	0.0001	0.002

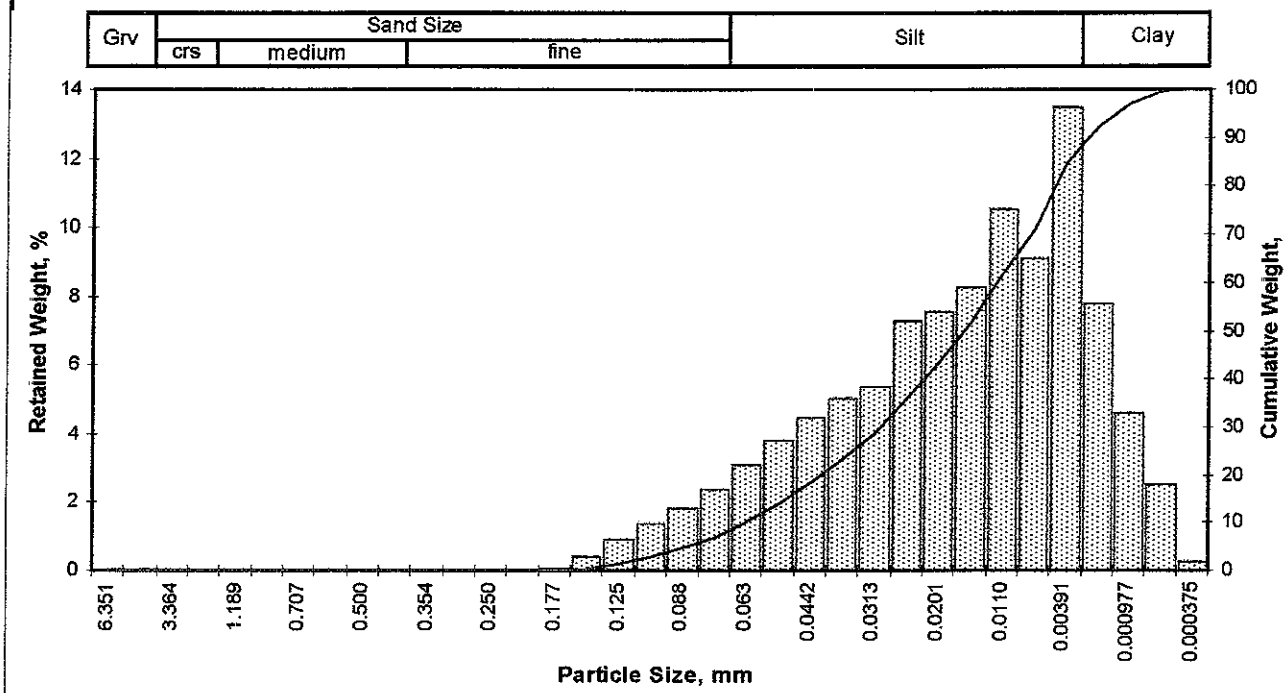
Measure	Trask	Inman	Folk-Ward
Median phi	5.65	5.65	5.65
Median in	0.0008	0.0008	0.0008
Median mm	0.020	0.020	0.020
Mean, phi	5.39	5.96	5.86
Mean in	0.0009	0.0006	0.0007
Mean mm	0.024	0.016	0.017
Sorting	0.462	1.694	1.719
Skewness	0.913	0.181	0.219
Kurtosis	0.245	0.700	1.058
Grain Size Description (Wentworth scale)		Silt (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	7.57
Silt	.00391 mm	80.35
Clay	<.00391 mm	12.08
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	B2-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.00	0.00
0.0331	0.841	0.25	20	0.00	0.00
0.0278	0.707	0.50	25	0.00	0.00
0.0234	0.595	0.75	30	0.00	0.00
0.0197	0.500	1.00	35	0.00	0.00
0.0166	0.420	1.25	40	0.00	0.00
0.0139	0.354	1.50	45	0.00	0.00
0.0117	0.297	1.75	50	0.00	0.00
0.0098	0.250	2.00	60	0.00	0.00
0.0083	0.210	2.25	70	0.00	0.00
0.0070	0.177	2.50	80	0.06	0.06
0.0059	0.149	2.75	100	0.41	0.47
0.0049	0.125	3.00	120	0.90	1.37
0.0041	0.105	3.25	140	1.37	2.74
0.0035	0.088	3.50	170	1.81	4.55
0.0029	0.074	3.75	200	2.38	6.93
0.0025	0.063	4.00	230	3.08	10.01
0.0021	0.053	4.25	270	3.81	13.82
0.00174	0.0442	4.50	325	4.47	18.30
0.00146	0.0372	4.75	400	4.98	23.28
0.00123	0.0313	5.00	450	5.36	28.64
0.000986	0.0250	5.32	500	7.30	35.94
0.000790	0.0201	5.64	635	7.51	43.45
0.000615	0.0156	6.00		8.23	51.68
0.000435	0.0110	6.50		10.49	62.17
0.000308	0.00781	7.00		9.10	71.27
0.000154	0.00391	8.00		13.49	84.76
0.000077	0.00195	9.00		7.80	92.56
0.000038	0.000977	10.00		4.62	97.18
0.000019	0.000488	11.00		2.55	99.73
0.000015	0.000375	11.38		0.27	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	3.55	0.0034	0.086
10	4.00	0.0025	0.063
16	4.37	0.0019	0.048
25	4.83	0.0014	0.035
40	5.49	0.0009	0.022
50	5.93	0.0006	0.016
60	6.40	0.0005	0.012
75	7.28	0.0003	0.006
84	7.94	0.0002	0.004
90	8.67	0.0001	0.002
95	9.53	0.0001	0.001

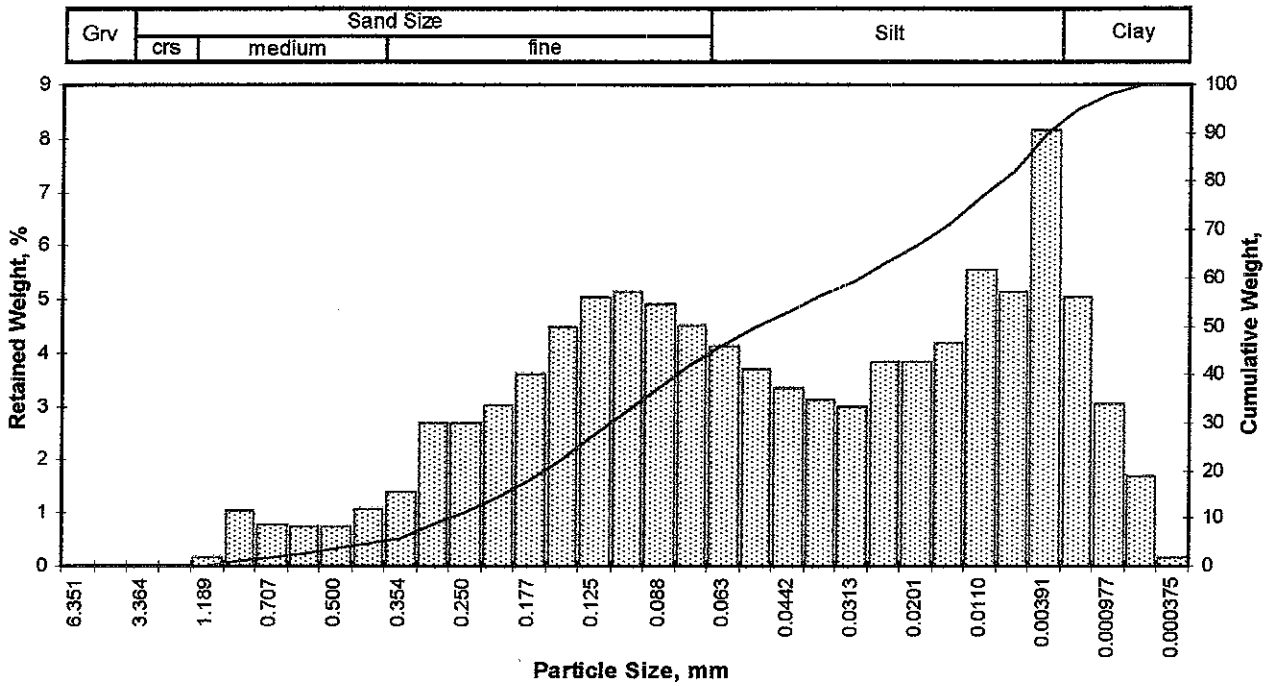
Measure	Trask	Inman	Folk-Ward
Median, phi	5.93	5.93	5.93
Median, in.	0.0006	0.0006	0.0006
Median, mm	0.016	0.016	0.016
Mean, phi	5.59	6.16	6.08
Mean, in.	0.0008	0.0006	0.0006
Mean, mm	0.021	0.014	0.015
Sorting	0.428	1.786	1.799
Skewness	0.916	0.129	0.167
Kurtosis	0.239	0.674	1.002
Grain Size Description (Wentworth scale)			Silt (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	0.00
Fine Sand	200	6.93
Silt	.00391 mm	77.82
Clay	<.00391 mm	15.24
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	A2-1
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.15	0.15
0.0331	0.841	0.25	20	1.03	1.18
0.0278	0.707	0.50	25	0.77	1.95
0.0234	0.595	0.75	30	0.75	2.70
0.0197	0.500	1.00	35	0.76	3.45
0.0166	0.420	1.25	40	1.08	4.53
0.0139	0.354	1.50	45	1.40	5.93
0.0117	0.297	1.75	50	2.70	8.63
0.0098	0.250	2.00	60	2.71	11.34
0.0083	0.210	2.25	70	3.03	14.37
0.0070	0.177	2.50	80	3.60	17.97
0.0059	0.149	2.75	100	4.49	22.47
0.0049	0.125	3.00	120	5.04	27.51
0.0041	0.105	3.25	140	5.14	32.65
0.0035	0.088	3.50	170	4.89	37.54
0.0029	0.074	3.75	200	4.53	42.07
0.0025	0.063	4.00	230	4.11	46.18
0.0021	0.053	4.25	270	3.70	49.88
0.00174	0.0442	4.50	325	3.34	53.22
0.00146	0.0372	4.75	400	3.11	56.33
0.00123	0.0313	5.00	450	2.99	59.32
0.000986	0.0250	5.32	500	3.82	63.14
0.000790	0.0201	5.64	635	3.82	66.96
0.000615	0.0156	6.00		4.20	71.16
0.000435	0.0110	6.50		5.57	76.73
0.000308	0.00781	7.00		5.13	81.86
0.000154	0.00391	8.00		8.17	90.03
0.000077	0.00195	9.00		5.04	95.07
0.000038	0.000977	10.00		3.06	98.13
0.000019	0.000488	11.00		1.69	99.82
0.000015	0.000375	11.38		0.18	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.33	0.0156	0.397
10	1.88	0.0107	0.272
16	2.36	0.0077	0.194
25	2.88	0.0054	0.136
40	3.64	0.0032	0.080
50	4.26	0.0021	0.052
60	5.06	0.0012	0.030
75	6.34	0.0005	0.012
84	7.26	0.0003	0.007
90	8.00	0.0002	0.004
95	8.99	0.0001	0.002

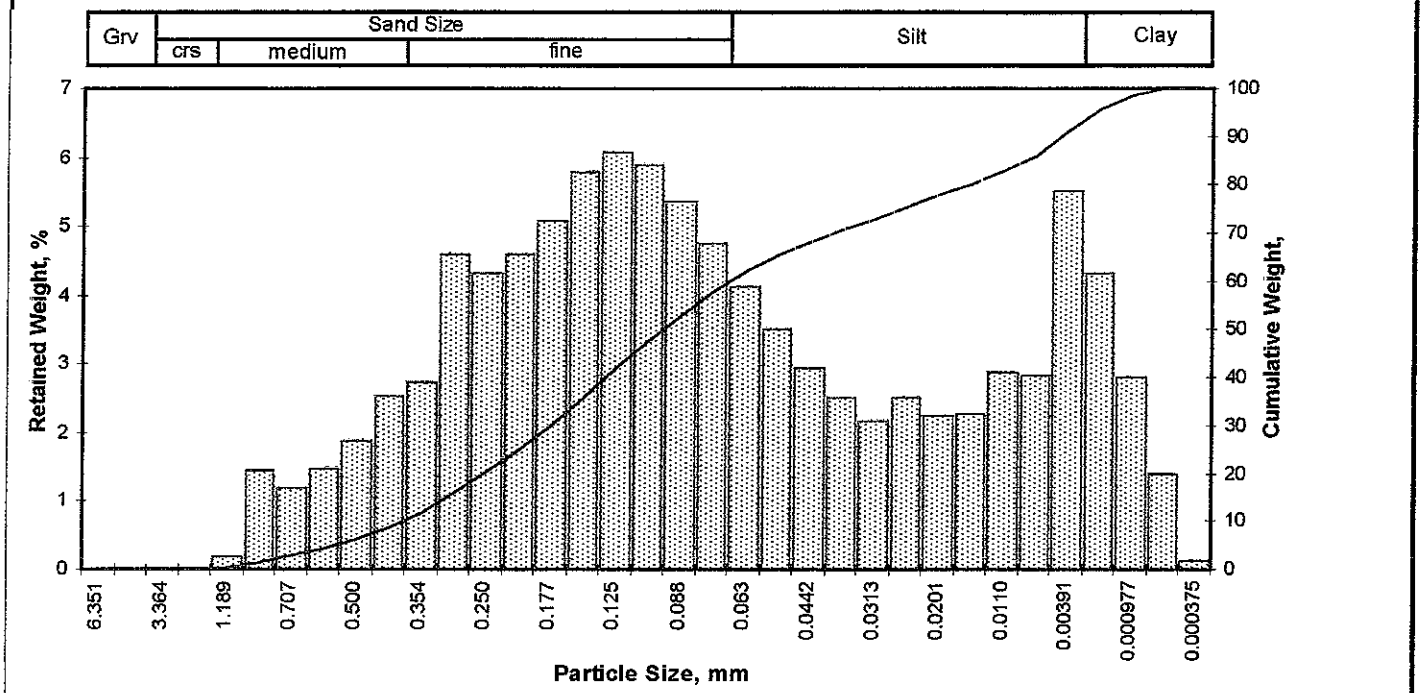
Measure	Trask	Inman	Folk-Ward
Median phi	4.26	4.26	4.26
Median in.	0.0021	0.0021	0.0021
Median mm	0.052	0.052	0.052
Mean, phi	3.75	4.81	4.63
Mean in.	0.0029	0.0014	0.0016
Mean mm	0.074	0.036	0.040
Sorting	0.301	2.449	2.384
Skewness	0.784	0.226	0.231
Kurtosis	0.231	0.562	0.904
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	4.53
Fine Sand	200	37.53
Silt	.00391 mm	47.96
Clay	<.00391 mm	9.97
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	A2-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.19	0.19
0.0331	0.841	0.25	20	1.43	1.62
0.0278	0.707	0.50	25	1.18	2.80
0.0234	0.595	0.75	30	1.47	4.27
0.0197	0.500	1.00	35	1.88	6.15
0.0166	0.420	1.25	40	2.52	8.66
0.0139	0.354	1.50	45	2.72	11.38
0.0117	0.297	1.75	50	4.59	15.97
0.0098	0.250	2.00	60	4.32	20.29
0.0083	0.210	2.25	70	4.61	24.90
0.0070	0.177	2.50	80	5.07	29.97
0.0059	0.149	2.75	100	5.78	35.75
0.0049	0.125	3.00	120	6.07	41.82
0.0041	0.105	3.25	140	5.88	47.70
0.0035	0.088	3.50	170	5.35	53.05
0.0029	0.074	3.75	200	4.75	57.80
0.0025	0.063	4.00	230	4.12	61.92
0.0021	0.053	4.25	270	3.51	65.43
0.00174	0.0442	4.50	325	2.93	68.36
0.00146	0.0372	4.75	400	2.50	70.86
0.00123	0.0313	5.00	450	2.18	73.04
0.000986	0.0250	5.32	500	2.51	75.55
0.000790	0.0201	5.64	635	2.26	77.81
0.000615	0.0156	6.00		2.28	80.08
0.000435	0.0110	6.50		2.88	82.96
0.000308	0.00781	7.00		2.84	85.80
0.000154	0.00391	8.00		5.52	91.32
0.000077	0.00195	9.00		4.33	95.65
0.000038	0.000977	10.00		2.81	98.46
0.000019	0.000488	11.00		1.40	99.86
0.000015	0.000375	11.38		0.14	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	0.85	0.0219	0.556
10	1.37	0.0152	0.386
16	1.75	0.0117	0.297
25	2.25	0.0082	0.210
40	2.93	0.0052	0.132
50	3.36	0.0038	0.098
60	3.88	0.0027	0.068
75	5.25	0.0010	0.026
84	6.68	0.0004	0.010
90	7.76	0.0002	0.005
95	8.85	0.0001	0.002

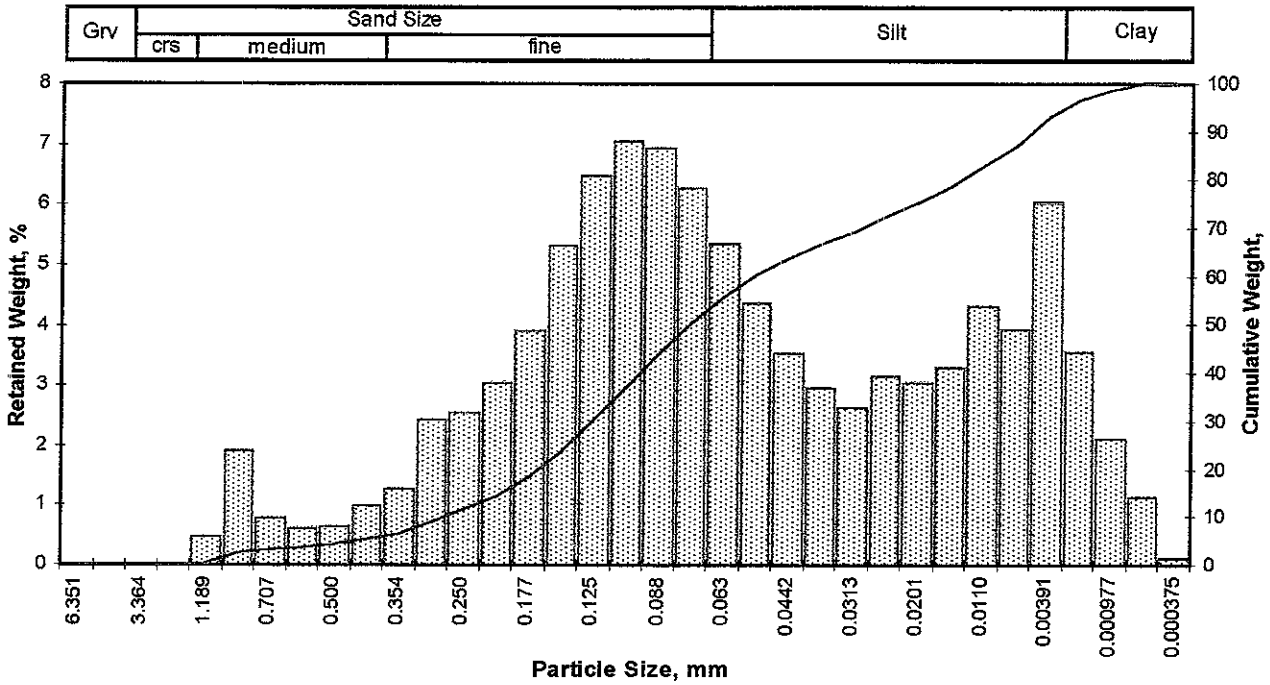
Measure	Trask	Inman	Folk-Ward
Median, phi	3.36	3.36	3.36
Median, in.	0.0038	0.0038	0.0038
Median, mm	0.098	0.098	0.098
Mean, phi	3.08	4.22	3.93
Mean, in.	0.0046	0.0021	0.0026
Mean, mm	0.118	0.054	0.066
Sorting	0.354	2.465	2.445
Skewness	0.760	0.349	0.361
Kurtosis	0.240	0.623	1.095
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	8.66
Fine Sand	200	49.13
Silt	.00391 mm	33.53
Clay	<.00391 mm	8.68
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	A2-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.46	0.46
0.0331	0.841	0.25	20	1.90	2.36
0.0278	0.707	0.50	25	0.78	3.14
0.0234	0.595	0.75	30	0.60	3.74
0.0197	0.500	1.00	35	0.63	4.37
0.0166	0.420	1.25	40	0.98	5.35
0.0139	0.354	1.50	45	1.26	6.61
0.0117	0.297	1.75	50	2.43	9.04
0.0098	0.250	2.00	60	2.53	11.57
0.0083	0.210	2.25	70	3.03	14.60
0.0070	0.177	2.50	80	3.91	18.50
0.0059	0.149	2.75	100	5.31	23.81
0.0049	0.125	3.00	120	6.47	30.28
0.0041	0.105	3.25	140	7.06	37.34
0.0035	0.088	3.50	170	6.92	44.26
0.0029	0.074	3.75	200	6.28	50.54
0.0025	0.063	4.00	230	5.33	55.86
0.0021	0.053	4.25	270	4.36	60.22
0.00174	0.0442	4.50	325	3.52	63.74
0.00146	0.0372	4.75	400	2.96	66.70
0.00123	0.0313	5.00	450	2.63	69.33
0.000986	0.0250	5.32	500	3.16	72.49
0.000790	0.0201	5.64	635	3.04	75.53
0.000615	0.0156	6.00		3.29	78.82
0.000435	0.0110	6.50		4.31	83.13
0.000308	0.00781	7.00		3.92	87.05
0.000154	0.00391	8.00		6.05	93.09
0.000077	0.00195	9.00		3.54	96.63
0.000038	0.000977	10.00		2.11	98.74
0.000019	0.000488	11.00		1.14	99.88
0.000015	0.000375	11.38		0.12	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.16	0.0176	0.447
10	1.85	0.0110	0.278
16	2.34	0.0078	0.198
25	2.80	0.0057	0.144
40	3.35	0.0039	0.098
50	3.73	0.0030	0.075
60	4.24	0.0021	0.053
75	5.58	0.0008	0.021
84	6.61	0.0004	0.010
90	7.49	0.0002	0.006
95	8.54	0.0001	0.003

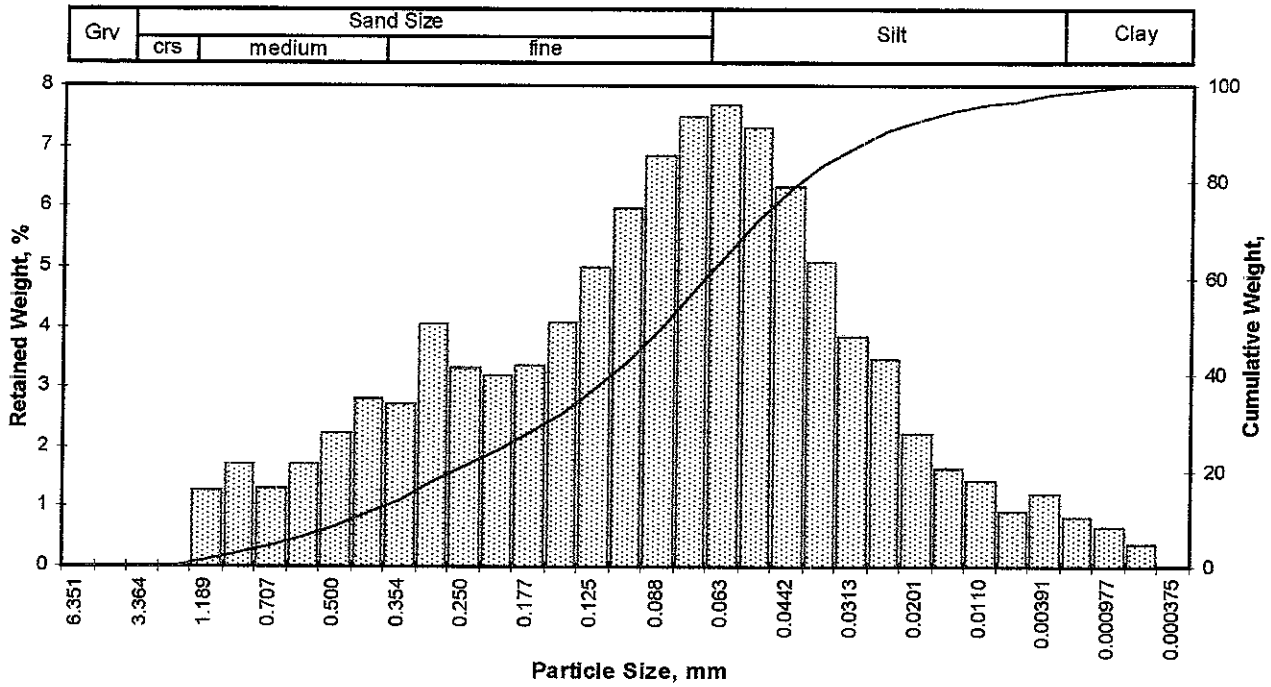
Measure	Trask	Inman	Folk-Ward
Median, phi	3.73	3.73	3.73
Median, in.	0.0030	0.0030	0.0030
Median, mm	0.075	0.075	0.075
Mean, phi	3.60	4.48	4.23
Mean, in	0.0032	0.0018	0.0021
Mean, mm	0.082	0.045	0.053
Sorting	0.380	2.136	2.186
Skewness	0.726	0.350	0.327
Kurtosis	0.226	0.727	1.084
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	5.35
Fine Sand	200	45.19
Silt	.00391 mm	42.56
Clay	<.00391 mm	6.91
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	BKG-1
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	1.28	1.28
0.0331	0.841	0.25	20	1.70	2.98
0.0278	0.707	0.50	25	1.31	4.29
0.0234	0.595	0.75	30	1.71	6.00
0.0197	0.500	1.00	35	2.22	8.22
0.0166	0.420	1.25	40	2.79	11.01
0.0139	0.354	1.50	45	2.72	13.73
0.0117	0.297	1.75	50	4.03	17.76
0.0098	0.250	2.00	60	3.33	21.09
0.0083	0.210	2.25	70	3.19	24.28
0.0070	0.177	2.50	80	3.35	27.63
0.0059	0.149	2.75	100	4.06	31.70
0.0049	0.125	3.00	120	4.99	36.69
0.0041	0.105	3.25	140	5.98	42.67
0.0035	0.088	3.50	170	6.84	49.51
0.0029	0.074	3.75	200	7.49	57.00
0.0025	0.063	4.00	230	7.67	64.67
0.0021	0.053	4.25	270	7.30	71.97
0.00174	0.0442	4.50	325	6.31	78.28
0.00146	0.0372	4.75	400	5.08	83.36
0.00123	0.0313	5.00	450	3.83	87.19
0.000986	0.0250	5.32	500	3.46	90.65
0.000790	0.0201	5.64	635	2.23	92.88
0.000615	0.0156	6.00		1.65	94.54
0.000435	0.0110	6.50		1.43	95.97
0.000308	0.00781	7.00		0.93	96.90
0.000154	0.00391	8.00		1.20	98.10
0.000077	0.00195	9.00		0.83	98.92
0.000038	0.000977	10.00		0.66	99.58
0.000019	0.000488	11.00		0.38	99.96
0.000015	0.000375	11.38		0.04	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	0.60	0.0259	0.658
10	1.16	0.0176	0.448
16	1.64	0.0126	0.321
25	2.30	0.0080	0.203
40	3.14	0.0045	0.114
50	3.52	0.0034	0.087
60	3.85	0.0027	0.069
75	4.37	0.0019	0.048
84	4.79	0.0014	0.036
90	5.26	0.0010	0.026
95	6.16	0.0005	0.014

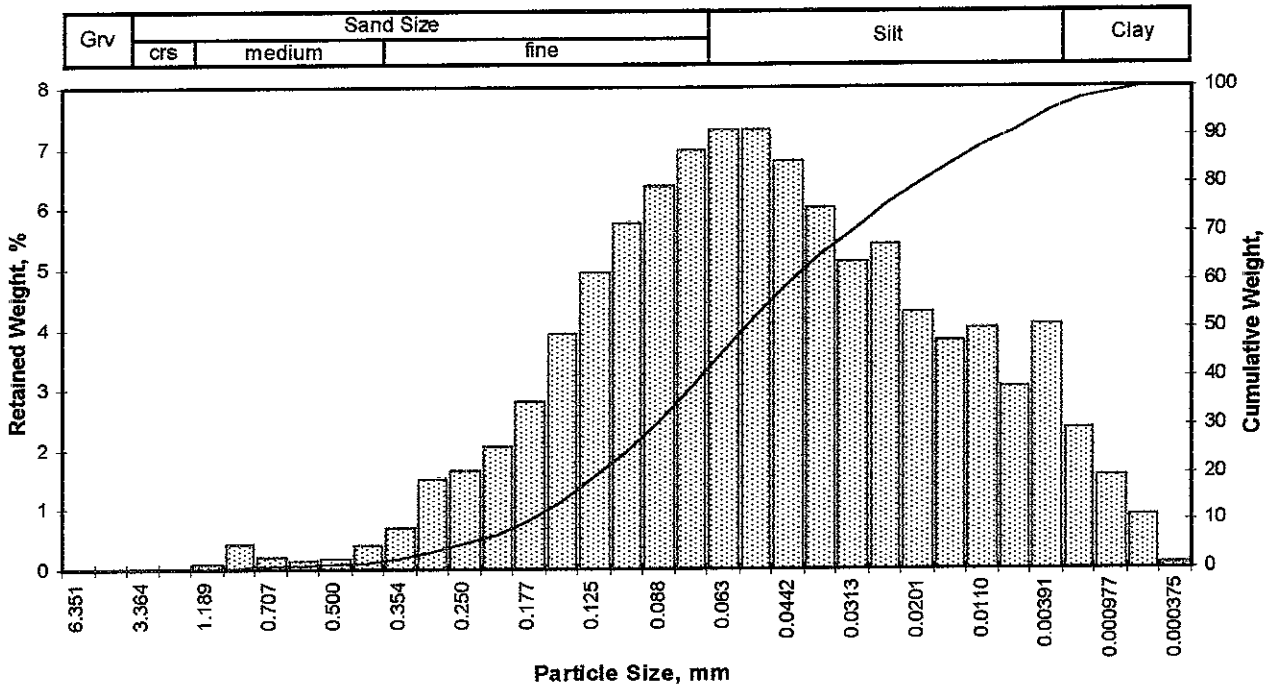
Measure	Trask	Inman	Folk-Ward
Median, phi	3.52	3.52	3.52
Median in	0.0034	0.0034	0.0034
Median mm	0.087	0.087	0.087
Mean, phi	2.99	3.22	3.32
Mean in	0.0049	0.0042	0.0040
Mean mm	0.125	0.108	0.100
Sorting	0.489	1.575	1.630
Skewness	1.133	-0.191	-0.119
Kurtosis	0.183	0.764	1.102
Grain Size Description (Wentworth scale)			Fine sand (based on Mean from Trask)

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	11.01
Fine Sand	200	45.99
Silt	.00391 mm	41.10
Clay	<.00391 mm	1.90
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	BKG-2
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.08	0.08
0.0331	0.841	0.25	20	0.44	0.52
0.0278	0.707	0.50	25	0.21	0.73
0.0234	0.595	0.75	30	0.14	0.87
0.0197	0.500	1.00	35	0.16	1.03
0.0166	0.420	1.25	40	0.41	1.44
0.0139	0.354	1.50	45	0.69	2.13
0.0117	0.297	1.75	50	1.50	3.63
0.0098	0.250	2.00	60	1.64	5.27
0.0083	0.210	2.25	70	2.05	7.32
0.0070	0.177	2.50	80	2.79	10.11
0.0059	0.149	2.75	100	3.92	14.03
0.0049	0.125	3.00	120	4.93	18.96
0.0041	0.105	3.25	140	5.74	24.70
0.0035	0.088	3.50	170	6.38	31.08
0.0029	0.074	3.75	200	6.96	38.04
0.0025	0.063	4.00	230	7.32	45.36
0.0021	0.053	4.25	270	7.30	52.66
0.00174	0.0442	4.50	325	6.79	59.45
0.00146	0.0372	4.75	400	6.00	65.45
0.00123	0.0313	5.00	450	5.10	70.55
0.000986	0.0250	5.32	500	5.39	75.94
0.000790	0.0201	5.64	635	4.26	80.20
0.000615	0.0156	6.00		3.80	84.00
0.000435	0.0110	6.50		4.00	88.00
0.000308	0.00781	7.00		3.03	91.03
0.000154	0.00391	8.00		4.07	95.10
0.000077	0.00195	9.00		2.34	97.44
0.000038	0.000977	10.00		1.57	99.01
0.000019	0.000488	11.00		0.89	99.91
0.000015	0.000375	11.38		0.09	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.96	0.0101	0.257
10	2.49	0.0070	0.178
16	2.85	0.0055	0.139
25	3.26	0.0041	0.104
40	3.82	0.0028	0.071
50	4.16	0.0022	0.056
60	4.52	0.0017	0.043
75	5.26	0.0010	0.026
84	6.00	0.0006	0.016
90	6.83	0.0003	0.009
95	7.97	0.0002	0.004

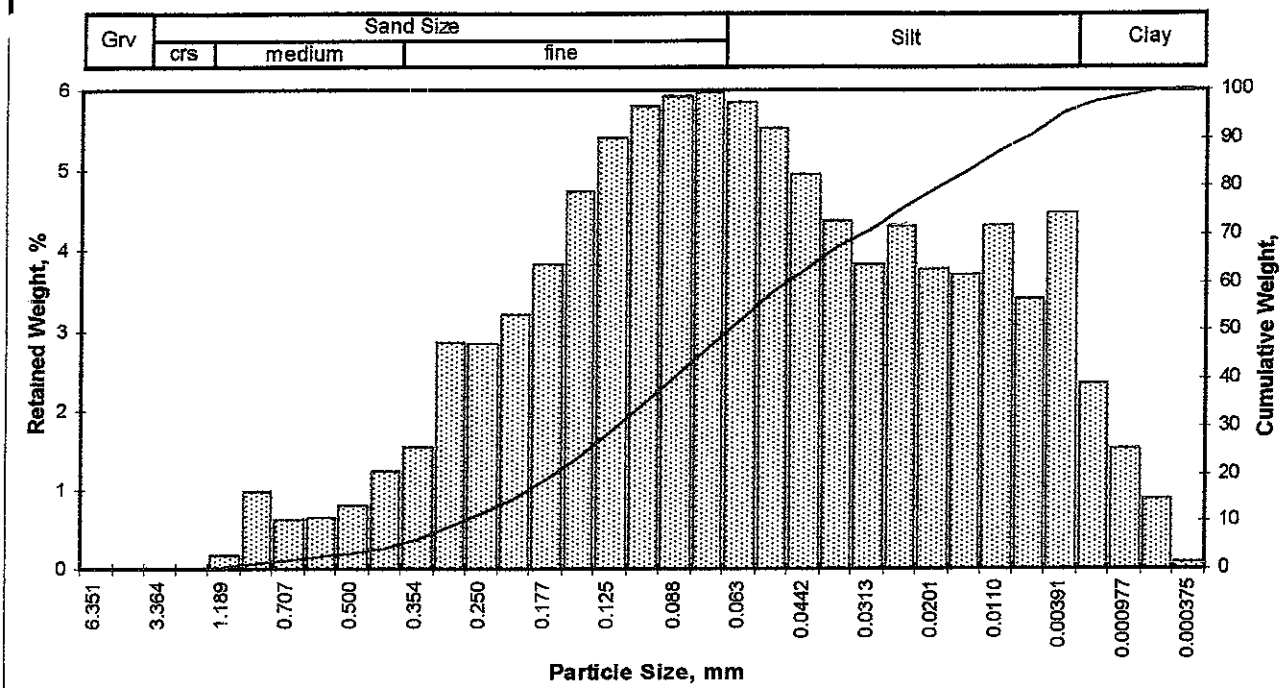
Measure	Trask	Inman	Folk-Ward
Median, phi	4.16	4.16	4.16
Median, in	0.0022	0.0022	0.0022
Median, mm	0.056	0.056	0.056
Mean phi	3.94	4.42	4.34
Mean, in	0.0026	0.0018	0.0019
Mean mm	0.065	0.047	0.050
Sorting	0.500	1.575	1.699
Skewness	0.930	0.169	0.219
Kurtosis	0.231	0.910	1.231
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	1.44
Fine Sand	200	36.60
Silt	.00391 mm	57.06
Clay	<.00391 mm	4.90
	Total	100

PTS Laboratories, Inc.

Particle Size Analysis - ASTM D4464M

Client:	VOC Analytical	**PTS File No:**	27221
Project:	N/A	**Sample ID:**	BKG-3
Project No:	G9707331	**Depth, ft:**	N/A



Opening Inches	Opening Millimeters	Phi of Screen	U.S. No.	Incremental Weight, percent	Cumulative Weight, percent
0.2500	6.351	-2.67	1/4	0.00	0.00
0.1873	4.757	-2.25	4	0.00	0.00
0.1324	3.364	-1.75	6	0.00	0.00
0.0787	2.000	-1.00	10	0.00	0.00
0.0468	1.189	-0.25	16	0.18	0.18
0.0331	0.841	0.25	20	0.97	1.15
0.0278	0.707	0.50	25	0.63	1.79
0.0234	0.595	0.75	30	0.66	2.44
0.0197	0.500	1.00	35	0.79	3.23
0.0166	0.420	1.25	40	1.23	4.46
0.0139	0.354	1.50	45	1.54	6.00
0.0117	0.297	1.75	50	2.86	8.86
0.0098	0.250	2.00	60	2.84	11.70
0.0083	0.210	2.25	70	3.21	14.91
0.0070	0.177	2.50	80	3.83	18.74
0.0059	0.149	2.75	100	4.75	23.49
0.0049	0.125	3.00	120	5.42	28.91
0.0041	0.105	3.25	140	5.80	34.71
0.0035	0.088	3.50	170	5.94	40.65
0.0029	0.074	3.75	200	5.98	46.63
0.0025	0.063	4.00	230	5.85	52.48
0.0021	0.053	4.25	270	5.52	58.00
0.00174	0.0442	4.50	325	4.97	62.98
0.00146	0.0372	4.75	400	4.38	67.36
0.00123	0.0313	5.00	450	3.84	71.20
0.000986	0.0250	5.32	500	4.32	75.52
0.000790	0.0201	5.64	635	3.77	79.29
0.000615	0.0156	6.00		3.71	83.00
0.000435	0.0110	6.50		4.31	87.31
0.000308	0.00781	7.00		3.41	90.72
0.000154	0.00391	8.00		4.47	95.19
0.000077	0.00195	9.00		2.33	97.52
0.000038	0.000977	10.00		1.51	99.03
0.000019	0.000488	11.00		0.88	99.91
0.000015	0.000375	11.38		0.09	100.00
TOTALS				100.00	100.00

Cumulative Weight Percent greater than			
Weight percent	Phi Value	Inches	Millimeters
5	1.34	0.0156	0.396
10	1.85	0.0109	0.277
16	2.32	0.0079	0.200
25	2.82	0.0056	0.142
40	3.47	0.0035	0.090
50	3.89	0.0026	0.067
60	4.35	0.0019	0.049
75	5.28	0.0010	0.026
84	6.12	0.0006	0.014
90	6.89	0.0003	0.008
95	7.96	0.0002	0.004

Measure	Trask	Inman	Folk-Ward
Median, phi	3.89	3.89	3.89
Median in	0.0026	0.0026	0.0026
Median, mm	0.067	0.067	0.067
Mean, phi	3.58	4.22	4.11
Mean in.	0.0033	0.0021	0.0023
Mean, mm	0.084	0.054	0.058
Sorting	0.426	1.898	1.952
Skewness	0.897	0.171	0.199
Kurtosis	0.216	0.744	1.102
Grain Size Description (Wentworth scale)		Very fine sand (based on Mean from Trask)	

Description	Retained on Sieve #	Weight Percent
Gravel	4	0.00
Coarse Sand	10	0.00
Medium Sand	40	4.46
Fine Sand	200	42.17
Silt	.00391 mm	48.55
Clay	<.00391 mm	4.81
	Total	100

VOC Analytical Laboratories

- 1212 E. KATELLA AVE. ANAHEIM, CA 92805
- 1085 SHARY CIRCLE CONCORD, CA 94518
- 801 WESTERN AVE. GLENDALE, CA 91201
- 4411 S. BROADWAY Ste. D-1 PHOENIX, AZ 85040

Sub to PTS 27221

Chain of Custody Record

Pg 1 of 3

V.O.C. Log # _____

Quote # _____

Company Name: VOC

Address: 1212 E Katella Ave

City: Anaheim State: CA Zip: 92805

Attn: Patty Mata Fax #: 714-978-9284

Project Name / Number: G9707331 PO#: 23217

Sampler Name / Signature: — Phone #: —

LAB ANALYSIS

Sample / pH / Pres Codes

Parameters: Particle Size ASTM D422; D4464 Dry Sieve or Laser

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code*	# of Cont	Particle Size ASTM D422	D4464 Dry Sieve or Laser	Field Filtered (Y/N)	Integrity OK (Y/N)	REMARKS
1	D2-1	7/15/97	0825	SO	1	X	X			Std Two week
2	D2-2	↓	0830	↓	↓	↓	↓			TAT
3	D2-3	↓	0834	↓	↓	↓	↓			
4	C2-1	↓	0840	↓	↓	↓	↓			
5	C2-2	↓	0848	↓	↓	↓	↓			
6	C2-3	↓	0855	↓	↓	↓	↓			
7	C3-1	↓	0911	↓	↓	↓	↓			
8	C3-2	↓	0930	↓	↓	↓	↓			
9	C3-3	↓	0946	↓	↓	↓	↓			
0										

Cancelled By 7/18/97
Cancelled By 7/18/97
Cancelled By 7/18/97

Matrix Codes*

SD	Solid Waste	OL	Oil
GW	Ground Water	SL	Sludge
EFF	Effluent	SO	Soil Sediment
AFW	Analyte Free H_2O	AQ	Aqueous
WW	Waste Water	NA	Nonaqueous
DW	Drinking Water	PE	Petroleum
SU	Surface Water	O	Other ____ (Please Specify)

Pres Codes

A- None	E- HCl
B- HNO_3	F- MeOH
C- H_2SO_4	I- Ice
D- NaOH	O- Other

Short Hold Y____ N____ Ice Y____ N____

QA/QC Report Level: None____ 1____ 2____ 3____ Other____ COC OK Y N Initials

T.A.T. Request: Standard RUSH Date required Custody Seals Y N Temp Control ____°C Local Job Y N

Item	Relinquished by	Date	Time	Received by	Date	Time
	Sharon Malone	7/17/97	10:15	A. Makijan	7/17/97	10:15
ALL	COURIER	7/17/97	13:00	[illegible]	7/17/97	13:00

C.O.C. # ~~100007~~

VOC Analytical Laboratories

- ❑ 1212 E. KATELLA AVE. ANAHEIM, CA 92805
- ❑ 1085 SHARY CIRCLE CONCORD, CA 94518
- ❑ 801 WESTERN AVE. GLENDALE, CA 91201
- ❑ 4411 S. BROADWAY Ste. D-1 PHOENIX, AZ 85040

27221

V.O.C. Log # _____

Chain of Custody Record

Pg 2 of 3

Quote # _____

Company Name: VOC

Address: 1212 E Katella Ave

City: Anaheim State: CA Zip: 92805

Attn: Patty Mata Fax #: 714-978-9284

Project Name / Number: G9707331 PO#: 23217

Sampler Name / Signature: — Phone #: —

LAB ANALYSIS

Parameters: Particle Size (ASTM D422), D4464 (Dry Sieve only)

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code	# of Cont	Particle Size (ASTM D422)	D4464 (Dry Sieve only)
1	B3-1	7/15/97	1028	SO	1	X	X
2	B3-2	↓	1036	↓	↓	↓	↓
3	B3-3		1052				
4	B1-1		1104				
5	B1-2		1135				
6	B1-3		1144				
7	B2-1		1232				
8	B2-2		1240				
9	B2-3	↓	1252	↓	↓	↓	↓
0							

Sample / pH / Pres Codes

Field Filtered (Y/N)

Integrity OK (Y/N)

Matrix Codes *

SD	Solid Waste	OL	Oil
GW	Ground Water	SL	Sludge
EFF	Effluent	SO	Soil Sediment
AFW	Analyte Free H_2O	AQ	Aqueous
WW	Waste Water	NA	Nonaqueous
DW	Drinking Water	PE	Petroleum
SU	Surface Water	O	Other _____ (Please Specify)

Pres Codes

A- None	E- HCl
B- HNO_3	F- MeOH
C- H_2SO_4	I- Ice
D- NaOH	O- Other

REMARKS

Std Two week TAT

Short Hold: Y____ N____

Ice: Y____ N____

QA/QC Report Level: None____ 1____ 2____ 3____ Other____

COC OK: Y N Initials

T.A.T. Request: Standard

RUSH: Date required

Custody Seals: Y N

Temp Control: ____°C

Local Job: Y N

Item	Relinquished by	Date	Time	Received by	Date	Time
ALL	Sharon Malone	7/17/97	10:15	A. Mata	7/17/97	10:15
	Courier	7/17/97	13:00	[illegible]	7/17/97	13:00

C.O.C. # ~~000074~~

VOC Analytical Laboratories

- 1212 E. KATELLA AVE. ANAHEIM, CA 92805
- 1085 SHARY CIRCLE CONCORD, CA 94518
- 801 WESTERN AVE. GLENDALE, CA 91201
- 4411 S. BROADWAY Ste. D-1 PHOENIX, AZ 85040

27221
Pg 3 of 3

V.O.C. Log # _____

Quote # _____

Chain of Custody Record

Company Name: VOC
Address: 1212 E Katella Ave
City: Anaheim State: CA Zip: 92805
Attn: Patty Mata Fax #: 714-978-9284
Project Name / Number: G9707331 PO#: 23217
Sampler Name / Signature: — Phone #: —

LAB ANALYSIS

#	Sample Label (Client ID)	Collected Date	Collected Time	Matrix Code	# of Cont	Parameters	Particle Size ASTM D422	D4464 Dry Sieve or Laser	Field Filtered (Y/N)	Integrity OK (Y/N)	REMARKS
1	A2-1	7/15/97	1358	SO	1		X	X			Std Two week
2	A2-2	↓	1408	↓	↓		↓	↓			TAT
3	A2-3	↓	1424	↓	↓		↓	↓			
4	BKG-1	↓	1446	↓	↓		↓	↓			
5	BKG-2	↓	1452	↓	↓		↓	↓			
6	BKG-3	↓	1452	↓	↓		↓	↓			
7											
8											
9											
0											

Matrix Codes

SD	Solid Waste	OL	Oil
GW	Ground Water	SL	Sludge
EFF	Effluent	SO	Soil Sediment
AFW	Analyte Free H_2O	AQ	Aqueous
WW	Waste Water	NA	Nonaqueous
DW	Drinking Water	PE	Petroleum
SU	Surface Water	O	Other ____ (Please Specify)

Pres Codes

A- None	E- HCl
B- HNO_3	F- MeOH
C- H_2SO_4	I- Ice
D- NaOH	O- Other

Short Hold: Y____ N____
Ice: Y____ N____

QA/QC Report Level: None____ 1____ 2____ 3____ Other____
COC OK: Y N
Initials:

T.A.T. Request: Standard
RUSH: Date required
Custody Seals: Y N
Temp Control: ____°C
Local Job: Y N

Item	Relinquished by	Date	Time	Received by	Date	Time
	Sharon Malone	7/17/97	10:15	A. Mak[illegible]	7/17/97	10:15
ALL	Courier	7/17/97	13:00	[illegible]	7/17/97	13:00

C.O.C. # ~~1000074~~

APPENDIX I

MINERALOGICAL RESULTS

PETROGRAPHIC
Consultants International
inc

MINING AND METALLURGY
• Mineral and Rock Identification
• Process Mineralogy

OIL AND GAS RESEARCH
• Reservoir Studies
• Diagenetic Evaluation

July 25, 2000

Mr. Darrel Van Winkle
Brown and Caldwell
9040 Friars Rd., Suite 220
San Diego, CA 92108

Dear Derral:

We have enclosed the electron microprobe analyses. We chose samples highest in nickel and chromium so as to have the best chance to find these elements. In addition, we probed minerals in these samples that were most likely to carry nickel and chromium in their structures

Due to computer problems, the electron microprobe operator was unable to download our data file; therefore, we annotated and xeroxed our copy of data file.

Please let us know if you have any questions concerning the analyses. Thank you for your business.

Sincerely,

Paula L. Hansley Theresa M Cookro

Paula L. Hansley and Theresa M. Cookro

Theresa M. Cookro
Paula L. Hansley

303-455-2405
Fax: 303-458-6215

4444 King Street
Denver, Colorado 80211

email: inforocks@att net

Electron Microprobe Analysis

Parameters:

Machine: Cameca Microbeam

Standards:

Arsenic: Orpiment
Chromium: Chromium-D
Iron and sulfur: Pyrite
Magnesium: Olivine
Nickel: Metallic nickel
Potassium: Orthoclase
Sulfur: Orpiment
Titanium: Rutile

Accelerating voltage: 17.3 kV

Beam current: 20 na

Count time on sample: 30 seconds
Count time on background: 5 seconds

Methodology:

Six polished thin sections containing the highest amounts of Ni and Cr (as per bulk chemical analysis) were selected to be analyzed with the electron microprobe. Grains most likely to contain these elements were identified under the petrographic microscope and marked with a black marking pen. Then, each black circle was scratched with a diamond scribe so that it could be easily seen under the electron microprobe. Finally, the sections were carbon-coated.

Each element (see above) was put on the appropriate spectrometer in preparation for wavelength dispersive analysis (WDS), and standardization was run for each element under the same conditions as the analyses of the unknowns. Each slide was put into the vacuum chamber in turn, and the unknown grains were analyzed. An elemental dispersive analysis (EDS) was first run on a spot in the unknown grains to be analyzed to identify the grain. Finally, WDS was conducted on the unknown grains. If the unknown turned out to be a mineral not of interest (i.e., an altered ilmenite grain), a WDS analysis was not run to save time.

Possible Analytical Problems:

Because the samples contained minerals of widely variable hardness, a good polish was impossible to obtain. Poor polish made the analytical totals artificially low. In addition, elements such as F, Cl, etc., and substances such as water were not analyzed for in micaceous minerals.

Matrix affects were accentuated because in some cases (i.e, Cr, micas) appropriate standards (minerals similar to the unknown) were not available.

The spectrometer on which sulfur had been placed was not working properly at times during the analyses; however, we were able to check for the presence of sulfur by looking at the EDS spectrum.

Samples Analyzed:

13-05	13-34
13-10	13-42
13-11D	13-53
13-30	

Results:

1. **Sample 13-05**

Two unknown opaque minerals were analyzed by EDS and found to be ilmenite and oxidized ilmenite. The one (oxidized) ilmenite (spot 1, point 1) was analyzed by WDS and found to have .03 wt percent Cr. A chlorite was analyzed by WDS (spot 3, point 1) and found to have .02 wt percent Ni and no Cr.

2. **Sample 13-10**

Two unknown opaque minerals representative of others in the sample were analyzed by EDS and found to be ilmenite; therefore, WDS analyses were not done. Chlorites were analyzed by EDS and a typical grain was analyzed by WDS and found to have .04 wt. percent Ni and no Cr.

3. Sample 13-11D

Three unknown grains typical of other grains in the sample were analyzed by EDS and found to be iron oxides with varying amounts of iron.

4. Sample 13-30

Eight biotite grains were analyzed and all but one (analysis 8) were found to contain trace amounts of Cr and Ni. The analyses have a low total percent partly due to the absence of titanium and water in the analyses. Chromium varied from .02 to .07 wt percent; Ni varied from 0 to .05 wt percent. Cobalt was present in three grains in amounts up to .02 wt. percent. Several muscovite grains were analyzed by EDS; none contained even traces of Cr, Ni, or Co.

5. Sample 13-34

Three unknown grains were examined and found to be iron oxide. Several chlorites were analyzed but found to contain no Cr or Ni. No WDS analyses were conducted.

6. Sample 13-42

Seven grains were analyzed by WDS analysis:

1. Muscovite (.02 wt. % Cr and 0 wt. % Ni))
2. Chlorite (.01 wt. % Cr and .01 wt. % Ni)
3. Chlorite (0 wt. % Cr and 0 wt. % Ni)
4. Chlorite (.02 wt. % Cr and 0 wt. % Ni)
5. Muscovite (0 wt. % Cr and .01 wt. % Ni)
6. Chlorite (0 wt. % Cr and .01 wt. % Ni)
7. Muscovite (.02 wt. % Cr and .02 wt. % Ni)

7. Sample 13-53

Several opaque grains typical of this sample and their lighter inclusions were analyzed by WDS. Pentlandite (light yellowish white in reflected light) occurs as inclusions in darker chromite and picotite. Sulfur does not appear in some of the pentlandite WDS analyses because the spectrometer on which sulfur had been placed only worked intermittently; however, the presence of sulfur was verified by an EDS analysis. In addition, some grains that appeared to be Fe spinel with only traces of Cr were analyzed only by EDS.

Twelve representative WDS analyses for the following grains are included:

1. Chromite
2. Pentlandite
3. Pentlandite
4. Picotite
5. Chromite
6. Pentlandite
7. Oxidized pentlandite(?)
8. Pentlandite
9. Oxidation rim around pentlandite
10. Pentlandite
11. Chromite
12. Chromite

Discussion:

Biotite, muscovite, and chlorite were analyzed for the presence of Cr and Ni. These elements can substitute in the octahedral sites of all three minerals. Samples were chosen that contain the highest percentages of Cr and Ni. Biotite in sample #13-30 (Cr = 967 ppm) was found to contain the most Cr-- up to .07 wt. % Cr, and much smaller amounts of Ni. Neither muscovite nor chlorite was found to have more than .02 wt. % Ni or Cr in any of the samples analyzed

Much of the biotite in these samples has altered partially or totally to chlorite. The fresh, primary biotite in #13-30 is high in Cr. On the other hand, the chlorite, which formed from the alteration of biotite, contains negligible Cr. These results mirror those of other studies, which have found that elements such as Ni, Cr, Cu, and Ti are released from biotite when it alters to chlorite. Iron oxides, which were another alteration product of biotite, were not probed and Cr released from biotite may be adsorbed onto the surfaces of these grains.

In sample #13-53, which contains the highest percentage of Ni and relatively high amounts of Cr, many grains were analyzed. The major nickel-bearing species was found to be pentlandite ($(Fe,Ni,Co)_9S_8$). Chromium-bearing species are chromite ($FeO\ Cr_2O_3$), which also contains traces of Ti, Al, Mg, and Ni, picotite ($(Fe,Mg)(Al,Cr)_2O_4$), and possibly Fe-spinel. This sample is an ultramafic rock that is commonly enriched in chromium and nickel

FILE INFORMATION

User Name Colorado School of Mines
Company
Title
File ~~1310~~.ana
Last Saved 12/07/00 13:19
Comments

GENERAL CONDITIONS FOR ALL ANALYSES

Beam Current 15.000
Accelerating Voltage 17.3
Take Off Angle 40.0
Tilt Angle 0.0
Azimut Angle 0.0

SAMPLE DESCRIPTION

Elt	W%	Acq	Standards
O		Stoic	(Ni2Cr3K1Mg2Fe2Al3Si4O2As3Ti4)
Mg		WDS	c:\Program Files\XMasPlus\std\olivineSpring-A
Al		WDS	c:\Program Files\XMasPlus\std\orthoclaseOr1-A
Si		WDS	c:\Program Files\XMasPlus\std\orthoclaseOr1-A
S		WDS	c:\Program Files\XMasPlus\std\pyrite-elba-f
K		WDS	c:\Program Files\XMasPlus\std\orthoclaseOr1-A
Ti		WDS	c:\Program Files\XMasPlus\std\rutile-A
Cr		WDS	c:\Program Files\XMasPlus\std\Crmetal-D
Fe		WDS	c:\Program Files\XMasPlus\std\pyrite-elba-f
Co		WDS	c:\Program Files\XMasPlus\std\cobalt-f
Ni		WDS	c:\Program Files\XMasPlus\std\nickel-f
As		WDS	c:\Program Files\XMasPlus\std\orpiment-F

ACQUISITION PARAMETERS

WDS Peak/Background

Elt	Sp	Xtal	PkPos	PkTim	BgTim	Shift1	Shift2	Slope	BgVal
Mg Ka	2	TAP	38448	30000	5000	500	-500		
Al Ka	2	TAP	32442	20000	5000	500	-500		
Si Ka	2	TAP	27736	20000	5000	500	-500		
S Ka	1	PET	61389	30000	5000	500	-500		
K Ka	1	PET	42733	30000	5000	500	-500		
Ti Ka	1	PET	31441	30000	5000	500	-500		
Cr Ka	1	PET	26213	30000	10000	500	-500		
Fe Ka	3	LIF	48079	30000	5000	500	-500		
Co Ka	3	LIF	44432	30000	5000	500	-500		
Ni Ka	3	LIF	41183	30000	10000	500	-500		
As La	2	TAP	37605	30000	5000	500	-500		

MEASURES

Point 1 : (10183, 19306, 2269)----------spot1 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	22.5	30029	14.2	5000	14.31	0.6	1.0000
Al	39.8	20020	42.4	5000	14.31	-0.2	1.0000
Si	45.1	20020	44.1	5000	14.31	0.1	1.0000
S	7.4	30029	5.0	5000	14.31	0.2	1.0000
K	12.2	30029	14.3	5000	14.31	-0.1	1.0000
Ti	1035.9	30029	36.1	5000	14.31	69.9	1.0000
Cr	40.2	30029	36.4	10010	14.31	0.3	1.0000
Fe	3429.0	30029	23.3	5000	14.31	238.0	1.0000
Co	17.0	30029	18.3	5000	14.31	-0.1	1.0000
Ni	15.4	30029	15.7	10010	14.31	-0.0	1.0000
As	19.0	30029	18.6	5000	14.31	0.0	1.0000

Point 2 : (2730, 25906, 2221)----------spot3 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	2392.0	30029	51.8	5000	14.22	164.6	1.0000
Al	2643.0	20020	55.0	5000	14.22	182.0	1.0000
Si	4024.3	20020	54.7	5000	14.22	279.2	1.0000
S	2.2	30029	2.0	5000	14.22	0.0	1.0000
K	8.9	30029	7.8	5000	14.22	0.1	1.0000
Ti	16.8	30029	16.5	5000	14.22	0.0	1.0000
Cr	21.6	30029	21.3	10010	14.22	0.0	1.0000
Fe	937.7	30029	9.3	5000	14.22	65.3	1.0000
Co	9.6	30029	11.2	5000	14.22	-0.1	1.0000
Ni	10.6	30029	9.6	10010	14.22	0.1	1.0000
As	34.1	30029	180.1	5000	14.22	-10.3	1.0000

13-05 **RESULTS**

PAP Procedure

Ilmenite

Point 1 : (10183, 19306, 2269), 2 iterations----------spot1 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat
O	20.97		52.69						0.00	0.0
Mg	0.03	[0.02, 0.05]	0.05	0.0014	0.0004	0.9056	1.0000	1.0000	0.05	0.02
Al	0.00	[0.00, 0.24]	0.00	0.0000	0.0000	0.9403	1.0000	1.0000	0.00	0.00
Si	0.00	[0.00, 0.02]	0.00	0.0001	0.0000	0.9197	1.0000	1.0000	0.01	0.00
S	0.05	[0.00, 0.10]	0.06	0.0010	0.0005	0.9371	1.0000	1.0000	0.05	0.03
K	0.00	[0.00, 0.10]	0.00	0.0000	0.0000	0.9848	1.0000	1.0000	0.00	0.00
Ti	6.46	[6.38, 6.55]	5.42	0.1125	0.0609	1.0603	1.0000	1.0000	10.78	2.47
Cr	0.03	[0.00, 0.07]	0.02	0.0003	0.0003	1.0653	1.0000	1.0000	0.05	0.01
Fe	58.00	[57.46, 58.55]	41.74	1.2320	0.5346	1.0652	1.0000	1.0000	74.62	19.01
Co	0.00	[0.00, 0.20]	0.00	0.0000	0.0000	1.0866	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.18]	0.00	0.0000	0.0000	1.0477	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.04]	0.00	0.0001	0.0000	1.1527	1.0000	1.0000	0.01	0.00
Sum	85.56		100.00						85.56	21.55

Chlorite

Point 2 : (2730, 25906, 2221), 2 iterations----------spot3 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	30.78		58.01						0.00	0.00
Mg	10.18	[10.08, 10.27]	12.62	0.3927	0.1025	0.9937	1.0000	1.0000	16.88	5.22
Al	7.12	[7.03, 7.20]	7.95	0.7388	0.0689	1.0317	1.0000	1.0000	13.45	3.29
Si	11.22	[11.13, 11.31]	12.05	0.3827	0.1112	1.0091	1.0000	1.0000	24.00	4.98
S	0.00	[0.00, 0.04]	0.00	0.0001	0.0000	1.0282	1.0000	1.0000	0.00	0.00
K	0.01	[0.00, 0.03]	0.01	0.0008	0.0001	1.0805	1.0000	1.0000	0.01	0.00
Ti	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	1.1634	1.0000	1.0000	0.00	0.00
Cr	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	1.1689	1.0000	1.0000	0.00	0.00
Fe	17.30	[17.06, 17.55]	9.34	0.3380	0.1466	1.1688	1.0000	1.0000	22.26	3.87
Co	0.00	[0.00, 0.13]	0.00	0.0000	0.0000	1.1923	1.0000	1.0000	0.00	0.00
Ni	0.02	[0.00, 0.06]	0.01	0.0002	0.0002	1.1496	1.0000	1.0000	0.02	0.00

As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2635	1.0000	1.0000	0.00	0.00
Sum	76.64		100.00						76.64	17.37

B-05

Point 1 : (17401, 16150, 2262)----------spot3 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	2209.4	30029	48.5	5000	14.21	152.1	1.0000
Al	2564.7	20020	52.2	5000	14.21	176.8	1.0000
Si	3896.7	20020	55.9	5000	14.21	270.3	1.0000
S	37.2	30029	3.1	5000	14.21	2.4	1.0000
K	9.0	30029	8.7	5000	14.21	0.0	1.0000
Ti	20.7	30029	19.9	5000	14.21	0.1	1.0000
Cr	21.6	30029	22.2	10010	14.21	-0.0	1.0000
Fe	994.5	30029	12.6	5000	14.21	69.1	1.0000
Co	9.0	30029	10.8	5000	14.21	-0.1	1.0000
Ni	12.4	30029	10.3	10010	14.21	0.1	1.0000
As	30.6	30029	160.9	5000	14.21	-9.2	1.0000

13-10 **RESULTS**

PAP Procedure

Point 31 : (17401, 16150, 2262), 2 iterations----------spot3 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	29.88		57.51						0.00	0.00
Mg	9.37	[9.28, 9.46]	11.87	0.3629	0.0947	0.9903	1.0000	1.0000	15.54	4.95
Al	6.89	[6.81, 6.97]	7.86	0.7177	0.0670	1.0282	1.0000	1.0000	13.02	3.28
Si	10.83	[10.74, 10.91]	11.87	0.3705	0.1076	1.0057	1.0000	1.0000	23.16	4.95
S	0.82	[0.75, 0.88]	0.78	0.0141	0.0080	1.0248	1.0000	1.0000	0.82	0.33
K	0.00	[0.00, 0.03]	0.00	0.0002	0.0000	1.0769	1.0000	1.0000	0.00	0.00
Ti	0.01	[0.00, 0.04]	0.00	0.0001	0.0000	1.1595	1.0000	1.0000	0.01	0.00
Cr	0.00	[0.00, 0.23]	0.00	0.0000	0.0000	1.1650	1.0000	1.0000	0.00	0.00
Fe	18.27	[18.02, 18.52]	10.07	0.3577	0.1552	1.1648	1.0000	1.0000	23.50	4.20
Co	0.00	[0.00, 0.11]	0.00	0.0000	0.0000	1.1883	1.0000	1.0000	0.00	0.00
Ni	0.04	[0.00, 0.08]	0.02	0.0003	0.0003	1.1457	1.0000	1.0000	0.05	0.01
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2593	1.0000	1.0000	0.00	0.00
Sum	76.10		100.00						76.10	17.73

Point 6 : (13789, 26333, 2270)----------spot3 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	1750.1	30029	46.5	5000	14.39	118.4	1.0000
Al	2619.1	20020	51.1	5000	14.39	178.5	1.0000
Si	5620.3	20020	71.7	5000	14.39	385.6	1.0000
S	2.3	30029	2.4	10010	14.39	-0.0	1.0000
K	716.4	30029	11.6	5000	14.39	49.0	1.0000
Cr	28.2	10010	20.5	5000	14.39	0.5	1.0000
Fe	626.5	30029	9.5	10010	14.39	42.9	1.0000
Co	9.4	20020	8.9	5000	14.39	0.0	1.0000
Ni	9.5	30029	8.6	10010	14.39	0.1	1.0000
As	28.7	20020	129.5	5000	14.39	-7.0	1.0000

Point 7 : (13289, 26513, 2265)----------spot3 point2

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	1896.2	30029	48.2	5000	14.37	128.6	1.0000
Al	2634.3	20020	58.0	5000	14.37	179.3	1.0000
Si	5829.9	20020	71.6	5000	14.37	400.7	1.0000
S	2.7	30029	2.6	10010	14.37	0.0	1.0000
K	909.8	30029	13.9	5000	14.37	62.3	1.0000
Cr	22.5	10010	22.2	5000	14.37	0.0	1.0000
Fe	606.8	30029	9.3	10010	14.37	41.6	1.0000
Co	9.7	20020	9.7	5000	14.37	0.0	1.0000
Ni	11.4	30029	9.5	10010	14.37	0.1	1.0000
As	29.0	20020	143.6	5000	14.37	-8.0	1.0000

Point 8 : (13442, 27366, 2265)----------spot3 point3

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	1869.6	30029	44.7	5000	14.38	126.9	1.0000
Al	2580.7	20020	57.2	5000	14.38	175.5	1.0000
Si	5716.8	20020	72.8	5000	14.38	392.5	1.0000
S	2.6	30029	2.6	10010	14.38	0.0	1.0000
K	819.6	30029	12.7	5000	14.38	56.1	1.0000
Cr	23.5	10010	25.0	5000	14.38	-0.1	1.0000
Fe	618.5	30029	8.5	10010	14.38	42.4	1.0000
Co	9.7	20020	10.8	5000	14.38	-0.1	1.0000
Ni	10.5	30029	11.1	10010	14.38	-0.0	1.0000
As	28.2	20020	132.4	5000	14.38	-7.2	1.0000

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RESULTS

PAP Procedure

Point 1 : (15297, 19224, 2278), 2 iterations----------spot1 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	34.56		58.61						0.00	0.00
Mg	7.90	[7.82, 7.98]	8.81	0.3021	0.0788	1.0019	1.0000	1.0000	13.09	3.61
Al	6.96	[6.88, 7.04]	7.00	0.7168	0.0669	1.0403	1.0000	1.0000	13.15	2.87
Si	16.34	[16.23, 16.45]	15.79	0.5526	0.1605	1.0174	1.0000	1.0000	34.96	6.46
S	0.02	[0.00, 0.05]	0.02	0.0004	0.0002	1.0368	1.0000	1.0000	0.02	0.01
K	5.76	[5.66, 5.87]	4.00	0.4738	0.0528	1.0895	1.0000	1.0000	6.94	1.64
Cr	0.04	[0.00, 0.08]	0.02	0.0003	0.0003	1.1786	1.0000	1.0000	0.04	0.01
Fe	11.79	[11.61, 11.98]	5.73	0.2297	0.0997	1.1785	1.0000	1.0000	15.17	2.35
Co	0.00	[0.00, 0.14]	0.00	0.0000	0.0000	1.2022	1.0000	1.0000	0.00	0.00
Ni	0.05	[0.01, 0.09]	0.02	0.0005	0.0005	1.1591	1.0000	1.0000	0.05	0.01
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2738	1.0000	1.0000	0.00	0.00
Sum	83.43		100.00						83.43	16.95

Point 2 : (15290, 19702, 2276), 2 iterations----------spot1 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs	Ox%	Cat#
O	33.45		58.00				0.00	0.00

Mg	7.98	[7.90, 8.06]	9.10	0.3057	0.0798	1.0002	1.0000	1.0000	13.23	3.77
Al	6.71	[6.63, 6.79]	6.90	0.6918	0.0645	1.0385	1.0000	1.0000	12.67	2.85
Si	15.33	[15.22, 15.44]	15.14	0.5194	0.1509	1.0157	1.0000	1.0000	32.80	6.27
S	0.01	[0.00, 0.03]	0.00	0.0001	0.0001	1.0350	1.0000	1.0000	0.01	0.00
K	7.24	[7.12, 7.36]	5.14	0.5960	0.0665	1.0876	1.0000	1.0000	8.72	2.13
Cr	0.02	[0.00, 0.06]	0.01	0.0001	0.0001	1.1766	1.0000	1.0000	0.02	0.00
Fe	11.47	[11.28, 11.65]	5.70	0.2237	0.0971	1.1765	1.0000	1.0000	14.75	2.36
Co	0.02	[0.00, 0.08]	0.01	0.0002	0.0002	1.2001	1.0000	1.0000	0.02	0.00
Ni	0.01	[0.00, 0.05]	0.00	0.0001	0.0001	1.1572	1.0000	1.0000	0.01	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2717	1.0000	1.0000	0.00	0.00
Sum	82.23		100.00						82.23	17.38

Point 3 : (15246, 22309, 2275), 2 iterations----------spot2 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	33.76		58.39						0.00	0.00
Mg	7.92	[7.84, 8.00]	9.01	0.3032	0.0791	1.0011	1.0000	1.0000	13.13	3.70
Al	6.78	[6.69, 6.86]	6.95	0.6981	0.0651	1.0395	1.0000	1.0000	12.80	2.86
Si	15.73	[15.62, 15.84]	15.50	0.5323	0.1546	1.0167	1.0000	1.0000	33.65	6.37
S	0.02	[0.00, 0.05]	0.02	0.0004	0.0002	1.0359	1.0000	1.0000	0.02	0.01
K	6.06	[5.95, 6.17]	4.29	0.4983	0.0556	1.0886	1.0000	1.0000	7.30	1.76
Cr	0.06	[0.01, 0.11]	0.03	0.0005	0.0005	1.1777	1.0000	1.0000	0.06	0.01
Fe	11.73	[11.55, 11.92]	5.81	0.2286	0.0992	1.1775	1.0000	1.0000	15.09	2.39
Co	0.00	[0.00, 0.23]	0.00	0.0000	0.0000	1.2012	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.05]	0.00	0.0000	0.0000	1.1582	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2729	1.0000	1.0000	0.00	0.00
Sum	82.06		100.00						82.06	17.10

Point 4 : (15246, 22831, 2273), 2 iterations----------spot2 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	33.52		58.12						0.00	0.00
Mg	7.88	[7.80, 7.96]	8.99	0.3019	0.0788	1.0004	1.0000	1.0000	13.07	3.71
Al	6.64	[6.57, 6.72]	6.83	0.6852	0.0639	1.0387	1.0000	1.0000	12.55	2.82
Si	15.53	[15.42, 15.63]	15.34	0.5258	0.1527	1.0159	1.0000	1.0000	33.21	6.33
S	0.01	[0.00, 0.03]	0.01	0.0001	0.0001	1.0352	1.0000	1.0000	0.01	0.00
K	6.96	[6.84, 7.08]	4.94	0.5732	0.0639	1.0878	1.0000	1.0000	8.39	2.04
Cr	0.03	[0.00, 0.08]	0.02	0.0002	0.0002	1.1768	1.0000	1.0000	0.03	0.01
Fe	11.56	[11.37, 11.75]	5.74	0.2254	0.0978	1.1767	1.0000	1.0000	14.87	2.3
Co	0.00	[0.00, 0.20]	0.00	0.0000	0.0000	1.2004	1.0000	1.0000	0.00	0.00
Ni	0.02	[0.00, 0.06]	0.01	0.0002	0.0002	1.1574	1.0000	1.0000	0.02	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2719	1.0000	1.0000	0.00	0.00
Sum	82.15		100.00						82.15	17.29

Point 5 : (14672, 22696, 2274), 2 iterations----------spot2 point3

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	33.75		57.96						0.00	0.00
Mg	7.81	[7.73, 7.89]	8.83	0.2994	0.0781	1.0000	1.0000	1.0000	12.95	3.66
Al	6.64	[6.56, 6.72]	6.76	0.6853	0.0639	1.0383	1.0000	1.0000	12.55	2.80
Si	15.65	[15.54, 15.76]	15.31	0.5303	0.1540	1.0155	1.0000	1.0000	33.48	6.34
S	0.02	[0.00, 0.04]	0.02	0.0003	0.0002	1.0348	1.0000	1.0000	0.02	0.01
K	7.77	[7.65, 7.90]	5.46	0.6402	0.0714	1.0874	1.0000	1.0000	9.36	2.26
Cr	0.03	[0.00, 0.08]	0.02	0.0003	0.0003	1.1763	1.0000	1.0000	0.03	0.01
Fe	11.44	[11.26, 11.63]	5.63	0.2234	0.0969	1.1762	1.0000	1.0000	14.72	2.33
Co	0.02	[0.00, 0.08]	0.01	0.0002	0.0002	1.1999	1.0000	1.0000	0.02	0.00
Ni	0.00	[0.00, 0.18]	0.00	0.0000	0.0000	1.1569	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2714	1.0000	1.0000	0.00	0.00
Sum	83.14		100.00						83.14	17.41

Point 6 : (13789, 26333, 2270), 2 iterations----------spot3 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	33.12		58.35						0.00	0.00
Mg	7.36	[7.29, 7.44]	8.54	0.2820	0.0736	1.0010	1.0000	1.0000	12.21	3.51
Al	6.85	[6.77, 6.94]	7.16	0.7063	0.0659	1.0393	1.0000	1.0000	12.95	2.94
Si	15.48	[15.38, 15.59]	15.54	0.5240	0.1522	1.0165	1.0000	1.0000	33.13	6.39
S	0.00	[0.00, 0.07]	0.00	0.0000	0.0000	1.0358	1.0000	1.0000	0.00	0.00

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K	6.58	[6.47, 6.70]	4.75	0.5417	0.0604	1.0885	1.0000	1.0000	7.93	1.95
Cr	0.07	[0.02, 0.12]	0.04	0.0006	0.0006	1.1775	1.0000	1.0000	0.07	0.02
Fe	11.14	[10.96, 11.32]	5.62	0.2171	0.0942	1.1774	1.0000	1.0000	14.33	2.31
Co	0.01	[0.00, 0.07]	0.00	0.0001	0.0001	1.2011	1.0000	1.0000	0.01	0.00
Ni	0.02	[0.00, 0.06]	0.01	0.0001	0.0001	1.1581	1.0000	1.0000	0.02	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2727	1.0000	1.0000	0.00	0.00
Sum	80.65		100.00						80.65	17.13

Point 7 : (13289, 26513, 2265), 2 iterations----------spot3 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	34.53		57.96						0.00	0.00
Mg	8.00	[7.92, 8.08]	8.84	0.3063	0.0799	1.0013	1.0000	1.0000	13.27	3.66
Al	6.89	[6.81, 6.97]	6.85	0.7096	0.0662	1.0396	1.0000	1.0000	13.01	2.84
Si	16.09	[15.98, 16.21]	15.39	0.5446	0.1582	1.0168	1.0000	1.0000	34.43	6.37
S	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	1.0361	1.0000	1.0000	0.00	0.00
K	8.38	[8.25, 8.52]	5.76	0.6895	0.0769	1.0888	1.0000	1.0000	10.10	2.38
Cr	0.00	[0.00, 0.05]	0.00	0.0000	0.0000	1.1778	1.0000	1.0000	0.00	0.00
Fe	10.79	[10.61, 10.97]	5.19	0.2105	0.0913	1.1777	1.0000	1.0000	13.88	2.15
Co	0.00	[0.00, 0.06]	0.00	0.0000	0.0000	1.2014	1.0000	1.0000	0.00	0.00
Ni	0.04	[0.00, 0.08]	0.02	0.0003	0.0003	1.1584	1.0000	1.0000	0.04	0.01
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2731	1.0000	1.0000	0.00	0.00
Sum	84.73		100.00						84.73	17.41

Point 8 : (13442, 27366, 2265), 2 iterations----------spot3 point3

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	33.85		58.10						0.00	0.00
Mg	7.90	[7.81, 7.98]	8.92	0.3023	0.0789	1.0012	1.0000	1.0000	13.09	3.68
Al	6.74	[6.66, 6.82]	6.86	0.6946	0.0648	1.0395	1.0000	1.0000	12.74	2.83
Si	15.76	[15.65, 15.87]	15.41	0.5334	0.1549	1.0167	1.0000	1.0000	33.72	6.37
S	0.00	[0.00, 0.08]	0.00	0.0000	0.0000	1.0360	1.0000	1.0000	0.00	0.00
K	7.54	[7.42, 7.67]	5.30	0.6205	0.0692	1.0887	1.0000	1.0000	9.09	2.19
Cr	0.00	[0.00, 0.31]	0.00	0.0000	0.0000	1.1778	1.0000	1.0000	0.00	0.00
Fe	11.02	[10.84, 11.20]	5.42	0.2147	0.0932	1.1776	1.0000	1.0000	14.17	2.24
Co	0.00	[0.00, 0.18]	0.00	0.0000	0.0000	1.2013	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.15]	0.00	0.0000	0.0000	1.1583	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2730	1.0000	1.0000	0.00	0.00
Sum	82.81		100.00						82.81	17.31

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Cr	18.4	30029	18.1	10010	14.29	0.0	1.0000
Fe	96.1	30029	6.3	5000	14.29	6.3	1.0000
Co	7.2	30029	8.5	5000	14.29	-0.1	1.0000
Ni	9.0	30029	8.3	10010	14.29	0.0	1.0000
As	18.8	30029	23.4	5000	14.29	-0.3	1.0000

Point 6 : (14701, 17142, 2267)----------spot2 point12

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	1922.1	30029	41.8	5000	14.29	131.6	1.0000
Al	3261.9	20020	62.3	5000	14.29	223.9	1.0000
Si	3597.0	20020	54.9	5000	14.29	247.9	1.0000
S	4.1	30029	2.0	5000	14.29	0.1	1.0000
K	10.3	30029	6.7	5000	14.29	0.3	1.0000
Ti	22.7	30029	19.0	5000	14.29	0.3	1.0000
Cr	23.0	30029	22.9	10010	14.29	0.0	1.0000
Fe	1081.2	30029	10.9	5000	14.29	74.9	1.0000
Co	10.1	30029	12.5	5000	14.29	-0.2	1.0000
Ni	11.1	30029	10.5	10010	14.29	0.0	1.0000
As	26.6	30029	139.6	5000	14.29	-7.9	1.0000

Point 7 : (5577, 17180, 2225)----------spot3 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	142.4	30029	16.9	5000	14.28	8.8	1.0000
Al	6926.6	20020	108.0	5000	14.28	477.5	1.0000
Si	7776.4	20020	79.6	5000	14.28	539.0	1.0000
S	2.2	30029	1.8	5000	14.28	0.0	1.0000
K	423.2	30029	11.4	5000	14.28	28.8	1.0000
Ti	29.5	30029	16.7	5000	14.28	0.9	1.0000
Cr	20.3	30029	18.2	10010	14.28	0.1	1.0000
Fe	92.9	30029	6.7	5000	14.28	6.0	1.0000
Co	7.2	30029	7.9	5000	14.28	-0.0	1.0000
Ni	8.8	30029	7.9	10010	14.28	0.1	1.0000
As	18.1	30029	27.7	5000	14.28	-0.7	1.0000

13-42 RESULTS

PAP Procedure

Biotite (altered)

Point 1 : (5007, 6029, 2197), 2 iterations----------spot1 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	47.01		62.42						0.00	0.00
Mg	0.30	[0.28, 0.33]	0.27	0.0113	0.0030	1.0248	1.0000	1.0000	0.50	0.10
Al	21.10	[20.90, 21.30]	16.61	2.1243	0.1982	1.0641	1.0000	1.0000	39.86	6.39
Si	23.31	[23.16, 23.45]	17.63	0.7708	0.2239	1.0407	1.0000	1.0000	49.86	6.78
S	0.07	[0.03, 0.10]	0.04	0.0011	0.0006	1.0605	1.0000	1.0000	0.07	0.02
K	4.23	[4.14, 4.32]	2.30	0.3401	0.0379	1.1144	1.0000	1.0000	5.09	0.88
Ti	0.19	[0.16, 0.22]	0.09	0.0029	0.0016	1.1999	1.0000	1.0000	0.32	0.03
Cr	0.02	[0.00, 0.05]	0.01	0.0002	0.0002	1.2055	1.0000	1.0000	0.03	0.00
Fe	1.70	[1.62, 1.79]	0.65	0.0326	0.0141	1.2054	1.0000	1.0000	2.19	0.25
Co	0.00	[0.00, 0.23]	0.00	0.0000	0.0000	1.2297	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.1856	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.3025	1.0000	1.0000	0.00	0.00
Sum	97.92		100.00						97.92	14.45

Chlorite

Point 2 : (5058, 5784, 2205), 2 iterations----------random1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	30.54		57.96						0.00	0.00
Mg	8.15	[8.06, 8.23]	10.17	0.3161	0.0825	0.9880	1.0000	1.0000	13.51	4.21
Al	9.24	[9.14, 9.35]	10.40	0.9650	0.0900	1.0258	1.0000	1.0000	17.46	4.31
Si	9.93	[9.85, 10.02]	10.74	0.3408	0.0990	1.0033	1.0000	1.0000	21.25	4.45
S	0.04	[0.00, 0.07]	0.04	0.0007	0.0004	1.0224	1.0000	1.0000	0.04	0.01

K.	0.02	[0.00, 0.05]	0.02	0.0020	0.0002	1.0743	1.0000	1.0000	0.03	0.01
Ti	0.05	[0.02, 0.08]	0.03	0.0008	0.0005	1.1567	1.0000	1.0000	0.09	0.01
Cr	0.01	[0.00, 0.04]	0.00	0.0001	0.0001	1.1622	1.0000	1.0000	0.01	0.00
Fe	19.55	[19.29, 19.81]	10.63	0.3836	0.1665	1.1621	1.0000	1.0000	25.14	4.40
Co	0.00	[0.00, 0.25]	0.00	0.0000	0.0000	1.1855	1.0000	1.0000	0.00	0.00
Ni	0.01	[0.00, 0.05]	0.00	0.0001	0.0001	1.1430	1.0000	1.0000	0.01	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2563	1.0000	1.0000	0.00	0.00
Sum	77.54		100.00						77.54	17.40

Chlorite

Point 3 : (12061, 6706, 2236), 2 iterations----------random2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	30.06		57.87						0.00	0.00
Mg	8.14	[8.06, 8.23]	10.32	0.3163	0.0825	0.9873	1.0000	1.0000	13.50	4.28
Al	9.08	[8.98, 9.18]	10.37	0.9486	0.0885	1.0251	1.0000	1.0000	17.16	4.30
Si	9.64	[9.56, 9.72]	10.57	0.3309	0.0961	1.0027	1.0000	1.0000	20.62	4.38
S	0.01	[0.00, 0.04]	0.01	0.0001	0.0001	1.0217	1.0000	1.0000	0.01	0.00
K	0.04	[0.02, 0.06]	0.03	0.0033	0.0004	1.0736	1.0000	1.0000	0.05	0.01
Ti	0.02	[0.00, 0.05]	0.01	0.0003	0.0002	1.1560	1.0000	1.0000	0.03	0.01
Cr	0.00	[0.00, 0.22]	0.00	0.0000	0.0000	1.1615	1.0000	1.0000	0.00	0.00
Fe	19.63	[19.37, 19.89]	10.83	0.3853	0.1672	1.1613	1.0000	1.0000	25.26	4.49
Co	0.00	[0.00, 0.18]	0.00	0.0000	0.0000	1.1847	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.19]	0.00	0.0000	0.0000	1.1423	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2555	1.0000	1.0000	0.00	0.00
Sum	76.62		100.00						76.62	17.47

Chlorite

Point 4 : (5095, 5785, 2204), 2 iterations----------spot1 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	29.80		57.79						0.00	0.00
Mg	8.15	[8.06, 8.23]	10.40	0.3165	0.0826	0.9868	1.0000	1.0000	13.51	4.32
Al	9.02	[8.93, 9.13]	10.38	0.9433	0.0880	1.0246	1.0000	1.0000	17.05	4.31
Si	9.40	[9.32, 9.48]	10.39	0.3230	0.0938	1.0021	1.0000	1.0000	20.12	4.31
S	0.02	[0.00, 0.06]	0.02	0.0004	0.0002	1.0211	1.0000	1.0000	0.02	0.01
K	0.05	[0.02, 0.07]	0.04	0.0038	0.0004	1.0730	1.0000	1.0000	0.05	0.01
Ti	0.05	[0.02, 0.08]	0.03	0.0008	0.0004	1.1553	1.0000	1.0000	0.08	0.01
Cr	0.02	[0.00, 0.05]	0.01	0.0002	0.0002	1.1608	1.0000	1.0000	0.03	0.01
Fe	19.71	[19.45, 19.97]	10.95	0.3869	0.1679	1.1607	1.0000	1.0000	25.35	4.55
Co	0.00	[0.00, 0.21]	0.00	0.0000	0.0000	1.1840	1.0000	1.0000	0.00	0.00
Ni	0.00	[0.00, 0.18]	0.00	0.0000	0.0000	1.1416	1.0000	1.0000	0.00	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2548	1.0000	1.0000	0.00	0.00
Sum	76.21		100.00						76.21	17.53

~~Muscovite~~ altered biotite

Point 5 : (5010, 5918, 2205), 2 iterations----------spot1 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	44.56		62.53						0.00	0.00
Mg	0.48	[0.45, 0.50]	0.44	0.0178	0.0047	1.0253	1.0000	1.0000	0.79	0.17
Al	19.69	[19.50, 19.88]	16.38	1.9796	0.1847	1.0646	1.0000	1.0000	37.20	6.29
Si	22.31	[22.17, 22.45]	17.83	0.7369	0.2140	1.0413	1.0000	1.0000	47.72	6.84
S	0.03	[0.00, 0.06]	0.02	0.0005	0.0003	1.0610	1.0000	1.0000	0.03	0.01
K	3.55	[3.47, 3.63]	2.04	0.2855	0.0318	1.1149	1.0000	1.0000	4.28	0.78
Ti	0.15	[0.12, 0.18]	0.07	0.0023	0.0012	1.2005	1.0000	1.0000	0.25	0.03
Cr	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	1.2062	1.0000	1.0000	0.01	0.00
Fe	1.70	[1.62, 1.78]	0.68	0.0325	0.0141	1.2060	1.0000	1.0000	2.19	0.26
Co	0.00	[0.00, 0.13]	0.00	0.0000	0.0000	1.2303	1.0000	1.0000	0.00	0.00
Ni	0.01	[0.00, 0.05]	0.00	0.0001	0.0001	1.1862	1.0000	1.0000	0.02	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.3031	1.0000	1.0000	0.00	0.00
Sum	92.48		100.00						92.48	14.38

Chlorite

Point 6 : (14701, 17142, 2267), 2 iterations----------spot2 point12

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	30.01		57.90						0.00	0.00
Mg	8.08	[8.00, 8.17]	10.26	0.3140	0.0819	0.9871	1.0000	1.0000	13.40	4.25
Al	8.70	[8.60, 8.80]	9.95	0.9089	0.0848	1.0249	1.0000	1.0000	16.43	4.12
Si	9.89	[9.81, 9.98]	10.87	0.3398	0.0987	1.0024	1.0000	1.0000	21.17	4.51
S	0.05	[0.01, 0.08]	0.05	0.0008	0.0005	1.0215	1.0000	1.0000	0.05	0.02

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K	0.03	[0.01, 0.05]	0.02	0.0026	0.0003	1.0734	1.0000	1.0000	0.04	0.01
Ti	0.03	[0.00, 0.06]	0.02	0.0004	0.0002	1.1557	1.0000	1.0000	0.04	0.01
Cr	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	1.1612	1.0000	1.0000	0.00	0.00
Fe	19.75	[19.49, 20.01]	10.92	0.3877	0.1682	1.1611	1.0000	1.0000	25.41	4.52
Co	0.00	[0.00, 0.08]	0.00	0.0000	0.0000	1.1844	1.0000	1.0000	0.00	0.00
Ni	0.01	[0.00, 0.06]	0.01	0.0001	0.0001	1.1420	1.0000	1.0000	0.02	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2553	1.0000	1.0000	0.00	0.00
Sum	76.56		100.00						76.56	17.4

Point 7 : (5577, 17180, 2225), 2 iterations----------spot3 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	44.31		62.50						0.00	0.00
Mg	0.56	[0.54, 0.59]	0.52	0.0210	0.0055	1.0254	1.0000	1.0000	0.93	0.20
Al	19.28	[19.10, 19.46]	16.12	1.9382	0.1808	1.0647	1.0000	1.0000	36.43	6.19
Si	22.37	[22.23, 22.51]	17.97	0.7388	0.2146	1.0413	1.0000	1.0000	47.85	6.90
S	0.01	[0.00, 0.04]	0.01	0.0002	0.0001	1.0611	1.0000	1.0000	0.01	0.00
K	3.73	[3.65, 3.81]	2.15	0.2999	0.0334	1.1150	1.0000	1.0000	4.49	0.83
Ti	0.09	[0.06, 0.12]	0.04	0.0014	0.0008	1.2005	1.0000	1.0000	0.16	0.02
Cr	0.02	[0.00, 0.05]	0.01	0.0002	0.0002	1.2062	1.0000	1.0000	0.03	0.00
Fe	1.64	[1.56, 1.72]	0.66	0.0313	0.0136	1.2061	1.0000	1.0000	2.10	0.25
Co	0.00	[0.00, 0.17]	0.00	0.0000	0.0000	1.2304	1.0000	1.0000	0.00	0.00
Ni	0.02	[0.00, 0.06]	0.01	0.0001	0.0001	1.1863	1.0000	1.0000	0.02	0.00
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.3032	1.0000	1.0000	0.00	0.00
Sum	92.03		100.00						92.03	14.40

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Mg	24.1	[illegible]	23.8	5000	14.39	0.0	1.0000
Al	37.[illegible]	[illegible]	33.6	5000	14.39	0.3	1.0000
Si	58.[illegible]	[illegible]	50.1	5000	14.39	0.6	1.0000
S	7.[illegible]	[illegible]	29.0	5000	14.39	-1.5	1.0000
K	14.[illegible]	[illegible]	13.6	5000	14.39	0.1	1.0000
Ti	34.[illegible]	30029	31.3	5000	14.39	0.2	1.0000
Cr	45.[illegible]	30029	47.0	10010	14.39	-0.1	1.0000
Fe	2085.[illegible]	30029	16.8	5000	14.39	143.8	1.0000
Co	140.5	30029	20.1	5000	14.39	8.4	1.0000
Ni	1897.9	30029	25.6	10010	14.39	130.1	1.0000
As	19.9	30029	19.4	5000	14.39	0.0	1.0000

Point 11 : (8488, 29693, 2235)----------spot4 point2

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	148.5	30029	19.1	5000	14.41	9.0	1.0000
Al	541.5	20020	36.1	5000	14.41	35.1	1.0000
Si	60.1	20020	50.8	5000	14.41	0.6	1.0000
S	5.8	30029	2.3	5000	14.41	0.2	1.0000
K	15.1	30029	13.1	5000	14.41	0.1	1.0000
Ti	187.6	30029	29.3	5000	14.41	11.0	1.0000
Cr	1426.1	30029	44.6	10010	14.41	95.9	1.0000
Fe	3290.8	30029	21.2	5000	14.41	226.9	1.0000
Co	18.4	30029	19.5	5000	14.41	-0.1	1.0000
Ni	24.1	30029	17.0	10010	14.41	0.5	1.0000
As	19.1	30029	27.5	5000	14.41	-0.6	1.0000

Point 12 : (10364, 11467, 2213)----------spot5 point1

Elt	Pk(cps)	Pk(ms)	Bg(cps)	Bg(ms)	nA	(Pk-Bg)/Bc	APF
Mg	134.5	30029	19.5	5000	14.36	8.0	1.0000
Al	412.5	20020	33.2	5000	14.36	26.4	1.0000
Si	52.9	20020	44.7	5000	14.36	0.6	1.0000
S	5.4	30029	3.5	5000	14.36	0.1	1.0000
K	13.8	30029	11.3	5000	14.36	0.2	1.0000
Ti	167.8	30029	29.8	5000	14.36	9.6	1.0000
Cr	1069.2	30029	41.4	10010	14.36	71.6	1.0000
Fe	3552.9	30029	22.0	5000	14.36	245.9	1.0000
Co	19.7	30029	22.0	5000	14.36	-0.2	1.0000
Ni	27.3	30029	16.0	10010	14.36	0.8	1.0000
As	21.4	30029	30.3	5000	14.36	-0.6	1.0000

13-53 RESULTS

PAP Procedure

Chromite

Point 1 : (18486, 29076, 2261), 2 iterations----------spot1 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	22.26		52.93						0.00	0.00
Mg	0.61	[0.59, 0.64]	0.96	0.0258	0.0067	0.9100	1.0000	1.0000	1.01	0.43
Al	1.52	[1.48, 1.55]	2.14	0.1720	0.0160	0.9449	1.0000	1.0000	2.86	0.97
Si	0.01	[0.00, 0.03]	0.02	0.0005	0.0001	0.9242	1.0000	1.0000	0.03	0.01
S	0.00	[0.00, 0.07]	0.00	0.0000	0.0000	0.9417	1.0000	1.0000	0.00	0.00
K	0.00	[0.00, 0.03]	0.00	0.0000	0.0000	0.9896	1.0000	1.0000	0.00	0.00
Ti	1.19	[1.15, 1.23]	0.95	0.0206	0.0112	1.0655	1.0000	1.0000	1.99	0.43
Cr	10.47	[10.27, 10.67]	7.66	0.0977	0.0977	1.0705	1.0000	1.0000	15.31	3.47
Fe	51.76	[51.28, 52.25]	35.25	1.1021	0.4782	1.0704	1.0000	1.0000	66.59	15.99
Co	0.00	[0.00, 0.08]	0.00	0.0000	0.0000	1.0920	1.0000	1.0000	0.00	0.00
Ni	0.15	[0.10, 0.20]	0.10	0.0015	0.0014	1.0528	1.0000	1.0000	0.19	0.04
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.1583	1.0000	1.0000	0.00	0.00
Sum	87.99		100.00						87.99	21.34

Pentlandite

Point 2 : (18582, 29116, 2263), 2 iterations----------spot1 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs	Ox%	Cat#

O	18.81		37.71						0.00	0.00
Mg	0.01	[0.00, 0.02]	0.01	0.0003	0.0001	0.9160	1.0000	1.0000	0.01	0.01
Al	0.00	[0.00, 0.02]	0.00	0.0003	0.0000	0.9511	1.0000	1.0000	0.01	0.00
Si	0.01	[0.00, 0.03]	0.01	0.0003	0.0001	0.9302	1.0000	1.0000	0.02	0.01
S	23.41	[23.09, 23.72]	23.66	0.4354	0.2466	0.9479	1.0000	1.0000	23.41	15.06
K	0.00	[0.00, 0.03]	0.00	0.0001	0.0000	0.9960	1.0000	1.0000	0.00	0.00
Ti	0.00	[0.00, 0.32]	0.00	0.0000	0.0000	1.0725	1.0000	1.0000	0.00	0.00
Cr	0.00	[0.00, 0.07]	0.00	0.0000	0.0000	1.0775	1.0000	1.0000	0.00	0.00
Fe	34.48	[34.12, 34.84]	20.01	0.7401	0.3211	1.0774	1.0000	1.0000	44.36	12.74
Co	1.72	[1.60, 1.83]	0.94	0.0156	0.0156	1.0991	1.0000	1.0000	1.72	0.60
Ni	31.97	[31.66, 32.28]	17.65	0.3058	0.3024	1.0597	1.0000	1.0000	40.68	11.23
As	0.02	[0.00, 0.06]	0.01	0.0003	0.0002	1.1660	1.0000	1.0000	0.03	0.01
Sum	110.23		100.00						110.23	39.65

Spot 1, pt 2

Pentlandite

~~Point~~ 3 : (18689, 29089, 2272), 2 iterations spot1 point3

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	18.55		41.43						0.00	0.00
Mg	0.00	[0.00, 0.02]	0.01	0.0002	0.0000	0.9116	1.0000	1.0000	0.01	0.00
Al	0.01	[0.00, 0.02]	0.01	0.0012	0.0001	0.9465	1.0000	1.0000	0.02	0.01
Si	0.02	[0.00, 0.04]	0.02	0.0006	0.0002	0.9257	1.0000	1.0000	0.04	0.01
S	14.47	[14.24, 14.70]	16.13	0.2708	0.1534	0.9433	1.0000	1.0000	14.47	9.34
K	0.00	[0.00, 0.12]	0.00	0.0000	0.0000	0.9912	1.0000	1.0000	0.00	0.00
Ti	0.02	[0.00, 0.04]	0.01	0.0003	0.0002	1.0673	1.0000	1.0000	0.03	0.01
Cr	0.02	[0.00, 0.06]	0.01	0.0002	0.0002	1.0723	1.0000	1.0000	0.02	0.01
Fe	34.65	[34.29, 35.02]	22.18	0.7451	0.3233	1.0722	1.0000	1.0000	44.58	12.85
Co	1.76	[1.65, 1.86]	1.06	0.0160	0.0160	1.0938	1.0000	1.0000	1.76	0.62
Ni	31.40	[31.09, 31.70]	19.11	0.3011	0.2978	1.0546	1.0000	1.0000	39.95	11.07
As	0.03	[0.00, 0.08]	0.02	0.0005	0.0003	1.1604	1.0000	1.0000	0.05	0.01
Sum	100.92		100.00						100.92	33.93

Pico TITE

~~Point~~ 4 : (16351, 35021, 2296), 2 iterations spot2 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	29.54		56.36						0.00	0.00
Mg	4.88	[4.82, 4.94]	6.13	0.1949	0.0509	0.9597	1.0000	1.0000	8.09	2.61
Al	16.13	[15.97, 16.28]	18.24	1.7345	0.1618	0.9965	1.0000	1.0000	30.47	7.77
Si	0.01	[0.00, 0.02]	0.01	0.0003	0.0001	0.9746	1.0000	1.0000	0.02	0.00
S	0.00	[0.00, 0.09]	0.00	0.0000	0.0000	0.9931	1.0000	1.0000	0.00	0.00
K	0.01	[0.00, 0.03]	0.00	0.0004	0.0001	1.0436	1.0000	1.0000	0.01	0.00
Ti	0.05	[0.02, 0.08]	0.03	0.0008	0.0004	1.1237	1.0000	1.0000	0.08	0.01
Cr	12.18	[12.05, 12.31]	7.15	0.1076	0.1076	1.1290	1.0000	1.0000	17.80	3.04
Fe	21.97	[21.69, 22.25]	12.01	0.4459	0.1935	1.1289	1.0000	1.0000	28.26	5.11
Co	0.04	[0.00, 0.10]	0.02	0.0003	0.0003	1.1516	1.0000	1.0000	0.04	0.01
Ni	0.10	[0.06, 0.15]	0.05	0.0009	0.0009	1.1104	1.0000	1.0000	0.13	0.02
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.2208	1.0000	1.0000	0.00	0.00
Sum	84.89		100.00						84.89	18.59

Cr-Fe-Spinel or Chromite

Point 5 : (16342, 34993, 2301), 2 iterations spot2 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	23.41		52.51						0.00	0.00
Mg	0.51	[0.49, 0.54]	0.76	0.0217	0.0057	0.9082	1.0000	1.0000	0.85	0.35
Al	1.25	[1.22, 1.28]	1.66	0.1422	0.0133	0.9429	1.0000	1.0000	2.36	0.76
Si	0.00	[0.00, 0.02]	0.00	0.0001	0.0000	0.9223	1.0000	1.0000	0.01	0.00
S	0.00	[0.00, 0.05]	0.00	0.0000	0.0000	0.9398	1.0000	1.0000	0.00	0.00
K	0.01	[0.00, 0.03]	0.01	0.0006	0.0001	0.9875	1.0000	1.0000	0.01	0.00
Ti	1.05	[1.00, 1.09]	0.79	0.0182	0.0099	1.0633	1.0000	1.0000	1.75	0.36
Cr	9.84	[9.73, 9.96]	6.79	0.0921	0.0921	1.0683	1.0000	1.0000	14.39	3.11
Fe	58.14	[57.60, 58.69]	37.36	1.2474	0.5412	1.0682	1.0000	1.0000	74.80	17.07
Co	0.00	[0.00, 0.28]	0.00	0.0000	0.0000	1.0897	1.0000	1.0000	0.00	0.00
Ni	0.20	[0.15, 0.26]	0.12	0.0019	0.0019	1.0507	1.0000	1.0000	0.26	0.06
As	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	1.1559	1.0000	1.0000	0.00	0.00
Sum	94.43		100.00						94.43	21.71

Pentlandite

Point 6 : (18779, 12337, 2260), 2 iterations spot3 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#

(sulfur spectrometer not working)

13-53

Spot 3, pt 1

O	18.61		49.33						0.00	0.00
Mg	0.02	[0.00, 0.04]	0.04	0.0009	0.0002	0.9025	1.0000	1.0000	0.04	0.02
Al	0.01	[0.00, 0.02]	0.01	0.0008	0.0001	0.9370	1.0000	1.0000	0.01	0.01
Si	0.01	[0.00, 0.03]	0.02	0.0005	0.0001	0.9165	1.0000	1.0000	0.03	0.01
S	0.00	[0.00, 0.09]	0.00	0.0000	0.0000	0.9339	1.0000	1.0000	0.00	0.00
K	0.00	[0.00, 0.13]	0.00	0.0000	0.0000	0.9814	1.0000	1.0000	0.00	0.00
Ti	0.01	[0.00, 0.04]	0.01	0.0002	0.0001	1.0566	1.0000	1.0000	0.02	0.01
Cr	0.01	[0.00, 0.04]	0.01	0.0001	0.0001	1.0616	1.0000	1.0000	0.02	0.00
Fe	33.54	[33.18, 33.91]	25.47	0.7248	0.3145	1.0615	1.0000	1.0000	43.15	12.39
Co	1.93	[1.83, 2.03]	1.39	0.0178	0.0178	1.0829	1.0000	1.0000	1.93	0.68
Ni	32.85	[32.53, 33.17]	23.73	0.3136	0.3136	1.0441	1.0000	1.0000	41.81	11.55
As	0.00	[0.00, 0.33]	0.00	0.0000	0.0000	1.1489	1.0000	1.0000	0.00	0.00
Sum	87.00		100.00						87.00	24.66

Oxidized

Point 7 : (18755, 12288, 2267), 2 iterations---------- spot3 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	17.70		45.05						0.00	0.00
Mg	0.02	[0.00, 0.04]	0.03	0.0008	0.0002	0.9064	1.0000	1.0000	0.03	0.02
Al	0.00	[0.00, 0.02]	0.00	0.0003	0.0000	0.9411	1.0000	1.0000	0.00	0.00
Si	0.09	[0.07, 0.11]	0.13	0.0032	0.0009	0.9205	1.0000	1.0000	0.18	0.07
S	7.89	[7.72, 8.06]	10.03	0.1487	0.0842	0.9380	1.0000	1.0000	7.89	5.34
K	0.01	[0.00, 0.02]	0.01	0.0005	0.0001	0.9856	1.0000	1.0000	0.01	0.00
Ti	0.01	[0.00, 0.03]	0.00	0.0001	0.0001	1.0612	1.0000	1.0000	0.01	0.00
Cr	0.00	[0.00, 0.16]	0.00	0.0000	0.0000	1.0663	1.0000	1.0000	0.00	0.00
Fe	61.09	[60.53, 61.66]	44.56	1.2963	0.5624	1.0662	1.0000	1.0000	78.60	23.74
Co	0.00	[0.00, 0.21]	0.00	0.0000	0.0000	1.0876	1.0000	1.0000	0.00	0.00
Ni	0.26	[0.20, 0.32]	0.18	0.0025	0.0025	1.0487	1.0000	1.0000	0.33	0.10
As	0.02	[0.00, 0.06]	0.01	0.0003	0.0002	1.1538	1.0000	1.0000	0.03	0.01
Sum	87.08		100.00						87.08	29.27

Pentlandite (Sulfur spectrometer NOT working)

Point 8 : (10329, 20760, 2237), 2 iterations---------- spot6 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	18.51		49.26						0.00	0.00
Mg	0.02	[0.00, 0.03]	0.03	0.0007	0.0002	0.9023	1.0000	1.0000	0.03	0.01
Al	0.01	[0.00, 0.03]	0.02	0.0017	0.0002	0.9368	1.0000	1.0000	0.03	0.01
Si	0.01	[0.00, 0.03]	0.01	0.0004	0.0001	0.9163	1.0000	1.0000	0.02	0.01
S	0.00	[0.00, 0.00]	0.00	0.0000	0.0000	0.9336	1.0000	1.0000	0.00	0.00
K	0.00	[0.00, 0.22]	0.00	0.0000	0.0000	0.9811	1.0000	1.0000	0.00	0.00
Ti	0.00	[0.00, 0.17]	0.00	0.0000	0.0000	1.0564	1.0000	1.0000	0.00	0.00
Cr	0.00	[0.00, 0.04]	0.00	0.0000	0.0000	1.0614	1.0000	1.0000	0.00	0.00
Fe	33.91	[33.55, 34.28]	25.85	0.7329	0.3180	1.0613	1.0000	1.0000	43.63	12.59
Co	2.09	[1.99, 2.19]	1.51	0.0193	0.0193	1.0826	1.0000	1.0000	2.09	0.73
Ni	32.12	[31.81, 32.43]	23.29	0.3067	0.3067	1.0438	1.0000	1.0000	40.87	11.35
As	0.03	[0.00, 0.07]	0.02	0.0004	0.0003	1.1486	1.0000	1.0000	0.04	0.01
Sum	86.71		100.00						86.71	24.72

Iron oxides

Point 9 : (10324, 20745, 2237), 1 iterations---------- spot6 point2

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#
O	20.88		50.02						0.00	0.00
Mg	0.03	[0.02, 0.05]	0.05	0.0015	0.0004	0.9002	1.0000	1.0000	0.06	0.03
Al	0.01	[0.00, 0.02]	0.01	0.0007	0.0001	0.9347	1.0000	1.0000	0.01	0.00
Si	0.03	[0.02, 0.05]	0.05	0.0012	0.0004	0.9142	1.0000	1.0000	0.07	0.02
S	0.01	[0.00, 0.05]	0.01	0.0002	0.0001	0.9316	1.0000	1.0000	0.01	0.01
K	0.00	[0.00, 0.22]	0.00	0.0000	0.0000	0.9789	1.0000	1.0000	0.00	0.00
Ti	0.00	[0.00, 0.35]	0.00	0.0000	0.0000	1.0540	1.0000	1.0000	0.00	0.00
Cr	0.01	[0.00, 0.05]	0.01	0.0001	0.0001	1.0590	1.0000	1.0000	0.02	0.00
Fe	72.51	[71.87, 73.16]	49.75	1.5593	0.6766	1.0589	1.0000	1.0000	93.28	23.87
Co	0.00	[0.00, 0.17]	0.00	0.0000	0.0000	1.0802	1.0000	1.0000	0.00	0.00
Ni	0.14	[0.09, 0.20]	0.09	0.0014	0.0014	1.0415	1.0000	1.0000	0.18	0.05
As	0.00	[0.00, 0.04]	0.00	0.0000	0.0000	1.1459	1.0000	1.0000	0.00	0.00
Sum	93.64		100.00						93.64	23.98

Pentlandite (sulfur NOT working)

Point 10 : (8448, 29666, 2244), 2 iterations---------- spot4 point1

Elt	W%	interval(95%)	A%	Ix/Istd	Kratio	Z.A.F. coefs			Ox%	Cat#

13-53

Petrographic Analysis of Rock Samples from the Naval Command Control and Ocean Surveillance Center RDT&E Division Site, Morris Dam, Azusa, California

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Discussion

Summary:

Petrographic examination of rock samples from the Morris Dam Naval R & D site was performed to explain the presence of anomalously high values of chromium (Cr), nickel (Ni), arsenic (As), and sporadically distributed anomalously high values of copper (Cu) and lead (Pb) in soils on the site. Indeed, some of the samples have minerals that contain all of the elements. These minerals include chromite ($FeCr_2O_4$) and Cr-spinels, Cr- and Ni-enriched biotite, pentlandite ($(Ni, Fe, Co)_9S_8$), heazlewoodite (Ni_3S_2), millerite (NiS), arsenic-rich(?) pyrite, chalcopyrite ($(Cu,Fe)S_2$), chalcocite (Cu_2S), covellite (CuS), and malachite ($(Cu_2(CO_3)(OH)_2$. Possible galena (PbS) was found with sphalerite (ZnS) in sample #13-17.

Petrographic analyses of the 22 rock samples revealed both igneous and metamorphic rock types. Igneous rocks comprised 13 felsic rock samples including granite, quartz monzonite, and granodiorite composition, two amphibolites, and one ultramafic sample (pyroxenite or peridotite). Metamorphic samples constituted one biotite gneiss, two mica schists, one biotite schist, and one chlorite schist.

All of these rocks may have been metamorphosed to some degree, for metamorphism is sometimes not detectable, particularly in a granitic hand sample or polished section. Often, only a regional analysis can reveal the metamorphic textures. In addition, many of these granitic rocks could actually be of migmatitic origin (i.e., the result of metamorphism and partial melting of sedimentary rocks).

Most samples have been subjected to minor hydrothermal alteration (adularia and quartz veining, argillic and epidote alteration, sericitization). Chloritization of biotite, which is ubiquitous, is probably the result of metamorphism. Trace elements may have been introduced along fractures either during hydrothermal alteration or during metamorphism.

Electron microprobe quantitative analysis revealed that the ultramafic sample (#13-53) and at least one biotite schist (#13-30) were enriched in Cr and Ni. Chlorite, which is an alteration product of biotite in the schist, does not contain detectable Cr or Ni.

Implications:

Primary biotite contains Cr and Ni and the chlorite that has replaced it does not, indicating that Cr and Ni were released from biotite but were not incorporated into the chlorite structure. Other studies have also shown that when biotite alters to chlorite, elements such as Ti, Cr, Ni, etc. released from biotite are not incorporated into the chlorite structure (Bailey, 1987). Biotite in the granitic rocks may, too, be enriched in Cr and Ni; thus, this biotite may also be a source for Cr and Ni in the groundwater. Both Cr and Ni form stable oxyanions in groundwater at low temperatures (<100° C).

The Navy used this cataclastic rock for their pads. These naturally crushed and broken rocks are likely to be more deeply weathered, because of the larger surface area exposed to the weathering processes. Furthermore, the biotite in the cataclastic rocks is

altered more than the other minerals in the rock. It has been naturally squeezed, contorted, altered to chlorite, and oxidized. Additional mechanical breakdown from the use of heavy equipment would have facilitated the release of trace elements from the biotite structure.

Suggestions for future work:

Additional samples should be taken with an emphasis on the rock types (i.e., ultramafic rocks and biotite schist) shown in this study to be enriched in the target trace elements. Geologic reconnaissance could be done to look for the distinctive colors of arsenic oxides. Additional electron microprobe analyses of the Ni- and Cr-enriched rock-types and minerals identified in this study might be conducted, because not enough electron microprobe data were collected to statistically characterize, with a defined level of confidence, the metal concentrations in the rock samples. We think that further electron microprobe analysis might prove that many of the metals have a natural source. Because most of the rocks have abundant biotite, which may contain anomalously high concentrations of Cr and Ni, probe work should concentrate on the fresh biotite in a number of the samples.

Reference: Bailey, S.W., ed., 1987, Reviews in Mineralogy, vol. 13: Micas, Mineralogical Society of America, 584 p.

13-01 Quartz Monzonite

Hand sample: Weathered and fresh surfaces: medium brown (Fe oxides) to greenish gray; chlorite-rich rock; sausseritized plagioclase phenocrysts; some iron oxide staining.

Description of polished thin section: Very coarse; anhedral grains of K-feldspar, plagioclase, quartz, and biotite cut by numerous veinlets; fractured; veinlets offset plagioclase twins; propylitic (chlorite, epidote, and calcite) alteration; feldspars are sericitized and sausseritized.

Veins: Calcite-- Veinlets; pyrite and chalcopyrite inclusions; epidote selvages.
Epidote-- Discontinuous; up to 1 mm thick.
Pyrite-- Thin veinlets.
Chlorite-- Thin veinlets.
Quartz-- Veinlets; rare; discontinuous in feldspar; cut epidote veins.

Mineralogy

Nonopaque minerals:

Plagioclase—30%-- Brown; cloudy; anhedral grains (up to 5 mm diameter); twinned; very coarse; highly sausseritized; sericitized; chlorite and calcite veinlets; wavy twin lamellae show strain.

K-feldspar—24%-- Brown; cloudy; anhedral grains (up to 5 mm diameter); untwinned; very coarse; sericitized.

Quartz—12%-- Colorless; anhedral grains (up to 3 mm diameter); some inclusions; undulatory extinction; veinlets.

Epidote--8%-- Colorless to yellowish green; first to second order birefringence; veinlets; massive; widespread alteration of plagioclase; in veins.

Chlorite--7% -- Pleochroic yellow to green; anomalous indigo and purple interference colors;; alteration product of biotite and other minerals; also in veins; slightly oxidized; may be pennine (high Mg chlorite).

Calcite—5%-- Colorless; high differential relief and birefringence; in veinlets; mixed with chlorite; alteration product of feldspar and biotite and other mafic grains.

Biotite—5%-- Dark brown (oxidized); elongate grains (up to 3.5 mm long); altered to calcite, chlorite, titanium dioxides, and iron oxides; opaque (magnetite?) inclusions; may contain Cr in its structure.

13-01 (cont.)

Nonopaque minerals (cont.):

Muscovite/sericite—3%-- Colorless; second to third order birefringence; alteration product of feldspars; very fine grained; may be mixed with illite.

Pyroxene—2%-- Clear; third order birefringence; up to 3.5 mm diameter; some is uralitized (pale green to brown hornblende); highly fractured.

Clay—2%-- Illite(?); alteration product of feldspars.

Zircon--<1%-- Colorless; high relief and birefringence; subhedral to round; up to .2 mm; trace.

Apatite--<1%-- Colorless; prismatic to hexagonal; very low birefringence; moderate relief; local; up to .3 mm; prismatic; inclusions in K-feldspar; may be fluorapatite.

Sausserite--<1% -- Green: very fine grained alteration product of plagioclase: mixture of minerals, including epidote, clay and albite.

Opaque minerals:

Pyrite--1% -- Light yellow; moderately high reflectivity; isotropic; subhedral to anhedral; associated with chlorite veins.

Titanium dioxides--<1%-- White; very fine grained; local; alteration product of biotite.

Ilmenite--<1%-- Light yellow to cream; moderate reflectivity; anisotropic; disseminated grains (up to .3 mm); may be twinned; locally has pentlandite(?) inclusions.

Chalcopyrite--<1% -- Yellow; moderately high reflectivity; subhedral to anhedral; isotropic; associated with veins.

Millerite(?)--<1% -- White to slightly yellow; high reflectivity; very anisotropic; clusters of tiny needle-shaped grains.

Iron oxides--<1%-- Alteration product of biotite; earthy and crystalline; some is white in reflected light (hematite); may be mixed with manganese oxides.

Pentlandite(?)--<1%-- Pinkish cream; isotropic; moderate reflectivity; inclusions (30 microns) in ilmenite.

Discussion— This plutonic rock has undergone tectonic(?) stress and mineralogic alteration due to magmatic alteration.

13-02 Quartz monzonite

Hand sample: Plutonic rock. Weathered surface: pinkish gray; fresh: mottled green (chlorite), gray (quartz) and white (feldspar); prominent slickensides; tiny (<<1 mm) disseminated opaque grains; oxidized pyrite cubes.

Description of polished thin section: Hypidiomorphic granular; very coarse, anhedral feldspar and quartz grains; biotite has been partly chloritized; large grains are fractured and slightly displaced.

Veins: Calcite, chlorite, and quartz-- Discontinuous veinlets; some are displaced.
Fluorite-- Veinlets in feldspar.
Hematite-- Many discontinuous veinlets.
Quartz/adularia-- Veinlets in feldspar.

Mineralogy

Nonopaque minerals:

K-feldspar—30%-- Brown; cloudy; anhedral (5-6 mm); incipient alteration along cleavage planes; untwinned and Carlsbad twins; replaced by sericite, calcite, and clay; contains albite(?) veinlets.

Plagioclase—25%-- Brown; cloudy; anhedral (5 mm); twinning; clay alteration; also replaced by calcite; dissolution.

Chlorite—15%-- Pale green to brown pleochroism; blue-violet-purple under XP; very low birefringence; alteration product of biotite; associated with calcite; in veins.

Quartz—12%-- Colorless; anhedral (up to 2 mm); strained; intercalated grain boundaries.

Biotite—5%-- Pleochroic light to medium brown; shredded; oxidized and altered to chlorite; opaque inclusions; strongly distorted; 3-4 mm.

Calcite—5%-- Colorless; very high differential relief and birefringence; alteration product of biotite and feldspar; also in veins.

Muscovite/sericite--2%-- Colorless; second to third order birefringence; very fine grained; alteration product of feldspar; disseminated.

Epidote--1%-- Colorless; first to second order birefringence; some needle-shaped grains; associated with chlorite.

Adularia—1%-- Colorless; very low birefringence; negative relief; with quartz in veins.

13-02 (cont.)

Nonopaque minerals (cont.):

Clay--<1%-- Illite(?); alteration product of plagioclase.

Fluorite--<1%-- Clear; negative relief; isotropic; discontinuous veinlets through feldspar grains.

Zircon--<1%-- Colorless; high relief; high birefringence; parallel extinction.

Apatite--<1%-- Colorless; low birefringence; subrounded prisms; inclusions (up to .3 mm long) in feldspar.

Xenotime(?)--<1%-- Colorless; second order birefringence; high relief; one subhedral inclusion in chlorite.

Opaque minerals:

Hematite--2%-- White; fairly high reflectivity; anisotropic; oxidation product of biotite and other minerals(?); disseminated widely (some iron oxides are less reflective and are probably goethite).

Pyrite--1% -- Light yellow; moderately high reflectivity; isotropic; in veinlets and masses associated with chlorite.

Ilmenite--<1%-- Brownish white; weakly anisotropic; larger isolated and distinct grains (~.1 mm).

Discussion: This rock has been subjected to moderate tectonic(?) stress and late magmatic hydrothermal(?) alteration.

13-03 Granite

Hand sample: Weathered surface: medium green to light brown; fresh: mottled red, green, white and brown; highly fractured and weathered; contains chlorite, quartz and feldspar; medium to coarse grained; sample could be somewhat metamorphosed.

Description of polished thin section: Highly fractured; fractures are thin and filled with calcite and chlorite; rock composed of quartz, K-feldspar, and less plagioclase; grains are cut with numerous fractures; faint gneissic texture.

Veins: Calcite -- Abundant; opaque grains along selvages.
Chlorite—Dilational(?); up to .5 mm wide.
Quartz-- Abundant; opaque minerals; some veins contain fluorite and carbonate.

Mineralogy

Nonopaque minerals:

Quartz—42%-- Colorless; anhedral; some granoblastic textures; strained; flattened composite grains; intercalated grain boundaries.

K-feldspar—40%-- Pale brown; cloudy with numerous inclusions; untwinned and microcline; anhedral grains (up to 4 mm); more abundant than plagioclase; cut by calcite and chlorite veins; quartz inclusions; myrmekitic textures; some dissolution.

Plagioclase—10%-- Pale brown; cloudy; twinned; anhedral; partly replaced by calcite; dissolution textures; fractured; contorted twin lamellae; chlorite inclusions.

Calcite—5%-- Colorless; very high relief and birefringence; very fine grained to coarse; mostly in veins, but also locally replaced feldspar; abundant tiny opaque inclusions.

Chlorite—2%-- Pale green; olive to blue in XP; very low birefringence; in pods and veins; associated with opaque grains.

Adularia--<1%-- Colorless; anhedral to rhombic; very low birefringence; negative relief; microcrystalline to fine grained; patchy replacement of feldspar grains.

Apatite--<<1%-- Clear to gray; hexagonal; accessory grains.

Fluorite--<<1%-- Clear; isotropic; negative relief; tiny grains in quartz and carbonate veins.

13-03 (cont.)

Opaque minerals:

Iron oxides--<1%-- Gray to white (hematite); along selvages in veins; associated with calcite in fractures; may be mixed with manganese oxides.

Titanium dioxides--<1%-- Gray to white; very fine grained; anatase and leucoxene; associated with iron oxides.

Pyrite--<1%-- Yellowish white; moderately high reflectivity; isotropic; opaque; tiny grains (10 microns) in fractures and cavities; some grains associated with anatase and iron oxides ; tiny (<1 micron) grains common and disseminated in secondary quartz and calcite.

Chalcopyrite(?)--<<1%-- Brilliant yellow (1 micron) grain in cavity; moderately high reflectivity; isotropic; inclusion in pyrite; may be gold.

Ilmenite--<<1%-- White; moderate reflectivity; anisotropic (cream to brown).

Discussion: This metamorphosed granite has been subjected to relatively intense tectonic stress; however, the minerals are relatively fresh. This granite has been fractured and hydrothermally altered with the introduction of calcite, chlorite, adularia, and quartz. Alteration is primarily confined to fractures (mostly filled with calcite). The opaque minerals have been oxidized.

13-05 Quartz Monzonite

Hand sample: Mottled green (chloritized biotite) and white (feldspar grains); strongly weathered; fine-grained opaque minerals associated with chlorite; small (~5 mm) patches of iron oxides; weathering has caused expansion, breaking up the rock; rock crumbles easily.

Description of polished thin section: Abundant fractures; very coarse feldspars with propylitic alteration (calcite, chlorite, and albite); pyroxene and hornblende replaced by epidote and calcite; biotite altered to chlorite.

Veins: Calcite veinlets.

Mineralogy

Nonopaque minerals:

K-feldspar--40%-- Brown; cloudy due to clay (illite?) alteration; anhedral grains (3-4 mm diameter); patchy calcite replacement.

Plagioclase--24%-- Brown; cloudy due to clay (illite?) alteration; anhedral grains (up to 3 mm diameter); patchy calcite replacement.

Quartz--10%-- Colorless; anhedral; sheared and fractured; undulatory extinction; smaller (up to 1 mm diameter) than feldspar grains.

Chlorite--5%-- Pale green; bluish gray to odd violet color in XP; very low birefringence; replaced biotite, hornblende, pyroxene(?), and muscovite; associated with opaques and epidote.

Clay--5%-- Illite(?); alteration product of feldspar; associated with sericite.

Muscovite/sericite--5%-- Colorless; second to third order birefringence; very fine grained; ubiquitous alteration product of feldspar; associated with clay (illite?).

Epidote--3%-- Colorless; first to second order birefringence; high relief; parallel extinction; broken into pieces; interstitial; alteration product of hornblende, pyroxene(?), and biotite; associated with chlorite and opaque minerals.

Calcite--2%-- Clear; very high birefringence and relief; veinlets; patchy replacement of many grains.

Biotite--1%-- Elongate grains altered to chlorite and epidote; oxidized; up to 3 mm long.

13-05 (cont.)

Nonopaque minerals (cont.):

Hornblende--1%-- Elongate grains (up to 1.5 mm long); totally altered to chlorite, epidote, quartz, and opaque minerals.

Pyroxene(?)--1%-- Totally altered to epidote; broken, partly dissolved grains.

Albite--1%-- Colorless; first order white; patchy alteration of feldspar.

Apatite--<1%-- Colorless; low birefringence; moderate relief; round grains up to .3 mm diameter; inclusions in feldspar and biotite.

Zircon--<1%-- Colorless; subhedral grains (up to .25 mm); very high birefringence and relief.

Opaque minerals:

Iron oxides--1%-- White (hematite) to gray; moderately high reflectivity; anisotropic; massive (up to .6 mm diameter); associated with chlorite and titanium dioxides; oxidized ilmenite(?); probably mixed with manganese oxides.

Pyrite--<1%-- Light yellow; moderately high reflectivity; isotropic; associated with chlorite.

Ilmenite--<1%-- Light yellow to cream; moderate reflectivity; weakly anisotropic; twinned; pentlandite(?) inclusons; slightly oxidized.

Ti-magnetite--<1%-- Oxidized and replaced by chlorite and calcite; ilmenite lamellae visible; grains up to 1-2 mm diameter; sparse.

Pentlandite(?)--<1%-- Reddish brown white; isotropic; inclusion in ilmenite.

Titanium dioxides--<1%-- White (leucoxene); very fine grained; associated with iron oxides.

Discussion: This quartz monzonite has been propyllitically altered (calcite, epidote, albite, and sericite). The sample is so weathered, it is almost grus (weathered fragmental product of *in situ* granular disintegration of granitic rocks.

13-10 Quartz Monzonite

Hand sample: Weathered surface-- light reddish brown (Fe-oxides and clay); fresh surface-- mottled green and white. Quartz, feldspar, biotite, chlorite; dense; disseminated opaques associated with chlorite.

Description of polished thin section: Very coarse grained; hypidiomorphic granular; sericitic, argillic, and propylitic alteration of feldspar; chlorite and epidote replacement of hornblende; apatite is a particularly abundant accessory mineral.

Veins: Calcite and chlorite-- Abundant thin veinlets of calcite and chlorite; included opaque minerals; chlorite veins are post calcite; inclusions of fluorite.

Mineralogy

Nonopaque minerals:

Plagioclase--30%-- Brown; cloudy; anhedral to tabular grains up to 7 mm diameter; albite twins show deformation in many grains; sericitized and argillized (illitized?); small albite overgrowths on some grains.

K-feldspar--23%-- Brown; cloudy due to clay alteration (illitization) and sericitization; anhedral; patchy replacement by epidote.

Quartz--20%-- Colorless; undulatory extinction; cut by calcite veins; up to 2 mm diameter.

Chlorite--10%-- Pale green; anomalous blue to brown to violet birefringence; replaced biotite and muscovite; associated with epidote; in thin veins.

Calcite--5%-- Colorless; high birefringence and relief; in veins; also replaced feldspar and hornblende.

Hornblende--3%-- Pale yellowish green to pale green; low second order birefringence; up to 4 mm long; fractured; some chloritic alteration and replacement by epidote; dissolution; quartz and opaque inclusions.

Epidote--3%-- Colorless to pale yellow to pale yellowish green; second order birefringence; high relief; small, broken grains (up to .6 mm); replaced pyroxene, hornblende, and feldspar; associated with chlorite.

Pyroxene--2%-- Colorless; third order birefringence; replaced by epidote; dissolution; interstitial; orthopyroxene(?).

Nonopaque minerals (cont.):

Muscovite/sericite--2%-- Colorless; very fine grained; alteration product of feldspar; some is primary(?) and has been largely replaced by chlorite.

Clay--1%-- Illite(?); alteration product of feldspar.

Albite--<1%-- Colorless; first order birefringence; small overgrowths on plagioclase grains.

Sausserite--<1%-- Green; very fine grained; aggregate of minerals including epidote, sericite, albite, and clay, resulting from the alteration of plagioclase feldspar.

Biotite--<1%-- Opaque; almost totally altered to chlorite.

Apatite--<1%-- Colorless; anhedral to subhedral; low birefringence; moderate relief; inclusions in all framework grains; unusually abundant as an accessory mineral; rarely in clumps.

Corundum--<1%-- Colorless; low birefringence; very high relief; round inclusion (1 mm) in quartz.

Sphene--<1%-- Colorless; extremely high relief and birefringence; rounded (.25 mm) and elongate grains (1.5 mm) replaced by calcite; associated with epidote.

Fluorite--<1%-- Clear with blue spots; negative relief; isotropic; associated with chlorite and epidote; secondary.

Xenotime(?)--<1%-- Colorless; high relief and birefringence; tetragonal; inclusion in plagioclase.

Opaque minerals:

Pyrite--<1%-- Light yellow; moderately high reflectivity; isotropic; anhedral; replaced ilmenite or Ti-magnetite; associated with titanium dioxides.

Iron oxides--<1%-- Gray to white (hematite); anisotropic; oxidation product of biotite; veinlets; probably mixed with manganese oxides.

Titanium dioxides--<1%-- White; very fine grained; associated with iron oxides.

Ilmenite--<1%-- Pale brown to cream; anisotropic (cream to brown); moderate reflectivity; .1 mm; several grains (up to .1 mm); associated with chlorite.

13-10 (cont.)

Discussion: This quartz monzonite has undergone mild hydrothermal alteration (epidote and chlorite). The biotite is totally altered to chlorite

13-11 Granodiorite

Hand sample: Plutonic rock. Weathered and fresh surfaces: mottled medium brown to green (chloritized biotite) to pinkish white (feldspar). Local iron staining; minerals include quartz, K-feldspar, plagioclase, chlorite, epidote, pyrite; may have been slightly metamorphosed.

Description of polished thin section: Hypidiomorphic granular texture; very coarse; anhedral grains (2-3 mm); abundant biotite.

Veins: Calcite-- Discontinuous veinlets; cut feldspar grains.
Pyrite-- Tiny; discontinuous; <1 mm; rare.

Mineralogy

Nonopaque minerals:

Plagioclase--34% -- Cloudy due to abundant inclusions; anhedral; altered to sausserite and calcite; up to 8 mm.

K-feldspar--20% -- Cloudy; anhedral; abundant opaque inclusions; patchy kaolinite and calcite replacement.

Biotite—25%-- Light to medium green pleochroism; alteration to chlorite and calcite; opaque inclusions.

Calcite--6% -- Colorless; high birefringence and relief; in veins; replaced biotite and plagioclase feldspar along cleavages; opaque inclusions.

Quartz--5% -- Colorless; anhedral (up to 3 mm); strong undulatory extinction; some intercalated grain boundaries; dusty inclusions.

Chlorite—4%-- Colorless; very low birefringence; alteration product of biotite.

Kaolinite--2% -- Colorless; very low birefringence and negative relief; replaced K-feldspar in patches.

Muscovite/sericite--2%-- Colorless; second to third order birefringence; very fine grained; replaced feldspars and biotite.

Apatite--<1%-- Colorless; subhedral grains up to .1 mm; inclusions in biotite.

Epidote--<1%-- Pale green; first to second order birefringence; very fine grained alteration around biotite.

13-11 (cont.)

Nonopaque minerals (cont.):

Sausserite--<1%-- Green; very fine grained; aggregate of minerals including epidote, sericite, albite, and clay, resulting from the alteration of plagioclase feldspar.

Fluorite--<1%-- Clear; isotropic; negative relief; anhedral; associated with chlorite; replaced K-feldspar.

Rutile--<1%-- Clear to brown; colorful birefringence; very high relief intergrown with chlorite (associated with anatase, which has white internal reflections).

Opaque minerals:

Pyrite—<1%-- Whitish yellow; high reflectivity; isotropic; up to 25 microns; surrounded by oxidation; in veins.

Ilmenite--<1%-- Gray; moderately high reflectivity; anisotropic (brown to cream); some is twinned; chalcopyrite inclusions; disseminated; .6-1 mm.

Chalcopyrite--<1%-- Yellow; moderately high reflectivity; tiny grains surrounded by oxidation; inclusions in ilmenite.

Iron oxides--<1%-- Brown to white (hematite); oxidation product of biotite and other iron-bearing minerals.

Titanium dioxides--<1%-- Gray to white; anatase and leucoxene; associated with iron oxides.

Magnetite--<1%-- Light-medium gray; moderate reflectivity; isotropic; intergrown with ilmenite; inclusion of pentlandite(?).

Pentlandite(?)--<1%-- Cream white-light pink; moderately high reflectivity; isotropic; inclusion in magnetite; also disseminated very fine grained grains.

Discussion: This granodiorite has undergone minor alteration. Faint schistose texture in hand sample suggests that this rock may have been slightly metamorphosed.

13-11D Granodiorite

Hand sample: Weathered surface: mottled brown, green, pink and white; fresh surface: mottled green and white. White calcite/ quartz vein up to 7 mm thick; minerals include: calcite, quartz, plagioclase and K-feldspar, biotite, epidote; patches of Fe oxides; finely disseminated opaques; faint schistose textures.

Description of polished thin section: Very coarse (1-4 mm), fractured, anhedral grains of quartz and feldspar; abundant calcite veins; feldspars are highly altered; plagioclase >> K-feldspar; faint schistose texture.

Veins: Calcite in thin veins; also in "sheared" zones up to .5 mm wide.
Iron oxide-stained fractures.
Sericite-- Discontinuous veinlets.
Chlorite-- Oxidized veinlets.
Quartz-- Discontinuous; thin; rare.

Mineralogy

Nonopaque minerals:

Plagioclase--40%-- Cloudy; sausserite, calcite, sericite and clay alteration; twinned; patches of albitization; 1-5 mm.

Quartz and polycrystalline quartz--20%-- Colorless; some granoblastic grains—smaller, flattened grains between feldspars.

K-feldspar--17%-- Cloudy; sericitized, argillized; replaced by calcite; 1 to 4 mm.

Biotite--12%-- Brown to green; oxidized and chloritized; common; up to 7 mm long.

Hornblende(?)--5%-- Dark argillized and chloritized grains with abundant opaque inclusions.

Chlorite--2%-- Pale green to pale bluish green; very low birefringence; anomalous violet-red colors in XP; abundant opaque inclusions; replaced biotite and hornblende(?).

Clay--1%-- Illite(?); alteration of feldspar.

Pyroxene--<1%-- Clear; 2nd order birefringence; almost totally dissolved; partly replaced by chlorite; ~1.2 mm.

Apatite--<1%-- Colorless; low birefringence; moderate relief; up to .3 mm long; subhedral; most abundant accessory mineral; inclusions in grains.

13-11D (cont.)

Nonopaque minerals (cont.):

Zircon--<1%-- Colorless; high birefringence and relief; one subhedral grain (.5 mm).

Muscovite/sericite--<1%-- Colorless; third order birefringence; very fine grained; in veins; minor alteration of feldspars.

Adularia--<1%-- Colorless; very low birefringence; negative relief; patchy replacement of plagioclase.

Calcite--<1%-- Colorless; widespread replacement of feldspar; abundant veins.

Albite--<1%-- White; first order birefringence; patchy alteration of plagioclase.

Opaque minerals:

Iron oxides--2%-- Gray to cream-white; white internal reflections; oxidation product of biotite and hornblende(?); associated with titanium dioxides and manganesse(?) oxides.

Titanium dioxides--<1%-- White; leucoxene; very fine grained; associated with oxidized biotite.

Ilmenite--<1%-- White to brownish cream; moderately high reflectivity; anisotropic; several grains (up to .5 mm).

Pyrite--<1%-- Yellowish white; isotropic, one triangular grain (.05 mm).

Pentlandite(?)--<1%-- Light reddish brown; isotropic; surrounded by hematite.

Discussion: Schistose texture and abundant fractures indicate that this rock has been regionally metamorphosed. This rock has been argillized, chloritized, silicified and oxidized.

13-15 Quartz Monzonite

Hand sample: Weathered surface: medium greenish brown, brown, and white; fresh surface: white and greenish brown. Highly altered granitic rock that may have been metamorphosed; minerals include feldspar and biotite; rocks appears slightly crushed; local areas of iron oxides suggestive of disseminated sulfides.

Description of polished thin section: Coarse grained (1-4 mm); hypidiomorphic granular; anhedral grains show evidence of deformation (bent twin lamellae; fractured grains); mafic minerals are chloritized; plagioclase > K-feldspar.

Veins: Calcite/chlorite-- Abundant, discontinuous, irregular veinlets; opaque inclusions. Quartz-- Thin; sparse; later than calcite.

Mineralogy

Nonopaque minerals:

Plagioclase--30%-- Brown; cloudy; anhedral grains (2-5 mm); argillic, sausseritic, and sericitic alteration; bent twin lamellae; replacement by calcite; calcite veinlets.

K-feldspar--25%-- Brown; cloudy; abundant inclusions; argillic, sericitic, and calcite alteration; calcite veinlets; untwinned.

Quartz--20%-- Cloudy due to dusty inclusions; undulatory extinction; 1-4 mm; fractured, and fractures filled with calcite; veins.

Chlorite--10%-- Pale green to very pale green; anomalous blue-violet-red birefringence; replaced biotite and hornblende(?).

Clay--2%-- Illite(?); very fine grained alteration of feldspars.

Hornblende--<1%-- Totally altered; replaced by chlorite and calcite; opaque inclusions; 3.5 mm long.

Biotite--<1%-- Opaque; almost totally replaced by chlorite and oxidized; common.

Sausserite--<1%-- Green; very fine grained alteration of plagioclase.

Epidote--<1%-- Colorless to green; moderately low birefringence; associated with chlorite.

13-15 (cont.)

Nonopaque minerals (cont.):

Sphene--<1%-- Colorless to brown; very high relief and birefringence; replaced hornblende.

Apatite--<1%-- Colorless; low birefringence; subhedral; up to .2 mm; inclusions in feldspar.

Zircon--<1%-- Colorless; high relief and birefringence; subhedral grain (.1 mm).

Calcite--7%-- Colorless; very high relief and birefringence; replaced feldspars along cleavages; abundant veins.

Muscovite/sericite—1%-- Colorless; third order birefringence; uncommon; along cleavages in feldspar.

Opaque minerals:

Iron oxides--1%-- White to gray; anisotropic; in oxidized biotite and hornblende.

Manganese oxide mineral--<1%-- Grayish white; moderate reflectivity; anisotropic; in calcite veins.

Arsenic-rich(?) pyrite--<1%-- White; high reflectivity; anisotropic; massive to subhedral grains (up to .6 mm); good polish; associated with chlorite and titanium dioxides.

Ilmenite--<1%-- Cream with pink inclusions; moderately high reflectivity; very anisotropic (light blue to pink); subhedral—tends to be idiomorphic; up to .15 mm; common.

Pentlandite--<1%-- Pinkish white; isotropic; inclusions in ilmenite.

Ti-magnetite--<1%-- Opaque; altered grain (.7 mm); shows ilmenite lamellae.

Titanium dioxides--<1%-- White; very fine grained; leucoxene.

Discussion: This quartz monzonite has undergone mild hydrothermal alteration and possibly metamorphism. Arsenic may have replaced Fe in pyrite. Pentlandite(?) may have been introduced by hydrothermal alteration.

13-17 Biotite Gneiss

Hand sample: Weathered surfaces: grayish green (chlorite); fresh surface: layered green, gray, and white. Metamorphosed granitic rock with abundant chloritized biotite and minor muscovite with poorly defined schistose texture; micas are interlayered with quartz and feldspar; slippery feel (talc?).

Description of polished thin section: Coarse grained; irregularly banded rock; flattened grains of quartz, anhedral feldspar and elongate, aligned chloritized biotite, and muscovite; quartz and biotite rich; anhedral quartz and feldspar grains have intercalated grain boundaries.

Veins: Calcite-- Discontinuous veinlets; up to .15 mm thick.

Mineralogy

Nonopaque minerals:

Quartz--30%-- Clear; undulatory extinction; some flattened grains; round quartz inclusions in quartz; some granoblastic textures; minor chlorite inclusions.

Biotite--32%-- Pale yellowish green to dark olive green; up to 2 mm long; most is fresh; minor chlorite alteration; grains are aligned; "birdseye" texture; abundant pleochroic halos caused by radioactive inclusions.

K-feldspar--25%-- Brown; cloudy due to argillic alteration (mainly in centers of grains); anhedral grains (.25-1 mm); minor calcite replacement; quartz inclusions

Plagioclase--10%-- Brown; cloudy, anhedral grains; twinned; argillic and calcite alteration; quartz inclusions.

Muscovite/sericite--1%-- Clear; second to third order birefringence; a few larger primary grains intergrown with biotite; secondary muscovite is within altered feldspar grains and along feldspar cleavage plains; up to .5 mm.

Talc(?)--<1%-- Colorless; third order birefringence; very fine grained; alteration of biotite.

Pyroxene(?)--<1%-- Colorless; third order birefringence; high relief; .25 mm; interstitial; two grains.

Zircon--<1%-- Colorless; subhedral and rounded grains; up to .08 mm; at least six grains.

13-17 (cont.)

Nonopaque minerals (cont.):

Epidote--<1%-- Clear to pale yellowish green; second order birefringence; high relief; one grain (.25 mm); interstitial.

Calcite--<1%-- Colorless; high birefringence and relief; interstitial; minor replacement of grains; sparse veinlets.

Clay--<1%-- Illite(?); argillic alteration of feldspars.

Opaque minerals:

Iron oxides--1%-- Gray to white; oxidation of biotite; disseminated.

Sphalerite--<1%-- Gray; low reflectivity; good smooth polish; subhedral; isotropic; faint red internal reflections; completely opaque-black—"jack" or iron-rich variety; associated with biotite and chalcopyrite.

Galena(?)--<1%-- Gray; isotropic; low-moderate reflectivity; associated with sphalerite; intergrown with ilmenite.

Chalcopyrite--<1%-- Yellow; moderately high reflectivity; isotropic; tiny grains (up to 10 microns); in argillized K-feldspar and disseminated.

Ilmenite--<1%-- Brownish gray to gray; low-moderate reflectivity; anisotropic; up to .25 mm; tiny pyrite inclusions.

Pyrite--<1%-- Yellowish white; moderately high reflectivity; tiny remnants(?); oxidized; inclusions in ilmenite and magnetite; up to .2 mm.

Discussion: This regionally metamorphosed rock may have been derived from pelitic (aluminous) sediments, quartzo feldspathic sandstone or granitic igneous rock. This rock has been argillized and hydrothermally altered.

13-18 Quartz Monzonite

Hand sample: Weathered surface: medium brown; fresh surface: mottled green, white, and pink. Coarse grained rock with feldspar, quartz, biotite, chlorite, and calcite; disseminated tiny opaques.

Description of polished thin section: Very coarse grained granitic rock; hypidiomorphic granular texture; anhedral grains of quartz and feldspar; feldspar grains strongly argillized and plagioclase is replaced by calcite.

Veins: Calcite-- Thin (<<1 mm), discontinuous, and sinuous; vuggy textures.
Quartz-- Thin (~10 microns wide) and discontinuous; cut feldspar grains.

Mineralogy

Nonopaque minerals:

Plagioclase--40%-- Brown; cloudy due to argillic sericitic alteration; replaced by calcite; twinned; quartz inclusions; bent twin lamellae; small albite overgrowths on some grains.

K-feldspar—28%-- Brown; cloudy due to sericitic and argillic alteration; replaced by calcite; untwinned; dissolution; calcite veins; apatite inclusions.

Quartz—15%-- Cloudy due to inclusion trains and dusty opaque inclusions; anhedral grains (up to 4 mm); undulatory extinction; some composite grains; apatite inclusions; thin veins.

Clay—5%-- Illite(?); widespread alteration product of feldspar.

Chlorite—5%-- Very pale green to pale bluish green; anomalous brown-violet-blue birefringence; low relief; opaque and apatite inclusions; up to 2 mm long; alteration product of biotite.

Muscovite/sericite—3%-- Colorless; second to third order birefringence; rare primary grains (up to 1 mm); secondary sericite is an alteration product of feldspar; associated with chlorite.

Calcite—2%-- Colorless; high differential relief and birefringence; patchy replacement of feldspar, especially Ca plagioclase; up to medium grained; in veins.

Epidote—1%-- Pale yellowish green; high relief; second order birefringence; replaced pyroxene(?) and hornblende.

Biotite--<1%-- Totally chloritized and oxidized; vague remnants; were up to 2 mm long.

13-18 (cont.)

Nonopaque minerals (cont.):

Pyroxene--<1%-- Totally altered to chlorite, epidote, and opaque minerals.

Hornblende--<1%-- Argillized, chloritized; ~3.5 mm long; dissolution; zircon inclusions; minor epidote alteration.

Zircon--<1%-- Colorless; very high relief and birefringence; round inclusion (.1 mm) in plagioclase.

Apatite--<1%-- Colorless; moderate relief; low birefringence; inclusions in many minerals; up to .3 mm.

Albite--<1%-- Colorless; small overgrowths on plagioclase.

Opaque minerals:

Pyrite--<1%-- Yellowish white; moderately high reflectivity; isotropic; two tiny cubic to subhedral grains associated with chlorite.

Chalcopyrite--<1%-- Yellow; moderately high reflectivity; isotropic; ~10 microns; two inclusions in quartz.

Iron oxides--<1%-- Gray to white (hematite); moderate reflectivity; disseminated in oxidized biotite.

Titanium dioxides--<1%-- White; very fine grained; white internal reflections; associated with iron oxides.

Discussion: Except for minor argillic alteration and chloritization of biotite and calcite veining, this is a relatively fresh quartz monzonite.

13-21 Cataclastic Quartz Monzonite

Hand sample: Weathered surface: medium brown; fresh surface: mottled green, white, and pink. Minerals include feldspar, quartz, biotite, chlorite, and disseminated tiny opaques.

Description of polished thin section: Highly fractured; sericitized and argillized feldspars; abundant epidote; cataclastic quartz; biotite altered to chlorite; pulverized grains in fractures.

Veins: Epidote-- Abundant in small fractures.
Chlorite-- In small fractures; with epidote.
Iron oxides-- Coat fractures.

Mineralogy

Nonopaque minerals:

K-feldspar—35%-- Cloudy; untwinned; broken grains(up to 1 mm); slightly altered; opaque minerals along cleavages; fractures filled with epidote.

Plagioclase—25%-- Cloudy; totally fractured; untwinned grains are highly sericitized and argillized; minor epidote and chlorite alteration; albite-twinned grains are fresh (Na-rich); up to 1.5 mm; deformed twin lamellae.

Quartz--22%-- Clear; totally fractured and recrystallized; up to .5 mm; undulatory extinction; apatite inclusions.

Epidote--7%-- Yellowish green; second order; moderately high relief; up to 1 mm; anhedral; associated with chlorite; in fractures; minor replacement of feldspar.

Illite--%-- Clay-size; alteration product of plagioclase.

Chlorite--3%-- Pale yellowish green to pale brownish green; low birefringence; anomalous blue-violet interference colors; associated with epidote in fractures; alteration product of biotite.

Muscovite/sericite--2%-- Colorless; very fine grained; alteration product of plagioclase.

Apatite--<1%-- Colorless; very low birefringence; tiny inclusions (25 microns) in plagioclase.

13-21 (cont.)

Opaque minerals:

Iron oxides--<1%-- Grayish white; moderately high reflectivity; anisotropic; associated with epidote and chlorite in fractures; probably mixed with manganese oxides.

Ilmenite--<1%-- Cream to light brown; anisotropic; many anhedral grains (up to 1 mm); may have pinkish white inclusions.

Pyrite--<1%-- Yellowish white; moderately high reflectivity; isotropic; anhedral grain (12 microns) in fracture.

Gold(?)--<1%-- Brilliant yellowish gold; three grains (10-30 microns) in fractures in quartz.

Description: This quartz monzonite has been subjected to intense tectonic stress. Late magmatic and hydrothermal fluids moving along fractures were responsible for the argillization, chloritization, and sericitization of the rock.

13-22 Quartz Monzonite

Hand sample: Plutonic rock; faint gneissic textures. Weathered surface: brownish pink with green (muscovite) layers; fresh surface: pink and white. Prominent layers of wavy green muscovite.

Description of polished thin section: Very coarse feldspars (1-5 mm) with strained quartz; abundant chloritized biotite; abundant calcite veins; highly altered rock; very common tiny opaque minerals.

Veins: Calcite-- Numerous; irregular, discontinuous; ~25 microns wide
Chlorite-- Rare; associated with quartz and opaque minerals.
Quartz-- Rare; with calcite and chlorite.
Iron oxides-- Thin; merge into quartz and calcite veins.
Muscovite-- Thin, discontinuous veinlets.

Mineralogy

Nonopaque minerals:

Plagioclase--30%-- Cloudy; twinned; subhedral to anhedral; extensive calcite replacement; some sericitization and chloritization; apatite and microcline inclusions; some myrmekitic textures; minor albitization.

K-feldspar--25%-- Cloudy; untwinned; anhedral; extensively replaced by calcite; zircon and quartz inclusions.

Chlorite--20%-- Pale green; very low birefringence; anomalous colors; quartz and zircon inclusions; abundant opaque inclusions; associated with calcite; replaced biotite and plagioclase.

Quartz--15%-- Somewhat cloudy with dusty inclusions; anhedral; granoblastic texture with smaller recrystallized grains.

Muscovite/sericite—3%-- Colorless; third order birefringence; alteration product of feldspar; may include secondary clay; hand sample has muscovite layers about ~2 cm. thick.

Calcite--2%-- Colorless; high differential relief and birefringence; extensively replaced feldspars and mafic minerals; veins.

Biotite--1%-- Altered to chlorite and opaque minerals; quartz and abundant opaque inclusions.

Apatite--<1%-- Colorless; anhedral to subhedral; .05 mm; inclusions in K-feldspar.

13-22 (cont.)

Nonopaque minerals (cont.):

Zircon--<1%-- Colorless; high relief and birefringence; round inclusion (.05 mm) in quartz.

Albite--<1%-- Minor albitization of plagioclase, including small overgrowths.

Opaque minerals:

Iron oxides--3%-- White to gray; abundant in veins and as tiny oxidized magnetite(?) grains in oxidized biotite grains.

Ilmenite--<1%-- Opaque; up to 1 mm; oxidized grains.

Pentlandite(?)--<1%--Reddish brown, isotropic, inclusion in ilmenite.

Pyrite--<1%-- Light yellow; isotropic; disseminated grains associated with chlorite; some grains may be arsenic-rich; some grains seem to have arsenopyrite needles growing on their edges (could also be millerite).

Titanium dioxides--<1%-- White; very fine grained; abundant in altered biotite grains.

Discussion: This quartz monzonite was probably (faint gneissic textures) regionally metamorphosed. The rock was also fractured and hydrothermally altered.

13-23 Quartz Monzonite

Hand sample: Granitic rock. Weathered surface: brownish pink with green (chlorite) layers; fresh surface mottled white, pink, black and green. Minerals include quartz, feldspar, chlorite; and epidote.

Description of polished thin section: Very coarse; numerous wide (1 mm) fracture zones filled with chlorite, opaques, epidote, and calcite crosscut rock; mafic minerals are totally altered; cataclastic quartz; quartz-rich areas separated by calcite and chlorite.

Veins: Calcite-- Abundant; thin; opaque inclusions.
Chlorite-- Abundant; opaque inclusions.
Fluorite-- Veinlets associated with chlorite.
Iron oxides-- Sinuous veinlets; ubiquitous.

Mineralogy

Nonopaque minerals:

Quartz—30%-- Clear to cloudy; anhedral (up to 3 mm); undulatory extinction; strained and recrystallized in some areas; calcite and chlorite veins; traces of secondary, euhedral quartz associated with chlorite.

Plagioclase--27%-- Brown; cloudy with carbonate and clay inclusions; albite twins; bent lamellae; up to 4 mm; calcite and chlorite veins; replaced by calcite.

K-feldspar—20%-- Relatively clear; locally cloudy; untwinned; anhedral grains (up to 3.5 mm); some disseminated illite (?) alteration; apatite inclusions; calcite and chlorite veins.

Chlorite—12%-- Very pale green to pale green; abnormal violet-red birefringence; replaced biotite; also occurs in feldspar cleavages; opaque inclusions; associated with iron oxides and opaques.

Clay—3%-- Minor alteration of feldspar; locally abundant; illite(?).

Muscovite/sericite—1%-- Colorless; second and third order birefringence; very fine grained; minor alteration of feldspar.

Calcite—1%-- Colorless; high birefringence and relief; mainly in fractures; associated with opaques; replaced feldspar in patches.

13-23 (cont.)

Nonopaque minerals (cont.):

Epidote--1%-- Clear to very pale yellow; second order; high relief; fractured; associated with chlorite; intergrown with euhedral, secondary quartz; apatite inclusions; up to 1 mm.

Fluorite--<1%-- Purple to clear grains; negative relief; isotropic; tiny, sinuous veinlets.

Apatite--<1%-- Colorless; moderate relief; low birefringence; inclusions in feldspar.

Rutile--<1%-- Brown to light brown translucent grains; colorful birefringence; very high relief; associated with chlorite.

Opaque minerals:

Iron oxides--4%-- Gray-white; moderately high reflectivity; associated with calcite and chlorite.

Discussion: This rock has undergone the stresses of strong tectonic fault(?) movement; it may also be slightly metamorphosed. Unknown opaque minerals in veins have oxidized.

13-30 Biotite Schist

Hand sample: Regionally metamorphosed fine- to medium-grained intermediate(?) plutonic rock. Weathered surface: light grayish brown with patches of red; fresh surface mottled black, green, gray and white. Minerals include quartz, sausseritized(?) plagioclase and biotite; finely disseminated opaques, some opaques are partly altered to hematite; patches of brownish white clay.

Description of polished thin section: Very fresh metamorphosed rock; faint schistose texture of quartz and biotite in some areas; very little fracturing; biotite is fresh; coarse.

Veins: Calcite-- Sparse; thin, discontinuous veinlets (<.05 mm wide)
Biotite-- Discontinuous veins.

Mineralogy

Nonopaque minerals:

Quartz—28%-- Colorless; undulatory and straight extinction; anhedral; intercalated grain boundaries; patchy areas of fine-grained flattened quartz and biotite; other areas are even grained; bubble trains; opaque inclusions along recrystallized grain boundaries; zircon inclusion.

K-feldspar—27%-- Brown; cloudy; minor clay, calcite and chlorite alteration; untwinned; anhedral (up to 5 mm); quartz and rare zircon inclusions.

Plagioclase—25%-- Fresh; slightly cloudy; twinned; quartz inclusions; a trace of sausserite, calcite, and clay alteration.

Biotite—20%-- Very pale green to greenish brown to salmon pink (phlogopite?); fresh; opaque inclusions; minor replacement by chlorite; pleochroic halos due to radioactive inclusions; contains up to .23 wt. % Cr (see electron microprobe results).

Calcite--<1%-- Colorless; high birefringence; patchy alteration; sparse veins; along cleavages in feldspar.

Chlorite--<1%-- Pale green to colorless; very low birefringence (bluish gray); minor replacement of biotite.

Sausserite--<1%-- Green; very fine grained; alteration of plagioclase feldspar.

Clay--<1%-- Illite(?); minor alteration of feldspars.

13-30 (cont.)

Nonopaque minerals (cont.):

Zircon--<1%-- Colorless; very high relief and birefringence; inclusions in quartz and feldspar; anhedral to subhedral (<.05 mm).

Apatite--<1%-- Colorless; very low birefringence; moderate relief; inclusions in biotite and K-feldspar; .2 mm.

Epidote(?)--<1%-- Colorless to pale yellow; small anhedral grains; interstitial; with biotite.

Fluorite--<1%-- Colorless; isotropic; negative relief; one grain.

Opaque minerals:

Chalcopyrite--<1%-- Yellow; opaque; three grains (~10 microns); in quartz and argillized K-feldspar.

Titanium dioxides--<1%-- White; leucoxene; very fine grained; alteration of biotite and Ti-magnetite(?).

Iron oxides--<1%-- Opaque; tiny inclusions in chlorite; oxidation products of magnetite(?) in biotite.

Discussion: Regionally metamorphosed plutonic rock. Electron microprobe results show that Cr has substituted in the biotite structure; chlorite does not contain detectable Cr. This schist was subjected to granulite grade metamorphism. It could have been derived from arenaceous sediments or siliceous igneous rocks.

13-34 Chlorite Schist

Hand sample: Weathered surface: greenish gray and white; fresh surface: medium green and white. Highly altered rock with schistose texture. Minerals include chloritized biotite, hornblende(?); K-feldspar, plagioclase, quartz, and calcite(?) (vein); slippery feel suggestive of talc.

Description of polished thin section: Almost totally altered to chlorite and calcite; rock was composed of biotite, feldspar, and quartz.

Veins: Calcite-- Thin veinlets.
Iron oxides/chlorite-- Thin veinlets; rare.

Mineralogy

Nonopaque minerals:

Calcite--48%-- Colorless; very high birefringence and relief; has replaced most grains; also in veins.

Chlorite--25%-- Pale yellow to pale greenish brown; very low birefringence (bluish gray); replaced biotite and other grains in patches; opaque inclusions.

K-feldspar—8%-- Dark grains with patchy extinction (adularia?); largely replaced by calcite and chlorite.

Plagioclase—8%-- Twinned grains; most have been replaced by calcite, sausserite, clay, and chlorite; sparse apatite inclusions; up to 1 mm.

Quartz--5%-- Colorless; small grains and remnants; has been replaced by calcite and chlorite; small amounts of secondary, euhedral quartz.

Adularia(?)--2%-- Colorless; very low birefringence; secondary; may have replaced feldspar and caused patchy extinction.

Muscovite/sericite--2%-- Colorless; third order birefringence; associated with chlorite; up to .15 mm; very fine grained alteration of feldspar.

Biotite--1%-- Light brown to brown pleochroism; altered to chlorite and opaques.

Fluorite(?)--<1%-- Colorless; isotropic; negative relief; in altered feldspar with chlorite and calcite; rare.

Hornblende--<1%-- Green; mostly altered to chlorite and calcite.

13-34 (cont.)

Nonopaque minerals (cont.):

Apatite--<1%-- Colorless; low birefringence; hexagonal and prismatic grains.

Talc(?)--<1%-- Colorless; third order birefringence; very fine grained; alteration product of biotite.

Opaque minerals:

Pyrite--<1%-- Yellowish white; opaque; remnants up to .12 mm; dissolved, not oxidized; disseminated.

Chalcocite(?)- Gray; tiny grains intergrown with or replaced pyrite; red internal reflections(?); ~25 microns; covellite alteration.

Covellite--<1%-- Bluish gray; very anisotropic (orange to light orange); alteration product of chalcocite(?).

Iron oxides--<1%-- Grayish white; light gray to gray anisotropy; in biotite; associated with chlorite and secondary euhedral quartz; up to .6 mm long;

Discussion: This rock has been hydrothermally altered (adularia, quartz) and metamorphosed (biotite altered to chlorite). This rock could have been derived from pelitic rocks or siliceous igneous rocks.

13-38 Amphibolite

Hand sample: Weathered surface: brownish green; fresh surface: medium green. Medium-grained plutonic rock with abundant and biotite.

Description of thin section: Hornblende, biotite, and plagioclase constitute most of this rock; minor quartz; relatively fresh.

Veins: None.

Mineralogy

Nonopaque minerals:

Hornblende—66%-- Very pale yellowish green to very pale green; lower second order birefringence; large 2V (close to 90 degrees); biaxial negative; anhedral to subhedral (rare); fresh; minor dissolution; aligned magnetite inclusions; apatite and quartz inclusions; straight trains of opaque inclusions that have a pattern suggestive of total replacement of an earlier formed mineral; poikiloblastic texture with plagioclase.

Biotite—18%-- Very pale yellow to pinkish brown (phlogopite?); most is fresh; some has been replaced by chlorite; apatite and quartz inclusions.

Plagioclase—8%-- Cloudy; untwinned and twinned; anhedral (up to 1.2 mm); sericitic alteration; hornblende inclusions; included in hornblende.

Muscovite/sericite--3%-- Clear; second order birefringence; very fine grained; alteration product of plagioclase feldspar.

Chlorite—3%-- Colorless to very pale green; low birefringence; wavy extinction; alteration product of biotite(?).

Quartz—1%-- Colorless; anhedral (up to .3 mm); round inclusions in other minerals as well as individual grains.

Apatite--<1%-- Colorless; moderate relief; low birefringence; round grains; up to .6 mm.

Sphene--<1%-- Pale yellowish brown; subhedral; very high relief and birefringence; inclusions in biotite (alteration?).

13-38 (cont.)

Opaque minerals:

Ilmenite--<1%-- Brownish gray to gray; very anisotropic; fresh; elongate; inclusions in biotite and chlorite; up to .6 mm long.

Heazlewoodite(?)--<<1%-- Light bronze yellow; anisotropic showing slightly purplish tints; very fine grained; included in hornblende and biotite.

Chromite(?)--<1%-- Light to medium gray; moderate reflectivity; isotropic; good polish; very fine grained; intergrown with pyrite.

Magnetite--<1%-- Gray; low reflectivity; isotropic grains form abundant tiny inclusions in hornblende.

Pyrite--<<1%-- Yellow; moderately high reflectivity; subhedral; isotropic; inclusions in plagioclase and hornblende.

Leucoxene--<<1%-- Gray; white internal reflections; earthy; intergrown with pyrite; alteration product of biotite, ilmenite or Ti-magnetite.

Discussion: Ni (heazlewoodite(?)) may have been introduced due to hydrothermal alteration.

13-42 Mica Schist

Hand Sample: Weathered surface: medium greenish brown; fresh surface: medium gray green. Highly developed foliation; corrugated cleavage surfaces; satiny to greasy luster (phyllitic); schistose texture; chlorite rich; disseminated silver-colored opaques minerals(<.5 mm); slippery feel, suggestive of the presence of talc.

Description of polished thin section: Coarse grained (~ 1 mm); quartz, feldspar and muscovite; abundant elongate muscovite grains in wavy, subparallel alignment; aggregates of quartzite and feldspar between layers of mica; some tight folds in mica; pods of quartzite; cross-cutting fabric-- small fractures stained with iron oxides cut across grains but not across porphyroblasts.

Veins: Quartz and adularia(?)-- Rare; discontinuous.
Iron oxides-- Thin.

Mineralogy

Nonopaque minerals:

Quartz--34%-- Colorless; microcrystalline; elongate pods and porphyroblasts; thin pods are parallel to foliation of mica; apatite inclusions; composite grains with intercalated grain boundaries; forms metamorphic "eyes" with mica and chlorite around the grains.

Biotite--20%-- Pale yellowish green to medium green; inclusions (up to .3 mm) in feldspar; oxidized and altered to chlorite; may contain traces of Cr and Ni.

Chlorite--14%-- Pale green to pale bluish green; some is olive green; very low birefringence; alteration product of feldspar and biotite.

Muscovite--10%-- Colorless; second to third order birefringence; aligned parallel to schistosity.

K-feldspar(?)—10%-- Clear to cloudy due to clay alteration; less altered than plagioclase; formed metamorphic "eyes" with mica and chlorite around the grains.

Plagioclase—5%-- Cloudy due to clay and sausserite alteration; pinkish tinge; anhedral; untwinned and twinned; sausseritic and chloritic alteration; quartz inclusions; residual phenocrysts; porphyroblasts; many crystals have been broken; formed metamorphic "eyes" with mica and chlorite alteration around the grains.

Talc(?)--3%-- Colorless; third order birefringence; very fine grained; aligned parallel to schistosity; secondary; gives rock a slippery texture.

13-42 (cont.)

Nonopaque minerals (cont.):

Calcite--2%-- Brown patches; very fine grained; very high birefringence; replaced Ca-rich plagioclase with sausserite.

Adularia--1%-- Colorless; negative relief; very low birefringence; anhedral and rhombic; in veins with quartz.

Corundum--<1%-- Colorless; very high relief; very low birefringence; .08 mm.

Zircon--<1%-- Colorless; high relief and birefringence; several grains (.05 mm); primary.

Sausserite--<1%-- Green, fine grained aggregate of minerals; replaced plagioclase.

Fluorite--<1%-- Colorless; isotropic; negative relief; .1 mm.

Rutile--<1%-- Rounded medium brown; pinkish gray in reflected light; associated with chlorite; secondary.

Opaque minerals:

Iron oxides--<1%-- Opaque; small disseminated fragments; around some muscovite and chlorite.

Magnetite--<1%-- Gray-brown; isotropic; rare grains (~25 microns).

Pyrite--<1%-- Light yellow; moderately high reflectivity; isotropic; elongate grains appear to have developed with the foliation.

Chalcopyrite--<1%-- Yellow; moderately high reflectivity; isotropic; tiny grain (10 microns); covellite alteration around margins.

Covellite--<1%-- Blue; orange in XP; alteration product of chalcopyrite.

Malachite--<1%-- Green; tiny grains; visible in hand sample; oxidation product of copper minerals.

Discussion: This rock could have been derived from pelitic rocks or siliceous igneous rocks. Cu was introduced along fractures during hydrothermal alteration.

13-42D Amphibolite

Hand sample: Weathered surface: dark brownish gray; fresh surface: very dark gray. Dense igneous rock; visible hornblende crystals.

Description of polished thin section: Very coarse grained; mostly hornblende; less quartz, muscovite, and pyroxene; abundant ilmenite.

Veins: Epidote and iron oxides-- Discontinuous veinlets.

Mineralogy

Nonopaque minerals:

Hornblende--70%-- Pale olive green to greenish blue; strong pleochroism; second order birefringence; extinction angle ~11 degrees; biaxial -; large 2V; euhedral to anhedral; coarse to very coarse; abundant opaque inclusions; fresh.

Quartz--8%-- Colorless; fine grained; subrounded crystals; locally has green tourmaline inclusions.

Epidote--5%-- Colorless to yellow (pleochroic); moderate birefringence; fine grained.

Carbonate(?)--3%-- Colorless; high birefringence; associated with epidote.

Plagioclase--1%-- Colorless; anhedral; sericite and sausserite alteration; associated with epidote.

Actinolite(?)--1%-- Colorless to light green pleochroism; very fine grained needles; secondary.

Muscovite/sericite--<1%-- Colorless; second to third order birefringence; contorted; very coarse grains surrounded by very fine grained muscovite; hornblende and quartz inclusions.

Sausserite--<1%-- Pale green; very fine grained alteration product of plagioclase.

Pyroxene--<1%-- Colorless; second order green and blue birefringence; parallel extinction; smaller crystals than hornblende.

Apatite--<1%-- Colorless; low birefringence; moderate relief; uniaxial negative; round grains and inclusions in hornblende.

Zircon--<1%-- Colorless; high relief and birefringence; subrounded; up to .05 mm.

13-42D (cont.)

Opaque minerals:

Ilmenite--8%-- Brownish gray; moderate reflectivity; anisotropic; twin lamellae; very coarse anhedral grains.

Pyrite--3%-- Yellowish white; moderately high reflectivity; isotropic; cubic to anhedral; inclusions in ilmenite; up to .6 mm.

Chalcopyrite--<1%-- Yellow; moderately high reflectivity; isotropic; anhedral grains up to .15 mm; some covellite alteration; disseminated.

Covellite--<1%-- Blue; anisotropic in shades of orange; alteration product of chalcopyrite.

Iron oxides--<1%-- Gray to white (hematite); red in transmitted light; oxidation product of sulfides; pyrite inclusions.

Titanium dioxides<1%-- White; earthy; alteration product of biotite and ilmenite.

Discussion: Ni may have been introduced due to hydrothermal alteration along fractures.

13-46 Gneiss

Hand sample: Metamorphosed rock; weathered surface: layered pinkish brown and medium green; fresh surface: layered pink (K-feldspar). White (quartz and plagioclase feldspar) and greenish black biotite; textbook example of gneiss; trace iron staining suggestive of disseminated opaques.

Description of polished thin section: Coarse grained; fresh, anhedral grains of quartz, K-feldspar, plagioclase, and minor muscovite; chloritized biotite; small amounts of alteration; plagioclase > K-feldspar.

Veins: None.

Mineralogy

Nonopaque minerals:

Quartz--40%-- Colorless; undulatory extinction; anhedral (up to 4 mm); plagioclase inclusions.

Plagioclase--24%-- Brown; twinned; anhedral (up to 4 mm); quartz and chlorite inclusions; albite overgrowths (up to .05 mm); clay and sericite alteration.

K-feldspar--20%-- Colorless; microcline and untwinned grains; relatively fresh; albite overgrowths; quartz inclusions; patchy replacement by albite; up to 2.5 mm.

Biotite--5%-- Pale yellowish brown to pale yellow; shreddy grains; altered mostly to chlorite; sparse fresh grains within quartz.

Clay(?)--5%-- Brown; illite(?); alteration product of plagioclase; covers entire grains.

Muscovite/sericite--3%-- Colorless; second to third order birefringence; fresh; primary (up to 5 mm long) and secondary (sericite); plagioclase inclusions.

Chlorite--2%-- Pale yellowish green to pale brownish green; anomalous bluish gray to violet interference colors; replaced biotite.

Zircon--<1%-- Colorless; high birefringence and relief; round; .2 mm.

Epidote--<1%-- Yellowish green; second order; moderately high relief; anhedral (.2 mm); associated with biotite, muscovite, and chlorite.

Albite--<1%-- Colorless; twinned and untwinned; anhedral to subhedral; overgrowths on plagioclase; patchy replacement of K-feldspar.

13-46 (cont.)

Opaque minerals:

Iron oxides--<1%-- Grayish white (hematite); moderately high reflectivity; anisotropic; along cleavage in biotite.

Titanium dioxides--<1%-- White; very fine grained; alteration product of biotite.

Discussion: This gneiss is relatively fresh except for chloritization of biotite. This gneiss may have been derived from pelitic (aluminous) sediments, quartzofeldspathic sandstone or granitic rock.

13-47 Cataclastic Granite

Hand sample: Weathered surface: medium brown; fresh surface: greenish white. Brecciated plutonic rock with abundant chlorite, clay and iron oxide alteration.

Description of polished thin section: Rock is totally broken up by fractures; fractures are filled with chlorite and iron oxides; quartz grains are pulverized into smaller grains; abundant argillic and potassic (adularia) alteration.

Veins: Chlorite and iron oxides-- Sinuous; associated with fluorite and opaque minerals.
Adularia-- Veins with chlorite selvages.
Quartz--Sinuous; cut chlorite and iron oxide veins.
Iron oxides-- Stain fractures; associated with chlorite.
Fluorite-- Tiny veins in quartz and feldspar.
Pulverized quartz, iron oxides, and clay-- Ropey-looking "veins" caused by fault movement and oxidation.

Mineralogy

Nonopaque minerals:

Quartz--40%-- Clear to cloudy; undulatory extinction; grains have been fractured and pulverized; some quartz has recrystallized showing extreme strain and intercalated grain boundaries; abundant dusty opaque inclusions; some tiny corundum inclusions in secondary (clear) quartz.

K-feldspar--28%-- Brown; fractured; strongly argillized; anhedral grains (up to 3 mm); fractured and broken grains are common.

Chlorite--10%-- Yellowish green to colorless; low birefringence; rare anomalous violet interference colors; alteration product of biotite; in veins; oxidized; rutile inclusions.

Biotite--10%-- Green to light olive green; some is opaque (oxidized); common; up to .5 mm long; altered to chlorite in part; squeezed between quartz and feldspar grains.

Plagioclase--5%-- Cloudy; twinned; argillized and sericitized along twinning planes; biotite inclusions; fractured and broken grains are common.

Clay--2%-- Illite(?); alteration of feldspar

Muscovite/sericite--1%-- Colorless; third order birefringence; broken grains (very fine grained up to 1 mm).

13-47 (cont.)

Nonopaque minerals (cont.):

Fluorite--1%-- Colorless; isotropic; negative relief; several patches (up to .7 mm diameter); in fractures with chlorite; secondary.

Zircon -- <1%-- Colorless; very high relief and birefringence; round to euhedral.

Amphibole(?) – <1% -- Dark grain (1 mm long); altered; cleavage.

Adularia--<1%-- Colorless; anhedral to rhombic; very low relief and birefringence; locally replaced plagioclase and quartz; common in veins.

Corundum(?)--<1% -- Colorless; square grain (.05 mm); in quartz; extremely high relief; low birefringence.

Epidote-- <1%-- Colorless to pale yellow; secondary; oxidized; in fracture.

Opaque minerals:

Iron and manganese oxides--3%-- Red to black; earthy; along fractures; manganese oxides are abundant on chemistry and are probably mixed with iron oxides.

Titanium dioxides--<1%-- White to yellow to gray; very fine grained; along fractures; associated with chlorite; some white internal reflections.

Pyrite--<1%-- Yellowish white; moderately high reflectivity; isotropic; tiny cubic grains associated with iron oxides and chlorite.

Gold(?)--<1%-- Brilliant yellow-gold; grain (~25 microns) in fracture.

Discussion: This granite shows evidence of intense tectonic stress and hydrothermal alteration. Chloritization of biotite can be evidence of low-grade metamorphism.

13-53 Peridotite(?) or Pyroxenite(?)

Hand sample: Weathered surface: medium gray to medium brownish gray; fresh surface: very dark gray to black. Highly altered medium- to fine-grained igneous rock.

Description of polished thin section: Xenomorphic granular texture; highly fractured grains of clinopyroxene and olivine replaced by serpentine; abundant opaque grains.

Veins: Serpentine-- Abundant; curved serpentine-filled fractures cut all grains.
Iron oxides-- Thin, discontinuous.

Mineralogy

Nonopaque minerals:

Serpentine--55%-- Colorless to pale yellowish green; very low birefringence; has replaced much of rock; in abundant curved fractures where fibers grew perpendicular to walls; chrysotile.

Clinopyroxene (augite)--17%-- Clear; second order birefringence (blue, red, yellow); fractured grains (up to 1 mm diameter); high relief; moderate 2V (~60 degrees); biaxial +; extinction angle up to 45 degrees; replaced by serpentine; opaque inclusions aligned parallel to cleavage; locally has deformation lamellae.

Olivine--8%-- Colorless; second to third order birefringence; anhedral grains; curved cracks; remnants up to .8 mm; much has been replaced by serpentine.

Chlorite--5%-- Colorless to pale green; very low birefringence; along cleavages of biotite grains; has replaced biotite.

Orthopyroxene--2%-- Colorless; first order birefringence; orthorhombic (parallel extinction); opaque inclusions; up to .75 mm long.

Quartz--<1%-- Colorless; anhedral (.1 mm); inclusions in serpentine.

Biotite(?)--<1%-- Opaque (oxidized); most grains have been totally oxidized and replaced by chlorite.

Rutile--<1%-- Pale brown-yellow; very high relief and birefringence; associated with chromite.

13-53 (cont.)

Opaque minerals:

Iron oxides—5%-- Gray; low reflectivity; rims some spinel grains; veinlets; oxidation product of biotite, oxides, and sulfides.

Fe-rich spinel--5%-- Gray; low reflectivity; isotropic; up to 1 mm diameter; intergrown with picotite, pentlandite, and heazlewoodite; some grains have iron oxide rims; disseminated.

Pentlandite--2%-- Cream to pale yellowish pink; moderately high reflectivity; isotropic; anhedral grains (up to .25 mm); intergrown with spinel; disseminated.

Pyrrhotite--<1%-- Cream to pale yellow-brown; moderately high reflectivity; anisotropic; intergrown with pentlandite.

Chromite--<1%-- Gray; low reflectivity; isotropic; subhedral grains (Ave. ~.1 mm); intergrown with Fe-rich spinel and picotite; disseminated in clinopyroxene.

Picotite--<1%-- Dark gray; low reflectivity; isotropic; auburn brown internal reflections; associated with rutile; intergrown with Fe-spinel and chromite; Al- and Cr-rich spinel.

Chalcopyrite(?)--<1%-- Yellow; isotropic; very fine grained.

Heazlewoodite--<1%-- Light yellow to pale yellowish pink (weakly pleochroic); moderately high reflectivity; anisotropic (purple to pink); intergrown with spinel and pentlandite; very fine grained.

Iron, nickel sulfide--<1%-- Pink; very anisotropic (dark pink to lighter); inclusion (25 microns) in heazlewoodite; contains less nickel than heazlewoodite. (spot 6)

Discussion: This is part of an ophiolite complex (ultramafic wedge of the ocean crust). Due to the extensive serpentinization, it is unclear whether this rock was a peridotite (>olivine) or pyroxenite (>pyroxene) when it cooled. In either case, the opaque fraction contains nickel- and chromium-bearing minerals (see electron microprobe results).

13-54 Mica Schist

Hand sample: Weathered surface: mottled medium brown, light brown and black; fresh surface: greenish brown and white. Rock contains muscovite, quartz, feldspar, chlorite, Fe and Mn oxides, and tiny disseminated opaque grains; strong schistosity.

Description of polished thin section: Aligned dark micas with quartzite between micaceous layers; feldspar "eyes"; pods of relatively fresh muscovite in biotite; K-feldspar>plagioclase.

Veins: Chlorite-- Veinlets in K-feldspar.

Mineralogy

Nonopaque minerals:

Quartz--35%-- Clear; quartzite; recrystallized; between micaceous layers.

K-feldspar-- 20%-- Brown; cloudy due to argillic and sericitic alteration; anhedral grains (up to 4 mm); fractured; chlorite veins.

Plagioclase-- 10%-- Dark brown; faint twinning; cloudy due to sericitic and argillic alteration; broken.

Phlogopite-- 10%-- Colorless to salmon-reddish-brown; higher birefringence than biotite; "birds-eye" texture; fresh grains (1-2.5 mm long); alteration product of biotite during metamorphism.

Biotite--8%-- Light brown to medium brown to dark brown; wavy extinction; fractured; aligned parallel to schistosity; contorted; altered in part to phlogopite.

Clay--5%-- Pale brown to dark brown; illite?); alteration product of feldspars.

Muscovite/sericite--5%-- Colorless; second to third order; local; grains are up to .5 mm; very fine grained sericite is an alteration product of plagioclase.

Chlorite--1%-- Very pale green to very pale bluish green; very low birefringence; anomalous bluish grain birefringence; in fractures; iron stained; local alteration product of biotite.

Andalusite--<1%-- Colorless; first order birefringence; moderately high relief; 90 degree cleavage; biaxial negative; associated with biotite.

13-54 (cont.)

Nonopaque minerals (cont.)

Apatite--<1%-- Colorless; very low birefringence; inclusions in feldspar.

Adularia --<1% -- Colorless; negative relief; very low birefringence; in cavity.

Zircon-- <1%-- Colorless; high birefringence and relief; .1 mm; inclusion in quartz.

Opaque minerals:

Iron and manganese (?) oxides--5%-- Dark; earthy; disseminated; along cleavage planes.

Discussion: This schist was probably derived from pelitic sediments or felsic plutonic rock. There is little evidence of accompanying hydrothermal alteration.

APPENDIX J

PHOTOGRAPHS FROM ROCK OUTCROPS

Field Notes from Field Reconnaissance Meeting and Field Sampling for Objective 13: Background Rock Sampling May 23 and 24, 2000.

Personnel Present for Field Meeting:

Monica Ryan, U.S. Navy, NAVFACENGCOM, Southwest Division
Isaac Hirbawi, CA Department of Toxic Substances Control, DTSC
Andres Cano, DTSC
John Christopher, DTSC
Cindi LaCamera, MWD
Ester Diaz, Los Angeles County Department of Public Works (LACDPW)
Karin Meyer, LACDPW
Gerald Goodman, LACDPW

The SI Work Plan Addendum (Brown and Caldwell, 2000) included Figure 3-1, which outlined 100x100 foot grid locations for defining where the rock samples would be collected. Certain grids were designated as sampling locations based upon random numbers and the definition that 20 samples would provide enough data to meet the DQOs specified in the Work Plan Addendum. The work plan addendum also outlined a contingency for relocating the sample locations to different locations should access constraints be present, or if a particular grid location lacked adequate outcrops to sample.

Upon conducting field reconnaissance and the site meeting several sample locations were relocated in agreement with all parties present during the meeting (which included those representatives listed above). The following summarizes the locations based on the original grid scheme and the final disposition after the reconnaissance, field meeting, and sampling.

Location 1: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface. Brown and Caldwell personnel also removed all surface material and sampled rock below the surface.

Location 2: **Meeting Decision:** Sampling location is okay. Attempt to minimize any impact from stream flowing through channel with outcrop by sampling as high as possible on the sides of the channel. **Sampling notes:** Brown and Caldwell personnel followed recommendations from the meeting and were successful sampling the outcrop above the channel. Sampled approximately 50 feet upstream approximately 10 feet above channel banks.

Location 3: **Meeting Decision:** Sampling in area described and viewed from road will be okay. No outcrops were visible from the road. **Sampling Notes:** Brown and Caldwell personnel successfully collected this sample approximately 50 feet above the road surface in the general area viewed from road. Highway patrol stopped and asked "what the heck are you doing." No problems after we explained.

Field Notes from Field Reconnaissance Meeting and Field Sampling for Objective 13: Background Rock Sampling May 23 and 24, 2000.

Location 5: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel followed recommendations from the meeting and were successful sampling the outcrop. Brown and Caldwell personnel removed all surface material to 1 foot and sampled rock below the surface.

Location 10: **Meeting Decision:** Sampling on outcrop viewed from road will be okay. Sampling Notes: Brown and Caldwell personnel successfully collected this sample from the outcrop noted.

Location 11: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface on North side of Highway 39. Brown and Caldwell personnel also removed all surface material and sampled rock below the surface

Location 13: **Meeting Decision:** Sampling from this area is okay, but no outcrops were visible from vantage point during meeting. All personnel present decided if no outcrops were observed during closer reconnaissance, then the location would be moved to location 17. **Sampling notes:** Brown and Caldwell personnel followed performed reconnaissance of area and found that outcrops in Location 13 were poor. Moved over to Location 17 and sampled as high as possible attempting to get above high water mark. All exposed outcrop had some evidence of "bleaching" from reservoir water. Removed approximately 0.5 foot of surface material before sampling.

Location 15: **Meeting Decision:** Sampling location is okay, but attempt to locate another outcrop on south side of bluff. If need arises to sample viewed outcrop, attempt to minimize any lead enhancement from motor vehicles by removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel did not find any outcrop on south side of bluff. Brown and Caldwell personnel followed recommendations from the meeting and sampled the outcrop near the road surface, but we also removed all surface material to approximately 0.5 foot and sampled rock below the surface.

Location 18: **Meeting Decision:** Sampling location is okay, but attempt to locate another outcrop on south side of bluff. If need arises to sample viewed outcrop, attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on outcrop and removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel found an outcrop on south side of bluff downslope and away from the road, near northwestern boundary of the grid area.

Field Notes from Field Reconnaissance Meeting and Field Sampling for Objective 13: Background Rock Sampling May 23 and 24, 2000.

Location 21: **Meeting Decision:** Sampling location was not specifically identified with all parties present, but we discussed how we should attempt to locate an outcrop on south side of bluff. **Sampling notes:** Brown and Caldwell personnel found an outcrop on south side of bluff downslope, near southeastern boundary of the grid area.

Location 22: **Meeting Decision:** Sampling location is okay. Attempt to minimize any lead enhancement from motor vehicles by sampling as high as possible on the outcrop, and removing and not sampling surface exposures of the outcrop. **Sampling notes:** Brown and Caldwell personnel followed recommendations from the meeting and were successful sampling the outcrop approximately 10 feet vertically above the road surface. Brown and Caldwell personnel also removed all surface material and sampled rock below the surface.

Location 23: **Meeting Decision:** Sampling location was not specifically identified with all parties present, but we discussed how we should attempt to locate an outcrop above bleached high water line if at all possible. **Sampling notes:** Brown and Caldwell personnel found an outcrop high up on slope, near northern corner of the grid area.

Location 30: **Meeting Decision:** Sampling from outcrop near VAL as viewed from road will be okay. **Sampling Notes:** Brown and Caldwell personnel successfully collected this sample from the outcrop viewed from road. Some evidence that a grout or cement-type material was at one time sprayed near this rock was evident on portions the outcrop. Brown and Caldwell personnel removed all surface material and collected samples from deeper within the rock to avoid any influence from this material.

Location 34: **Meeting Decision:** Sampling from outcrop near eastern bluff below VAL as viewed from first pad at site will be okay. **Sampling Notes:** Brown and Caldwell personnel successfully collected this sample from the outcrop viewed from pad. Difficulty getting deep sample was encountered due to hardness of rock. All parties witnessed this sample being collected. Brown and Caldwell personnel attempted to remove as much material as possible. All parties agreed the sample was sufficient.

Location 38: **Meeting Decision:** Sampling from outcrops viewed from lower portion of facility will be okay. Attempt to get above bleaching of high water mark. Additional reconnaissance with DTSC representative Andres Cano as we were sampling location 42 (for location 45 as discussed below) indicates that entry and sampling may be difficult, Andres suggests sampling of Location 41 would be okay if access proves dangerous. **Sampling Notes:** Brown and Caldwell personnel successfully collected this sample from an outcrop above the bleaching and on the very eastern corner of Location 38.

Location 45:**Meeting Decision:** All personnel agreed that since location 45 is primarily in a paved area that sampling would occur from outcrops located towards center of Location 42. **Sampling Notes:** Brown and Caldwell personnel successfully collected this sample from an outcrop viewed by all parties. A duplicate was collected from this location.

Field Notes from Field Reconnaissance Meeting and Field Sampling for Objective 13: Background Rock Sampling May 23 and 24, 2000.

Location 46: **Meeting Decision:** Location on original map was area covered by vegetation with very difficult access. No clear outcrops were visible. Therefore, as agreed during meeting by all parties, Brown and Caldwell personnel moved this location to outcrop just under bridge at midpoint of site. **Sampling Notes:** Brown and Caldwell personnel were successful in sampling the amended outcrop location.

Location 47: **Meeting Decision:** Location agreed during meeting with stipulation that Brown and Caldwell personnel try to sample as high as possible to avoid the "leaching" effect from water in the reservoir (as observed by visual evidence of "bleaching" as noted on the rock). **Sampling Notes:** Brown and Caldwell personnel were successful in sampling this outcrop, although even at the highest point there was some evidence that we still were below the water line at some point in time. Brown and Caldwell personnel removed a fair amount of material attempting to get into rock that at least did not exhibit visual evidence of the "bleaching."

Location 53: **Meeting Decision:** Location 53 is primarily covered with asphalt and concrete. One location exists with a very weathered outcrop. This weathered outcrop was sampled before as part of the SI. Hence, a new location was picked in discussions with LACDPW and DTSC, which was located on the eastern edge of the peninsula, on an outcrop just below former Building 42015. **Sampling Notes:** The relocated sample was successfully collected from the mafic outcrop observed by Karen of LACDPW. Note this outcrop was below the water line for the reservoir discussed in Location 54, below. Brown and Caldwell personnel attempted to minimize any effect from leaching by sampling from 0.5 foot below the surface exposure.

Location 54: **Meeting Decision:** Location agreed during meeting with stipulation that Brown and Caldwell personnel try to sample as high as possible to avoid the "leaching" effect from water in the reservoir (as observed by visual evidence of "bleaching" as noted on the rock). **Sampling Notes:** Brown and Caldwell personnel were successful in sampling this outcrop, although even at the highest point there was some evidence that we still were below the water line at some point in time. Brown and Caldwell personnel removed a fair amount of material attempting to get into rock that at least did not exhibit visual evidence of the "bleaching."

The sample locations were sampled from approximately 12:30 pm, Tuesday May 23 through approximately 3:00 pm, Wednesday, May 24. Many locations were relatively easy access (i.e., walk up with minimal climbing or belay access needed). Several required rope belay or climbing. No accidents occurred, and all samples were successfully collected. All sample locations were photographed before and after sampling.

PHOTOGRAPHS OF LOCATION 1

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-01-RK-01

PHOTOGRAPHS OF LOCATION 2

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-02-RK-01

PHOTOGRAPHS OF LOCATION 3

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-03-RK-01

PHOTOGRAPHS OF LOCATION 5

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-05-RK-01

PHOTOGRAPHS OF LOCATION 10

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-10-RK-01

PHOTOGRAPHS OF LOCATION 11

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-11-RK-01, 13-11D-RK-01

PHOTOGRAPHS OF LOCATION 15

Outcrop prior to sampling.

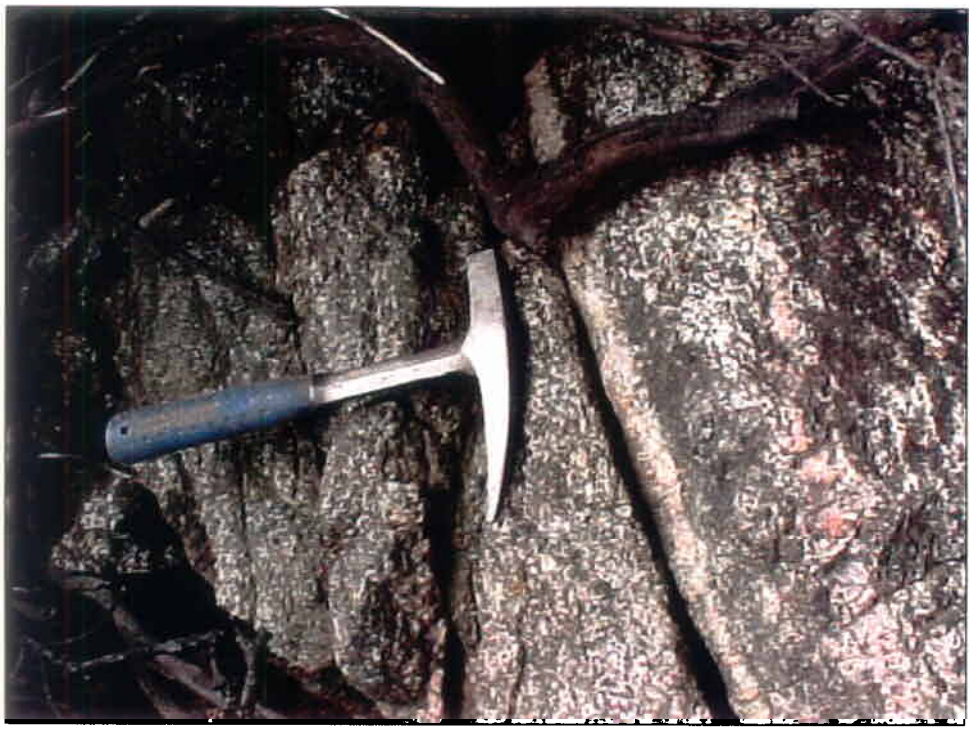
Outcrop after sampling.
Sample Number : 13-15-RK-01

PHOTOGRAPHS OF LOCATION 17

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-17-RK-01

PHOTOGRAPHS OF LOCATION 18



Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-18-RK-01

PHOTOGRAPHS OF LOCATION 21

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-21-RK-01

PHOTOGRAPHS OF LOCATION 22

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-22-RK-01

PHOTOGRAPHS OF LOCATION 23

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-23-RK-01

PHOTOGRAPHS OF LOCATION 30

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-30-RK-01

PHOTOGRAPHS OF LOCATION 34

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-34-RK-01

PHOTOGRAPHS OF LOCATION 38

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-38-RK-01

PHOTOGRAPHS OF LOCATION 42

Schist of outcrop prior to sampling.

Schist of outcrop after sampling.
Sample Number : 13-42-RK-01

PHOTOGRAPHS OF LOCATION 42

Pelagic portion of outcrop prior to sampling.

Pelagic portion of outcrop after sampling.
Sample Number : 13-42D-RK-01

PHOTOGRAPHS OF LOCATION 46

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-46-RK-01

PHOTOGRAPHS OF LOCATION 47

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-47-RK-01

PHOTOGRAPHS OF LOCATION 53

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-53-RK-01

PHOTOGRAPHS OF LOCATION 54

Outcrop prior to sampling.

Outcrop after sampling.
Sample Number : 13-54-RK-01